Western Cape Government
Economic Development and Tourism

Final Report

CONDUCTING SPECIFIC DIAGNOSTICS ON TRANSPORTER CONGESTION IN THE PORT OF CAPE TOWN LOGISTICS CHAIN AND MAKE RECOMMENDATIONS

ECONOGISTICS

EXECUTIVE SUMMARY

The effectiveness and efficiency of the Port of Cape is a strategic priority for Western Cape Government, as expressed in policy documents, State of the Province addresses and media statements.

One of the priorities was to reduce transporter congestion as a means to improve fluidity in the port logistics chain and to ensure the financial sustainability of transporter businesses. The focus has expanded from the Port only to the entire logistics chain. The anticipated cargo growth over the next five years has been quantified and requires a more robust, resilient, and efficient transporter component in the port logistics chain.

The following factors can be concluded from the study:

Port of Cape Town

- The single biggest constraint of the supply chain is the status of the RTGs and other operating equipment. Only 4 of the 23 RTGs are fully operational.
- Four RTGs are equipped with anti-sway equipment, but at the time of the surveys, it was never utilised when the port is shut down due to strong wind.
- A number of RTGs are standing out of service waiting for spare parts
- New truck drivers to the Transnet Port Terminal (TPT) did not always know where to drop containers and caused traffic flow problems in the port area.
- Night shift only pulls approximately 10% of the traffic and is therefore under-utilised and not cost-effective.
- Transnet National Ports Authority (TNPA) security and Transnet Port Terminal (TPT) security operate as two independent systems with limited communication.
- Handover between shifts is problematic and the procedures need to be tightened, i.e. formal written handovers.
- The TNPA security does not have access to the list of truckers with bookings and therefore allows access to the port randomly.
- Scanners at the gate do not always work and access is manually granted.
- The number of gates that allows access to the trucks and traffic management in the port is a matter of concern and should be investigated further.
- Trucks turning on Duncan Road could lead to incidents and should be resolved.
- The temporary staging area generates a lot of dust that is against the policy of the port and needs to be resolved.
- TNPA has identified Culemborg as a potential back of Port facility and the land was recently transferred from Transnet Properties to TNPA.

Gate systems

- The Truck Booking System (TBS) is similar to systems used internationally and is integrated with NAVIS.
- Compared with the "One-Stop" Vehicle Booking System (VBS), the TBS is limited and needs to be investigated for future expansion.
- Making bookings in the time that a block is open is a major constraint and the number of gate-bookings are limited. The impact is that trucks start queueing in Marine Drive, waiting for a block and TBS to open to make bookings.

- Truckers are also calling TPT operations to get a booking without making a reservation through the system.

Stakeholder engagement

The following conclusions were made from the stakeholder engagement:

- The productivity of the trucker's assets reduced from three loads per day to one load per day, due to the queuing of vehicles in the port and the low productivity of the TRG operators.
- The queuing of vehicles on Marine Drive resulted in criminal activities.
- One truckers' association already has a web-based system to manage approximately 600 trucks, which is the recommended way forward for other users.
- A truckers' association proposed a truck stop and holding area at Culemborg, which might be the best back-of-port facility available.
- The wind factor has been highlighted as the single biggest factor for delays in the terminal and solutions should be investigated to limit the impact thereof.
- Stakeholders pointed out that the low-performance of TPT operations have a big impact on the delays experienced and the resulting queuing of vehicles.

Diagnostic analysis

The following conclusions can be made from the diagnostic analysis:

- The project team did not manage to obtain historical data on time from TNPA and TPT.
- The literature review highlighted the impact of port delays, particularly delays caused by the wind. In February 2023, 237 minutes operational time were lost and approximately ten vessels could not gain access to the port.
- The grapes and deciduous fruit peak period are generally in the summer months and are directly affected by port delays.
- The unavailability of cranes and Rubber Tyre Gantry's (RTGs) in the Port seems to be a bigger concern than windbound delays and TBS challenges.
- Communication and transparency can mitigate the weather's impact on the port stakeholders' supply chain and it seems that the various WhatsApp groups are playing a part in achieving this.

The following recommendations are made based on the study:

- Transnet and Industry need to explore the possibility or opportunity of private investment to accelerate the procurement of new RTGs and/or to assist in procuring critical spare parts for the RTGs as a high priority.
- Transnet and Industry to explore the possibility of appointing a Private Service Provider (PSP) to operate the terminal.
- The Industry and Freight Forwarders to engage with Transnet to utilise a night shift for priority containers/reefers.
- Set up a workshop with TNPA and TPT to:
    - Address the lack of a traffic management plan and what such a traffic plan should look like.
    - Relook at the traffic flows in the temporary staging area and turning points.
    - Investigate the possibility of identifying trucks at the port gate that are registered before granting access to the port (possible integration with TBS or enabling the functionality of the scanner to identify registered trucks).

  - Address operational issues at the existing staging area before A-Check.
  - Reconfigure the movement of trucks at A-Check.
- Set up a workshop with the WC Government, Trucker Associations, Freight Forwarders and Industry to:
  - Develop a platform based on the existing web-based system to manage containers or consignment between the port and pack houses.
  - Implement a pilot site with a few truckers to test the effectiveness of the web-based system.
  - Integrate the web-based system with TPT systems.
  - Record keeping of truck movement through the different gates at the port.
- WhatsApp groups can be further enhanced by manually introducing notifications or by using a system to share notifications when a stack is open or closed for a booking. Moving containers and managing trucks from the packhouse to the port will be much more effective. This can be read with the previous point but can be implemented and tested earlier.
- Truck Turnaround Times (TTT), a critical supply chain measurement, should be extended beyond gate-in and gate-out at the Port, as the closure of the port is not currently calculated in the metrics or the impact on the industry.
- Terminal intelligence should be improved by increasing the level of data coordination between the port's terminal stakeholders, by performing calculations that enable appropriate trade-offs, which will inform better decision-making related to the terminals.
- Integrate OCR (Optical Character Recognition) software with existing software. OCR technology can scan all incoming and outgoing vehicles or value-added attributes as determined.
- Compared with One-Stop Vehicle Booking System, the TBS system is limited and needs to be investigated for future expansion.

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GLOSSARY

CTCT	Cape Town Container Terminal
CPT	Container Port Terminal
CTHCA	Cape Town Harbour Carriers Association
CTMPT	Cape Town Multi-Purpose Terminal
CTO	Container Terminal Order
DEDAT	Department of Economic Development and Tourism
EoDB	Ease of Doing Business
FDM	Freight Demand Model
FPEF	Fresh Produce Exporters Forum
GCH	Gross Crane moves per Hour
NAVIS	Navis is the global standard for terminal operating systems
PoCT	Port of Cape Town
PRDW	Port and Coastal Engineering
RTG	Rubber Tyre Gantry
SAAFF	South African Association of Freight Forwarders
SWH	Ship Working Hours
TBS	Truck Booking System
TEU	Twenty Foot Equivalent Unit
TFR	Transnet Freight Rail
TFUSA	Truckers for Unity South Africa
TNPA	Transnet National Port Authority
TPT	Transnet Port Terminals
TTT	Truck Turnaround Times
VBS	Vehicle Booking System
VGM	Verified Gross Mass
WC	Western Cape

1 INTRODUCTION

1.1 Purpose of the Report

The effectiveness and efficiency of the Port of Cape is a strategic priority for Western Cape Government, as expressed in policy documents, State of the Province addresses and media statements.

DEDAT has deployed resources since 2019 to give expression to this strategic priority. One of the priorities was to reduce transporter congestion as a means to improve fluidity in the port logistics chain and to ensure the financial sustainability of transporter businesses.

The first DEDAT research project into the root causes of transporter congestion was conducted in 2021. The investigation results provided valuable insights to WCG, industry, Transnet and the City of Cape Town on the transporter component of the port logistics chain. The action research outcome included designing and implementing a truck booking system by Transnet Port Terminals and the development of two-way communication systems between the terminal and transporters. This study will be made available to the successful bidder.

Interventions emanated from the first transporter congestion study were useful, but the situation is continuously evolving, especially regarding the entry of a new group of emerging transporter businesses. Secondly, the focus of DEDAT has expanded from the Port only to the entire logistics chain. Thirdly, the anticipated cargo growth over the next five years, which DEDAT has now quantified, requires a more robust, resilient, and efficient transporter component in the port logistics chain than currently. Further and more nuanced investigations and interventions are therefore required.

It is the objective of DEDAT to promote a high growth outcome, for which efficient transporter services are needed.

The following definition transport congestion are applicable to the study.

Transport congestion

The definitions of the term congestion mention such words as "clog," "impede," and "excessive fullness. In the transportation realm, congestion usually relates to an excess of vehicles on a portion of the roadway at a particular time resulting in speeds that are slower or congestion often means stopped or stop-and-go traffic.

1.2 Scope of Works

The scope of work required a focus on the following:

b) Engage stakeholders to plan and execute the assignment with adequate consensus. A stakeholder list is provided below.

c) Select appropriate indicators and conduct data analysis on truck turnaround time in Cape Town Container Terminal and Cape Town Multi-Purpose Terminal for 12 months before and 12 months after the implementation of the Truck Booking System, which was in October 2021.
d) Compare the Truck Booking System (TBS) in Port of Cape Town with global best practices and identify local system improvement opportunities.
e) Assess transporter behaviour on the TBS and document findings on undesirable behaviour, such as making but not using block bookings.
f) Conduct a pilot survey of 20 truck drivers parked on Marine Drive and Duncan Road and advise how the problem of illegal parking should be addressed. The survey should include the following:
   - Reason for parking.
   - Owner of a truck with contact details
   - Expected parking time.
g) Provide professional and stakeholder perspectives on Duncan Road's temporary truck parking facility's contribution to reducing truck congestion.
h) Conduct a pilot data analysis of two transporter WhatsApp groups created to improve communication between truckers and shift managers in the container terminal. Comment on the themes that are found and trends in these themes. It is envisaged that this work should not exceed a person/week respectively for a data analyst and a data scientist. Content on the WhatsApp groups will be provided to the successful bidder.
i) Conduct a preliminary analysis on trucks permitted to call at the Port of Cape Town container terminals. The analysis will be conducted in terms of at least the following data:
   - Number of trucks and frequency of visits
   - Truck Ownership
   - Membership of trucker associations
j) Document the process of issuing terminal container orders (from shipping lines and freight forwarders to transporters) and consider how this process can be optimised to reduce the bunching and congestion of trucks.
k) Stakeholder engagement should include at least the following persons:
   - Container terminal managers
   - Port, Port Operations and Port Security Managers
   - Representatives of 3 Trucker Associations in Port of Cape Town
   - South Africa Association of Freight Forwarders
   - Metro Police in the City of Cape Town

2 STRUCTURE OF REPORT

The project structure consists of the following:

- Literature review
- Stakeholder Engagement
- Diagnostic analysis
- Fieldwork
- Overview of Duncan roads temporary truck parking facility
- Benchmark the TBS with Global systems
- Transport behaviour on TBS
- The process from Freight forwarders to Port Terminal

2.1 Literature Review

The Department of Economic Development and Tourism has provided the following previous studies to be reviewed as input to the study.

2.1.1 Port Congestion and Efficiency Study, PRDW study, 2021

At a macro level, the landside container logistics chain can best be illustrated with the aid of a flow chart, as presented below in Figure 1.

Approximately 80% of the containers arrive at the Port of Cape Town or leave through the port terminals to inland port terminals. The majority of imported containers are collected by a container transporter and hauled directly to an importer, where the container is offloaded whilst the truck waits. The empty container is then transported to one of several empty container depots in the region. Approximately 20% of the imported containers may be taken to an unpacking facility. The container will be offloaded at the facility for amalgamation with larger loads or distribution to smaller importers. Once offloaded, the empty container will be returned to an empty container depot.

Containers for export follow the same process but in reverse. Due to demand surges and trade imbalances, the ratio of full and empty containers varies and containers also need to be shipped to and from the Port directly from the empty depots. Hence there is a general continuity of volume in the container logistics chain. A similar number of imported containers, through the port terminals, is subsequently received by the empty depots. An equal number of containers are dispatched from the empty container depots to the Port for export. In most typical years, imported and exported container volumes are similar.

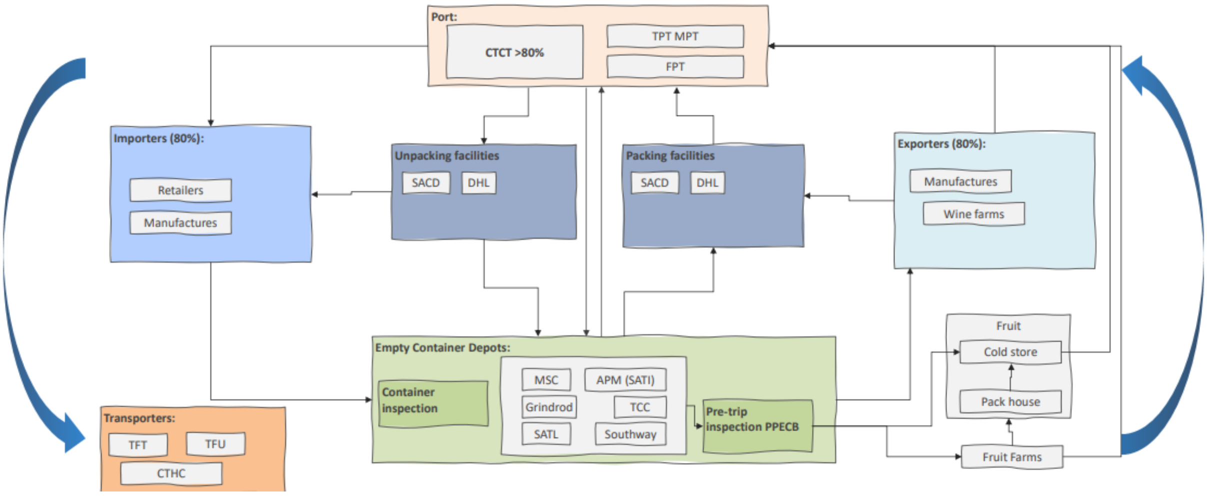


Figure 1: Macro Logistics Supply Chain Chart
Source: Adapted from Cape Town Port Congestion and Efficiency Study, PRDW (2021)

The consolidation of empty containers at empty container depots is a key component of the logistics chain. It allows shipping lines to check their containers for damage and provides low-cost storage for stock buffering.

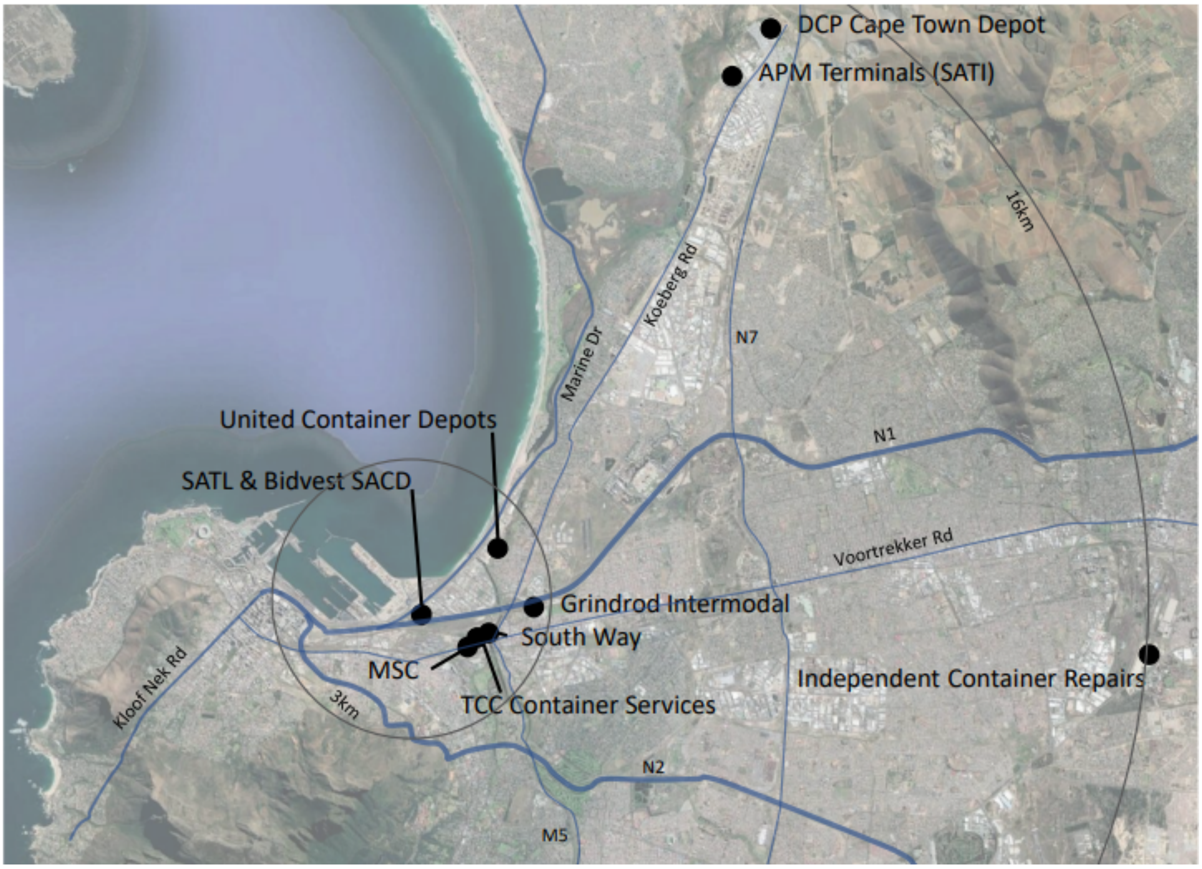


Figure 2: Cape Town Empty Container Depots
Source: Cape Town Port Congestion and Efficiency Study, PRDW (2021)

The inland empty container depots in the Cape Town region are mapped in Figure 2 above, showing that most terminals are within a 3km radius of the port.

The data in Figure 3 revealed no consistent gate flow of traffic through to the terminal. The trucks enter the terminal in the early morning hours. Trucks exit the terminal irregularly and the throughput is slow, which is one of the reasons why trucks start to queue before the A-Check gate.

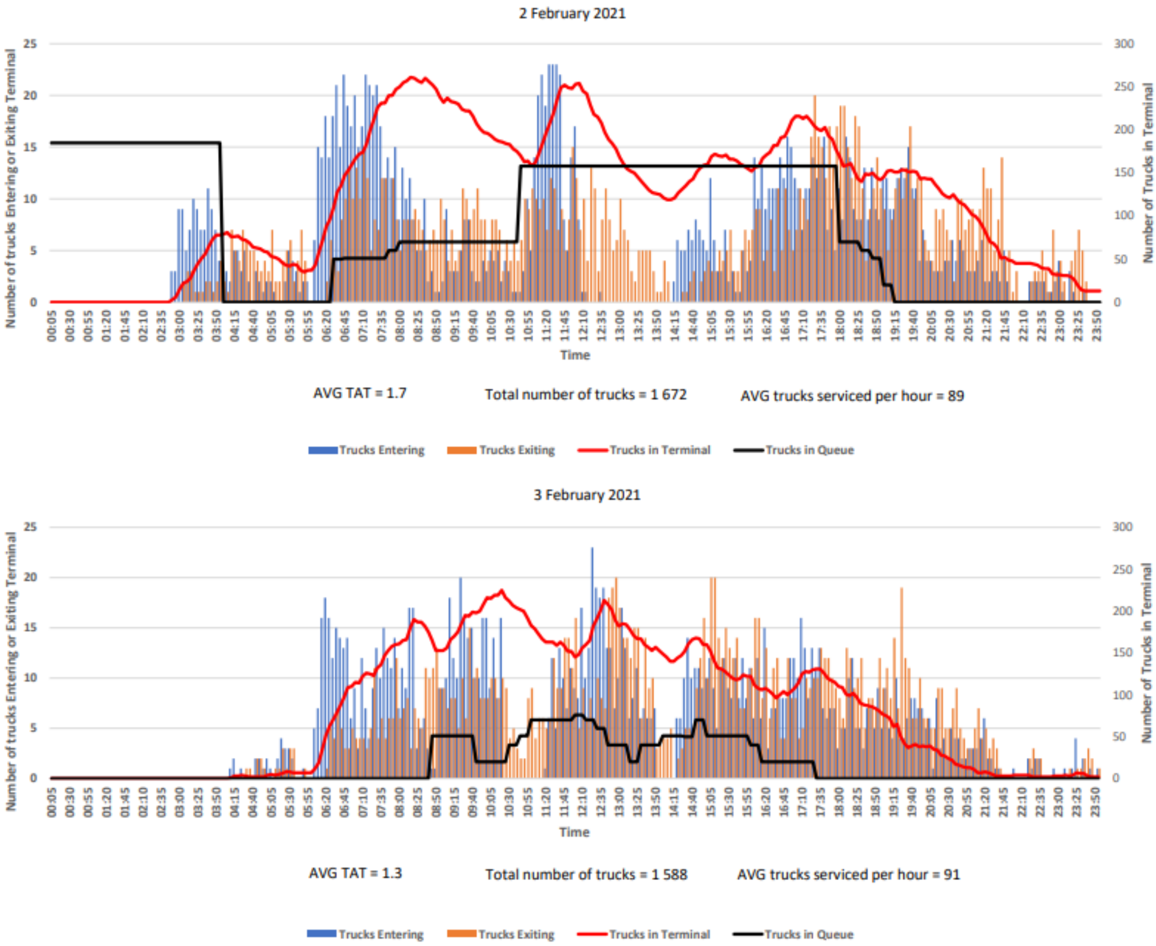


Figure 3: CTCT gate flows, A-Check queue and trucks in terminal
Source: Cape Town Port Congestion and Efficiency Study, PRDW (2021)

The PRDW Transport Congestion Study (2021) identifies the following focus areas to reduce traffic congestion:

- Improvement of traffic control measures.
- Traffic control is a major issue as the terminal's truck staging area is limited to approximately 60 trucks. With 250 trucks frequently waiting to access the terminal, the overflow results in congestion along the main port road (Duncan Dock Road). Transnet is designing a new truck staging area for the Terminal Phase 2B Expansion project. The new truck staging and gate are expected to reduce the congestion along Duncan Dock Road. However, the truck staging area will not change the waiting times of trucks, it will just provide a designated area for staging trucks.
- Improvement of cooperation in the Port.
  This is an area that has, in recent times, improved significantly. For example, the terminal holds weekly meetings with stakeholders and sends SMSs when there are operational

problems. There is, however, an opportunity for more transparency. The transporters to develop a prototype phone app to meet these objectives.

- Improvement of truck scheduling.
  It is required that the "Truck Appointment Systems" improves to influence truck arrivals positively.

All these improvement means are similar in that the aim is to flatten demand peaks and spread out the demand on the terminal.

The following key interventions are discussed below in the PRDW report:

- Influencing truck arrival times represents an opportunity for synchronisation of the logistics chain.
- Shift changes have been identified as a problem.
  - Shift changeover times need to be reduced by ensuring the relief shift is at the gate when the working shift ends.
- Night-time operations and catch-up gangs after wind delays.
  - After significant wind delays, there is significant pent-up demand the next day. In most cases, there are also overnight queues. Therefore, the terminal should proactively open when the wind drops at night and allow all container types, not reefers.
- Night shift delivery for reefers
  - The fruit export industry experiences significant peaks and represents high volumes with relatively few stakeholders. Thus, this is part of the logistics chain that can be synchronised to enable off-peak operations. This could potentially be achieved by an organisation rather than an incentive. The stakeholders include CTCT, empty depots, transporters, and cold stores.

2.1.2 Agrihub Inform, March 2021

Figure 4 indicates that the shelf-life of fresh produce varies by commodity group and products. Grapes, for instance, have a shorter shelf life than Citrus and will reflect the age at which stock arrives at the Port. Citrus can be kept much longer in the supply chain. The planning in the terminal should make provision for a product's shelf-life and seasonality.

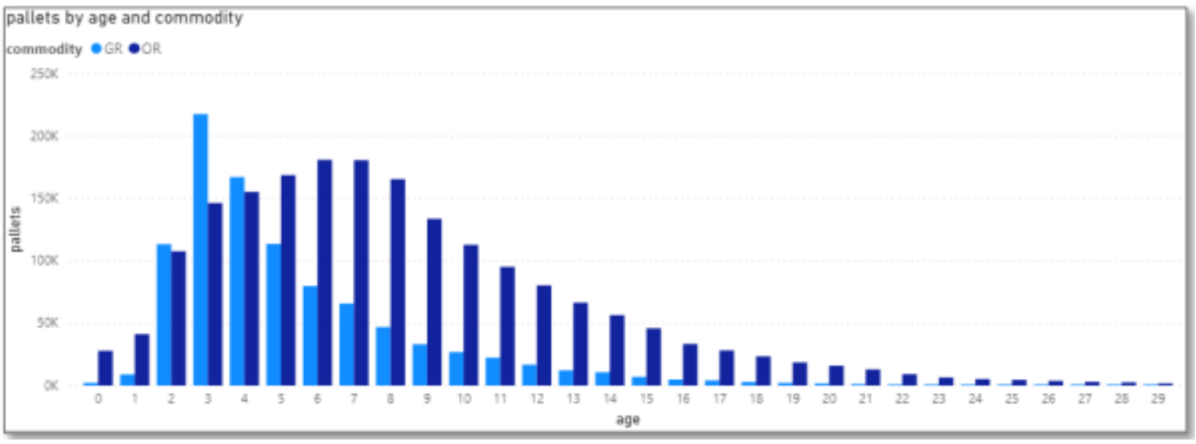


Figure 4: Stock age for arrival at the terminal, Grapes(GR) compare to Oranges (OR)
Source: Agribub Inform (2021)

Figure 5 illustrates the flow per commodity where zero represents stock shipped on the same day it entered the terminal, whereas two represents the third-day stock in the terminal.

The vessel berth date (Day Zero) impacts how the containers arrival at the terminal. This is directly linked to the parcel size per vessel, but a build-up of containers starts six days before the docking of a vessel. 90% of the containers arrive before or on the date (Day zero). If the vessel is stationed outside the port due to strong winds, the storage capacity can be severely affected in the stacks.

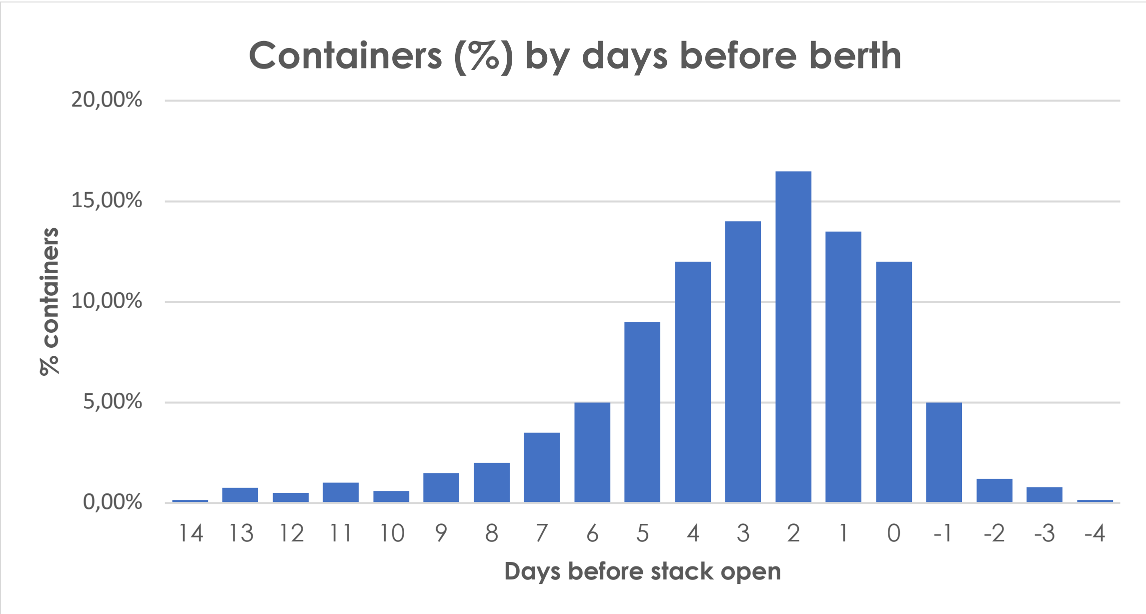
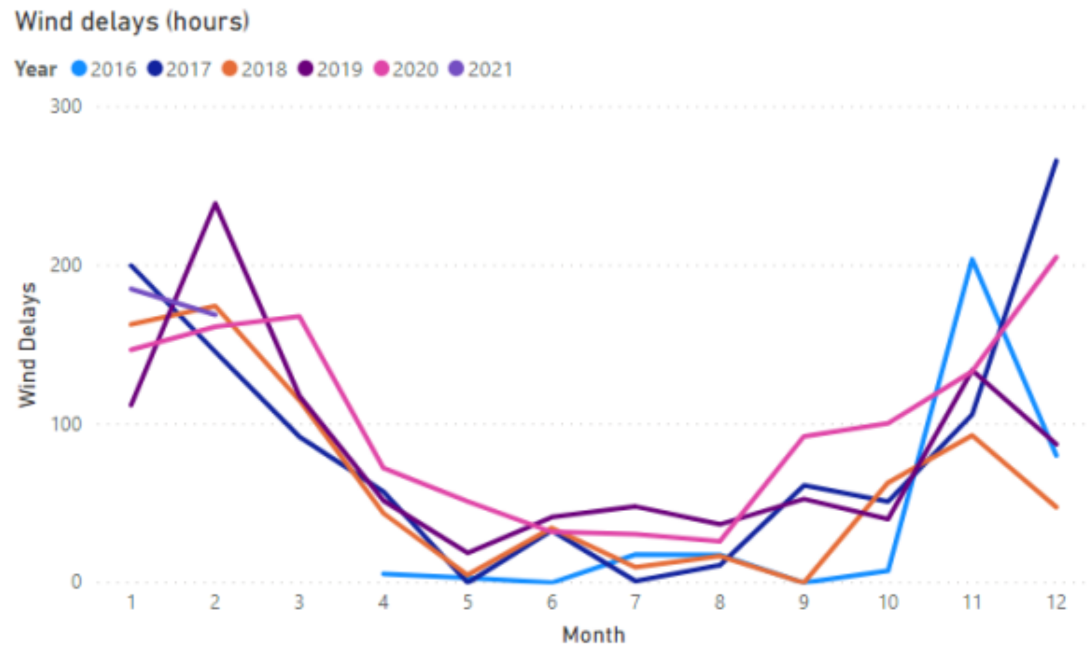


Figure 5: Container arrivals before vessel berthing
Source: Agribub Inform (2021)

Figure 6 shows that the Port of Cape Town is known for delays due to strong winds in the summer months. Potgieter, Goedhals-Gerber and Havenga note that straddle carriers are able to operate in wind speeds of up to 85km/h and gantry cranes in speeds of up to 100km/h.

If wind speeds surpass these limits, operators should make an informed choice whether to proceed with operations or not. The general rule of thumb in the Port of Cape Town is to close the Port for all operations when windspeeds exceed 80 km/h. Potgieter et al., found that the average time delay (hours) in summer months differed from that of winter months. According to the information in the graph, the average wind-related delay in summer is 11.83 hours per day; in winter, the delay lasts an average of 6.12 hours per day.



Month	2016	2017	2018	2019	2020	2021	Total
1		200.08	162.92	112.15	146.93	185.32	**162.92**
2		145.75	174.48	239.23	161.47	169.07	**169.07**
3		92.15	115.23	117.95	168.00		**116.59**
4	5.58	57.58	43.83	51.82	72.33		**51.82**
5	3.00	0.00	4.92	18.83	51.38		**4.92**
6	0.00	33.00	34.58	41.33	32.08		**33.00**
7	17.83	1.00	9.83	48.10	30.58		**17.83**
8	17.67	11.00	16.83	36.83	26.22		**17.67**
9	0.00	61.42	0.00	52.83	92.42		**52.83**
10	7.50	51.25	63.17	40.17	100.65		**51.25**
11	203.95	106.08	92.95	133.97	133.33		**133.33**
12	80.33	266.08	47.73	87.42	205.37		**87.42**

Figure 6: Hours lost due to wind at SACPT by month (2016-2021)
Source: Agribub Inform (2021)

As containers start to arrive for intended vessels and if plans change, the stack close date can change, which explains why containers continue to arrive after stacks have closed.

Figure 7 and Figure 8 illustrate the impact of trucks arriving too early or too late, resulting in queueing on Duncan Road and Marine Drive, where trucks need to wait for the stack to open or re-open again.

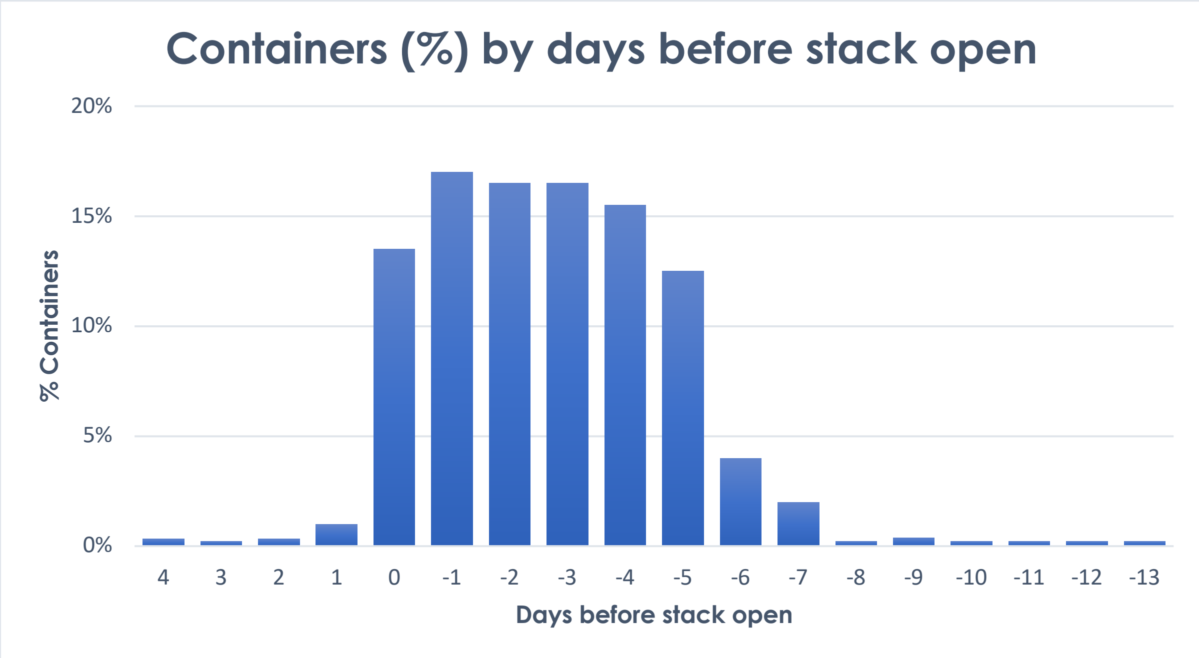


Figure 7: Arrival of containers before stacks open
Source: Adapted from Agribub Inform (2021)

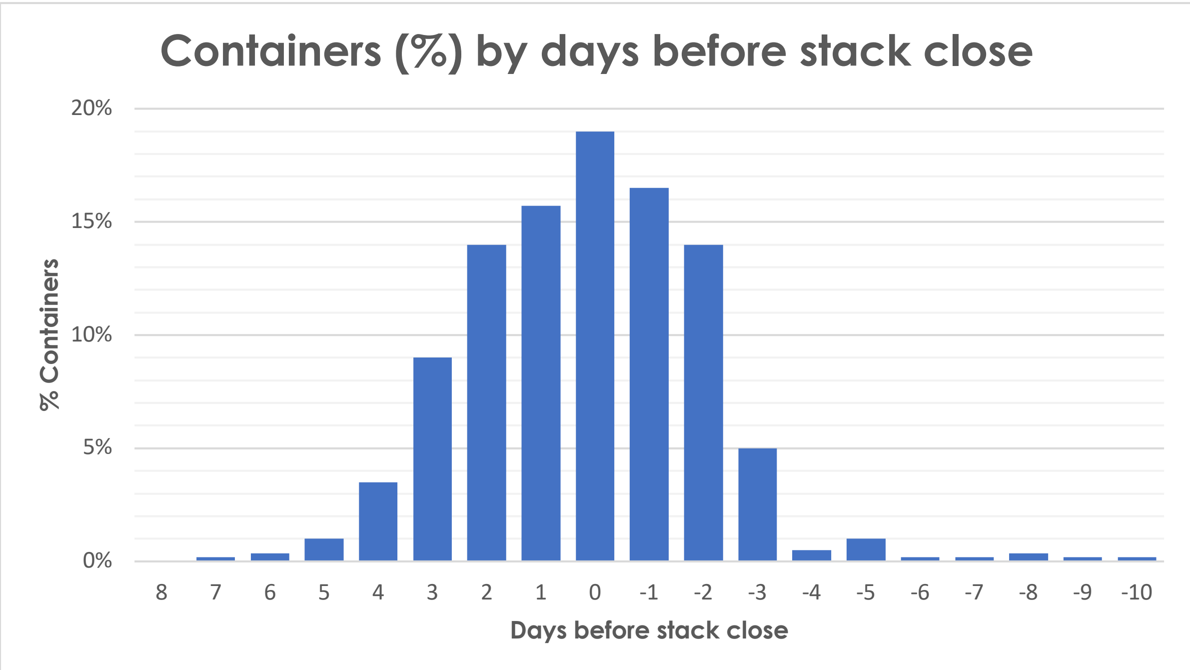


Figure 8: Arrival of containers before stack close
Source: Adapted from Agribub Inform (2021)

2.1.3 Overview of the Port's Freight Flows, Gain Group Data WC "FGM TM."

This section discussed the Port's flows in relation to National and Provincial freight.

2.1.3.1 Fruit

A monthly disaggregation of the Agrihub data provides visibility of the seasonal patterns experienced by each commodity group and the specific underlying commodities, as shown in Figure 9 below. Table grapes are the dominant fruit type by pallets exported through the PoCT in 2021.

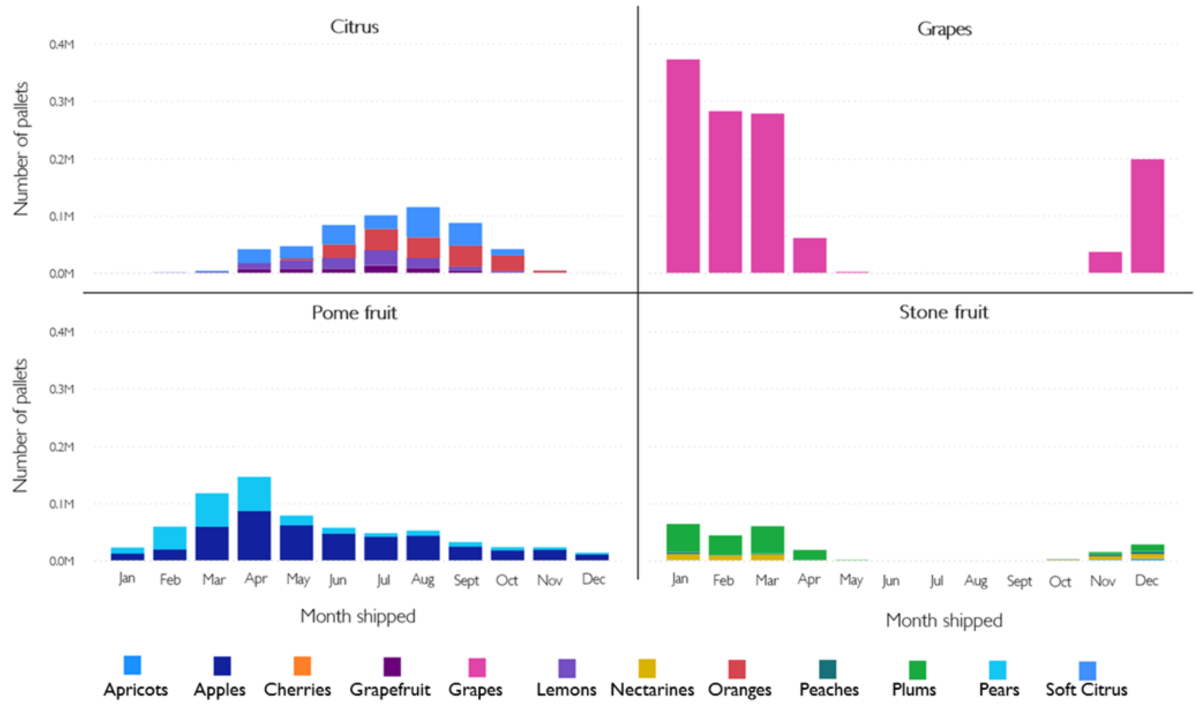


Figure 9: Monthly disaggregation of fruit types linked to the Port of Cape Town
Source: Agrihub Inform (2021)

The location of cold stores and container volumes by fruit commodity group types are mapped out in Figure 10 below. As can be seen in the chart at the bottom right of the map, citrus fruit represents most of the container movements. Pome fruit also contributes a considerable share, followed by a lesser contribution in the grape and stone fruit commodity groups.

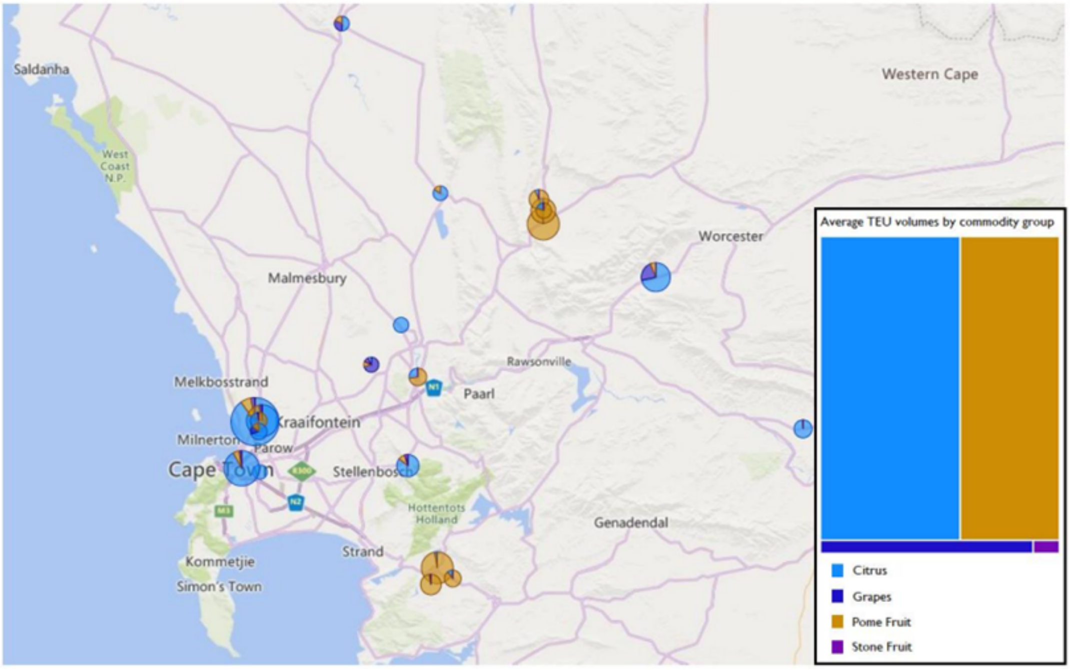


Figure 10: Locations and relative volumes of cold fruit stores linked to the Port of Cape Town
Source: Agrihub Inform (2021)

2.1.3.2 Containerised and Non-containerised Cargo

The PoCT's disaggregated port flow volume contributions for 2020 are shown in Figure 11 below, indicating the import or export percentages of the flows.

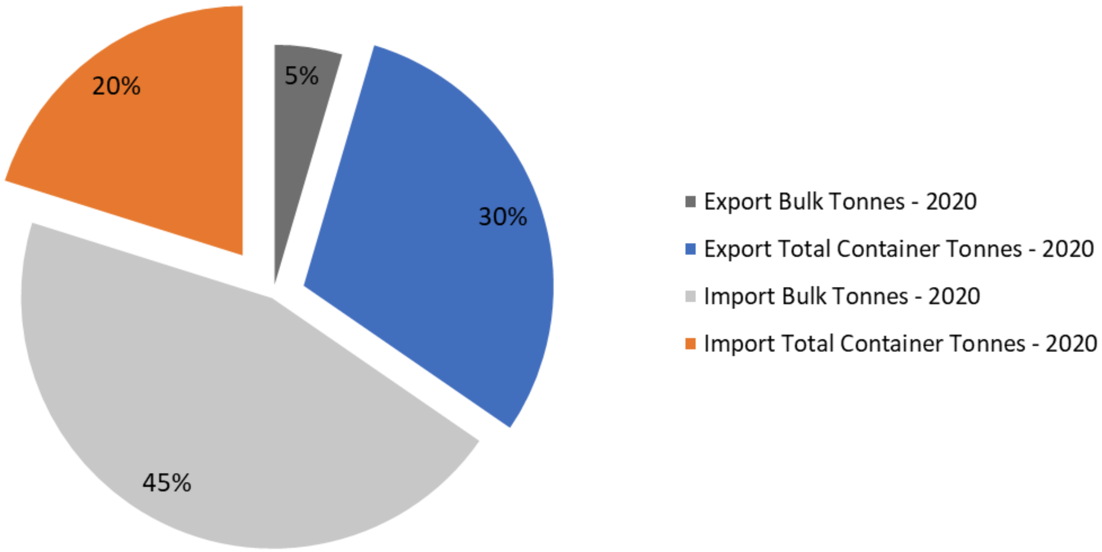


Figure 11: Disaggregated port volumes by direction, for non-containerised and containerised for 2020
Source: WC FDM™ Port Enhancement (2020)

Non-containerised (bulk) imports of 4.3 million tonnes represent nearly half (45%) of the PoCT's flows, while containerised imports of 1.9 million tonnes account for a further 20%. This supports the PoCT's reputation as a predominantly import-orientated port (6.2 million tonnes, 65% of all flows). While the containerised exports of 2.9 million tonnes contribute a substantial volume of 30% to the port's total flows, non-containerised (bulk) exports of 0.4 million tonnes represent a mere 5% thereof. The biggest portion of the non-containerised (bulk) imports is liquid petroleum fuels.

Export and import containerised cargo can be disaggregated further by container type, namely Dry, Reefer 20-foot and 40-foot containers. Figure 12 splits the total flow contributions of containerised exports and imports, namely 30% (2.9 million tonnes) and 20% (1.9 million tonnes) respectively, according to the volumes related to each container type.

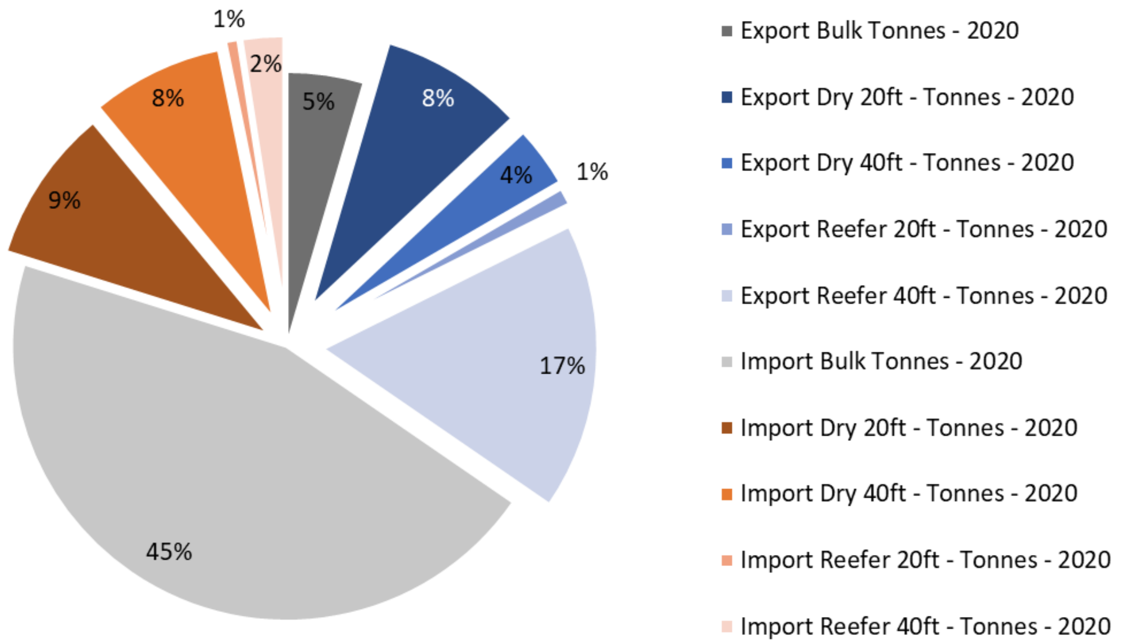


Figure 12: Disaggregated port volumes by direction for non-containerised and per container type for 2020
Source: WC FDM™ Port Enhancement (2020)

It is evident from the pie chart above that Dry 20-foot containers account for most (45.4%) of containerised imports (9% of PoCT trade), followed closely by the 38.7% contribution of the larger 40-foot counterparts (8% of PoCT trade). Refrigerated containers are, therefore, used for relatively few containerised imports, more specifically 3.7% (1% of PoCT trade) and 12.2% (2% of PoCT trade) for smaller 20-foot and larger 40-foot reefer containers, respectively.

In contrast, Reefer 40-foot containers represent most (56.4%) of containerised exports (17% of PoCT trade), which is double the next closest 28.2% contribution (8% of PoCT trade) of Dry 20-foot containers. The 17% of the 40-foot reefer containers can be ascribed to fruit commodity exports. The larger dry counterparts represent 12.0% (4% of PoCT trade), while the contribution of smaller refrigerated containers is nearly negligible in comparison at 3.4% (1% of PoCT trade). Table 1 below depicts the exact breakdown of these volumes in tonnes.

Table 1: The Port of Cape Town's containerised flow volumes by container type for 2020

Container type	Export tonnes (% of containerised exports)	Import tonnes (% of containerised imports)	Total tonnes (% of container trade)
Dry 20ft	805 088 (28.2%)	869 665 (45.4%)	1 674 753 (35.1%)
Dry 40ft	342 727 (12.0%)	740 731 (38.7%)	1 083 457 (22.7%)
Reefer 20ft	96 594 (3.4%)	70 411 (3.7%)	167 006 (3.5%)
Reefer 40ft	1 612 218 (56.4%)	234 957 (12.2%)	1 847 175 (38.7%)
Total	**2 856 627 (59.9%)**	**1 915 764 (40.1%)**	**4 772 391 (100%)**

Source: WC FDM™ Port Enhancement (2020)

Containerised cargo by commodity

The container exports and imports tonnes per commodity are shown in Figures 13 and 14, respectively.

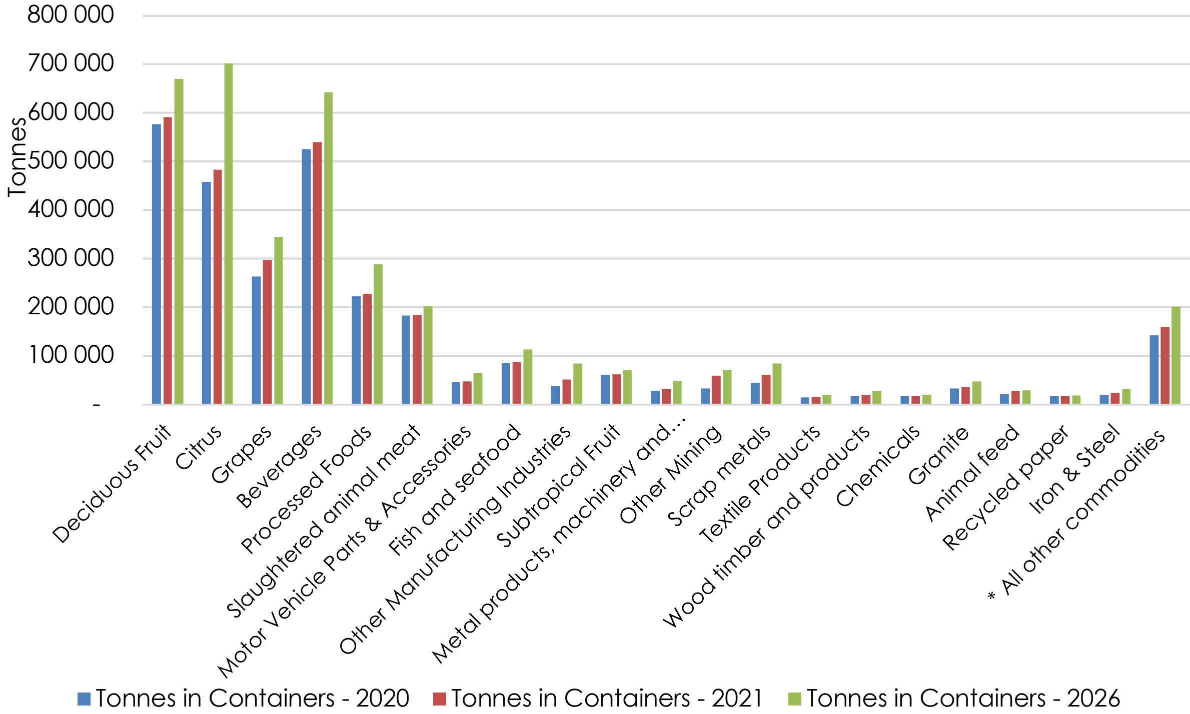


Figure 13: Tonnes per commodity for export containers
Source: WC FDM™ Port Enhancement (2020)

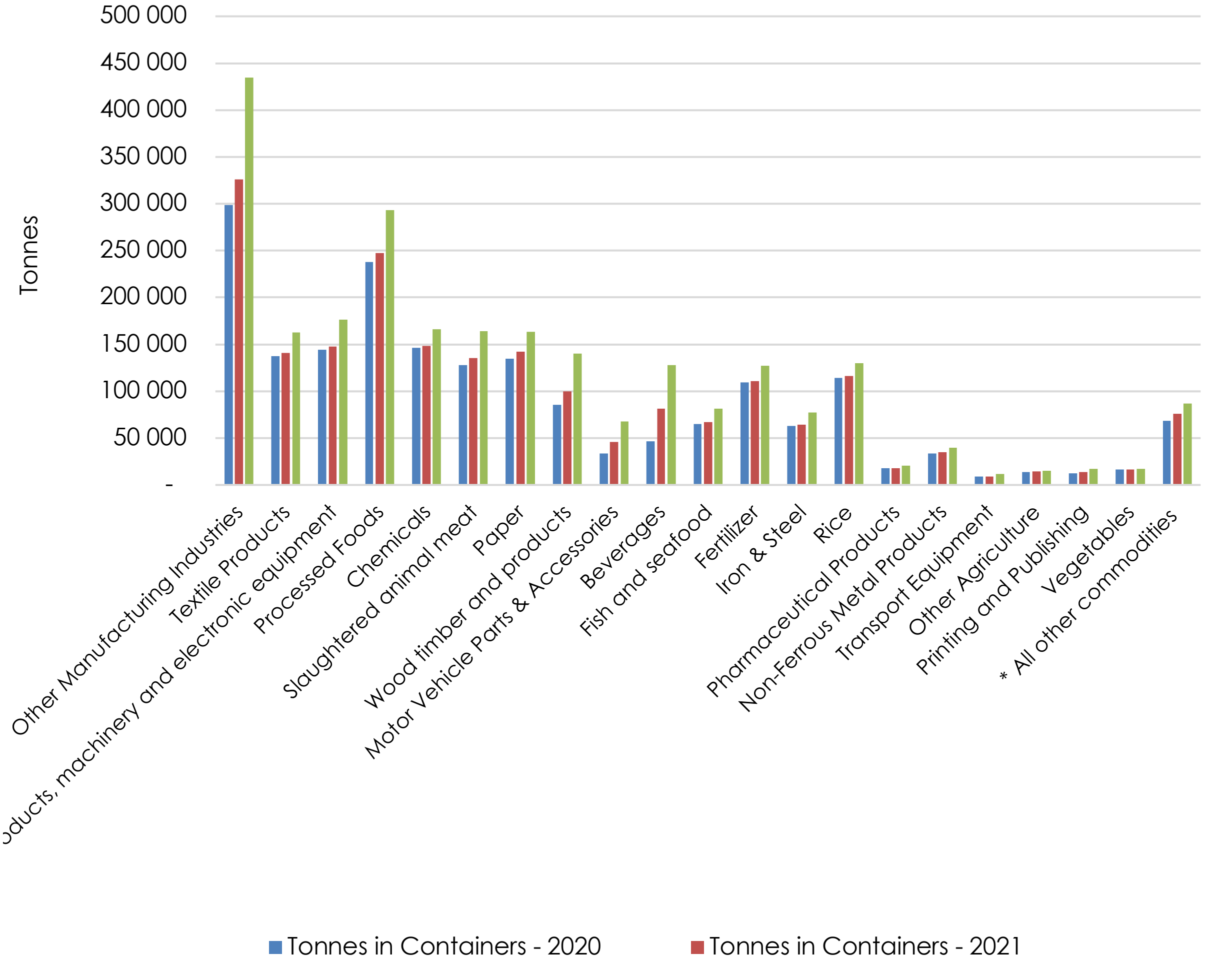


Figure 14: Tonnes per commodity for import containers
Source: WC FDM™ Port Enhancement (2020)

2.1.3.3 Containerised Cargo by Month in 2020

The data also allows the frequency of the PoCT's containerised cargo flows to be split by month. Figure 15 on the next page shows the Port's monthly export TEUs by container type for 2020.

Figure 15: Export TEUs per month and per type for 2020
Source: WC FDM™ Port Enhancement (2020)

July is the busiest month for export containers (26 474 TEUs), while May is the least busy (16 035 TEUs). Figure 16 below provides the same disaggregation but for the PoCT's containerised cargo imports.

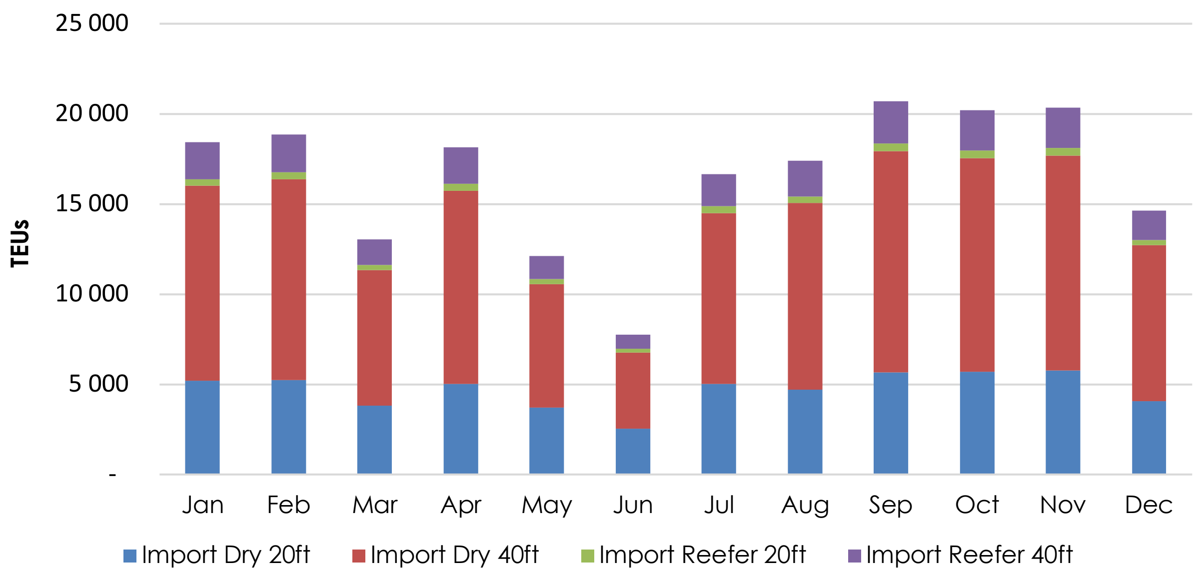


Figure 16: Import TEUs per month and per type for 2020 (WC FDM™ PE)
Source: WC FDM™ Port Enhancement (2020)

The graph in the figure above shows September is the busiest month for import containers (20 693 TEUs), with June being a very quiet month for container imports in comparison (7 765 TEUs). It is important to note the difference between the graphs in Figures 17 and 18, which shows that the port exported more containers than it imported in 2020.

2.1.3.4 Containerised Cargo by Month in 2021

Because the enhanced WC FDM™ includes data beyond the base year, it is also possible to provide a higher-frequency projection of these disaggregated monthly cargo flows for 2021. Figure 17 below shows the Port's monthly export TEUs by container type for 2021. The graph shows February is the busiest month for export containers (27 419 TEUs) in 2021, although just narrowly more than the months of March, June, and July. October was the least busy month (17 703 TEUs).

Figure 18 on the next page shows this information for the PoCT's import containers. In 2020, September was the busiest month for import containers (22 253 TEUs) in 2021, with October and November also being similarly busy months. Like in 2020, the least busy month for container imports in 2021 was June with 8 347 TEUs.

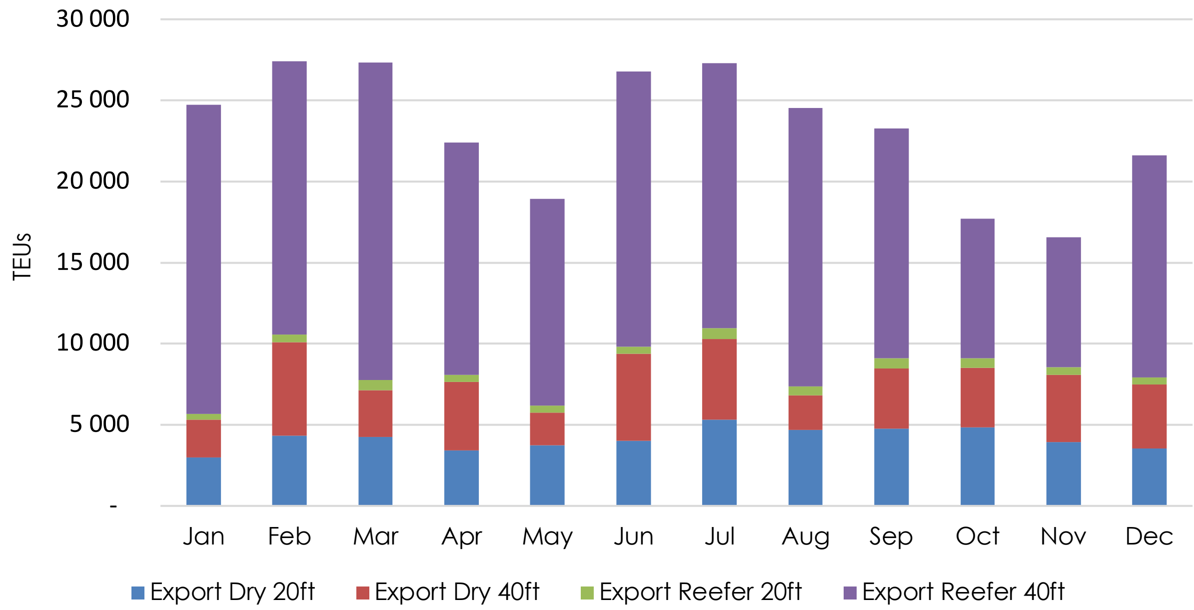


Figure 17: Export TEUs per month and per type for 2021
Source: WC FDM™ Port Enhancement (2020)

Figure 18: Import TEUs per month and per type for 2021
Source: WC FDM™ Port Enhancement (2020)

In 2020, the PoCT's containerised cargo exports were considerably more than the imports in 2021 when comparing the flow volumes in Figures 19 and 20.

2.1.3.5 Containerised Cargo by Month in 2026

For the same reasons discussed above, it is possible to provide disaggregated monthly cargo flows predicted for the 2026 forecast year. Figure 19 below shows the Port's monthly export TEUs by container type predicted for 2026.

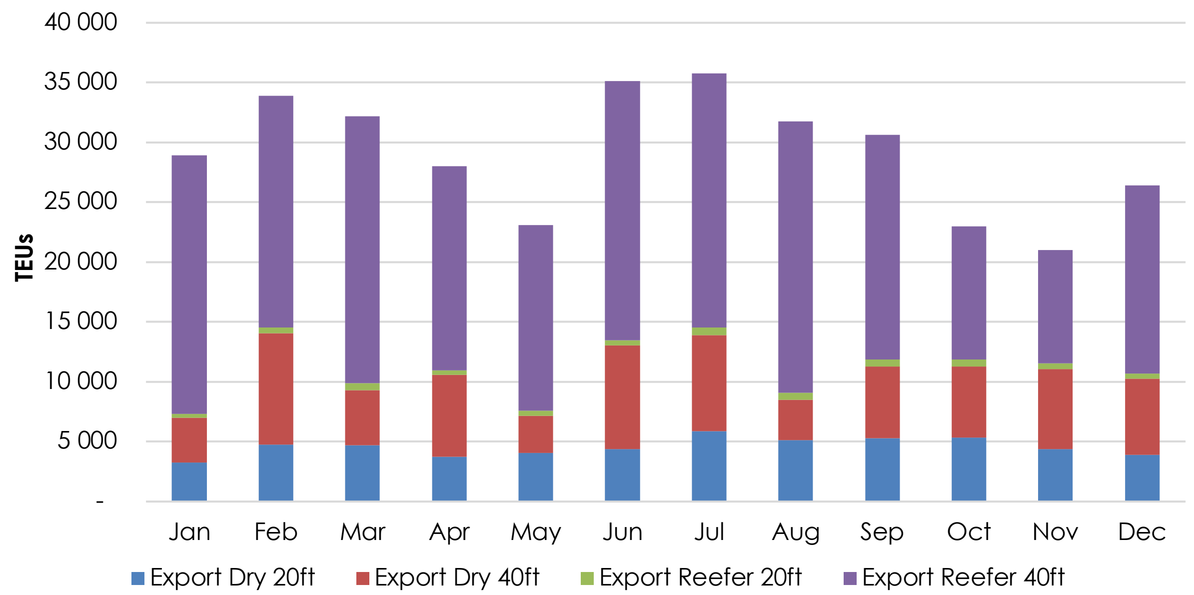


Figure 19: Export TEUs per month and per type for 2026
Source: WC FDM™ Port Enhancement (2020)

As with the 2020 base year, July is estimated to be the busiest month for export containers (35 351 TEUs) in 2026, which represents narrowly less movement than June's 35 116 export TEUs. November will be the least busy month for containerised exports, with 20 994 TEUs.

Figure 20 below shows this information for the PoCT's import containers. As in both 2020 and 2021, September was the busiest month for import containers (28 127 TEUs) in 2026. Furthermore, as of 2021, October and November were expected to be as busy as September. The least busy month for container imports in 2026 is predicted to be June (10 423 TEUs), echoing 2020 and 2021's data.

Once again, the PoCT's containerised cargo exports are estimated to be considerably more than the imports in 2026 when the flow volumes in Figures 20 and 21 presented below are compared. This is because the National FDM™ container model's output for the PoCT was used for the WC FDM™, which sees the growth in container volumes between 2020 and 2026 having a compound annual growth rate of 5.1%.

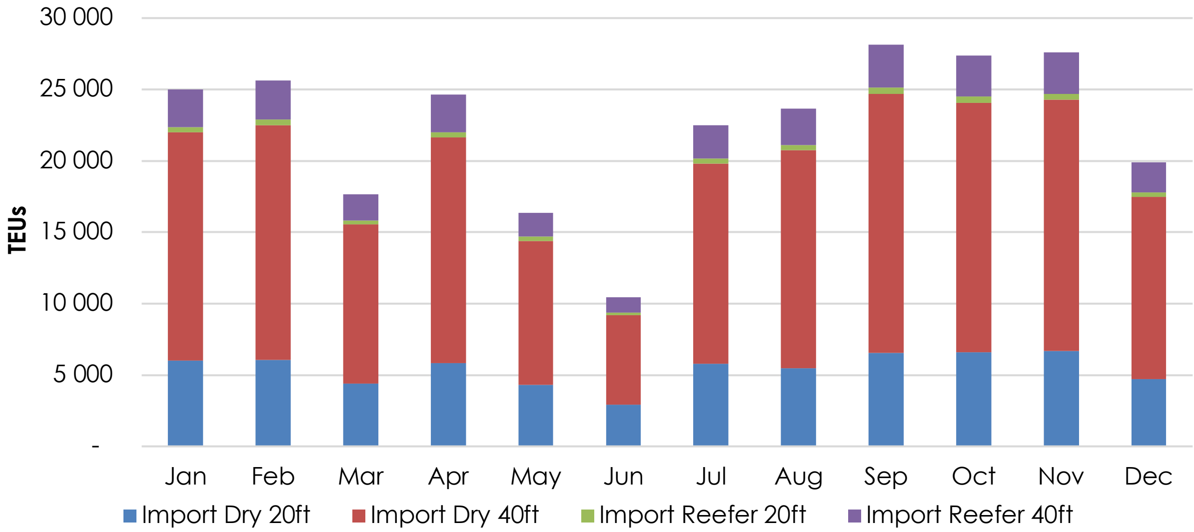


Figure 20: Import TEUs per month and per type for 2026
Source: WC FDM™ Port Enhancement (2020)

2.1.3.6 Containerised Fruit by Month in 2020

The enhanced WC FDM™ also enables the PoCT's containerised fruit flows to be isolated from all trade and disaggregated further into fruit commodity groups and individual fruit commodities. The Port's monthly fruit flow volumes for 2020, measured by the number of TEUs, are shown in Figure 21.

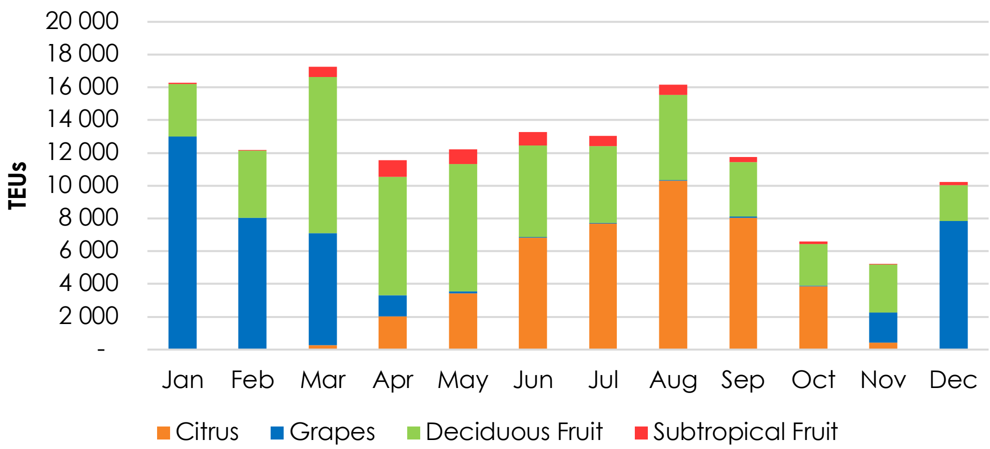


Figure 21: Fruit volumes split per month for 2020
Source: WC FDM™ Port Enhancement (2020)

The graph in Figure 21 above provides a great overview of these fruit commodity groups' seasonality. Grapes are predominantly handled at the Port during the warmer Summer months (December to March), while the PoCT's citrus flows mostly occur during the Winter and late Spring, reaching a peak during August.

Deciduous fruit is handled throughout the year, especially during late Summer and Autumn (March to May). The Port has relatively little subtropical fruit flows, which occur around the middle of the year. This graph, therefore, allows its users to determine which fruit commodity group will be most impacted by a disruption in a certain month or timeframe.

Earlier in the report, container volumes by fruit commodity group were mapped using the data received from Agrihub. With the enhanced model, it is now possible to show more detailed freight flow maps of the Agrihub fruit commodity groups. Figure 22 maps the major containerised fruit cargo locations as received from Agrihub, and flows modelled on assumed routes in the PoCT's logistics chain for 2021.

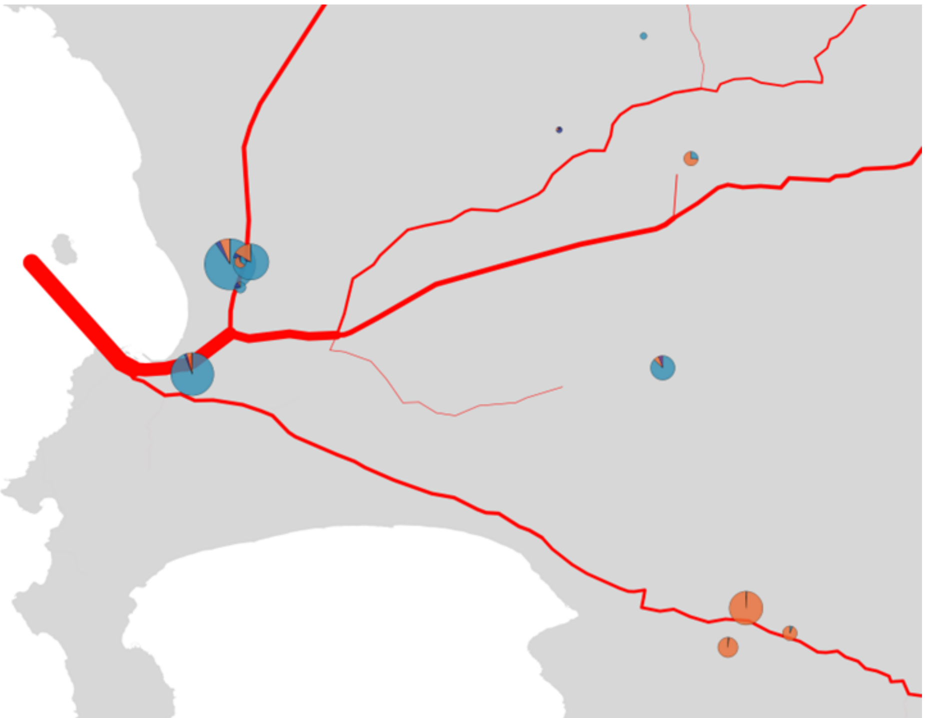


Figure 22: Fruit commodity group flows linked to the Port of Cape Town
Source: WC FDM™ Port Enhancement (2020)

The flows are indicated by the red lines on the map, with the lines' thickness representing the flows' size. The pie chart colours on the map show each major location's flows according to the contribution of each fruit commodity group, namely citrus (light blue), deciduous fruit, and grapes (dark blue).

Deciduous fruit consists of the pome fruit (orange) and stone fruit (purple) commodity groups as categorised by Agrihub. Since no Agrihub data was received for the subtropical fruit commodity group, it is important to note that subtropical fruit flows are excluded from these maps. Subtropical fruit data is based on inland origin production locations from aerial satellite imagery (as used for most agriculture production) and export volumes from PPECB data. The subtropical fruit products exported at Cape Town are predominantly avocados with some litchis and mangos.

These flows can also be mapped separately for each fruit commodity group. Figures 23 to 24 below map the major containerised fruit cargo locations received from Agrihub and flows modelled on assumed routes in 2021 for the citrus, deciduous fruit, and grapes fruit commodity groups, respectively.

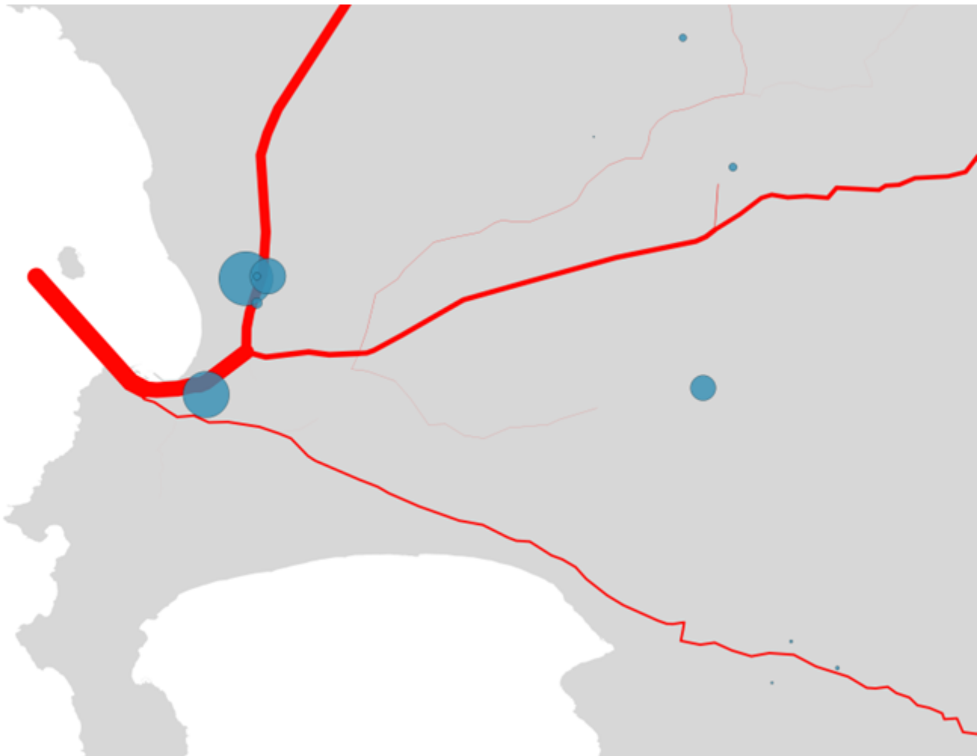


Figure 23: Citrus fruit commodity group flows linked to the Port of Cape Town
Source: WC FDM™ Port Enhancement (2020)

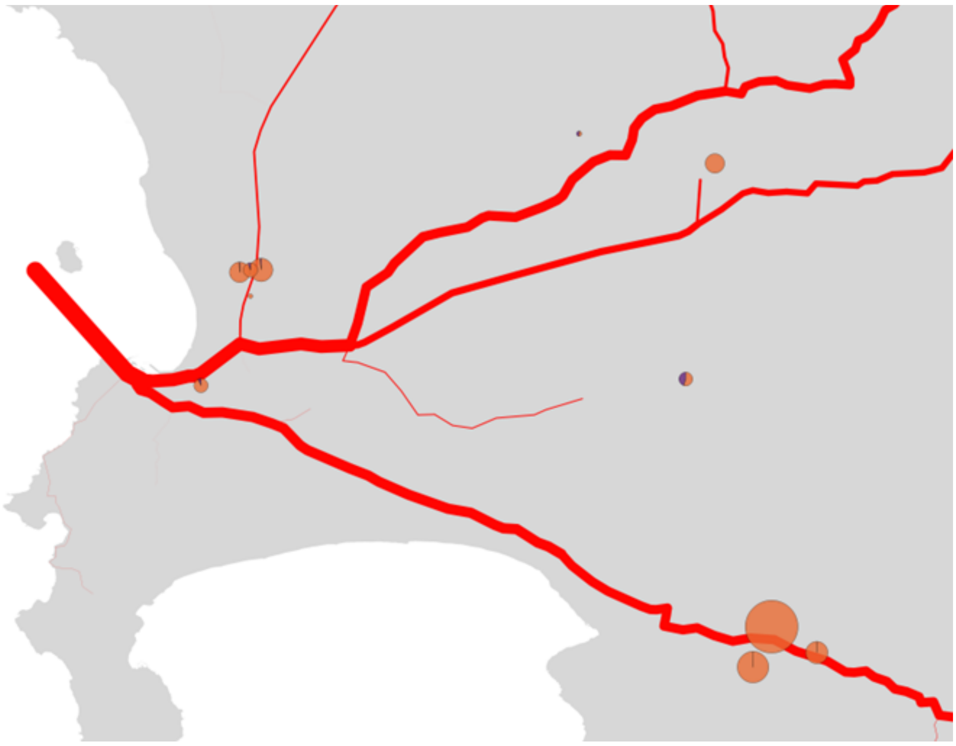


Figure 24: Deciduous fruit commodity group flows linked to the Port of Cape Town
Source: WC FDM™ Port Enhancement (2020)

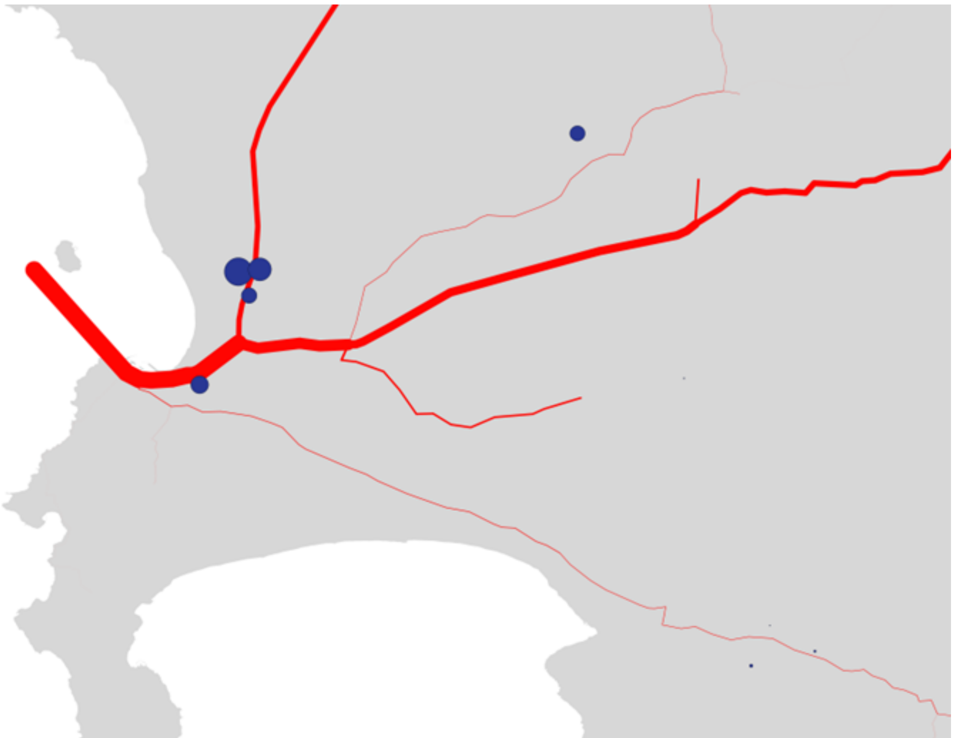


Figure 25: Grapes fruit commodity group flows linked to the Port of Cape Town
Source: WC FDM™ Port Enhancement (2020)

2.1.3.7 The Impact of Weather Delays on Monthly Containerised Fruit Flows

Historical weather data was obtained for 2011-2020 for the PoCT to superimpose a profile of past weather delays onto the flows that have been discussed until now. This allows the impact of weather delays on the Port's containerised cargo flows to be visualised, which can help estimate the risks related to the CTCT being closed during seasonal peaks.

Figure 26 shows the monthly operation time lost during every year within that period. It is important to note that this operation time lost refers to the number of hours per month that the CTCT was unable to operate due to various weather disruptions. The historical weather data shows significant delays especially around November to March, with the months of April to August affected the least by weather delays.

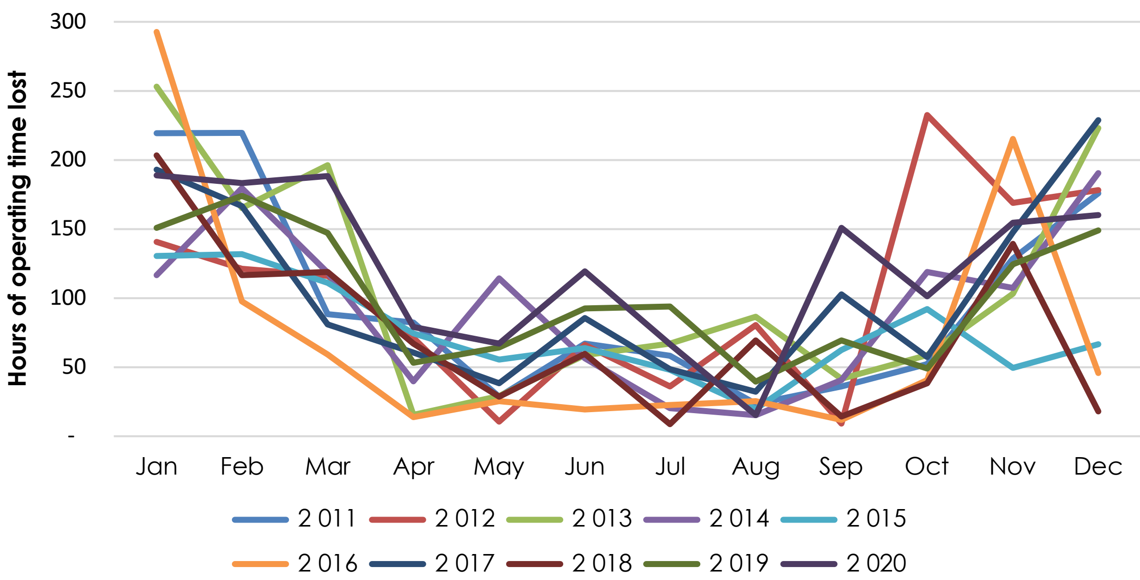


Figure 26: Historical hours of operation time lost per month due to weather delays
Source: WC FDM™ Port Enhancement (2020)

The months of January and December are the most disrupted, i.e., the months that have seen the most operation time lost historically, based on data from 2011 to 2020. For the most part, this is essentially due to these months being the windiest of the year for the CTCT area. Given that wind significantly influences the terminal's ability to operate, the reason behind the u-shaped curve in Figure 26 above is clear. The figure also shows that the annual weather delay profile remained consistent.

Using both 2021 and this historical weather delay data, the dotted line graphs shown in Figure 27 on the next page show the average (black), minimum (green), and maximum (red) number of hours lost per month. This allows greater comparison of the monthly weather profile. The figure also includes an accompanying pie chart, which provides a breakdown of the weather delay causes.

As mentioned before, the wind is the biggest cause of weather delays at the CTCT, with it labelled as the reason behind approximately 89% of all the weather delays at the terminal between 2011 and 2021. In comparison, fog, and the ranging of vessels both contributed an equal 6%, to the CTCT's historic weather delays.

Due to its negligible contribution (1%), the 'Other' category shown in the pie chart groups together the minor causes of historic weather delays at the terminal, namely 'Meetings', 'Navis down' and 'Other'. For more detail on these causes of weather delays, Table 6 on the next page provides an overview of the number of times the causes were cited as causes of weather delays each year.

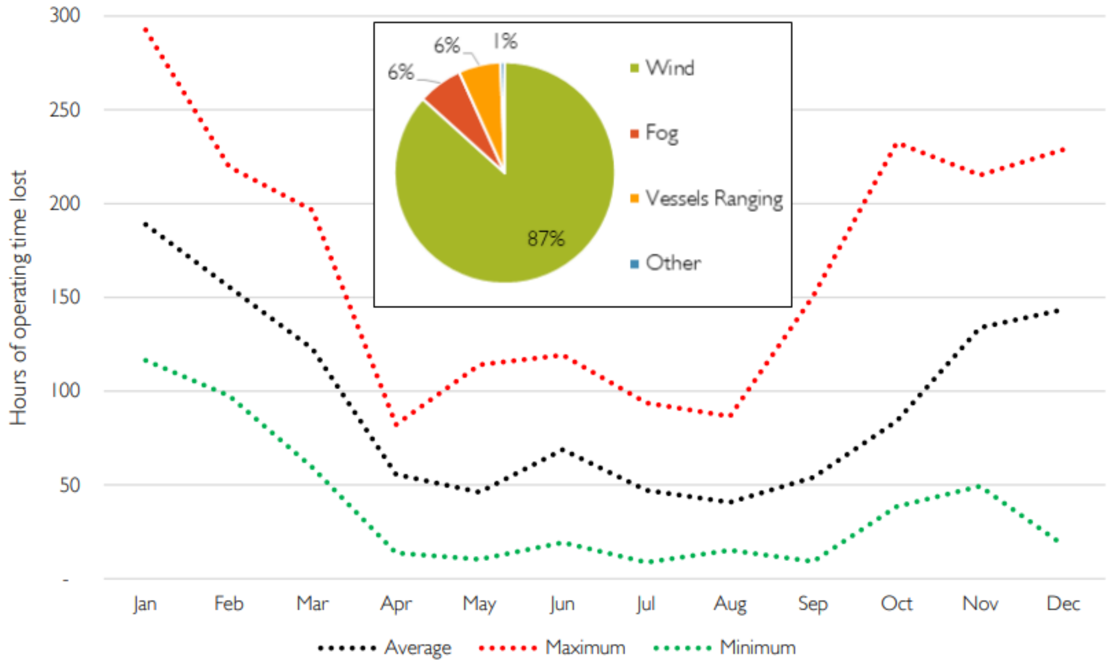


Figure 27: Average, minimum, and maximum number of hours of operation time that was lost per month due to weather delays from historical data, with the main causes of these delays shown in the pie chart
Source: WC FDM™ Port Enhancement (2020)

Table 2: Annual overview of weather delay causes from 2011 to 2021

Year	The annual number of hours delayed					
	Fog	Meeting	Navis down	Other	Vessels Ranging	Wind
2011	70	-	-	5	30	1 065
2012	67	2	-	17	-	1 145
2013	58	-	-	8	94	1 138
2014	36	-	-	1	152	929
2015	87	-	-	9	53	757
2016	57	6	-	-	47	759
2017	50	6	-	1	1	1 006
2018	54	13	1	3	128	683
2019	121	-	-	1	77	1 009
2020	139	-	-	-	144	1 192
2021	32	-	-	-	-	494

Source: Transnet Port Terminal CPT

This information can be superimposed on the disaggregated fruit flows shown in Figure 28 to portray the vulnerability of fruit types during specific months relative to the weather capacity challenges experienced by the CTCT. Figure 29 on the next page provides this view, with the average hours lost line from Figure 29 used to portray the impact of weather delays on monthly containerised fruit flows.

The line is included in most of the report's remaining graphs since it plays an important part in addressing the required outcomes of the project. To complement and simplify the further analysis, the exact values represented by the average hours lost line are shown in Table 3.

It was not possible to obtain further information from TPT. Because information such as the operation capacity per hour per day is unknown, it is, unfortunately, impossible to link hours lost to capacity lost.

Table 3: Average hours lost per month

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Number of hours	189	156	123	56	46	69	47	41	54	84	134	144

Source: WC FDM™ Port Enhancement (2020)

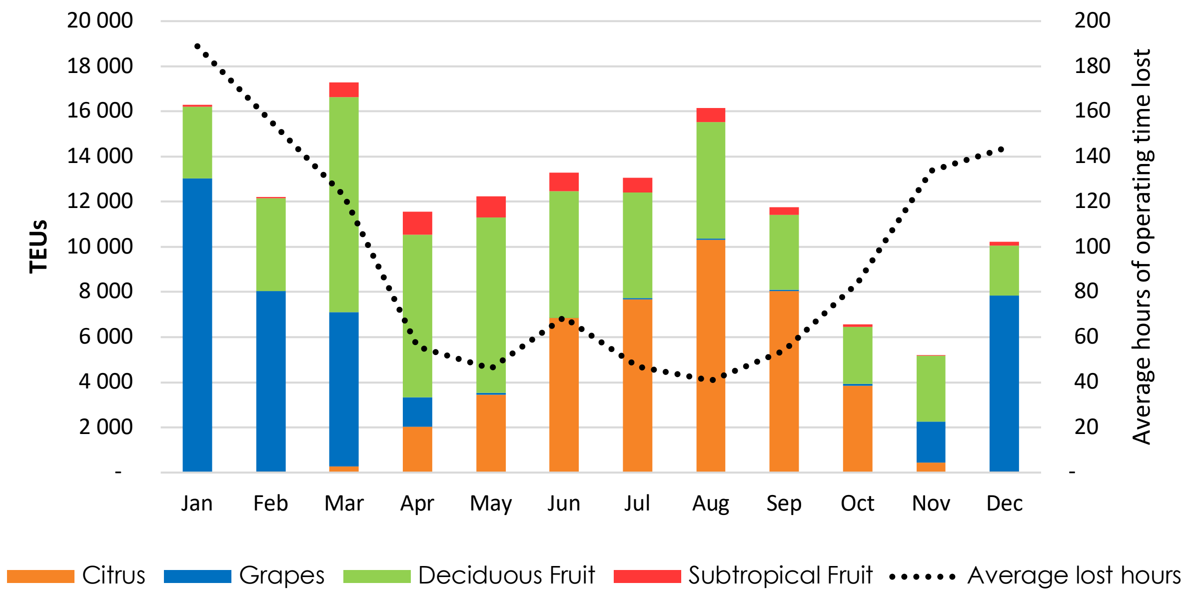


Figure 28: TEUs per fruit type for 2020 compared to operation lost time
Source: WC FDM™ Port Enhancement (2020)

Looking further than fruit only, the impact of weather capacity challenges on all the CTCT's trade can be assessed. Figure 29 below shows the total TEU volumes handled by the terminal per month, including the average hours lost due to weather delays, in 2020. The flows are disaggregated by sector, i.e., by their relation to the agriculture, mining, or manufacturing sectors of the economy. Since fruit flows are key to the outcomes of this project, agriculture flows are split into 'Fruit and 'Other Agriculture'.

Empty and transshipment containers are also isolated as a flow category due to their many pivotal differences from full containers. Together, this provides a more holistic idea of how weather delays impact the overall terminal and/or its key separate containerised flows throughout the year.

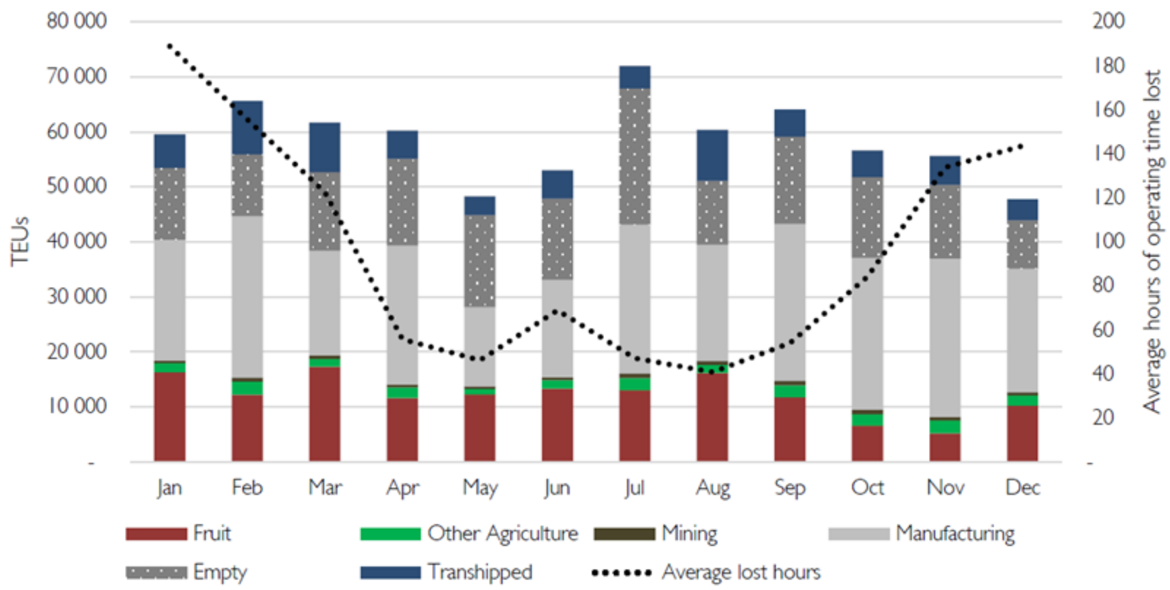


Figure 29: Total Cape Town Container Terminal TEUs for 2020
Source: WC FDM™ Port Enhancement (2020)

When all the CTCT's containerised trade is considered, it can be deducted that July was the busiest month (72 018 TEUs) in 2020, while it also has the highest number of empty and transhipment container TEUs, namely 28 880. Fortunately, it was also a month with relatively low operation time being lost due to weather delays. On the other hand, December was the least busy month with 47 754 TEUs being handled at the terminal during 2020, narrowly less than the 48 259 TEUs of May. December also had the least number of empty and transhipment container TEUs (12 669).

However, December was shown to be affected heavily by operation downtimes due to weather, especially wind. Relative to the number of full containers, May has a high number of empty and transhipment container TEUs (41.6% of its total TEUs), while December's empty and transhipment container TEUs represent only 26.5% of the month's total TEUs.

This information is, therefore, due for further consideration and interpretation. Although the weather delays during the month of July were not that significant, the volumes handled during the month were very high. Large volumes of additional empty refrigerated containers arrive, presumably for utilising citrus exports. This might imply that a weather delay in July can be seen as more problematic than a weather delay in December, even though weather delays happen far more frequently in December than in July. Further investigation and research must be undertaken to determine what effect a possible delay might cause and which monthly volumes are more acceptable to delay, especially after perishability is considered.

2.1.3.8 Fruit Perishability

This section discusses the classification of containerised fruit perishability. Kader (2002) describes the relative perishability and potential storage life of various fresh fruit types. Given optimal storage conditions, this author's work is seen as a benchmark for the typical shelf life of different fruit types. Biological factors that impact fruit deterioration are respiration, ethylene production, compositional changes, growth and development, transpiration or water loss, physical damage, and physiological and pathological breakdown. All of these are related to the impacts of time duration, the fruit's immediate environment and impacts from handling the fruit or the packaging/container it is in. The environmental factors that influence deterioration are temperature, relative humidity, atmospheric composition, ethylene, and light.

Postharvest technologies and procedures exist to minimise the occurrence of deterioration and include temperature management procedures, control of relative humidity and various other environmental practices such as specific packaging, air movement and exchange, removal of ethylene, and controlled or modified atmosphere and sanitation. Despite all these possible interventions, time duration to market remains the number one enemy of all the procedures and protocols to maintain the market value of produce from origin to shelf.

From Kader's (2002) research, an index of relative perishability (very low, low, moderate, high, and very high) is proposed that indicates the relationship between various fruit types and typical storage life. Table 8 is an interpretation from Kader (2002) showing details of this relationship to Agrihub commodity groups. This expected storage life is based on ideal conditions, according to the specific fruit type's temperature and humidity specifications. It should be noted that some of these fruit types' storage life can be extended beyond these proposed values from Kader (2002) with very specific packing and controlled climate interventions, amongst others. For this report and data analysis, these values were used for the classification of relative perishability.

CTCT primary sector TEUs per month with fruit perishability disaggregation compared to lost operation time

Table 4: Relative perishability of fruit included in the Agrihub dataset

Agrihub Commodity	Commodity Name	Relative Perishability	Storage Life
GF	Grapefruit	Moderate	4-8 weeks
LE	Lemons	Low	8-16 weeks
OR	Oranges	Moderate	4-8 weeks
SC	Soft Citrus	Moderate	4-8 weeks
GR	Table Grapes	High	2-4 weeks
AP	Apples	Moderate	4-8 weeks
PR	Pears	Moderate	4-8 weeks
AC	Apricots	Very High	< 2 weeks
CH	Cherries	Very High	< 2 weeks
NE	Nectarines	High	2-4 weeks
PE	Peaches	High	2-4 weeks
PL	Plums	High	2-4 weeks

Source: Kader (2002)

Note: The Agrihub dataset did not include details on any subtropical fruit types. These fruit types (avocadoes, mangoes, bananas, guavas, etc.) were all classified as "High" relative perishability (Kader, 2002)

These perishability classifications were built into the Agrihub dataset per detailed sub-commodity and translated into related WC FDMTM commodity groups. This enabled the team to interpret the perishability of all fruit commodities passing through the CTCT, as indicated in Figure 30 below.

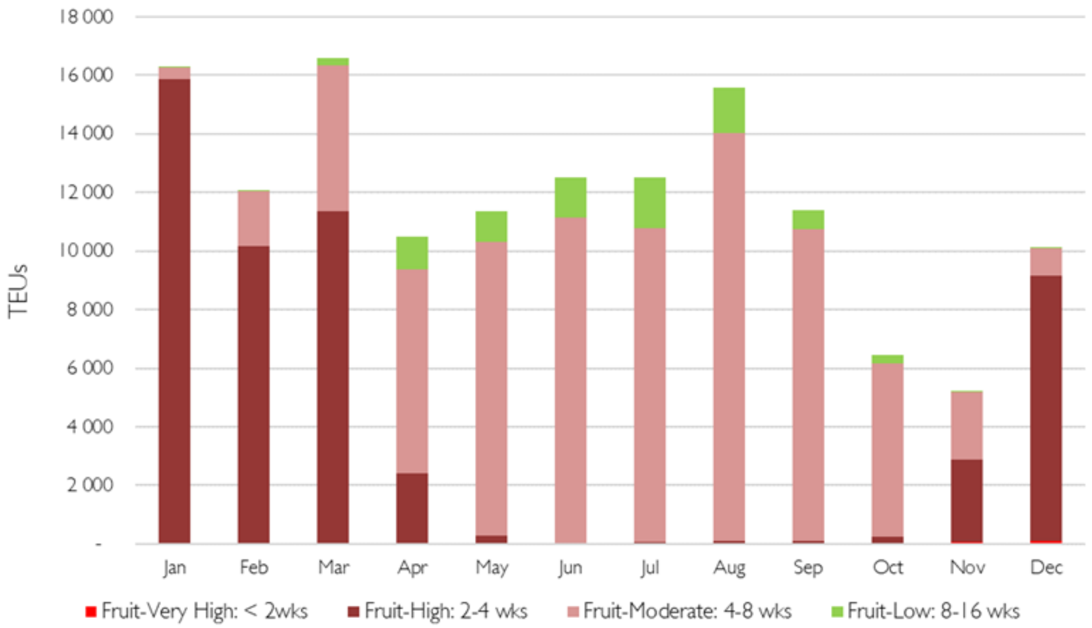


Figure 30: Fruit containers disaggregated into perishability categories for 2020 according to underlying Agrihub commodity groups and monthly volumes.
Source: WC FDM™ Port Enhancement (2020)

It will be noted that a negligible volume of "Very high" perishability fruit is using the CTCT due to the long duration of maritime shipping to destination countries. Exporters rather use air transport as the preferred mode due to the faster transit and relatively short, expected storage life. The most "vulnerable" fruit types using the CTCT are the "High" relative perishability fruits such as table grapes, nectarines, peaches, and plums. These are all concentrated around the summer months when ambient temperatures are at their highest and the most port wind disruptions and delays are experienced.

A large percentage of all citrus fruit as well as pome fruit (apples and pears) falls in the "Moderate" category and is harvested and shipped within the colder, ambient winter months, also requiring less energy for refrigeration. Small volumes of lemons fall in the "low" perishability category and are shipped mostly in the autumn and winter months.

Figure 31 below provides a more holistic overview of the impact perishability has on the CTCT's operations in 2020 by adding information on the TEUs related to other agriculture, mining, and manufacturing – along with the average hours lost line discussed earlier in the report. This allows for more considered trade-offs related to prioritising fruit, other agriculture, mining, or manufacturing to be made according to the terminal's operational capacity (which is largely influenced by weather delays) and cargo's perishability classification.

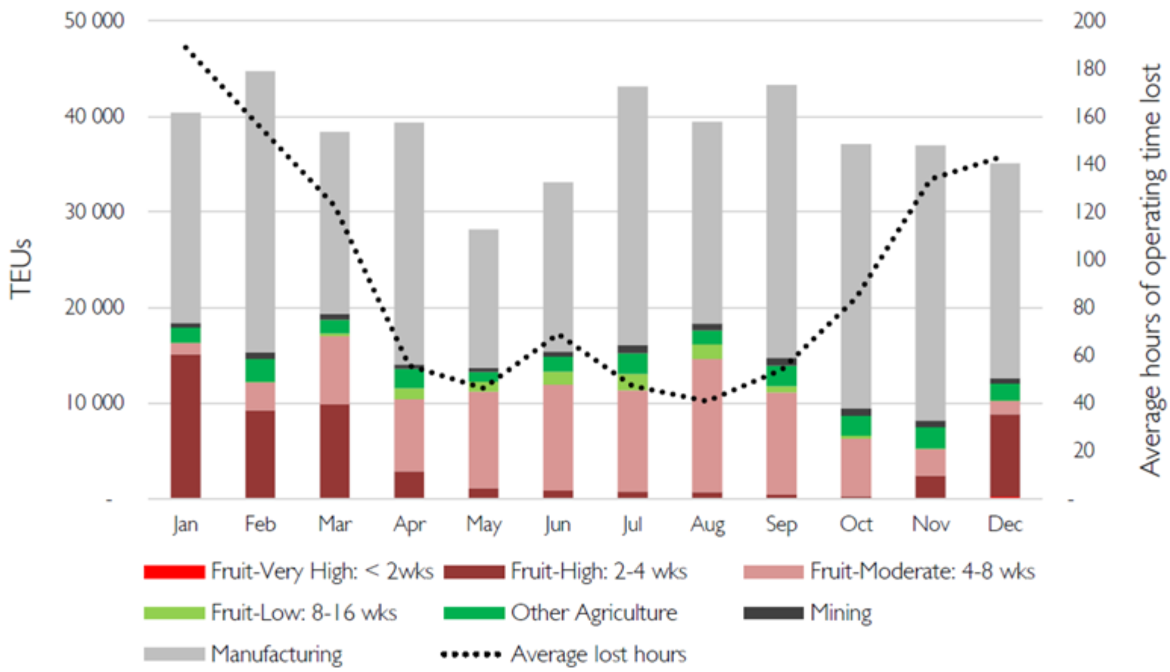


Figure 31: Monthly breakdown of the perishability of fruit and other sectors with average hours of operating time lost for 2020
Source: WC FDM™ Port Enhancement (2020)

Kader identified various environmental factors that influence deterioration. One of these factors is temperature, which can influence the relative perishability and potential storage life of various fresh fruit types. The shelf life of the fruit can therefore be extended through proper temperature management. Temperature breaks reduce the fruit's quality, shelf life, marketability, and revenue-generating potential. Research by Goedhals-Gerber, Stander and Van Dyk (2017) indicated that 81% of the temperature breaks in reefer containers carrying summer fruit originate within the CTCT.

This was further supported by research on pome fruit in the cold export chain (South African leg), which identified three areas of temperature breaks, namely;
(1) during the packhouse and cold-store stages,
(2) when the containers entered the port of export by truck and delays occurred before the containers were plugged into a power source inside the reefer stacks and
(3) when the container was unplugged from the stacks and loaded onto the vessel (just before the actual time of departure [ATD]).

Temperature breaks are prevalent in export cold chains, such as at gate-in, ATD, the actual time of arrival (ATA) of the vessel in the port of import and inside a container at its doors (Goedhals-Gerber, Haasbroek, Freiboth & Van Dyk, 2015; Goedhals-Gerber et al., 2017). Other research also highlights the need for more collaboration between the producers, fruit exporters, logistics service providers, the CTCT, and shipping lines (Goedhals-Gerber, Fedeli & Van Dyk, 2021).

2.1.3.9 The Impact of Perishability on Monthly Containerised Fruit in 2021

As with the previous graph for 2020, Figure 32 on the next page shows the impact of perishability on the CTCT's containerised fruit cargo projection for 2021, along with the TEU flows related to the terminal's other trade and the impact of weather delays on the terminal's operation time.

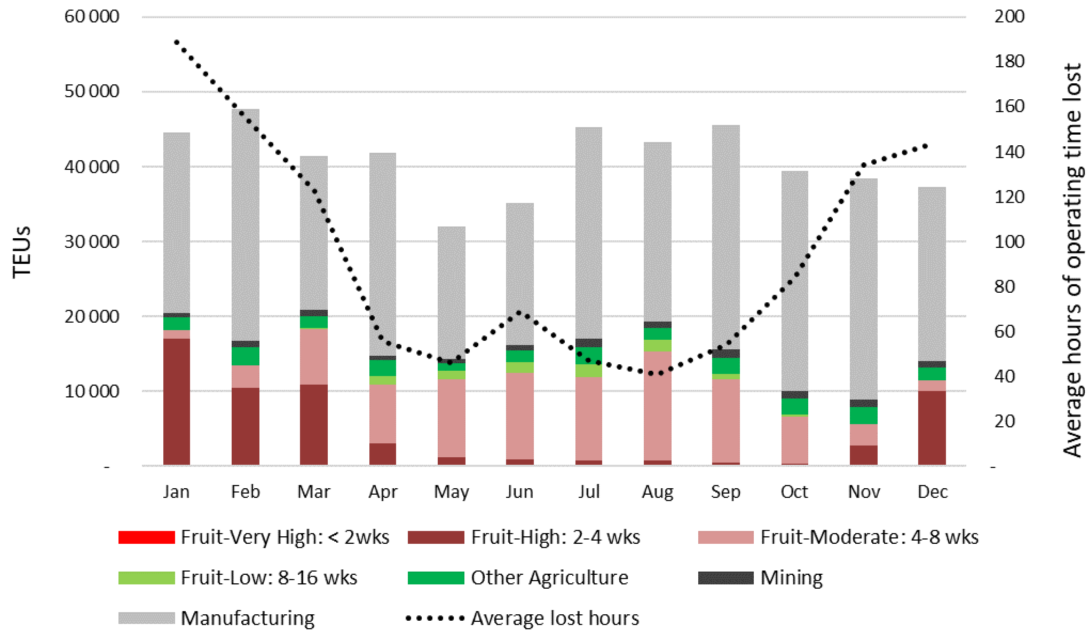


Figure 32: Monthly breakdown of the perishability of fruit and other sectors with average hours of operating time lost for 2021
Source: WC FDM™ Port Enhancement (2020)

2.1.3.10 The Projected Impact of Perishability on Monthly Containerised Ffruit in 2026

Figure 33 on the next page shows the same information as the previous graph for 2021, but for the relevant projected flows and average operation time lost at the CTCT during 2026.

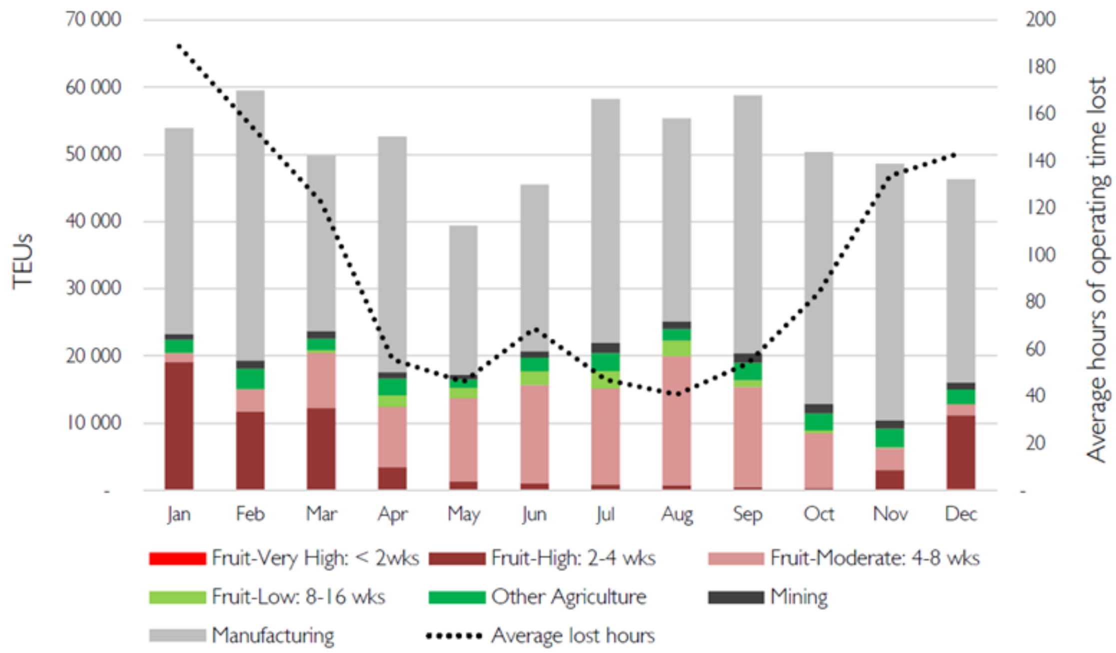


Figure 33: Monthly breakdown of the perishability of fruit and other sectors with average hours of operating time lost for 2026
Source: WC FDM™ Port Enhancement (2020)

2.2 Stakeholder Engagement

Table 5 below lists the stakeholders identified and interviewed during the execution of this project.

Table 5: Identified Stakeholders

Category	Entity	Representative
Transnet	TNPA	
	TNPA Port Operations	Akhona Nyweba
	TNPA Security	Thembani Gaqavu
	TPT Container Terminal Manager	Siyabonga Maqabangqa
	TPT Container Terminal	Lubabalo Kenana
Freight Forwarders	Hillebrand Gori	Rina Hertzog
	South African Association of Freight Forwarders (SAAFF)	Basil Hanival
	Western Cape Exporters	Terry Gale
Fruit industry	Fresh Produce Exporters Forum (FPEF)	Antionette van Heerden
	HORTGRO (Trade & Markets)	Jaques de Preez
Transporter associations	Truckers for Transformation	Derick Ongansie
	Truckers for Unity South Africa	Joubert Cilliers
	Chairman of Harbour Carriers	John Berry

2.2.1 Transnet Port Terminals (TPT)

Figure 34 presented below, depicts a diagram of the port layout for the Port of Cape Town cargo terminal.

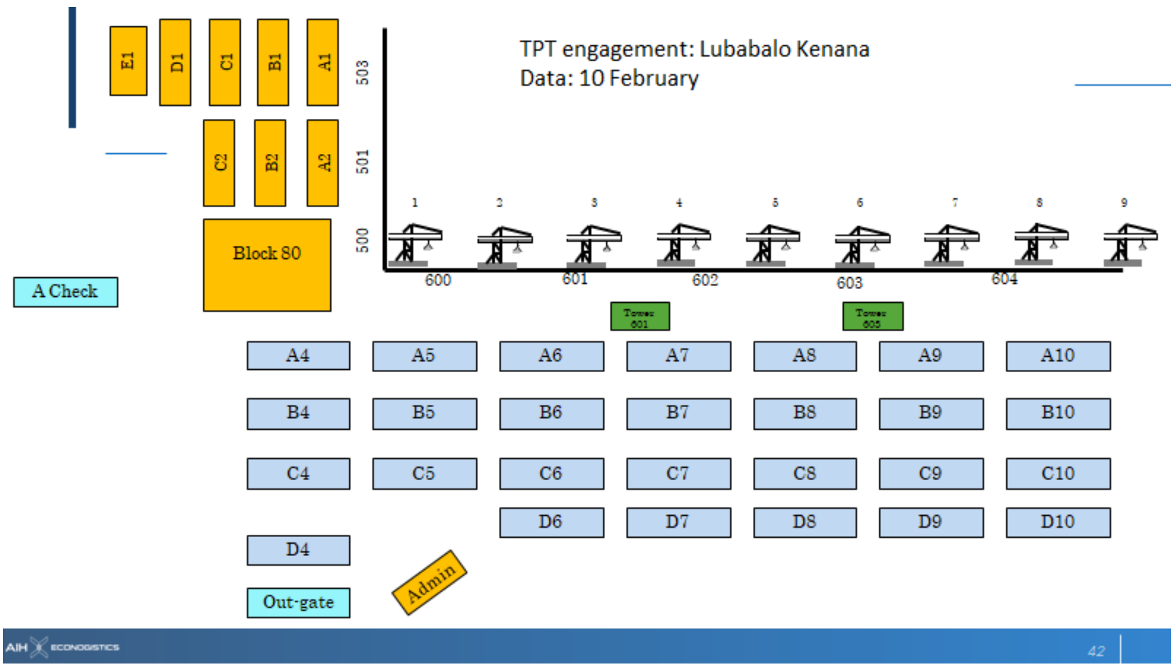


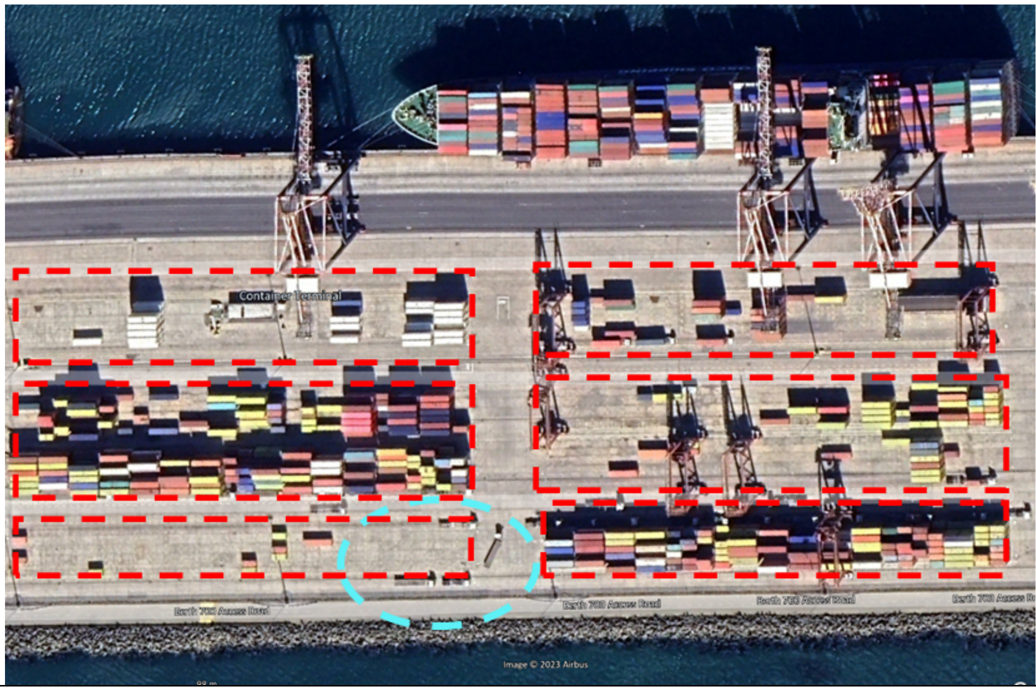
Figure 34: Layout of the container terminal in the Port of Cape Town

Figure 34 above illustrates a layout of the Port as follows:

- Berths 600 to 604;
- Increase of cranes at berth from 8 to 9;
- Block A4 to D10 form container traffic
- Block A1 to E1 are reefer containers
- Location of A-Check gate
- Location for the exit gate
- Location of administration office with the NAVIS planning software

Figure 35a illustrates the container blocks to stack containers. The blue circle demonstrate the movement of trucks between blocks. A few RTGs are also notable in Figure 35a and Figure 35b, illustrating a operational terminal with sufficient RTGs at the stacks.

a)



b)

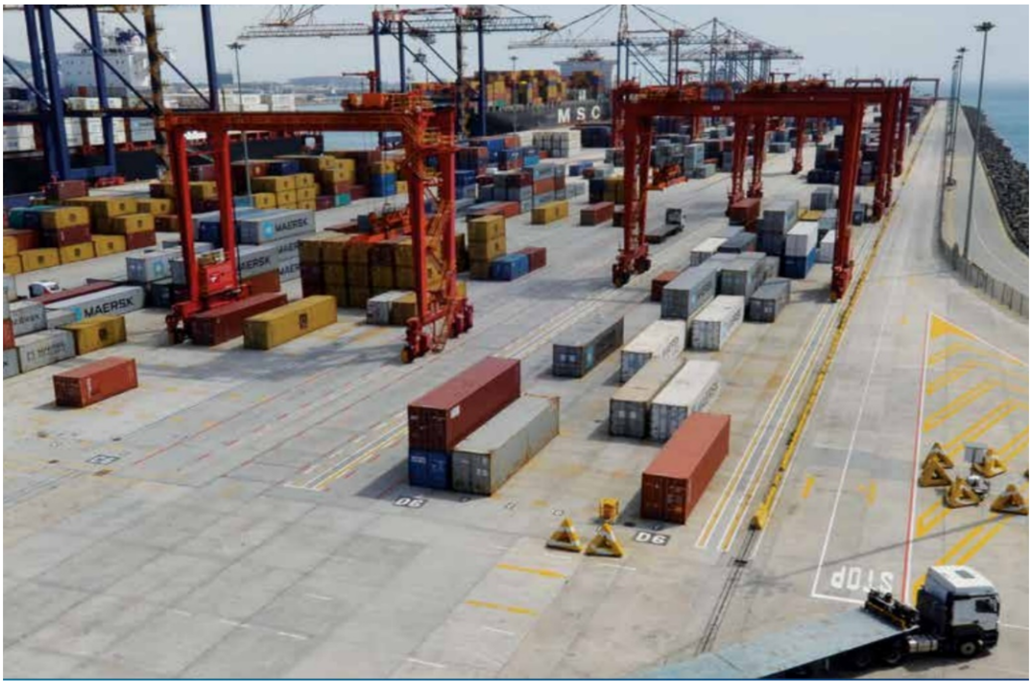


Figure 35: Stacking blocks

Figure 36 illustrates the queueing of trucks in the port area waiting to be offloaded. Notable is that only two RTGs are available to offload the vehicles while several RTGs are standing out of service at the left corner.

Figure 36: Queuing of trucks in Port

The following causes delays in the terminal:

- Truckers need to move through to security gate systems (TNPA and TPT) which are not fully integrated;
- Travel time of Truck from A-Check gate to designated stack;
- Position of container in a stack (re-stacking);
- Insufficient RTGs with anti-sway equipment (Only four available);
- Insufficient RTGs in operations due to lack of spare parts or out-of-service for repairs;
- Due to the shortage I operational RTGs, they are working in multiple stacks;
- Shut down of terminal operations due to a wind speed of 80km/h and above;
- Operating equipment out of service (waiting for spare parts, maintenance, life cycle)
- Productivity of the labour force

The following have an impact on the cycle time of trucks in the terminal:

- Queuing of vehicles at stacks, as indicated in Figure 6;
- Traffic flow disruption occurs When new drivers don't always know where to go in the terminal, which results in congestion in the terminal.
- Duration at A-check (Container numbers are captured at the gate and transmitted to the planning office(NAVIS). The driver waits for the gate slipe, indicating the block in the terminal where the container will be lifted and stacked in the stack. Truckers who did not make a reservation and needed to leave the terminals
- Failure of operating equipment during operations or the use of an RTG multiple stacks causes a delay for truckers waiting to be offloaded
- Productivity of the labour force

- Night shift is not fully utilised, which has a cost factor
- Shift changes cause delays for trucks waiting to be offloaded

Typical problem areas at the A-Check gate:

- Communication between the gate and the planning office (NAVIS) is cumbersome and causes delays at the gate.
- Duration to process container number at the gate to the planning office and receive the location stack number e stack.
- Shift changes delay access to the terminal.
- Queuing at the A-Check gate is not controlled.
- Truckers did not make a reservation.

The CTCT Terminal Manager has presented the TPT Strategy at a Freight Forum that 3 x berths have been fully operational since July 2022, resulting in:

- Volume increases, reduction of the turnaround time of vessels and vessel changeovers
- Landside operations 24-hour cycle.
- Weather delays: Working with staff and customers to recover quicker. Fluid relationships in place.
- 4 x RTGs are equipped with Anti-Sway equipment, together with the current feasibility study of remote working, intended to improve productivity and reduce delays during the windy periods.
- Long-term spare parts contracts for all equipment are in place.
- Increased reefer capacity with 200 units to 3200 plug points.
- Installed 2 x sets of Shore Tensioners to mitigate vessel ranging.
- Increased the number of Ship to Shore (STS) cranes from 8 to 9 to improve redundancy, as indicated in Figure 34 above.

Figure 37 below illustrates the number of trucks queuing at the A-Check gate to access the terminal and trucks queuing at Duncan.
Road waiting to access the A-Check gate.

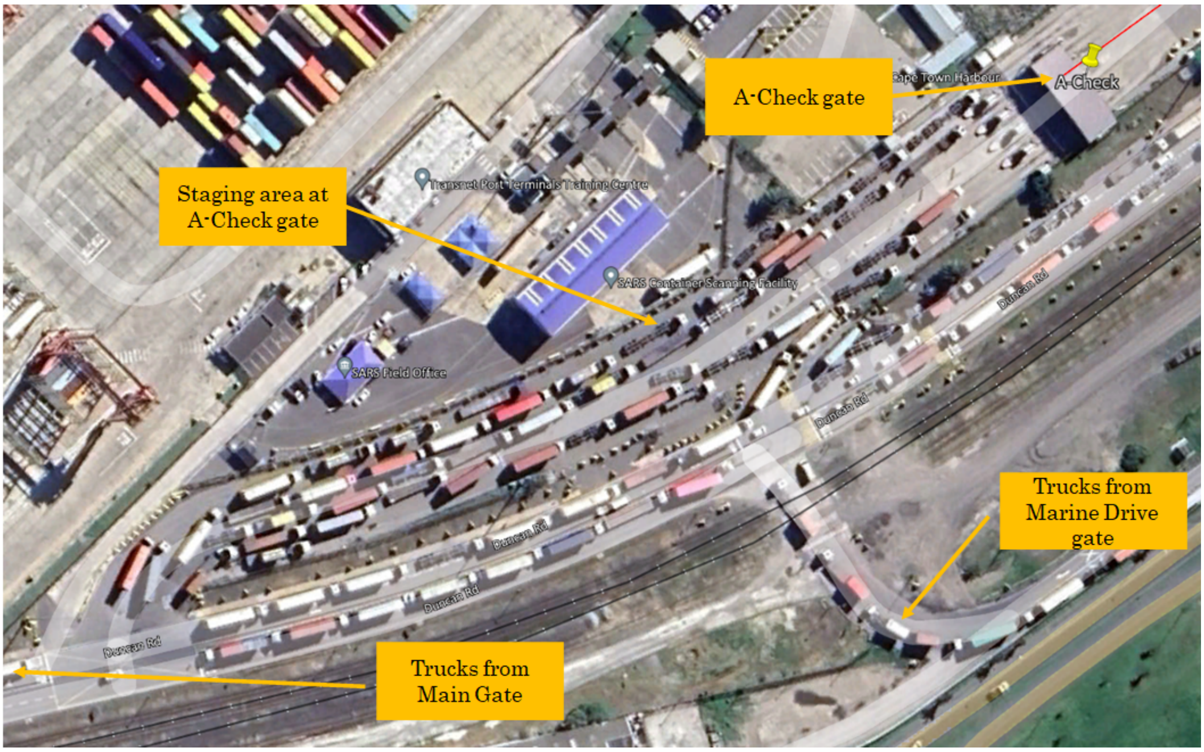


Figure 37: Queuing at A-check gate (2022)

Figures 38 and 39 below illustrate the queuing of trucks during peak periods along Duncan Road in the direction of the main Port gate. During the survey, some trucks have become stationary, resulting in trucks in the queue need to bypass it. This type of traffic behaviour could lead to incidents and accidents.

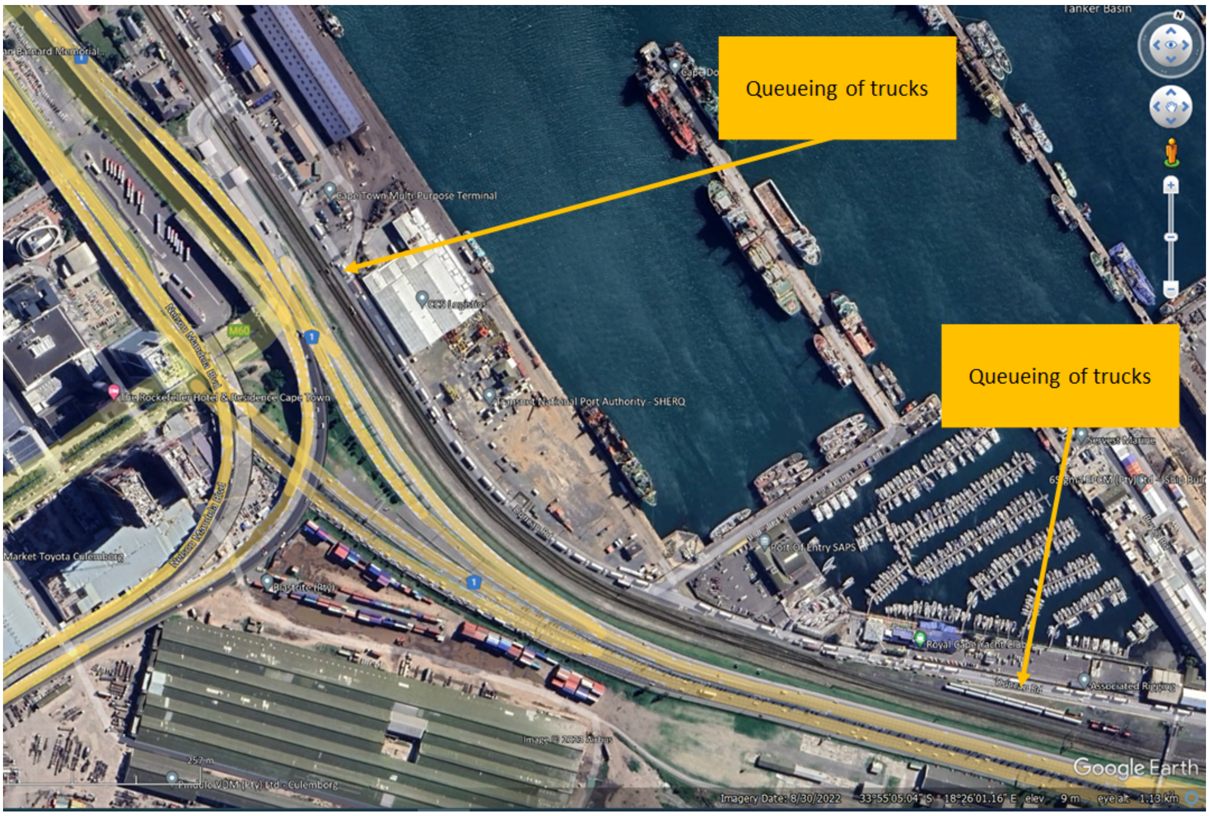


Figure 38: Queuing of vehicles on Duncan Drive

Figure 39: Queuing of vehicles on Duncan Drive

2.2.1.1 TBS system

TPT is using the TBS for truckers for gate appointments at the end of each week they generate several weekly reports, which include the following:

- End of shift report
- Main gate report
- CTCT reefer gate
- CTCT empty gate
- Number of waisted slots per trucking company
- Containers per stack
- Number of trucks visiting in the period
- Average truck turnaround time in Terminal

2.2.2 Transnet National Port Authority (TNPA)

TNPA is the land Lord of all port infrastructure and controls security in the port area. The following is observed during the site visit:

- Communication between TNPA and TPT can be improved, and the handover between shifts should be in writing.

- TNPA has no insight into the TBS information and randomly gives trucks access to the port.
- The access gates do not function very well, with scanners not always in working condition and access being manually granted).
- Limited traffic management is visible with trucks queueing on Duncan Road and turning into the temporary staging yard.
- Trucks can access the port at multiple gates, making the control and management of traffic difficult and should be limited.
- Turning container trucks into the staging yard is difficult and needs some control measures. The security guards try to regulate the traffic to allow the trucks to turn into the parking facilities.
- Staging areas are dusty, and a first in, first out principle applies.
- TNPA has identified Culemborg as a potential back-of-port facility and the land is recently transferred from Transnet Properties.
- TNPA has taken over the Culemborg property from Transnet properties.
  - Culemborg could be developed for a cold storage facility in the future.
  - The development framework is currently under discussion within Transnet and is not available in the public domain. It was not available for review.
  - Transnet has also identified the Port Industrial HubPark as a potential truck staging area in the future.

2.2.2.1 Possible Solution

TNPA & TPT should be utilising one security company in order to achieve the following:

- Conduct a traffic flow simulation:
  - To reduce or manage the number of access gates (analyse the possibility thereof).
  - To determine the most effective traffic flow in the Port.
  - To decrease the number of gates at the port, giving truckers access.
  - To develop a traffic management plan.
  - Possible use of a traffic circle to control the turning of container trucks.
- Dust control by using nano-materials at the staging area.
- Design Culemborg with inputs from the industry.

2.2.3 Transport Associations

Based on the interviews with the truckers associations, the following issues were highlighted:

- Trucks that are in poor condition.
- Criminal activities (Theft of tyres, parts of trucks and trailers) while waiting for a reservation or making a reservation when a block is open.
- Theft of trucks standing on public roads.
- Trucks are standing idling for up to 8 hours whilst waiting for a slot at A-check.
- A number of independent truckers without affiliation to a trucking association operate at the port.
- Bulk bookings by bigger companies and then not utilising the booked slots.
- Login at the booking system is not always available.
- Hauliers booked one day in advance.
- 3200 plug-in points available for reefers.
- Trucks leaving packhouses or storage facilities early in the morning cause queuing at the port.

- Trucks which are not processed during the day due to delays in the port stand waiting on Marine Drive to get a slot the following day.

The Truckers for Transformation trucker associations proposed the improvements outlined in Figure 40 and discussed below.

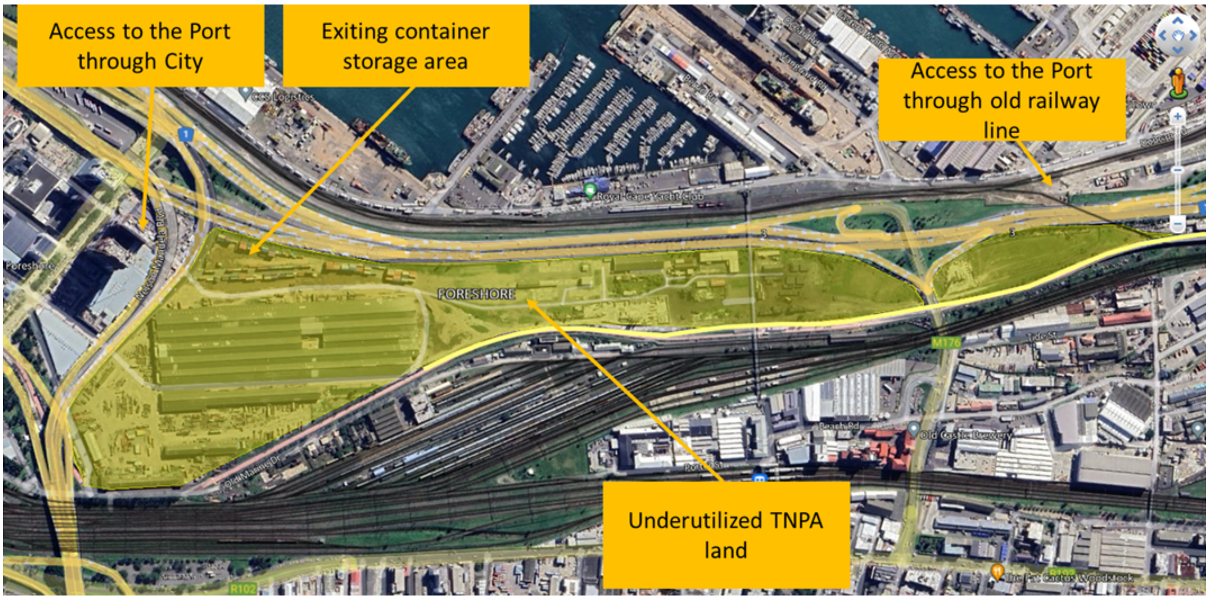


Figure 40: Underutilised Land at Culemborg

Transnet currently underutilises Culemborg. The land is transferred from Transnet Properties to TNPA for a back-of-port operation. Culemborg can access the port at the road over the rail bridge (old railway line) on the East and on the West, as indicated in Figure 40.

Figure 41 indicates the proposed development by the truckers association at Colemborg, which includes the following:

- Primary holding area.
- Additional holding area capacity.
- Possible routing, and
- Port holding area access route in blue.

Note: The proposed development does not include the long-term view of TNPA.

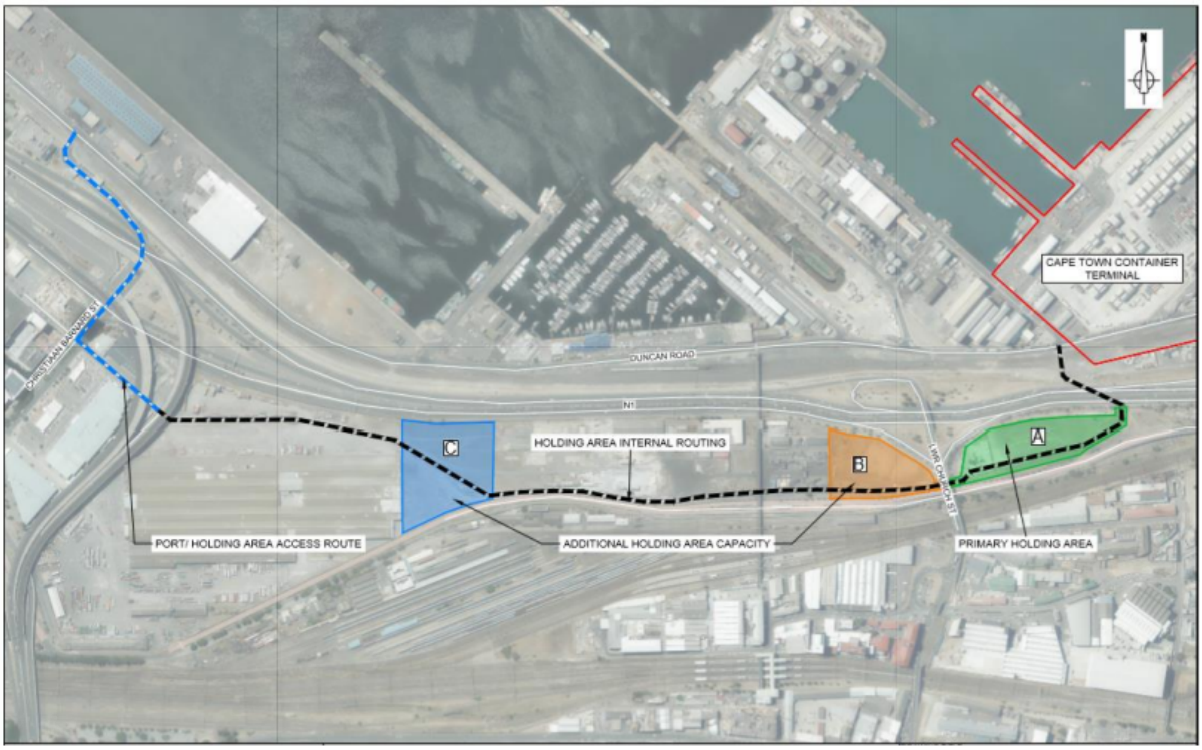


Figure 41: Proposed solution of the truckers association

Figure 42 illustrates a typical truck staging area which includes the following:

- Parking space
- Value-added services
- Maintenance facilities

Figure 42: Typical layout of a truck stop facility

Benefits of the proposed truck stop facility:

- TNPA has taken land over from Transnet Properties
- Sufficient space for the staging of trucks
- Sufficient capacity to stage loaded containers and reefer containers
- Truck stop facility provides value-added service to truckers which includes the following
    - Truck maintenance
    - Medical, cafeteria, social media
- Access to the port is via the following options
    - Direct access to the port through an old railway line
    - Access to the port holding area, as indicated in Figure 40
- Eradicating wasted time at all facilities will reduce business costs
- One of the biggest benefits is the decrease in emissions that is harmful to the environment. Trucks don't stand idling
- Increase the productivity of transporters
- Queueing and waiting time will be eradicated and the truckers can increase the cycle time of their assist
- Culemborg will reduce traffic congestion at CTCT and on Marine Drive
- The industry will become self-regulate
- No trucks will enter the port to discharge or evacuate containers as this facility will absorb all the traffic
- Less risk of cargo theft
- Personal safety
- Opportunity to plan consignment and avoid peaks (peak management)
- Cargo handling through coordination with terminal
- Integrate with A-Check to call vehicles
- Possibility for a road train concept truck with two 40-foot containers

2.2.4 CTHCA Members

The key concerns of the CTHCA members are as follows:

- Communication through existing WhatsApp groups is limited and can be improved.
- Possible communication inprovements.
    - Manage truckers to port – Departure from the loading point to prevent bundling at the port.
    - Status of the staging areas
    - Notification, when the stack is open, is a problem and needs to be resolved.
    - Trucking associations, trucking companies and processing facilities to utilise the night shift to reduce the of the queuing of trucks in Marien Drive.

Figure 43 below illustrates the traffic flow over 39 weeks in 2022. 50% of the traffic was in the morning and approximately 40% in the afternoon. Only 10% of the truckers discharged their containers during the night shift.

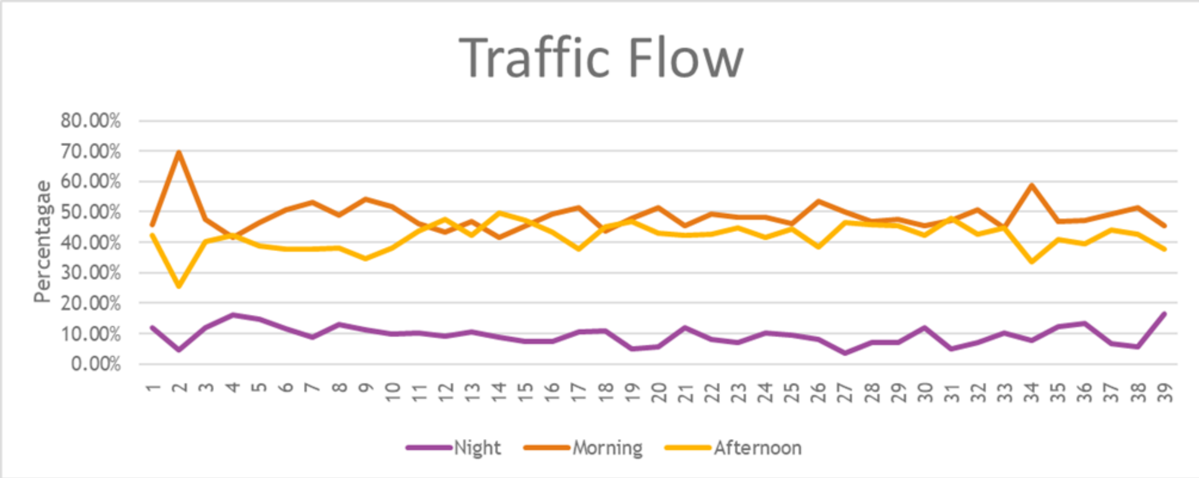


Figure 43: Traffic flow over 39 weeks in 2022

Figure 44 depicts the wind delays in hours between 2020 and 2022. 1200 hours were lost in 2021. The impact is that vessels can't get access to the port and the trend has continued in February and March 2023 where more than 12 vessels have been waiting outside the port.

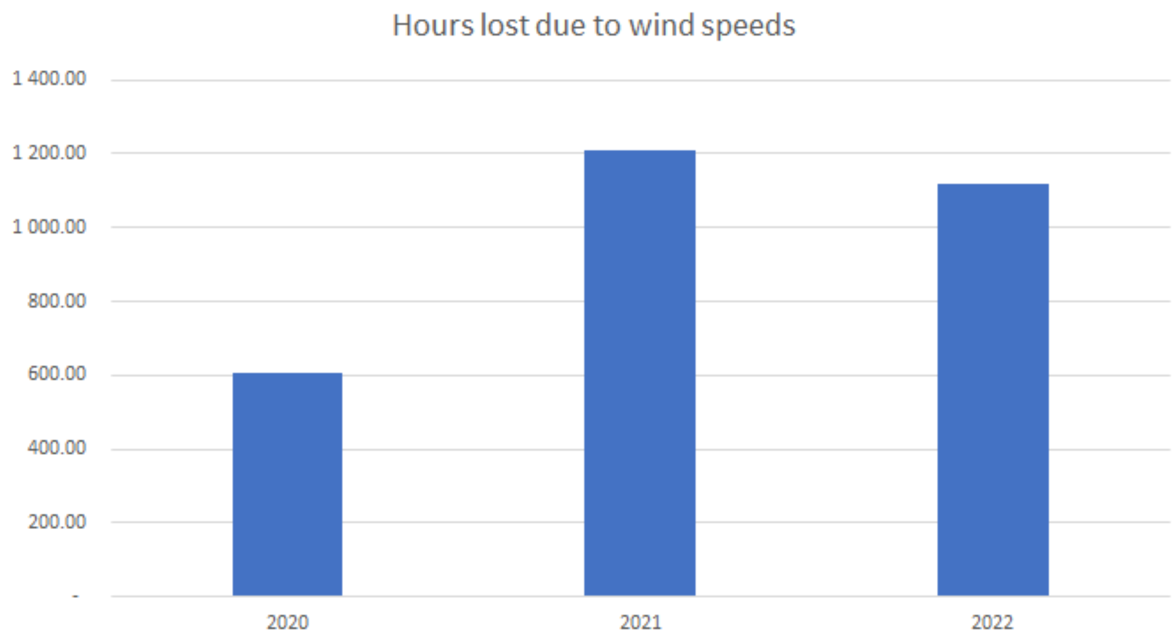


Figure 44: Time lost due to wind delays in the port

Figure 45 depicts the number of vessels waiting to gain access to the port. These delays are mostly attributed to the wind and movement of waves in the port.

Figure 45: Vessels waiting to get access to the Port of Cape Town (10 March 2023)

2.2.5 Hillebrand GORI

According to information shared by Hillebrand GORI the following are important matters to consider:

- Once the Vehicle Gross Mass (VGM) is pre-advised on Navis, transporters can only book a slot on the system when the system is open to take the container into port. The appointments fill up very quickly, so even when loading & pre advising are done in the mornings, the transporter might only get a slot in the afternoon.
- This process makes a turnaround trip very difficult for transporter and they sometimes cannot commit to more than one load per truck per day.
- When the port goes wind-bound, bookings slots get cancelled and only once the port is operational again will new booking slots be made available.

2.3 Diagnostic Analysis

The first step of a diagnostic analysis is to plan appropriately. The next section addresses the process followed in conducting the diagnostic analysis.

2.3.1 Select Appropriate Indicators and Conduct Data Analysis on Truck Turnaround Time

Select appropriate indicators and conduct data analysis on truck turnaround time in Cape Town Container Terminal (CTCT) and Cape Town Multi-Purpose Terminal (CTMPT) for 12 months before and 12 months after implementing the Truck Booking System, which was in October 2021.

Conduct a pilot data analysis of two transporter WhatsApp groups created to improve communication between truckers and shift managers in the container terminal. Comment on the themes that are found and trends in these themes.

2.3.2 Previous Work

This section provides an overview of prior knowledge that was used to inform and enhance the analysis of transporter congestion at the PoCT. While other port-related work also added insight to this study, previous projects such as the PoCT-enhancement of the Western Cape Freight Demand Model™ and a prefeasibility study for Belcon/Kraaicon were particularly valuable.

2.3.2.1 Enhancement of the WC FDM™ for Containerised Cargo through the PoCT

This project aimed to enhance the WC FDM™ to serve as an integrated evidence base for short- to medium-term capacity planning and intervention implementations aimed at improving efficiency in the port's container logistics chain and facilitating sufficient capacity development for the anticipated growth in Western Cape exports.

WC FDM™ 2020 base year data, its corresponding WC FDM™ report 2021, and data received from Agrihub were used to create an enhanced model, which enabled disaggregation of the port's container flows by containerised and non-containerised cargo, container type, month, fruit commodity group, and larger commodity groups.

Using the improved data, the impact of weather delays and the perishability of cargo was modelled to make recommendations for efficiency improvements at the PoCT.

The WC FDM™ is confined to those WC geographical districts from the national FDM™ (42 magisterial districts, 3 ports) for which freight either originates, is destined for, or moves within the district. The WC FDM™, therefore, utilises in part the "FDM" (which is a registered trademark of GAIN Group (Pty) Ltd). The model is a complete set of origin and destination freight movements per commodity (currently 86 commodities) and per transport mode (road, rail, and pipeline) for South Africa.

The following sources could be referenced for a more technical description of the model:

- Chapter 8 of Prof Jan Havenga's doctoral dissertation (2007),
- A research article by Havenga (2013), and
- Chapter 6 of a book by Havenga, Witthöft, De Bod and Simpson (2020).

The fruit flow data received from Agrihub contained pallet-focused and container-focused datasets that were integrated into the existing WC FDM™. These datasets were compiled during the Ease of Doing Business (EoDB) in PoCT research project Agrihub has worked on between 2019 and 2022. As a result, the data is mostly related to Western Cape fruit exports, with some fruit types excluded or not represented significantly from a national perspective.

2.3.2.2 Belcon/Kraaicon Pre-feasibility Study

The objectives of the pre-feasibility study were to confirm the proposed intermodal freight terminal site within the Kraaifontein area by undertaking a technical pre-feasibility review, which GAIN Group assisted by providing freight demand modelling, logistics and operations inputs.

Along with other inputs, these contributions were used to assess the relative merits of the two sites identified for the location of an inland intermodal freight terminal from a City of Cape Town planning authority perspective. Other objectives included identifying mechanisms or incentives within the City's jurisdiction that could contribute towards improving the business case of the preferred site, along with future work that needs to be conducted once a more detailed feasibility stage has been reached.

Although Belcon has sufficient capacity to stage containers and reefer containers the following main concerns are identified.

- Access form N1 and R300 during peak hours
- Rail access from Belcon to the PoCT through the commuter network could be a challenge.

2.3.3 Analysis of Truck Turnaround Time at the Port's Terminals

This section presents feedback on the process of selecting appropriate indicators and conducting data analysis on truck turnaround time in Cape Town Container Terminal (CTCT) and Cape Town Multi-Purpose Terminal (CTMPT) for 12 months before and 12 months after the implementation of the Truck Booking System, which was in October 2021.

After stakeholder consultation to determine the availability of data sources required to select these indicators, the following indicators were identified:

- Queuing time until trucks arrive at the port gate,
- Truck turnaround time inside the port (gate entry to gate exit), and
- Port equipment utilisation.

It is important to consider the impact of other variables in the port operating environment, such as weather conditions, the availability of electricity and labour unrest. These can skew the analysis of the identified indicators if they are not considered.

To inform the queuing time indicator, telemetry data for the time-period are required. Alternatively, security camera footage of Marine Drive and Duncan Road for the time-period could be used.

To inform the truck turnaround time indicator, the truck entry – and exit times for the time-period, which are recorded in the port operating system (NAVIS), are required. Access to the NAVIS system is also required to inform port equipment utilisation.

Various avenues were explored to gather this data, which included email correspondence and online discussions with numerous PoCT stakeholders such as freight forwarders, transporters, and fruit trade associations.

Although NAVIS data could not be obtained, data were received from Truckers for Unity South Africa (TFUSA). This data included truck turnaround time-related data for a single transport company, which only handles import containers at CTCT. This included data for the period 9 May 2022 until 3 March 2023. Limited truck turnaround time data was obtained for the 12-month period prior to the implementation of the Truck Booking System (TBS). This meant a comparative analysis to determine the TBS effectiveness could not be tested.
The Port Congestion and Efficiency Study of PRDW in 2021 gave a 30-day view

Detailed port closure data was obtained for the period 26 March 2020 to 7 February 2023, which enables the effectiveness of the TBS implementation to be assessed. Figure 45 below indicates the reasons for port closure for this time period.

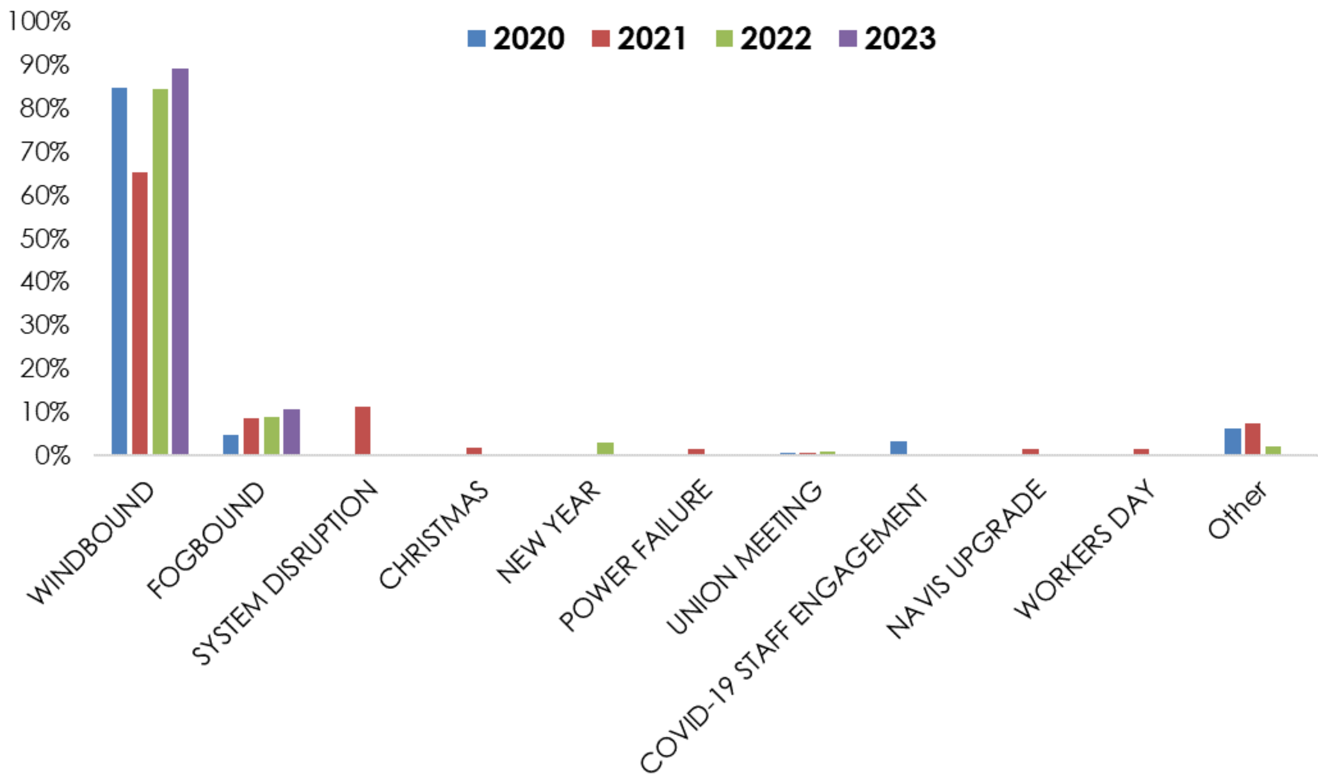


Figure 46: Proportional reasons for port closure in percentage per year
Source: Provided by PoCT (2020 – 2023)

The main reasons for port closures are weather related factors, although wind has a much bigger impact than fog.

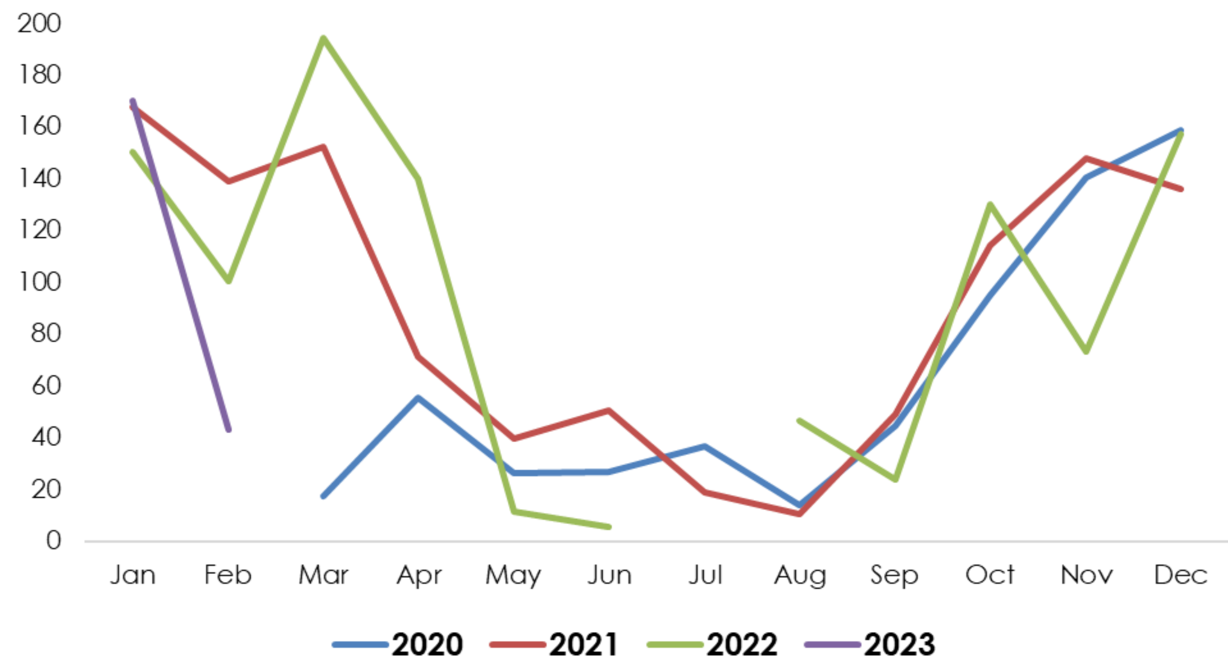


Figure 47: Total hours of windbound port closure per month
Source: Provided by PoCT (2020 – 2023)

Given how the TFUSA data was generated, it contains anomalies which excluded some entries from the analysis. Figure 48 shows the distribution of trucks arriving at the back of the queue at the PoCT. Evidently, very few trucks in this sample arrived at the port in the evening.

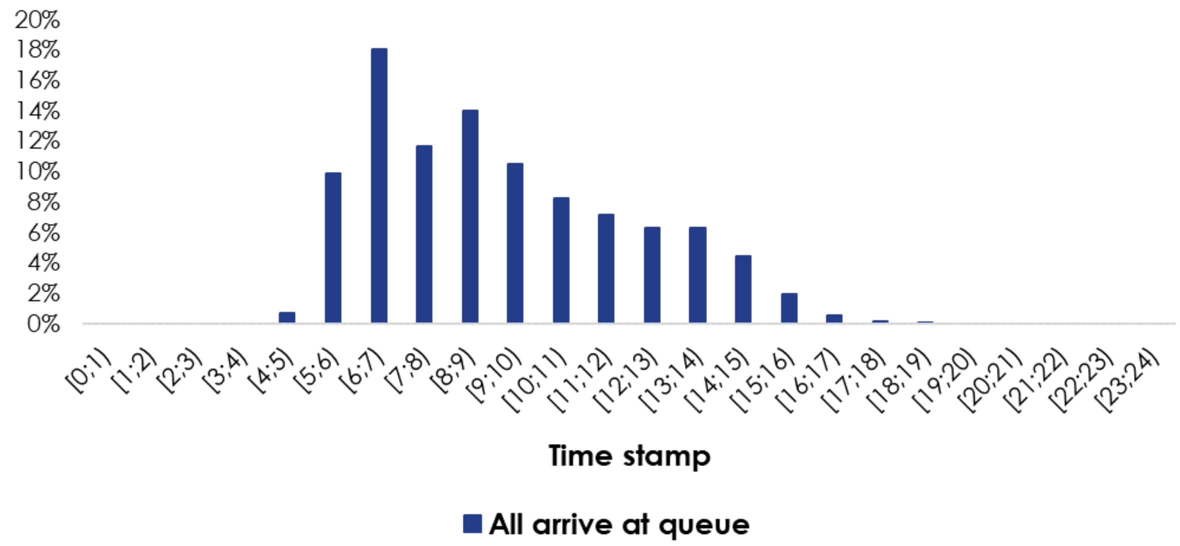


Figure 48: Trucks arrival time at the back of the queue
Source: Provided by TFUSA (2020 – 2023)

The data for arriving trucks are split into the categories shown in Table 6 on the next page. Only 3% of these trucks arrived at the back of the queue into the port while it was windbound. If this is expanded to include any reason for port closure, this number rises to 4%. This is despite the port being windbound for 19% of the year during the period of 04:00 – 19:00 (this is 22% for any closure). The time spent queuing for entry is 50% longer than average in the event of port closure. Interestingly, the time spent within the port area remains largely unaffected.

Table 6: Average time spent at the port

Dataset	Start to Gate in	Gate in to Gate Out	Start to Gate Out	Number of observations
Total	00:20:45	00:58:19	01:19:04	1 661
Excluding Windbound	00:29:29	00:58:22	01:18:51	1 619
Excluding ant Closure	00:20:19	00:58:14	01:18:33	1600
Wind bond	00:30:43	00:56:03	01:26:46	42
Any Closure	00:31:47	01:01:02	01:32:49	64

Source: Provided by TFSA (2020 – 2023)

The TBS was implemented in October 2021 to address congestion and throughput in PoCT. In the absence of detailed truck gate entry and exit data, historical yearly averages for truck turnaround times, container dwell time and RTG movements published in the Transnet Integrated Reports for 2016 to 2018 and Transnet Port Terminal Annual report 2019-2022 were analysed.

Figure 49 shows the average truck turnaround times (TTT) in the PoCT for the CTCT from 2016 to 2022 as reported by Transnet. The TTT are strongly correlated (0.60) with the total hours of port closure. Port closure alone is not sufficient to explain the increase in TTT as there were more hours of port closure in 2017 than in 2022, 1253 and 1159, respectively, despite the TTT more than doubling from 21 and 44, respectively. The decreased average TTT in 2021 cannot be fully attributed to the implementation of the truck booking system (TBS) as it was only implemented in October 2021. Despite total port closure hours decreasing from 1 732 to 1 159 TTT only improved by 1 minute, which is not that significant.

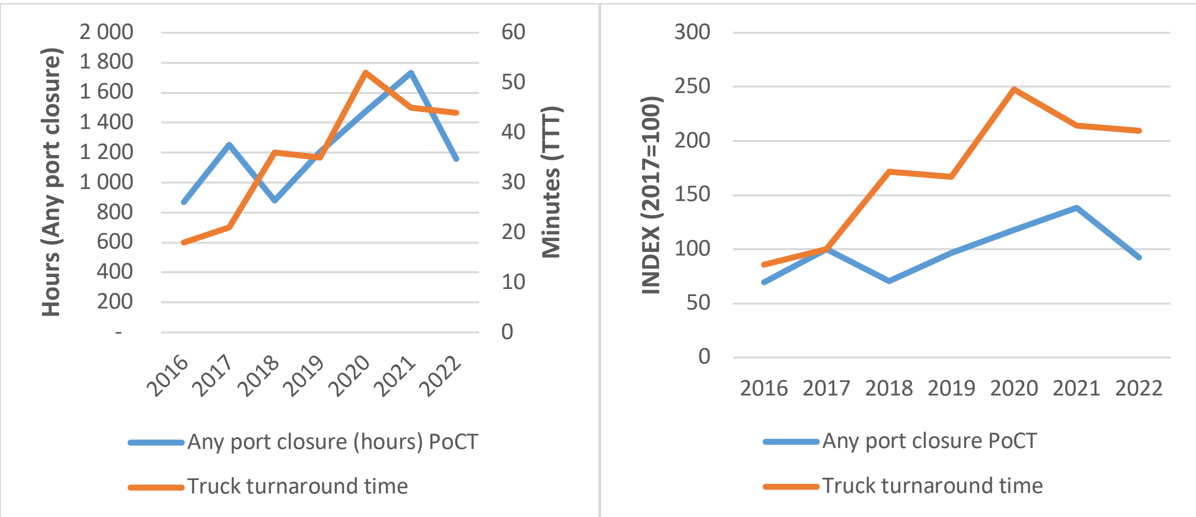


Figure 49: Average Truck Turnaround Times (gate to gate) and total hours of port closure (any)

It, therefore, appears that the TBS has been limited in its ability to improve TTT as 2022 appears to have been a better operating environment where port closure is concerned.

Slightly less than half of CTCT imports are empty containers and there is an even split between the total number of containers landed and shipped. Despite this even distribution of directionality, import containers have a significantly lower dwell time than export and transhipment containers, as seen in Figure 50. The reason why this discrepancy exists is unclear and is likely a combination of various factors. A very strong correlation exists between TTT and container dwell time for imports 0.95 and strong correlations for exports and transhipments, which were 0.60, 0.63, respectively.

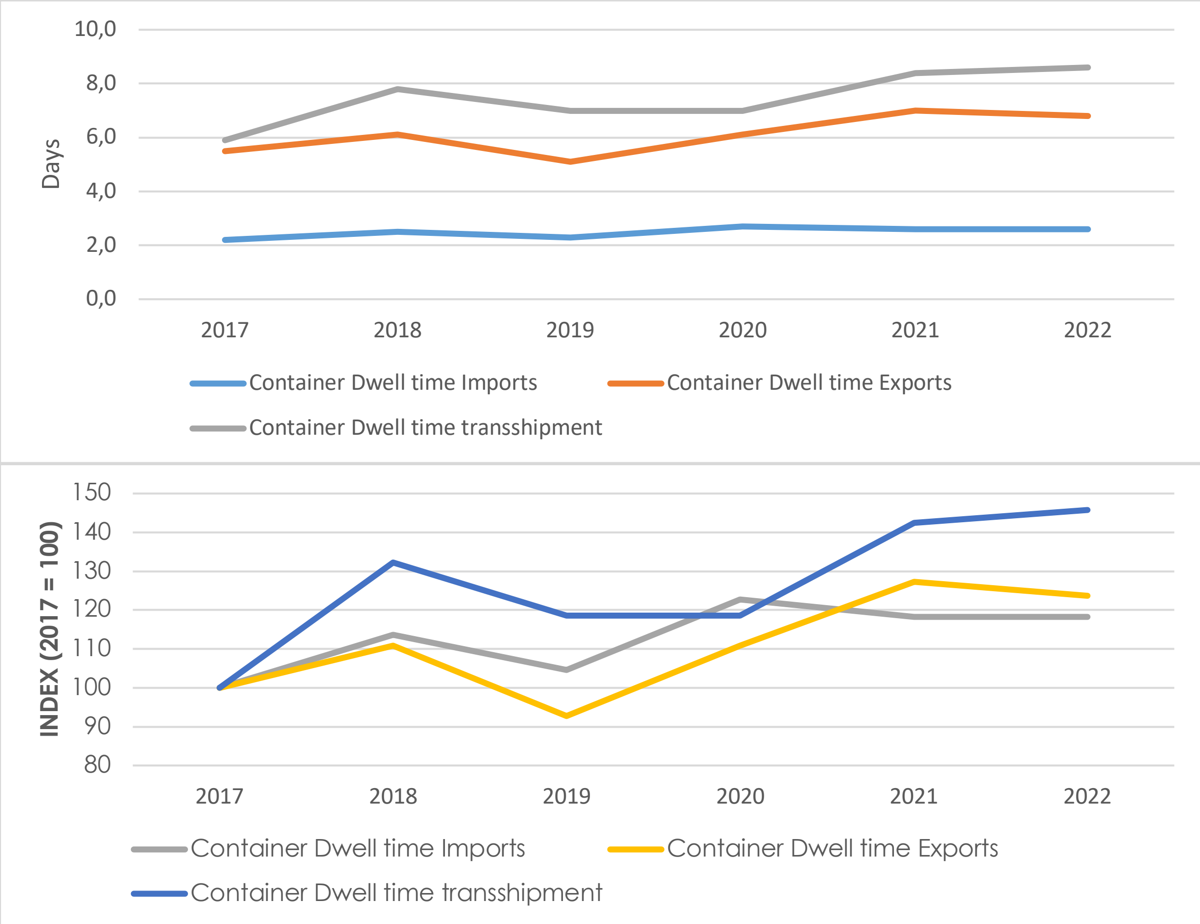


Figure 50: Container dwell times in the PoCT for imports exports and transhipments 2017-2022.

Part of the deterioration of container dwell times could be ascribed to the reduced productivity inside the port. Figure 51 shows the moves per gross crane hour and the container moves per ship working hour in the CTCT. Moves per gross crane hour (GCH) have decreased by 47% from 32 to 17 since 2016. Over the same period the container moves per ship working hour (SWH) went from 54 to 34, a 37% decrease.

There exists a very strong correlation between the container moves per GCH and SWH (0.95), as expected. When crane productivity goes down, the total number of containers moved to and from a ship will decrease. Strong negative correlations 0.86, 0.76 and 0.64 exist between moves per gross crane hour and container dwell times for imports, exports, and transhipments, respectively. The reduced productivity in 2018 and 2020 appears to have directly resulted in large increases in TTT in 2018 and 2020.

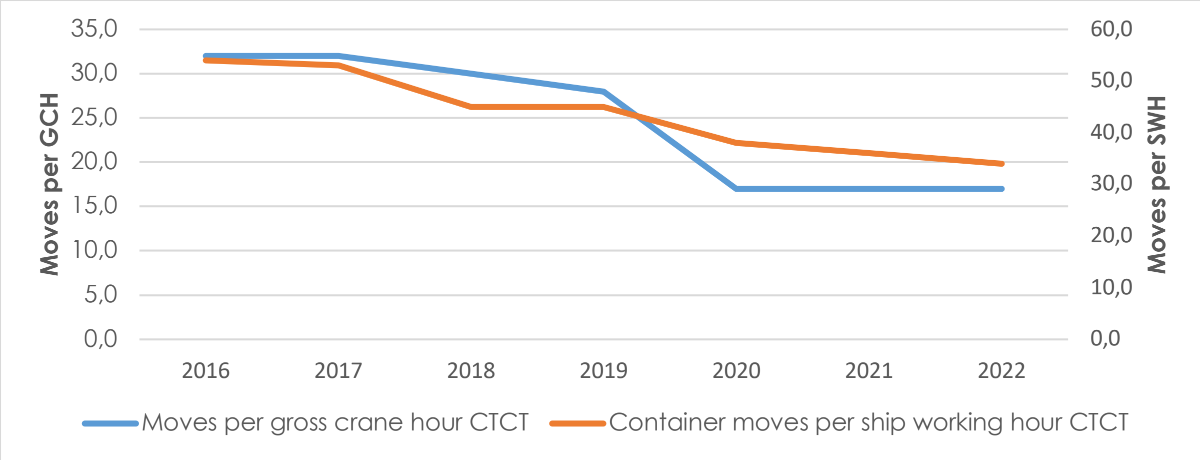


Figure 51: Moves per gross crane hour and container moves per ship working hour in CTCT.

TTT is very strongly negatively correlated, 0.90 and 0.94 with GCH and SWH, respectively. It could be argued that the TBS led to the marginal decrease in TTT in the CTCT, however, it is more likely caused by the large decrease in port closure for 2022, despite the lower container moves per ship working hour.

Crane productivity has remained at 17 moves per GCH since 2020 which indicates that each year less cranes have been operable inside the port.

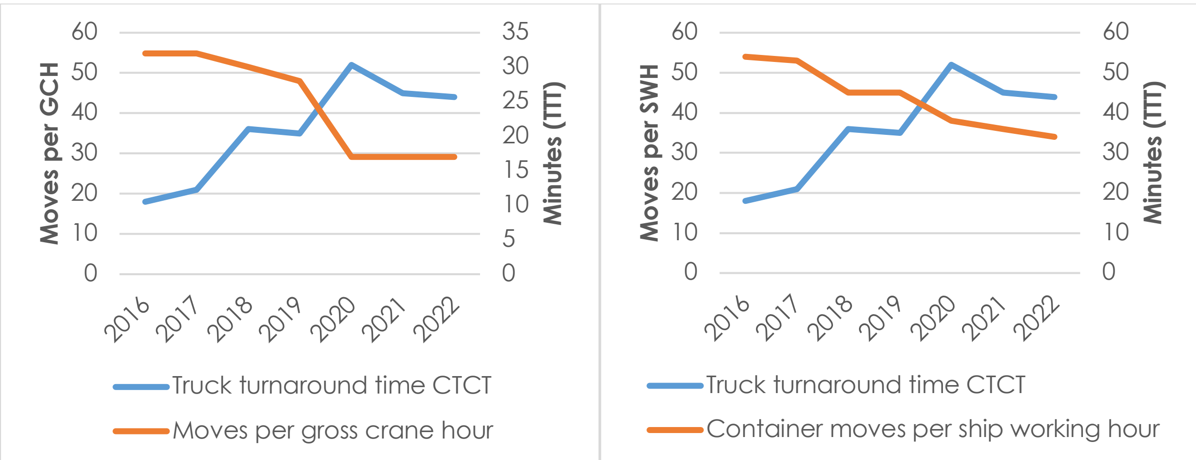


Figure 52: TTT compared to container moves per GCH and SWH

When considering container dwell times, moves per GCG and SWH, port closure and TTT, it becomes clear that the TBS is not currently a binding constraint on the port operating environment. In 2016 the CTCT handled 926 611 containers with an average TTT of 18 minutes without any TBS. In 2022 CTCT handled 8% less containers, 856 177, however, TTT increased to 44 minutes, of which a very small portion could be attributed to 289 additional hours of port closure, as the TTT was 21 minutes in 2017 when the port experienced 383 additional hours of port closure compared to 2016. The binding constraint on TTT in the port is, therefore, crane productivity.

Until crane productivity isn't returned to 2016 levels, the effectiveness of a TBS cannot be fully analysed in this heavily constrained port operating environment. It should also be noted that the TTT in this time series analysis is limited to gate-to-gate TTT inside the port terminal, the increase in container dwell times indicates that the queues outside the port terminal would have increased over this period and, therefore, the gate-to-gate TTT is underestimating the total congestion in the Cape Town port caused by the lack of port equipment productivity.

2.3.4 Thematic Analysis of Communication between Truckers and Shift Managers in the Container Terminal

Data from three WhatsApp groups were received, namely the Terminals, Fruit Industry and Cape Town Harbour Carriers Association (CTHCA). These WhatsApp groups are informal forms of communication used to enhance communication channels between port stakeholders.

The data for the Terminal WhatsApp group ranged from 31 December 2021 to 18 January 2023; Fruit Industry WhatsApp group from 11 March 2021 to 18 January 2023 and CTHCA WhatsApp group from 31 December 2021 to 18 January 2023. Like before, no data prior to the implementation of the TBS was obtained, meaning a comparative analysis to determine its effectiveness could not be conducted.

The methodology applied in the analysis of the WhatsApp groups was content analysis. Content analysis is a research methodology used to analyse and interpret the content of communication materials, such as written documents, audio or video recordings, social media posts, and other types of media.

The purpose of content analysis is to identify patterns, themes, and trends within the data and to draw conclusions based on these patterns. Content analysis involves several steps, including developing a coding scheme, coding the data, analysing the data and drawing conclusions. For the analysis of this project, a manual level one and two coding scheme was utilised for the Terminal and Fruit Industry WhatsApp groups. Due to time and budget limitations, the CTHCA WhatsApp group utilised automated data coding.

The three WhatsApp groups will be discussed separately below. It is important to note that the analyses below did not include attachment analysis.

2.3.4.1 WhatsApp Group: Terminals

Data analysed was for a period of 13 months (mainly for 2022) after the TBS was implemented. A total of 841 messages were received for this WhatsApp group, with 20 unique senders.

Table 7 summarises the number of unique senders and the number of messages for the period.

Table 7: Summary of the Terminals WhatsApp Group

	Number of Months	Number of Unique Senders	Number of Messages
2021	½	11	65
2022	12	19	716
2023	½	8	60
Total	**13**	**20**	**841**

The Terminals created this WhatsApp group for one-way instructions, communication, and feedback. The industry cannot post on this group. The distribution of message themes over the period is illustrated in Figure 52 below. More than 50% of these messages are focused on wind and terminal operations (i.e. updates to announce when it is open after being closed).

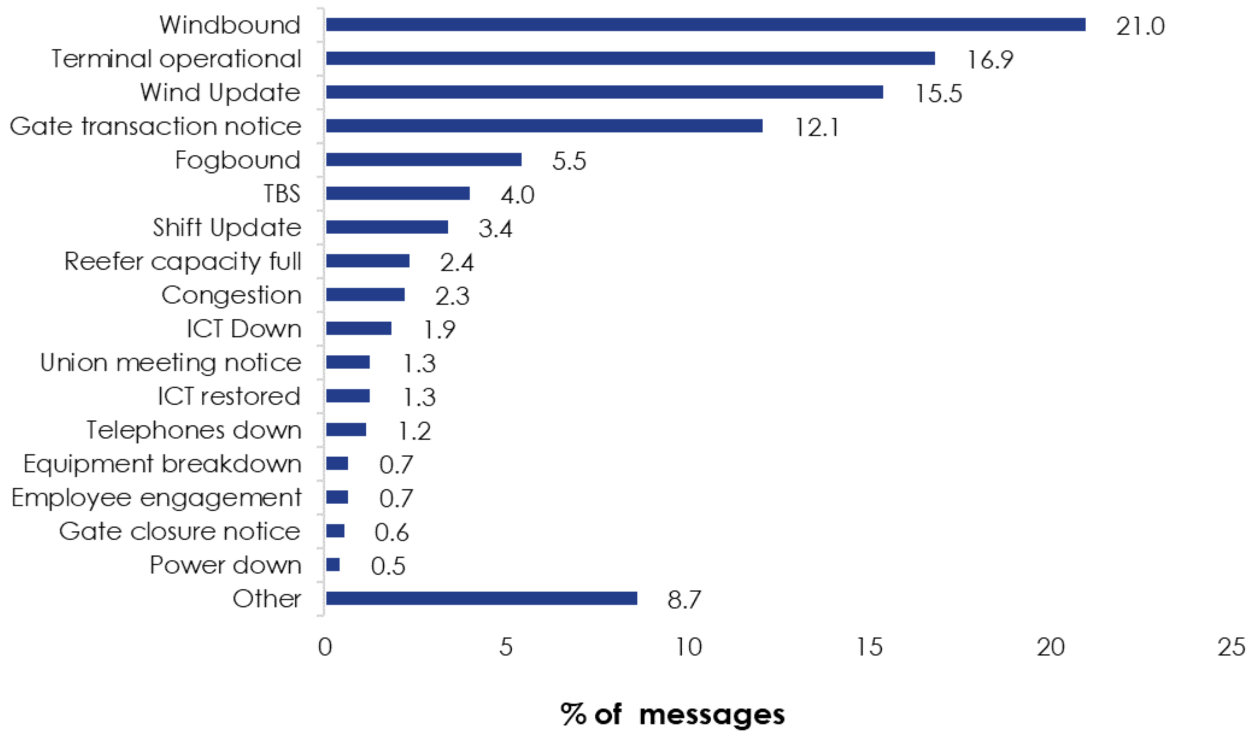


Figure 53: Level 1themes for I Terminal WhatsApp Group

Figure 54 shows the monthly distribution of the number of messages for wind and fog-related communication on the Terminals WhatsApp group.

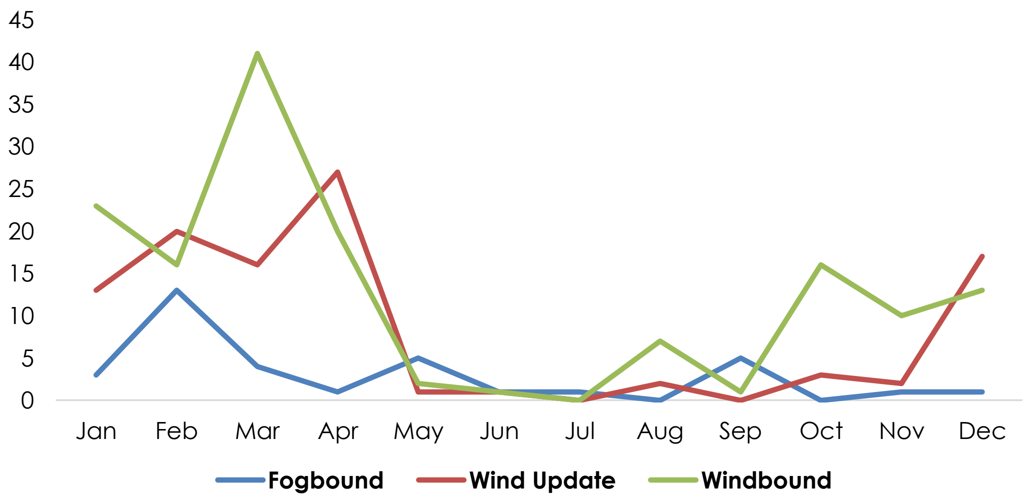


Figure 54: Monthly distribution of Terminal WhatsApp messages in 2022

The detail regarding the TBS is summarised in Figure 55 below.

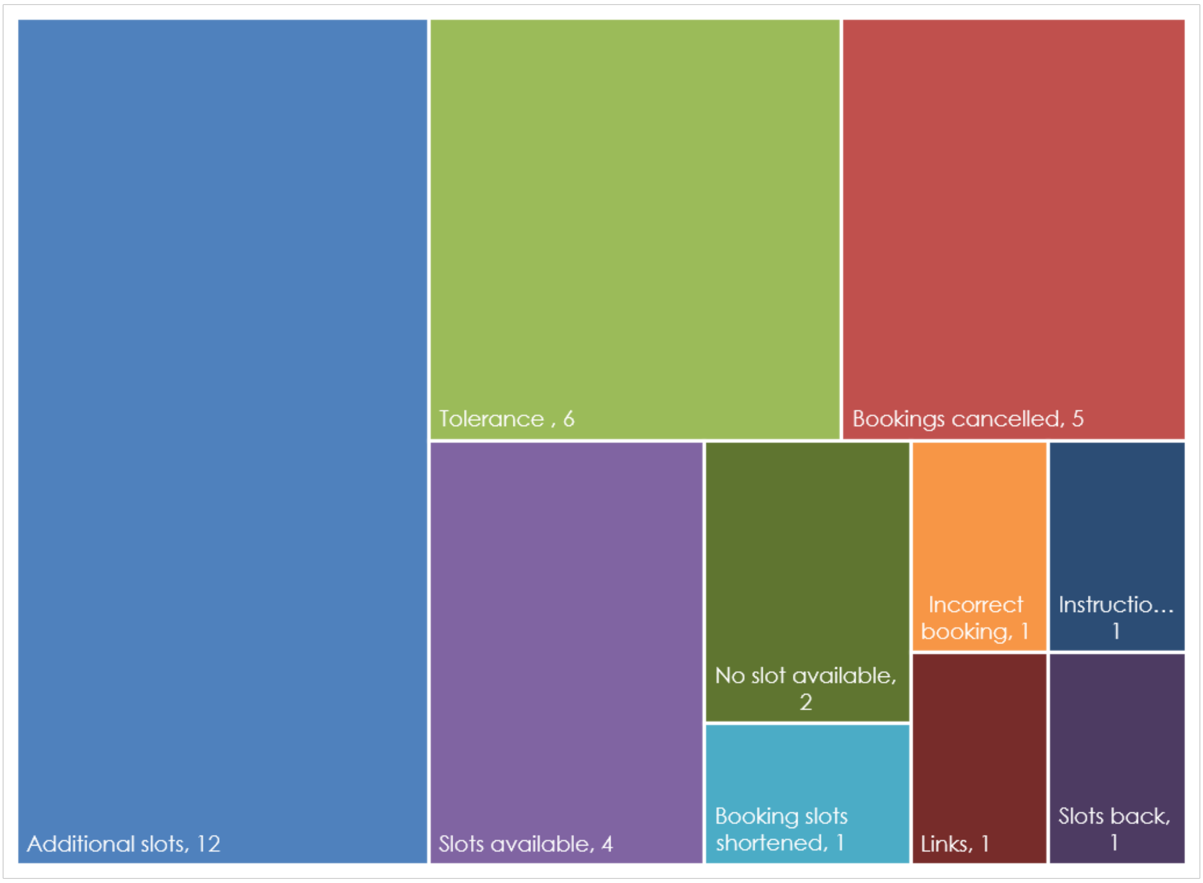


Figure 55: Level–2 - themes for the TBS

2.3.4.2 WhatsApp Group: Fruit Industry

A total of 9 791 messages were received for this WhatsApp group, with 248 unique senders. The Fruit Industry created this WhatsApp group for two-way communication and support for fruit stakeholders. 23% of the messages could not be coded objectively, and were, therefore, excluded.

The distribution of message themes over the period is illustrated in Figure 56 below.

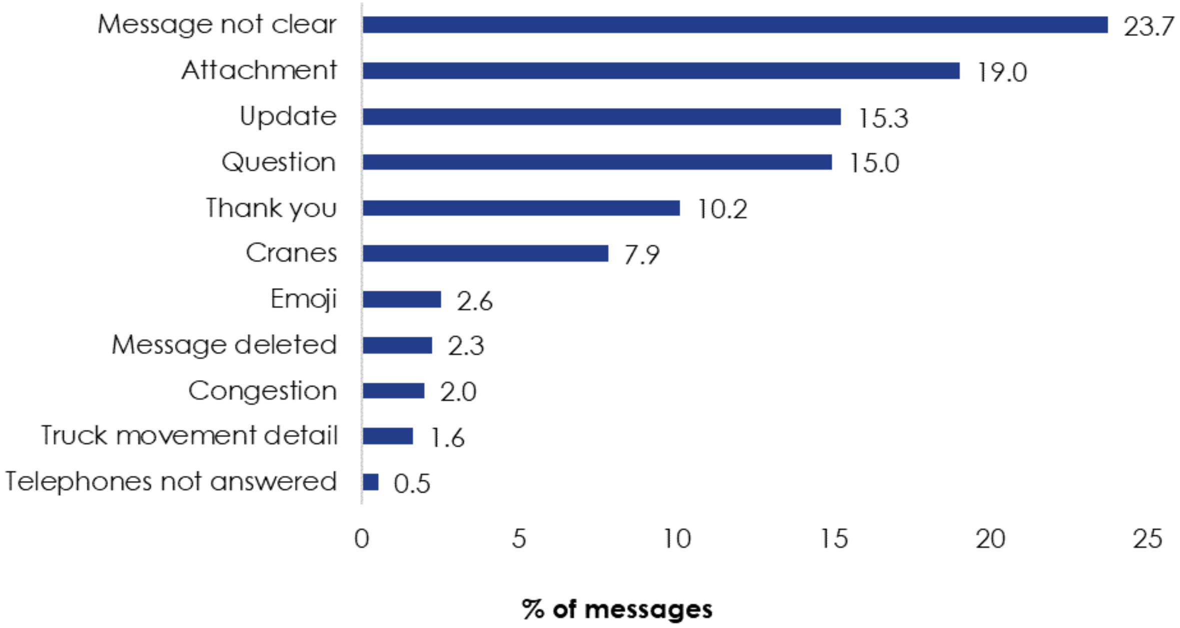


Figure 56: Level 1-themes for the Fruit Industry WhatsApp Groups

Understanding the difference between 'question' and 'update' related communication is important. Questions are messages communicated by the fruit industry, while updates are messages communicated by the port officials. The distribution of question and update-related themes over the period is illustrated in Figures 57 and 58, respectively. In addition, a breakdown of communication related to cranes specifically is provided in Figure 59.

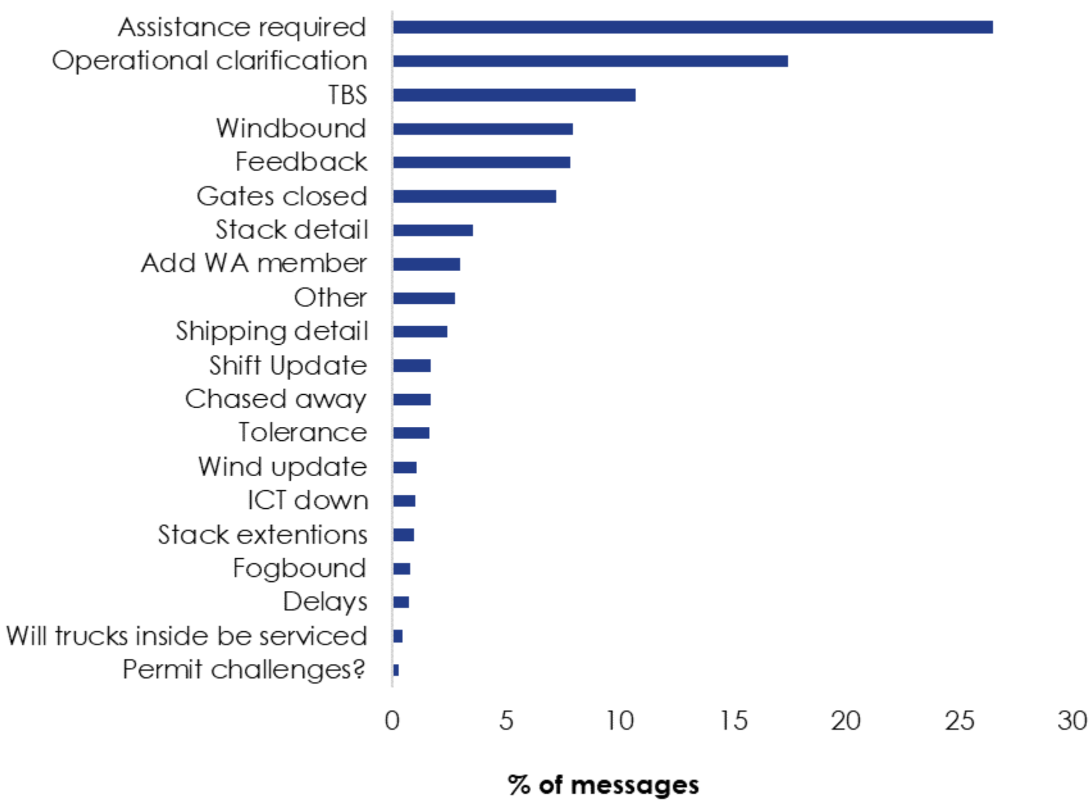


Figure 57: Questions-related themes for the Fruit Industry WhatsApp Group

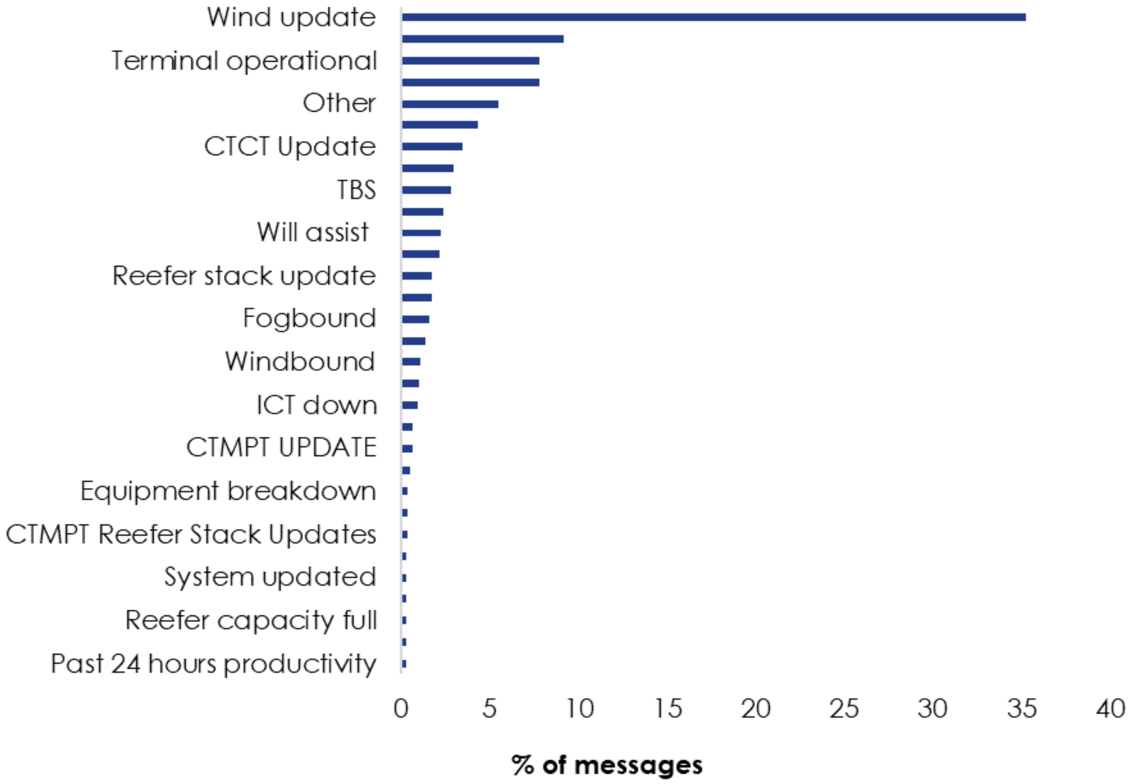


Figure 58: Update-related themes for the Fruit Industry WhatsApp Group

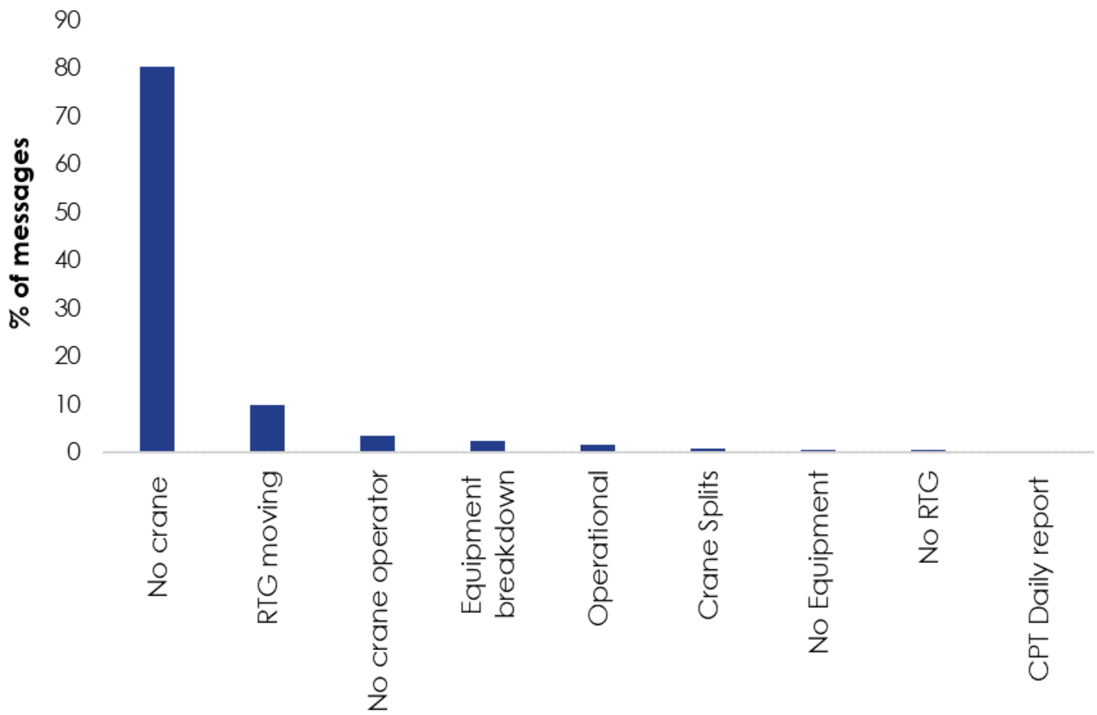


Figure 59: Crane-related themes for the Fruit Industry WhatsApp Group

Table 8: Overview of the Industry's questions on the Fruit Industry TBS

Questions	Number of Messages
No booking	44
More slots	40
Assistance	13
Earlier appointments	13
Cancelled slots	8
Tolerance	7
Rebook	5
Not open	4
Booking expired	3
Bookings closed	3
Instructions	3
Slots expired	3
Telephones not answered	3
Slots not utilised	2
Frustrated	2
Assistance available	1
Congestion	1
Early arrivals	1

Table 9: Overview of the Industry's questions (port's updates) on the Fruit Industry TBS

Updates	Number of Messages
Bookings open	7
Rebook	7
More slots	4
Assistance available	3
No booking	3
Slots not utilised	3
Not adding slots	2
Tolerance	2
Instructions	2
Bookings closed	1

Updates	Number of Messages
Congestion	1
Early arrivals	1
Increased slots	1
Movement Port	1
Not open	1
Registration update	1
Training date	1
Tutorial	1

2.3.4.3 WhatsApp Group: Cape Town Harbour Carriers Association

A total of 4 668 messages were received for this WhatsApp group, with 131 unique senders. The monthly distribution of messages is illustrated in Figure 59.

The CTHCA created this WhatsApp group for two-way communication and support for its stakeholders. A total of 16% of the messages could not be coded objectively and were, therefore, excluded.

A monthly distribution of messages over the period is illustrated in Figure 60 below.

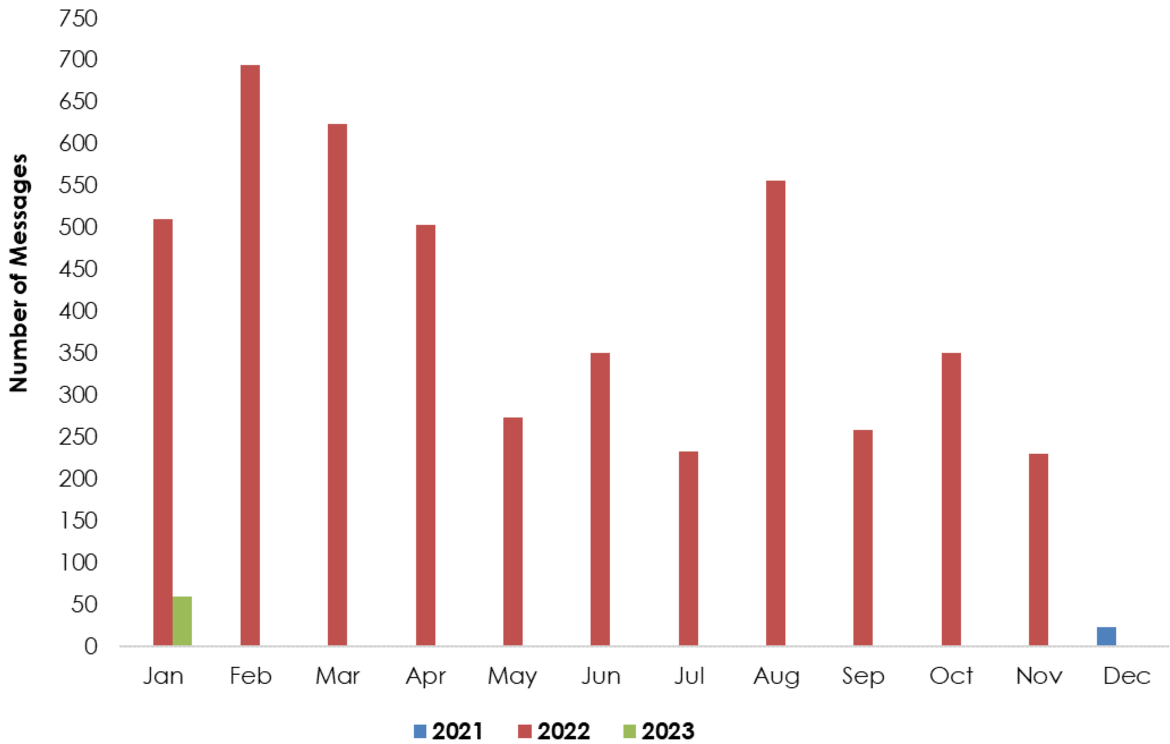


Figure 60: Monthly distribution of CTHCA WhatsApp messages

The distribution of message-themes over the period is illustrated in Figure 61 below.

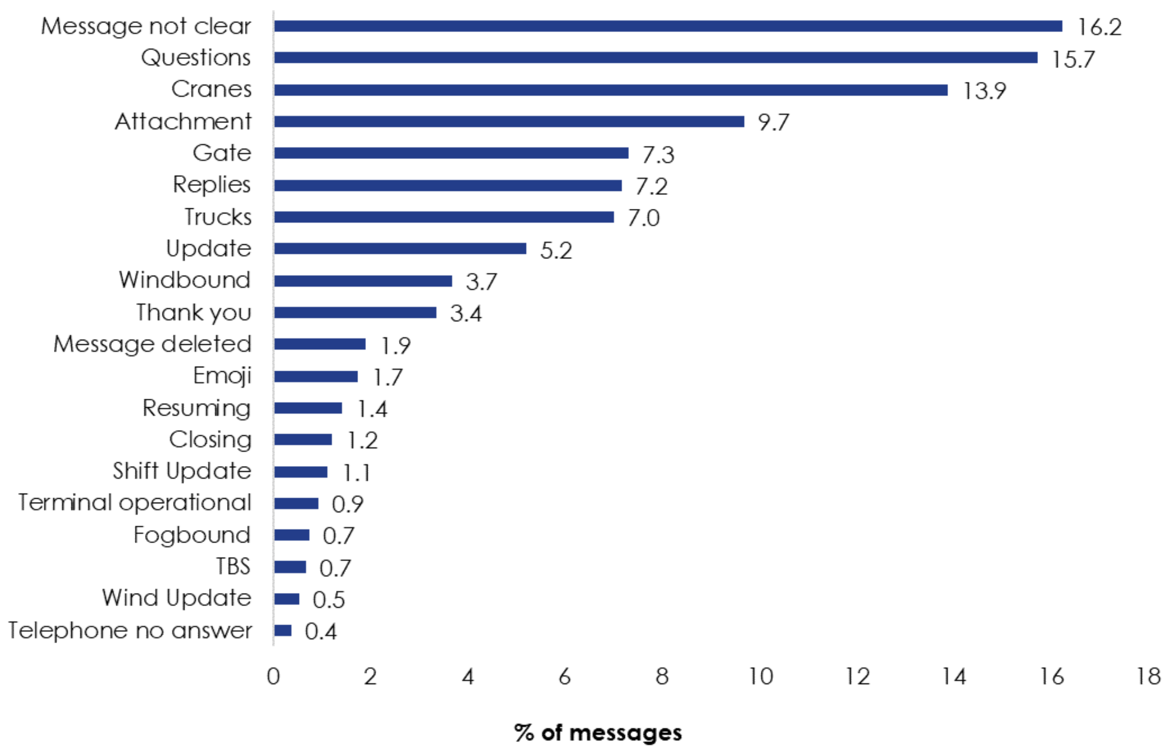


Figure 61: Level 1-themes for the CTHCA WhatsApp Group

INSIGHTS AND RECOMMENDATIONS

As seen in Figure 62, the port activity (measure of full containers handled at the port), is spread throughout the year, yet does not experience the seasonality of the average port downtime (reduced operating hours).

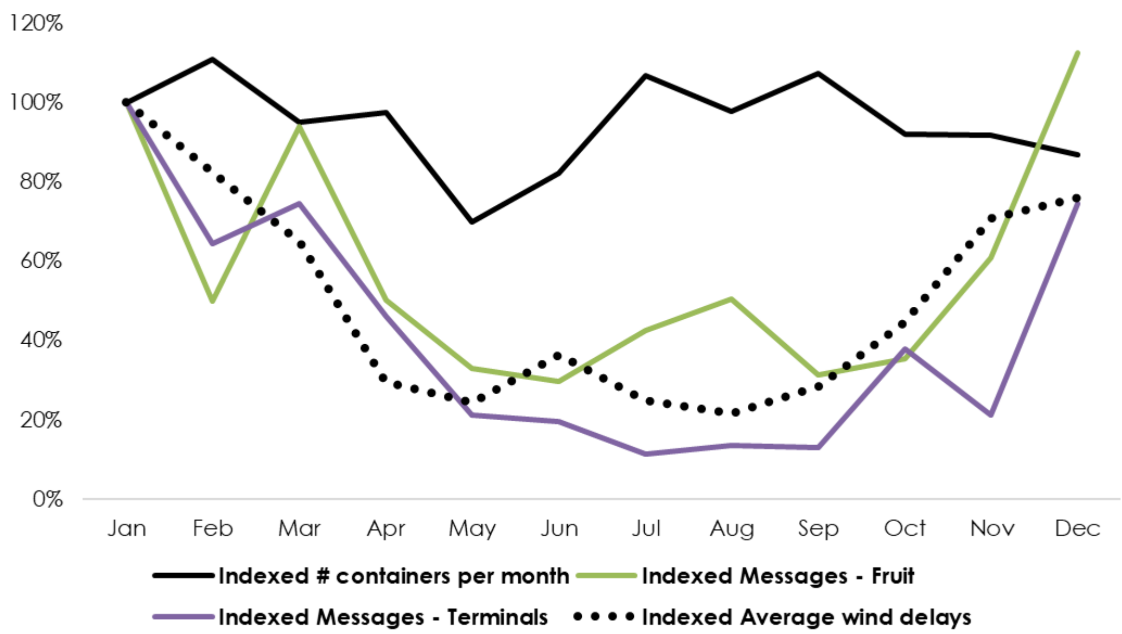


Figure 62: WhatsApp Group messages compared to CTCT activity and delay time

Although these WhatsApp groups are informal forms of communication, this approach has enabled greater levels of engagement between port stakeholders. It is evident from these messages that the port officials are playing an active role in this communication.

While it is difficult to avoid weather delays, the port stakeholders can mitigate weather's impact on the port supply chain through improved communication and transparency. It already seems like WhatsApp groups are playing a part in achieving this.

To address truck turnaround times, it is important to use a supply chain approach since many factors outside the port terminals also have an influence. This can be achieved by collaboration, especially information-sharing, between the port's stakeholders. There is a clear need for an integrated data management system.

More specifically, terminal intelligence can be improved by increasing the level of data coordination between the port's terminal stakeholders and performing calculations that enable appropriate trade-offs to be made, which will in turn inform better decision-making related to the terminals.

2.4 Fieldwork

2.4.1 Analysis on Truck Permitted to Call

This section sets out the data collection results as collected to develop an understanding of the current situation. Data collection occurred in and around the Port on 9 and 10 February 2023.

2.4.1.1 Observations

Two senior members of the team undertook unstructured observations of the activities at various locations in and around the Port on 9 and 10 February 2023

The observations included:
- Queueing in Marine Drive and surrounding areas
- Queueing in the Port
- Loading/offloading activity in the container terminal
- Gate activity at the terminal entrance and exit.

The observations have been used to contextualise the data analysis, and specific details are highlighted in other aspects of this report.

A general observation was that the circumstances encountered on 9 and 10 February were different each day. There was growing congestion on 9 February from early to late afternoon, with significant queues forming:
- Along Marine Drive
- At the entrance to the staging/parking area after the turnaround point
- At the entrance to the container terminal.

In contrast, there was very little queuing on 10 February, with a short queue developing from about 07:00 am at the entrance to the container terminal and subsiding by 08:30.

2.4.1.2 Methodology

The team comprised a senior person and one student who undertook a trucker survey. On 9 February, trucks parked on Marine Drive (shown in green in Figure 62) were surveyed. On 10 February, trucks were surveyed at the Port's container terminal entrance.

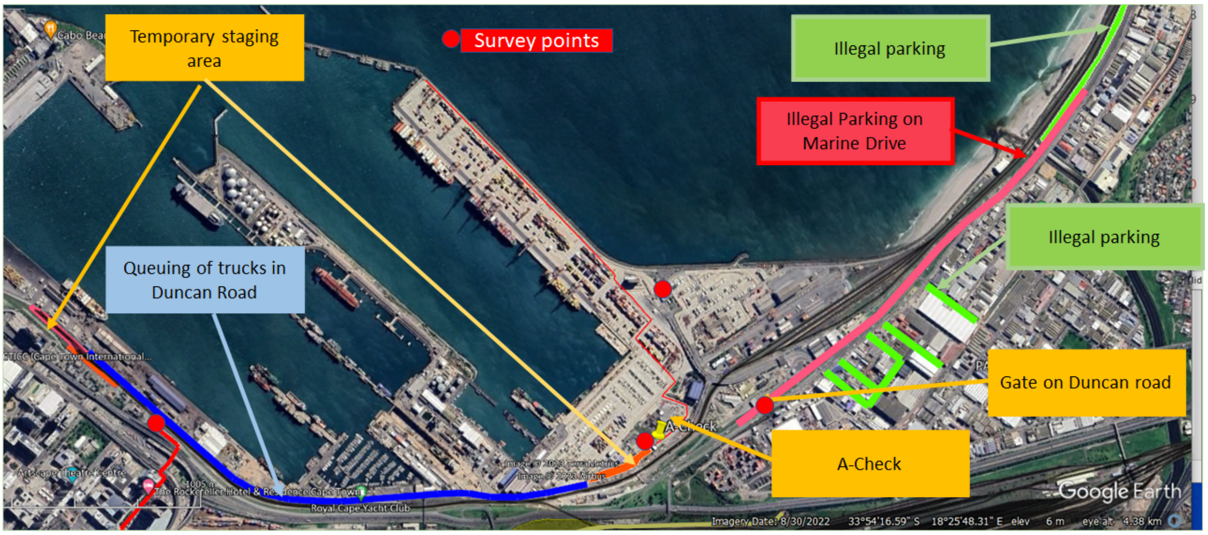


Figure 63: Study Area

The survey comprised a 1-page questionnaire including the following topics:

- Descriptive information, e.g. location, time, vehicle registration and company
- Truck owner details
- Booking system usage and experience
- WhatsApp Group usage and experience
- Parking e.g. reason, expected time and problems
- Queueing e.g. expected duration in and outside of Port, deviant behaviour, general problems

The data collection team comprised nine Masters level students from the University of Stellenbosch and three senior personnel to supervise, co-ordinate and make additional observations. The students worked in groups of two to record and photograph container truck movements at key points (marked in yellow in Figure 62) in the Port:

- Duncan Road entrance
- Duncan Road exit
- Container terminal entrance
- Container terminal exit.

The key information captured includes:

- Observation point
- Date and time of arrival at the point
- Vehicle registration
- Trucking company.

As many as possible of the truck movements at each observation point were recorded on paper supported by timestamped photographs.

Following the data collection, the paper records were captured in an Excel spreadsheet for further analysis. It should be noted that these observations in no way constitute a complete picture of all truck movements.

2.4.2 Truck movement results

2.4.2.1 Truck Movement Survey - 9 February 2023

The start of work was delayed on 9 February due to :

- Completion of the required safety induction training before working in the port area.
- Notifications to the various security personnel of the surveys being undertaken. This resulted in work being stopped at various times and points. However, by 13H30, the team was allowed to continue with only minor difficulties. Once the message had been received, cooperation with the team was excellent.

A total of 1457 movements were recorded trucks entering and exiting the port. Table 10 illustrates the gate-to-gate truck movements recorded between 06H00 and 17H00.

Table 10: Gate-to-gate movements on 9 February 2023

Number of trucks	Gate-to-gate flow
136 trucks	Trucks entering and leaving the Port at Duncan Rd.
79 trucks	Trucks moving from the Port entrance to A-Check gate
64 trucks	From A-Check gate to the container terminal exit gate.

As it was not possible to track all of the trucks at all of the points, the above need to be viewed as separate samples rather than an integrated data set. Accordingly, the calculated times serve as an indicator rather than a statistic.

It should be noted that for this analysis, some data were excluded due to:

- The data representing trucks leaving at the start of the observation period.
- The data representing trucks arriving at the end of the observation period.
- Some trucks leave via unmonitored exits.
- Errors and inconsistencies.

Figure 64 illustrates the distribution of the time spent by trucks in the Port on 9 February 2023. Whilst 12 trucks were able to turn around in a relatively quick time of under 30 minutes, one took 418 minutes. For most, the turnaround time was between 81 and 211 minutes. The average time spent in the Port was 129 minutes. 60 % of the trucks went through the port in 150 minutes and 80% of the trucks in 180 minutes

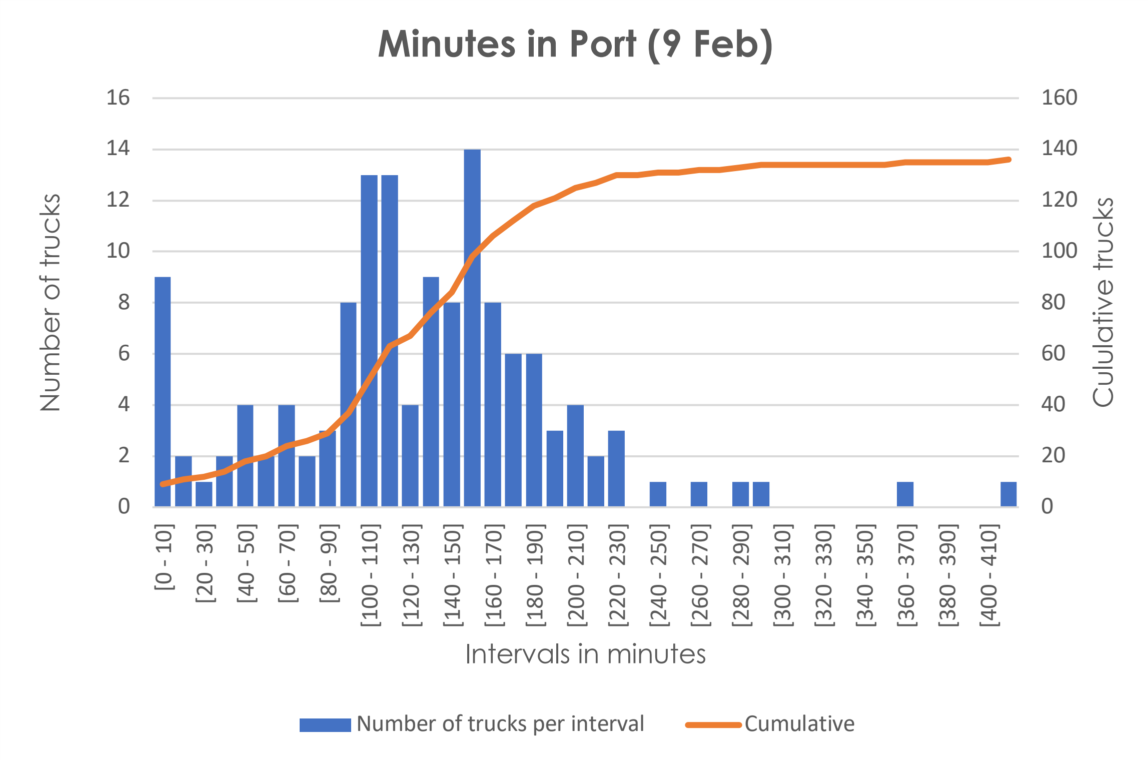


Figure 64: Time in Port 9 February 2023

Figure 65 illustrates the distribution of the time trucks spend waiting to enter the container terminal at the A-check gate on 9 February. As characterised by the extensive queueing observed on the day, the trucks experienced long delays of 40 to 130 minutes. The average queueing time was 82 minutes.

Observations revealed 50 trucks in the staging area at the A-check gate before the container terminal, 62 in Duncan Road waiting to enter the container terminal, and 82 in the parking/staging area at the turnaround point.

At times there was a small backup of trucks at the port entrance and before the exit.

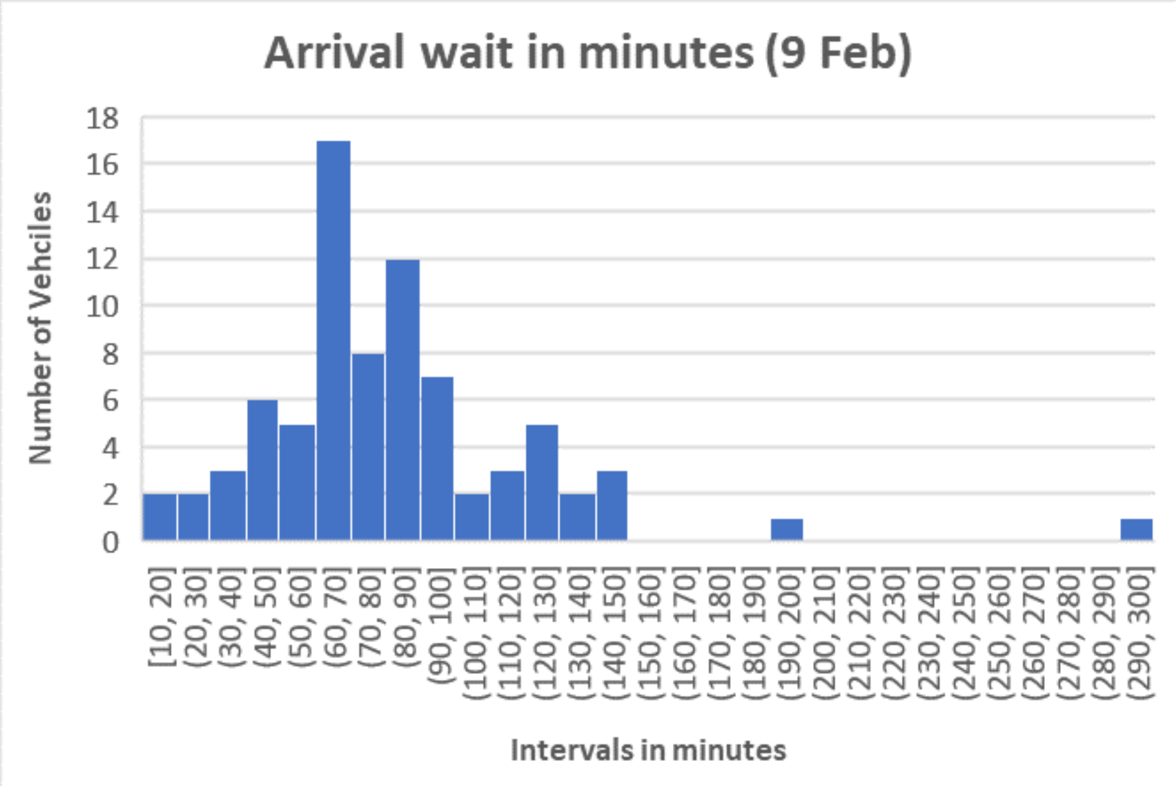


Figure 65: Time to reach A-check gate on 9 February 2023

The time spent in the container terminal is illustrated in figure 66. About half of the trucks were serviced within the 40-minute objective. But some were significantly longer, with the longest time calculated at 342 minutes. The average time was 69 minutes.

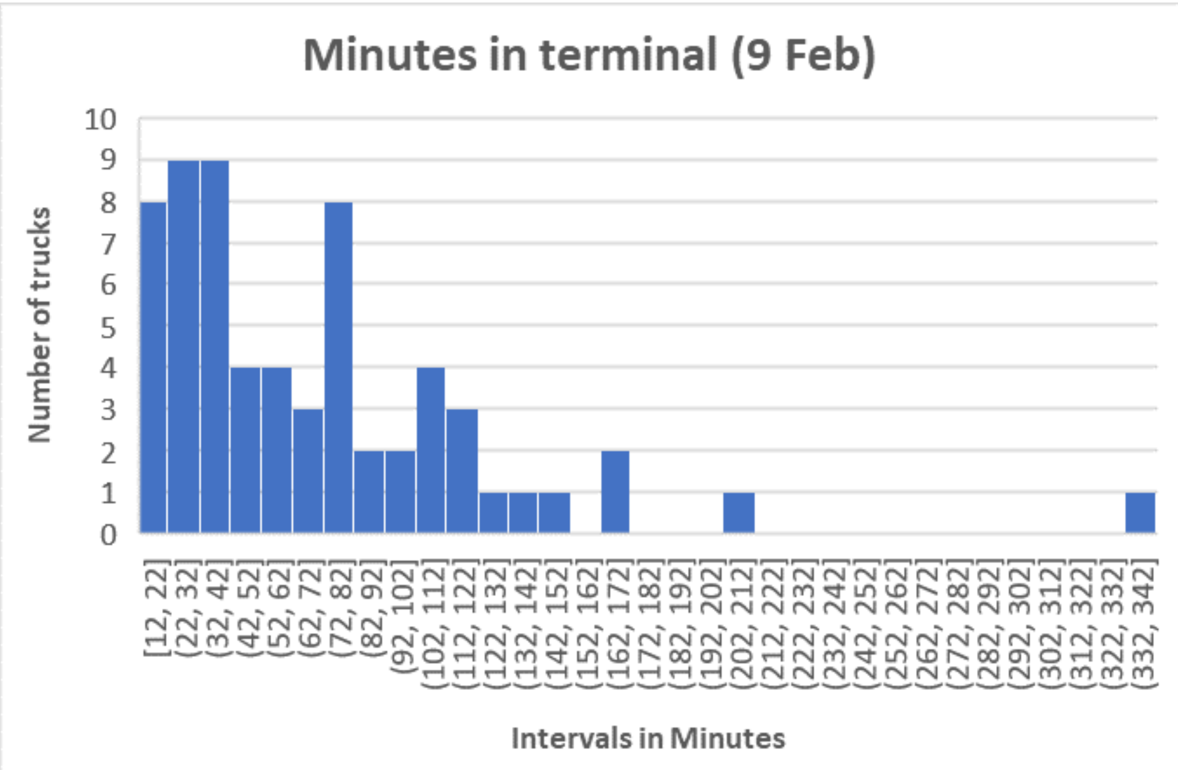


Figure 66: Time in container terminal on 9 February 2023

2.4.2.2 *Mian Transport Carriers*

Figure 67 illustrates the top 20 transport carriers observed on the 10 February 2023. 44% of the top 20 transport companies got access to the port and 41% went to the container terminal.

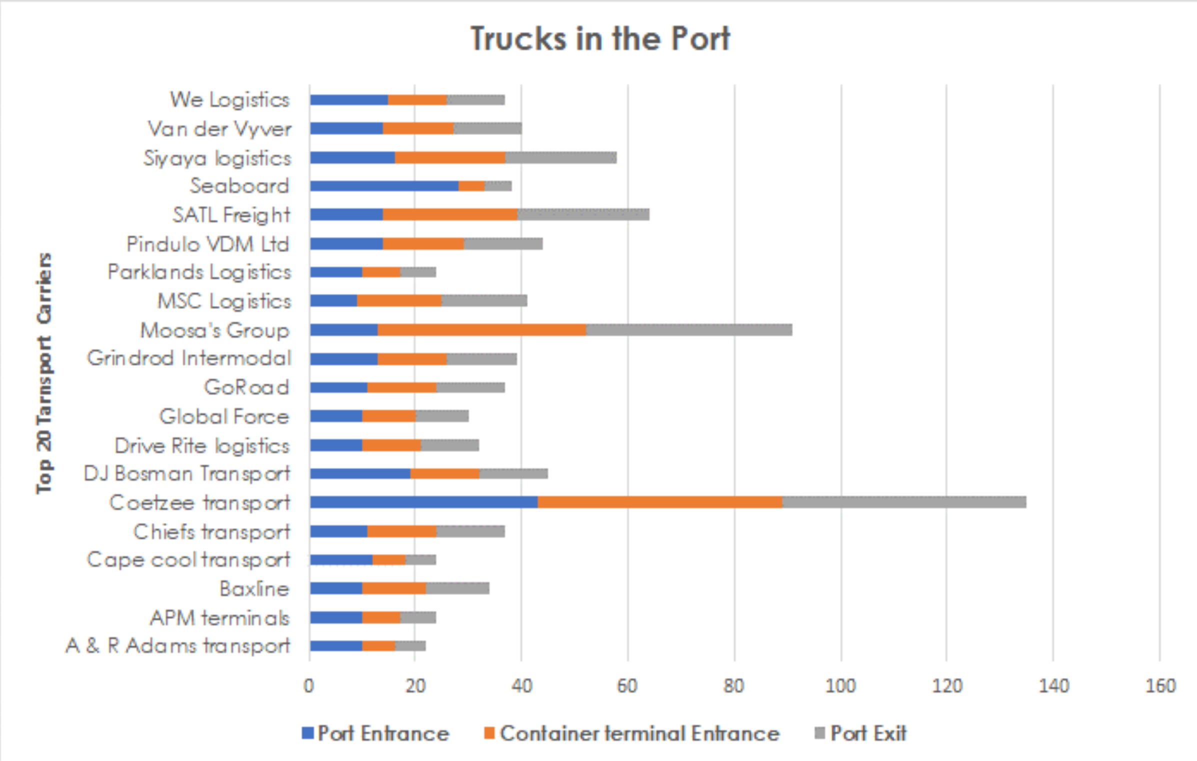


Figure 67: Main Transport Carriers

SATL Freight, Moosa's Group and Coetzee have transported the most traffic on the day.

2.4.2.3 *Truck Movement Survey - 10 February 2023*

A total of 2 546 movements were recorded. Table 11 illustrates the gate-to-gate truck movements recorded between 06H00 and 17H00.

Table 11: Gate-to-gate truck movements on 10 February 2023

Number of trucks	Gate-to-gate flow
271 trucks	Trucks entering and leaving the Port at Duncan Rd.
293 trucks	Trucks moving from the Port entrance to A-Check gate
305 trucks	From A-Check gate to the container terminal exit gate.

It was not possible to track all of the trucks at all of the points, the above need to be viewed as separate samples rather than an integrated data set. Accordingly, the calculated times serve as an indicator rather than a statistic.

It should be noted that for this analysis, some data were excluded due to the following:

- The data representing trucks leaving at the start of the observation period
- The data representing trucks arriving at the end of the observation period

- Some trucks leaving via un-monitored exits
- Errors and inconsistencies.

Figure 68 illustrates the distribution of the time spent by trucks in the Port on 10 February 2023. Whilst 14 trucks turn around in a relatively quick time of under 20 minutes, one took 496 minutes. For most, the turnaround time was between 26 and 126 minutes. The average time was 96 minutes. 60 % of the trucks went through the port in 90 minutes and 80% of the trucks in 130 minutes

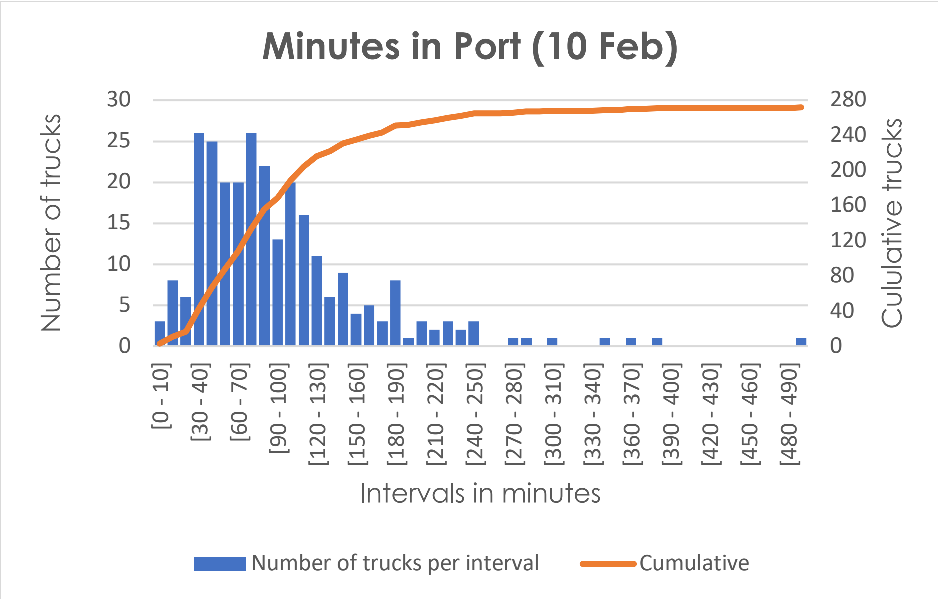


Figure 68: Time in Port 10 February 2023

Figure 69 illustrates the distribution of the time trucks spent waiting to enter the container terminal on 9 February 2023. As characterised by the lack of queueing observed on the day, almost all trucks reached the terminal within 21 minutes of entering the Port. The average waiting time was 12 minutes.

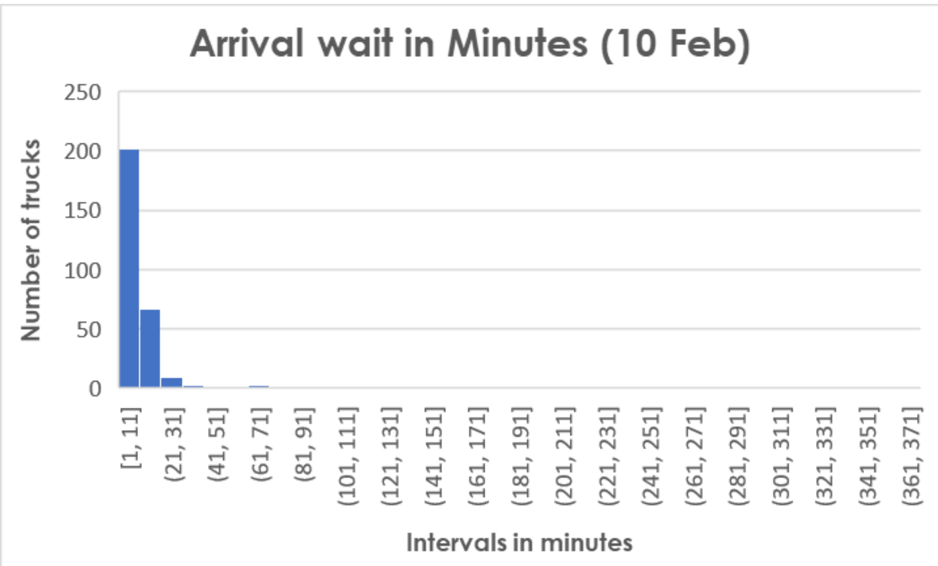


Figure 69: Time to reach A-check gate 10 February 2023

The time spent in the terminal is illustrated in Figure 70. Less than a quarter of the trucks were serviced within the 40-minute objective. But some were significantly longer, with the longest time at 314 minutes. The average time was 85 minutes.

The time taken to process a vehicle at the A-Check gate was also observed and calculated at an average of 45 seconds per vehicle. Therefore, using four lanes at the A-check gate equates to a maximum potential capacity of approximately 3 840 trucks in a 12-hour period.

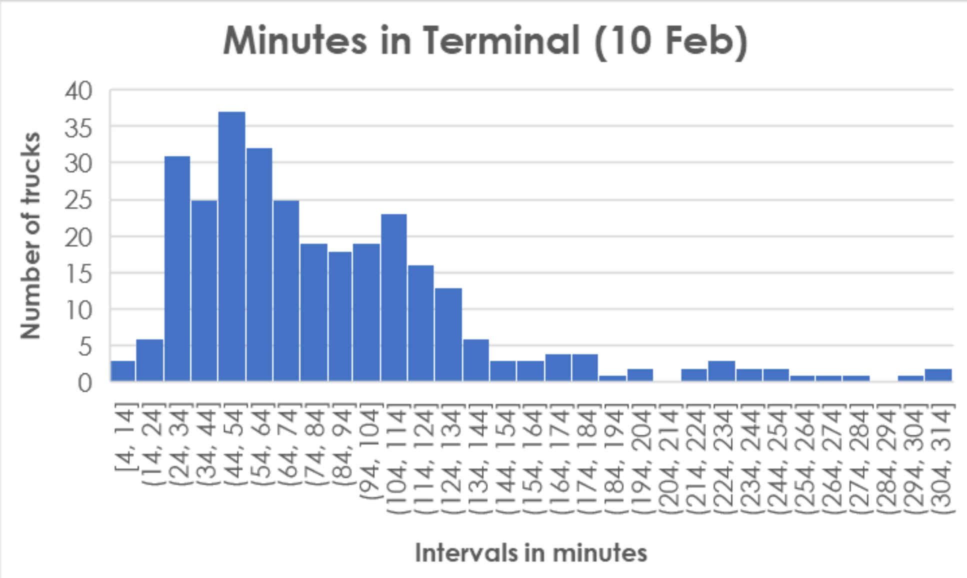


Figure 70: Time in container terminal 10 February

2.4.2.4 Port Gate Access (2022 – Feb 2023)

In support of the project to resolve the traffic flow in the port TNPA share all the truck data capture by security at the gates for the period Jan 2022 until February 2023. Table 12 shows the number of trucks captured from January 2022 to February 2023. An additional 100 446 entries and 84 567 exits had generic Name and ID entries such as '**VISITORS CARD**', '**MARINE EXIT**' or '**MARINE DRIVE ENTRANCE**' which cannot be matched to an exit. A further 741 418 entries and 613 173 exits was a duplication and was removed from the data used for analysis.

Table 12: TNPA gate data received

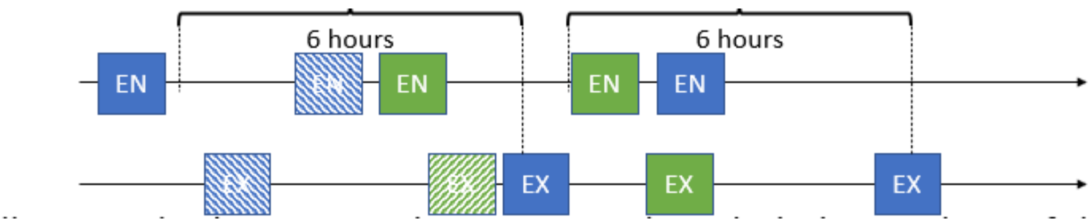
Gates	Entrance	Exit
Christiaan Barnard	110 983	106 165
Marine Drive P1	134 998	317 649
Marine Drive P2	134 998	209 222
Marine Drive P3	134 998	163 629
Marine Drive P4	135 798	No data received
SAPS	143 552	33 093
Total trucks through gates	795 327	829 757

The fact that only a third of the trucks could be matched is sufficient proof that the security system should be integrated between TPT and TNPA which will provided additional security and redundancy in the system. The field registered in the security system should also be reviewed.

The methodology followed in the data analysis was as follows:

- Link trip entries to exits of trucks.
- A six-hour duration was selected to simplify the analysis
- This limits the matching of different trips' entries and exits which could cause a cascading bias to the TTT towards a slightly higher average.

The methodology followed is graphical mapped below:



A total of 288 200 matched truck trips was used in the final analysis and the results are discussed below.

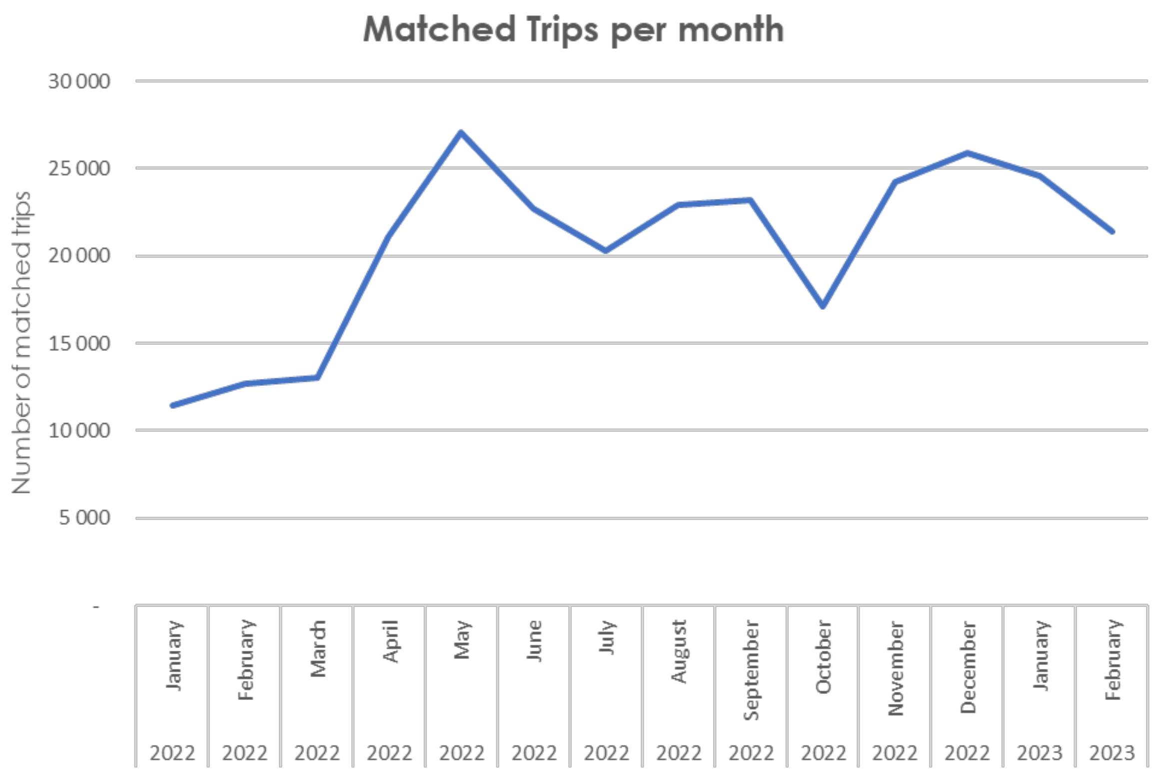


Figure 71:Match truck trips per month

Figure 71 illustrate the matched truck trips per month. The highest number of trucks were in May 2022 and December 2023.

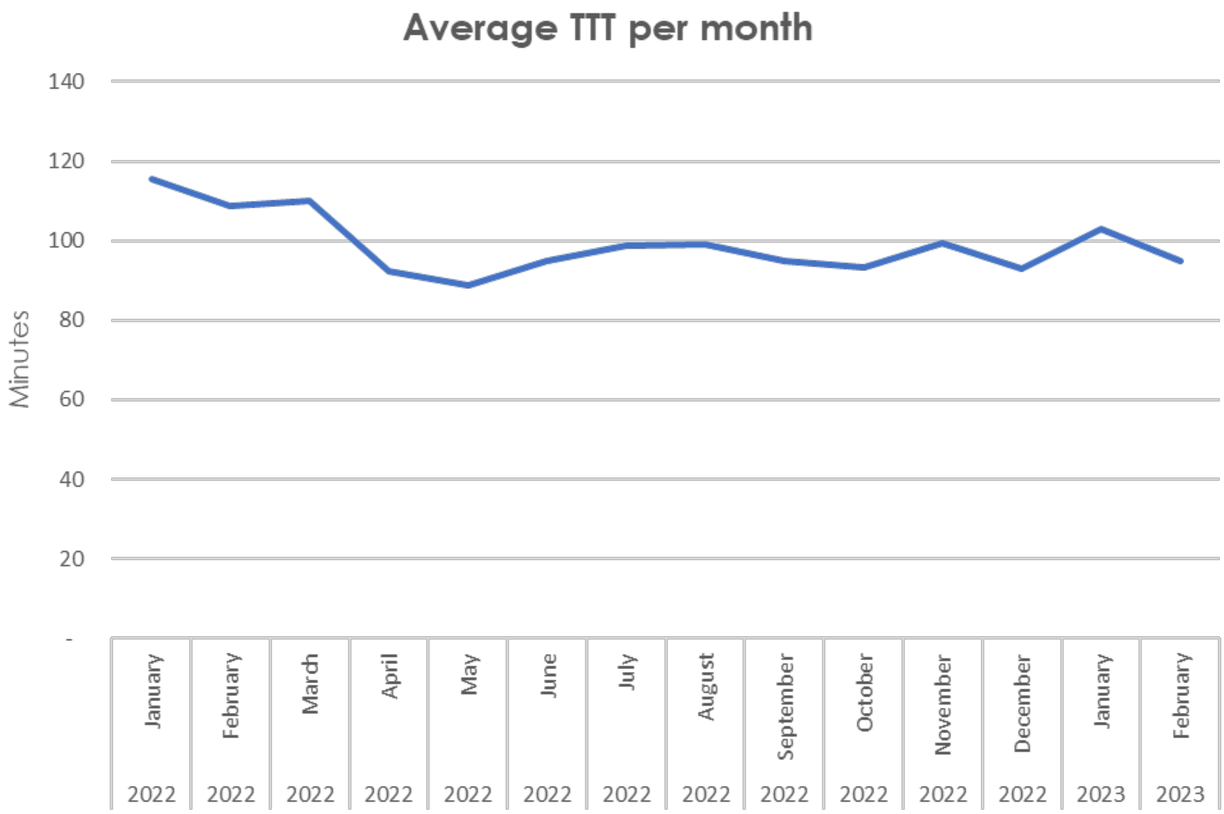


Figure 72: Average TTT per month in the Port (TNPA).

Figure 72 illustrate the average TTT per month The highest average of 118 minutes was measured in January 2022 and from June 2022 it was measuring just below 100 minutes. The average time of ±96 minutes in February 2023 correlates good with the data observed on 10 February 2023 (Figure 69) but is much better that the TTT observed on the 9 of February 2023 (Figure 64).

Figure 73 illustrate the matched gate-to-gate TTT distribution for 287 678 trucks over a 6-hour window. An average of 97.7 minutes was calculated. It also shows that ±54% ((±155 800 of 287 678 trucks) of the trucks have a TTT of 80 minutes or less. The impact is trucks is parking in the port area waiting to be processed or offloaded.

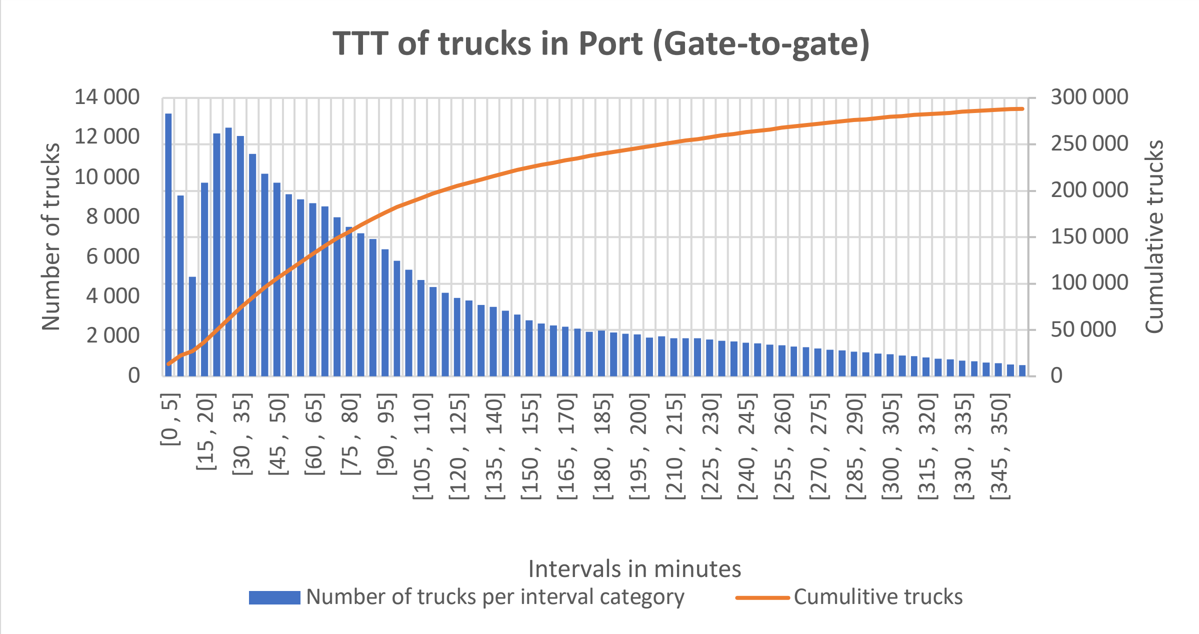


Figure 73: TTT for 286 000 trucks (Jan 2022 – Feb 2023

Figure 74 illustrate the average TTT per day per months. January, February and March as registered the highest TTT times over the period while the TTT of the other months has a narrow band around the average.

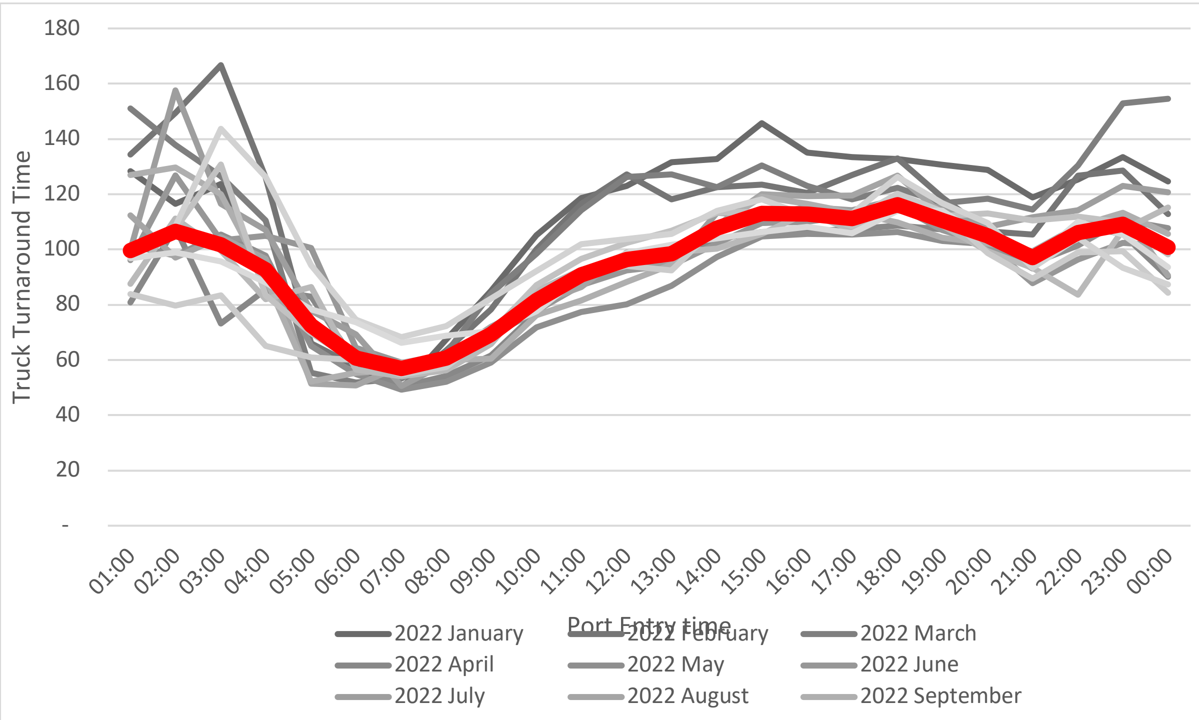


Figure 74: Average TTT per day per month

Figure 75 depicts the maximum trucks registered in the port per month. The highest number of ±2200 trucks/day was registered in April 2022. The highest average number of trucks per day were between February and March 2022. This is also the most critical period for the fruit industry.

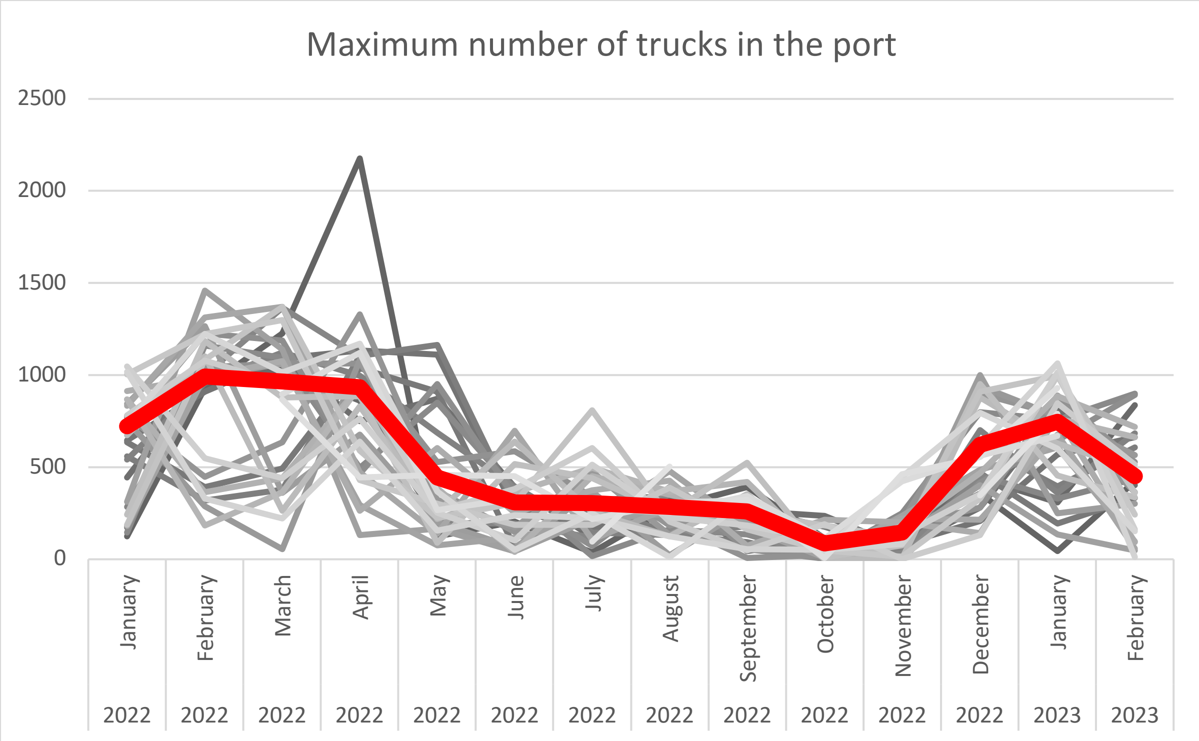


Figure 75: Maximum trucks in the port

2.4.2.5 Data of live tracking of trucks transported imported containers.

The Truckers for Unity South Africa (TFUSA) use live tracking devises on their vehicles to monitor their vehicles in the value chain. They have made data available for the study to be used a comparison. Various graphs were developed from the data and presented in Annexture A, but for the purpose of the report the following graphs are discussed in more detail.

The data sample was from week 19 in 2022 to week 9 in 2023. The data was analysed, and Figure 76 illustrate the weekly gate in gate out averages in minutes. The following maximum peaks was measures in week 25 (94 minutes), week 33 (88 minutes) and week 44 (94 minutes). A linear regress trendline was calculated which shows that the total average gate in gate out has been decreased from ±59 minutes to ±55 minutes.

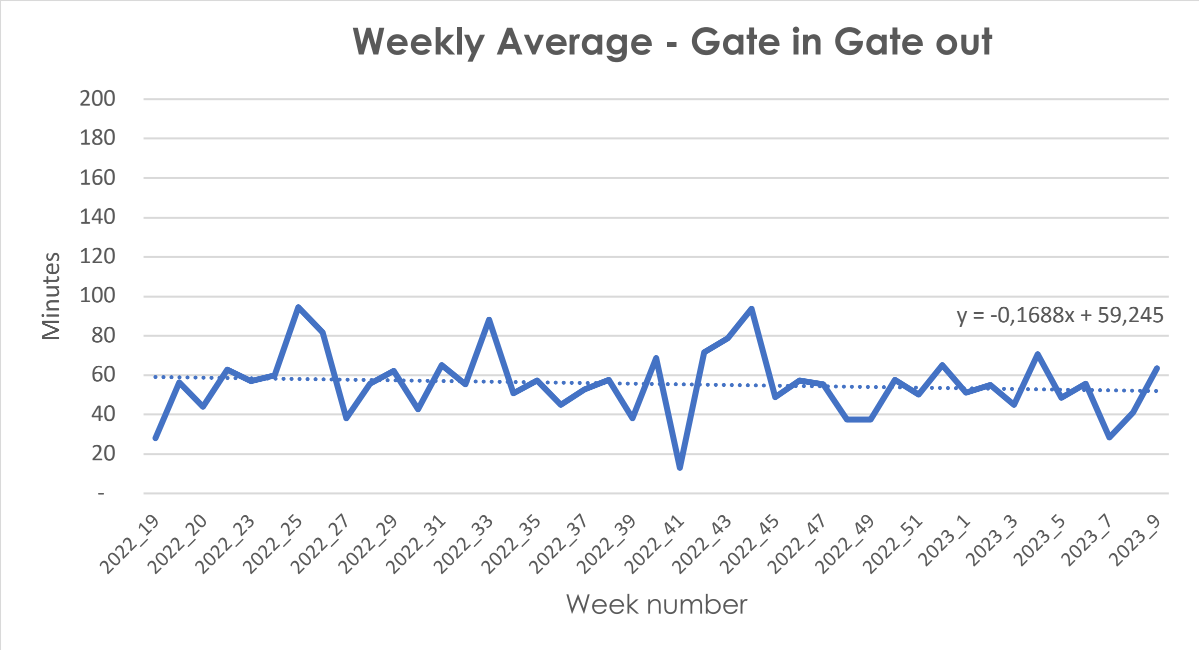


Figure 76: Weekly Gate-in Gate out averages

Figure 77 illustrate the weekly gate in gate out delays for the period from week 19 in 2022 to week 9 in 2023.

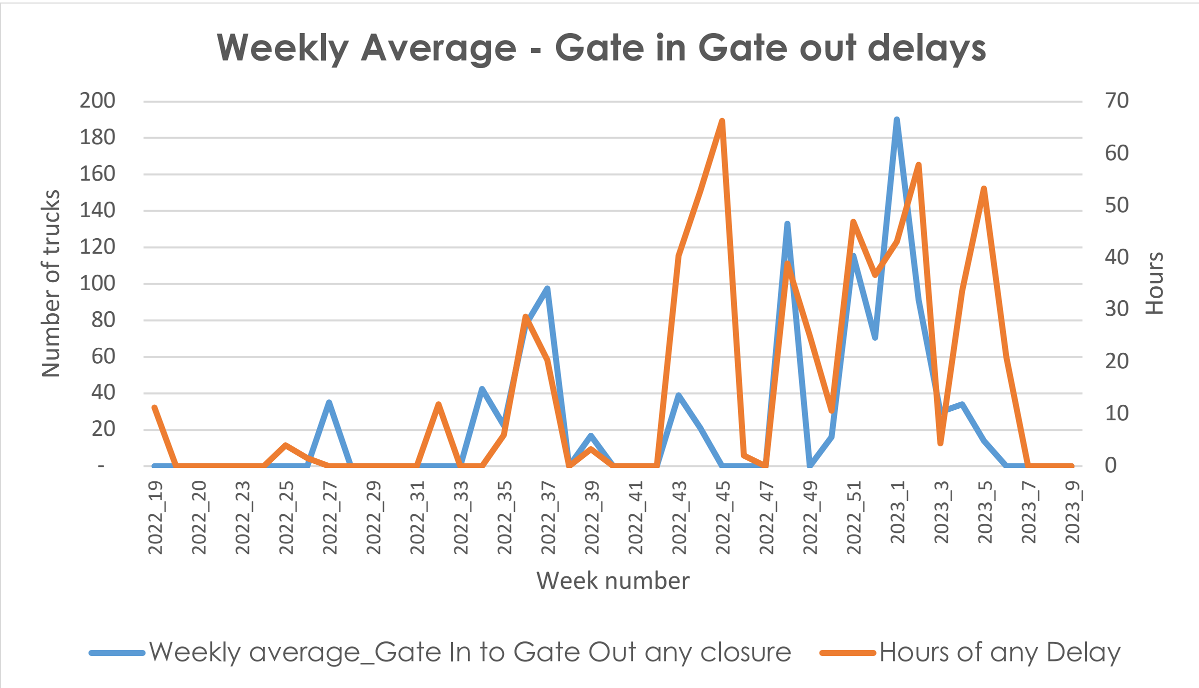


Figure 77: Weekly gate in gate out delays

Figure 78 depicts the number of trucks getting access to the port within different time intervals of 10 minutes. A sample size of 2094 was analysed over the period of time. The graphs also illustrate the cumulative number of trucks over the assessment period. It is important to note is that 59% (1235 trucks) of the trucks went through the port within 50 minutes and 80% (1690) of the trucks in 90 minutes.

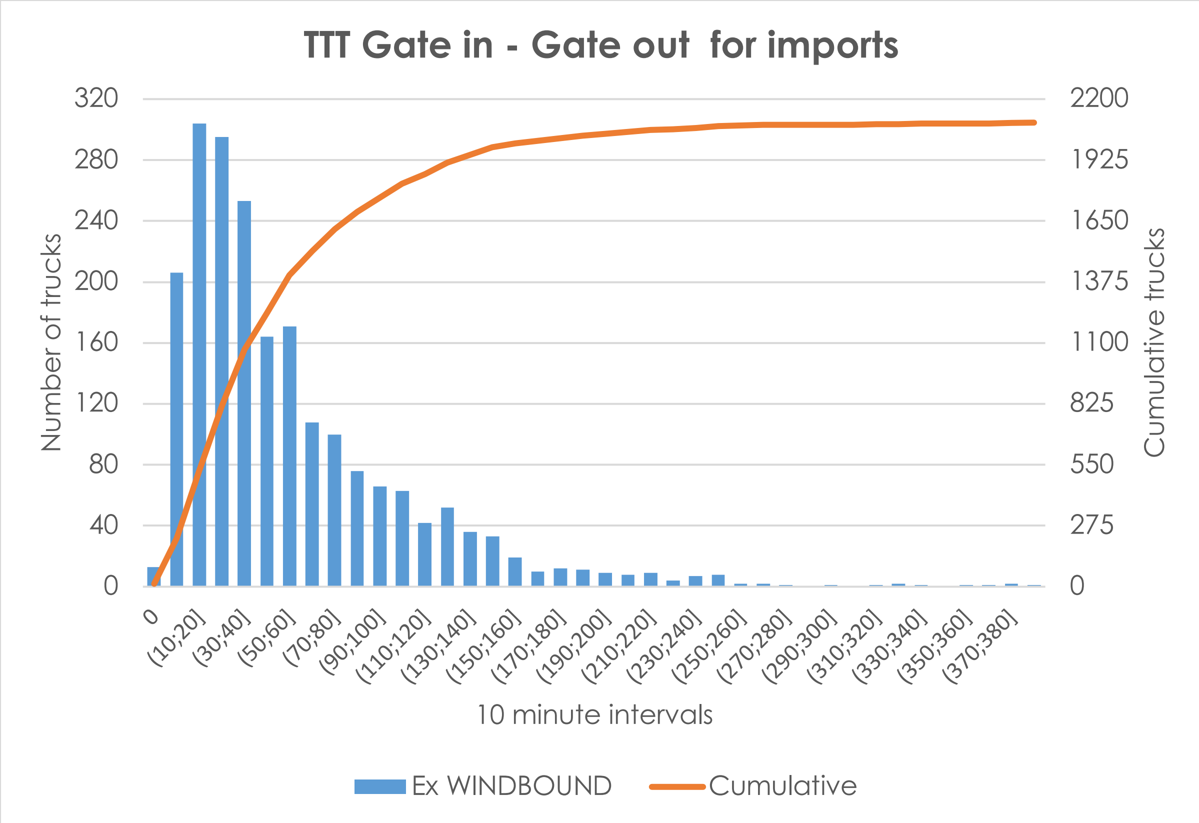


Figure 78: TTT gate in - Gate out of trucks

Table 13 illustrate a comparison between the different data sets been used. On 9 February the port was highly congested therefor the long Gate in to gate out times. On 10 February only mild congestion was experienced and the data correlate with the TNPA data. TFUSA make use of live tracking of their trucks and that could explain that the gate in to gate out time is much lower. The real benefit of live tracking of trucks is to plan the movement of trucks on a ongoing basis.

Table 13: Comparison of survey data

Description	Survey (9 Feb 2023) Minutes	Survey (10 Feb 2023) Minutes	TNPA Gate Data Minutes	TFUSA Data Minutes
Average time in port	129	97	98	55
59% trucks through gates	150	90	90	50
80% trucks through gates	180	130	165	90

According the TFSA (2020 – 2023) study the average truck turnaround time in the port was less than 34 minutes before 2019 (Figure 49). Since 2020 the TTT has increased to more than 50 minutes.

2.4.3 Booking System

Almost all (95%) make use of the booking system. The responses regarding problems have been categorised in Table 14. The comments from the truckers point to the system working well when there is no congestion, but some have issues with the system being slow and inflexible and the wind can disrupt plans, making the booking redundant.

Table 14: Booking system response

Problem	Responses
Waiting/slow	5
Inflexible	4
Wind	3
No issues	3
Staff attitude	2
Knowledge of use required	2
System issues	2
The previous system preferred	1
Blocking	1
Late arrivals	1
No choice	1
Works if there is no congestion	1
TOTAL	**26**

The suggestions (Table 15) indicate unhappiness with the booking system, with more than 25% suggesting a first come, first served system.

Table 15: Booking system suggestions

Suggestion	Responses
Change booking system	6
First come, first served principle	5
TBS is inflexible	2
Use an access card to stop pushing in	1
Security to check your booking time	1
Get rid of unions	1
TOTAL	**16**

2.4.3.1 Interviews

Of the truckers interviewed, 50% use a WhatsApp Group and do not report any problems. It keeps them up-to-date. Those who do not use it get information directly from their bosses/company.

The reported queuing times in the Port are set out below:

- Expected time is dependent on season and conditions
- Average ±1hours
- Minimum 10 minutes.

The following was observed on 9 February 2023 around 17H15:

- A growing queue at the entrance of the turnaround parking/staging area
- 80 trucks in the turnaround parking/staging area
- 62 trucks in the queue before the container terminal entrance
- 48 trucks in the container terminal entrance parking/staging area.

It was also noted that the entrance to the parking/staging area involves the negotiation of a tricky U-turn (Figure 79) and that the area is quite dusty, posing a health hazard.

Figure 79: Trucks entering the parking/staging area

Figure 80: Layout of the temporary parking area

Figure 79 and Figure 80 depicts the layout of the temporary parking for truckers. It consists of four lanes with a gravel surface.

In summary the reported queuing times at A-Check gate are set out below:

- Expected: 1–2 hours
- Average: ±5 hours
- Minimum: 10 minutes.

Deviant behaviour was also polled. The most common issue as illustrated in Table 16 below is pushing in.

Table 16: Deviant behaviour

Deviant behaviour	Responses
Pushing in	7
No issues	3
Bribery	2
Security abuse	2
Damage to property	1
Threatening truckers	1
TOTAL	**16**

The most common problem queuing in the Port is the disruption caused by wind, as shown in Table 17 below. Some concerns were also raised regarding the safety of the truck and truckers, while crane drivers were not always available to offload the containers.

Table 17: Parking-related problems

CATEGORIES	NUMBER
Wind delays	5
Security issues	2
Crane drivers not working	2
Offloading delays	1
Delays within the terminal	1
Trucker gates used by others	1
Transnet meetings delay/stop access	1
Congestion closes gates	1
TOTAL	**14**

2.4.3.2 Trucker Suggestions

Truckers were also allowed to make additional comments and suggestions regarding the parking/queuing, the booking system and traffic management. These comments are summarised in Table 18 below.

Table 18: Trucker's comments and suggestions

CATEGORIES	NUMBER
Lose booking system; first come, first served	7
Broken equipment	4
Port Elizabeth better	3
Port to provide parking	3
Crane driver issues	3
Safety	2
More staff	1
Wind delays	1
Pushing in	1
Inflexibility of rules	1
TOTAL	**26**

The booking system again proved unpopular, with comments that the previous system was better. In Port Elizabeth, truckers use an access card (Figure 78) and provide a number in the queue to prevent pushing in and several calls for first come, first served, as previously outlined.

Figure 81: Access card to Port of Port Elizabeth

There are also calls for more parking in the Port, together with suitable surfacing, bins etc.

Several suggestions called for queue management. During observations, it was noted that there is some form of control at the entrance to the container terminal but very little other than the actual gate points.

Additionally, there were several comments about equipment needing repair and maintenance for an extended period. It has been reported that only four of the cranes are fully operational. During an observation of the container terminal, it was noted that several cranes were partially dismantled, as shown in Figure 82. No repair activities were seen during the observation period.

Figure 82: Cranes awaiting repairs

There is some unhappiness with the performance of crane drivers. This point was reinforced during a discussion with a "operations manager" of an SMME waiting for one of his trucks. During a 1-hour observation of the container terminal, the following was noted:

- Only one crane movement in the first 17 minutes
- Thereafter, two cranes working regularly with a movement every 2–4 minutes
- Two other cranes worked sporadically
- A stacker working productively
- 15 cranes remained idle for an hour.
- Suggestions regarding the parking facilities, booking system, queueing and other

2.5 Overview of Duncan roads temporary truck parking facility

2.5.1 Truckers Survey: Drivers Parked on Marine Drive and Duncan road

A total of 22 truckers were surveyed.

2.5.1.1 Parking of Vehicles on Marine Drive

On 9 February 2023, nine truckers agreed to complete a survey interview which was undertaken in the South to North lane of Marine Drive (area marked in green in 15) between 08H30 and 11H15. The survey team reported growing queues and several drive-by surveys were undertaken to confirm the situation. The following observations were made (13H10–14H10):

- South to North

- Queue approximately 2.3 km starting before the intersection with Duncan Road.
- 81 trucks parked at the left of the roadside - Figure 83a.

- North to South
  - Queue approximately 800 m concentrated around the Duncan Road turnoff
  - 40 trucks parked on both sides of the road— Figure 83c.
  - five trucks parked in the service road -Figure 83b.
- Paarden Eiland
  - 14 trucks parked on the side roads close to the Duncan Road turn-off - Figure 83d.

On 10 February 2023, when there was less congestion in the Port, the illegal and uncontrolled parking on Marine Drive was limited too.

 a) Trucks queuing on Marine Drive (S to N)	 b) Trucks queueing on the service road
 a) Trucks queueing on both sides of Marine Drive (N to S) near Duncan road	 b) Truck in a side street in Paarden Eiland

Figure 83: Trucks queuing

The trucks not meant to park on Marine Drive can receive fines of approximately R 1 000,00. However, if they arrive early or the Port is congested, there are few viable alternatives. Two-thirds of the truckers interviewed in Marine Drive came from outside the Western Cape Province.

Survey responses have been combined with those of 10 February 2023 for analysis.

On 10 February 2023, a further (13) thirteen truckers were interviewed at the entrance to the container terminal.

2.5.1.2 Parking and Queuing Time

The reported parking times in Marine Drive are set out below:

- Expected: 3 - 4 hours
- Average: 4 - 6 hours
- Minimum 1 - 2 hours.

The main issue regarding parking on Marine Drive is a need for more adequate parking spaces, as set out in Table 19.

Table 19: Parking survey

Parking	Responses
No space inside the Port and none outside the Port	13
Truckers are fined on Marine Drive, and therefore, alternative parking is required	2
Can miss your slot from the holding area	1
Need space to hang around, not in the Port holding area	1
Try and find a safe place	1
Truckers dump waste	1
Dust in the port holding area	1
Holding area ok	1
No respect for drivers	1
Delays within the Port	1
TOTAL	**23**

2.5.1.3 Metro Police overview

According Mr Siganga form the Metro Police the following problem areas was identified:

- At Traffic Intersections and public spaces next to Port, designated routes theft of Reefer Cables by copper criminals' results in significant economic losses for exporters (high rejection of fruit cargo etc.).
- 60% of Trucks that transport containers into the Port of Cape Town do not have valid roadworthy certificates.
- Trucking companies employ undocumented foreign nationals.
- A high number of unroadworthy trucks cause breakdowns within the port precinct and when such a trucks get involved in accidents within the port papers in place.
- Process followed when there is an accident in the port normally is invalid.

The root cause of the problem areas are:

- No policing protocol in place despite this being the main export/import destination.
- No integrated visible policing plan despite regular reporting of incidents.
- Foreign drivers operate unlicensed vehicles (CTO's not checked in the Port).
- City Traffic officers issue fines to compliant transporters while non-compliant transporters, normally unregistered foreigners, are not getting fines normally they do not usually have the proper Inconsistency of patrolling (need visibility) most of the incidents also happen after hours.
- A high number of transporters are not compliant yet authorities are not attending to this (use public roads).
- Transporters can easily swop a registration/approval obtained for one truck to use it on five other trucks due to lack of integrated verification system.

- Trucking industry alleges that 80% of fines issued are nonsensical.
- Freight forwarders are allegedly not vetting transporters

2.6 Benchmark the TBS with Global Systems

Figure 84 depicts the Navis system, which Transnet currently uses.

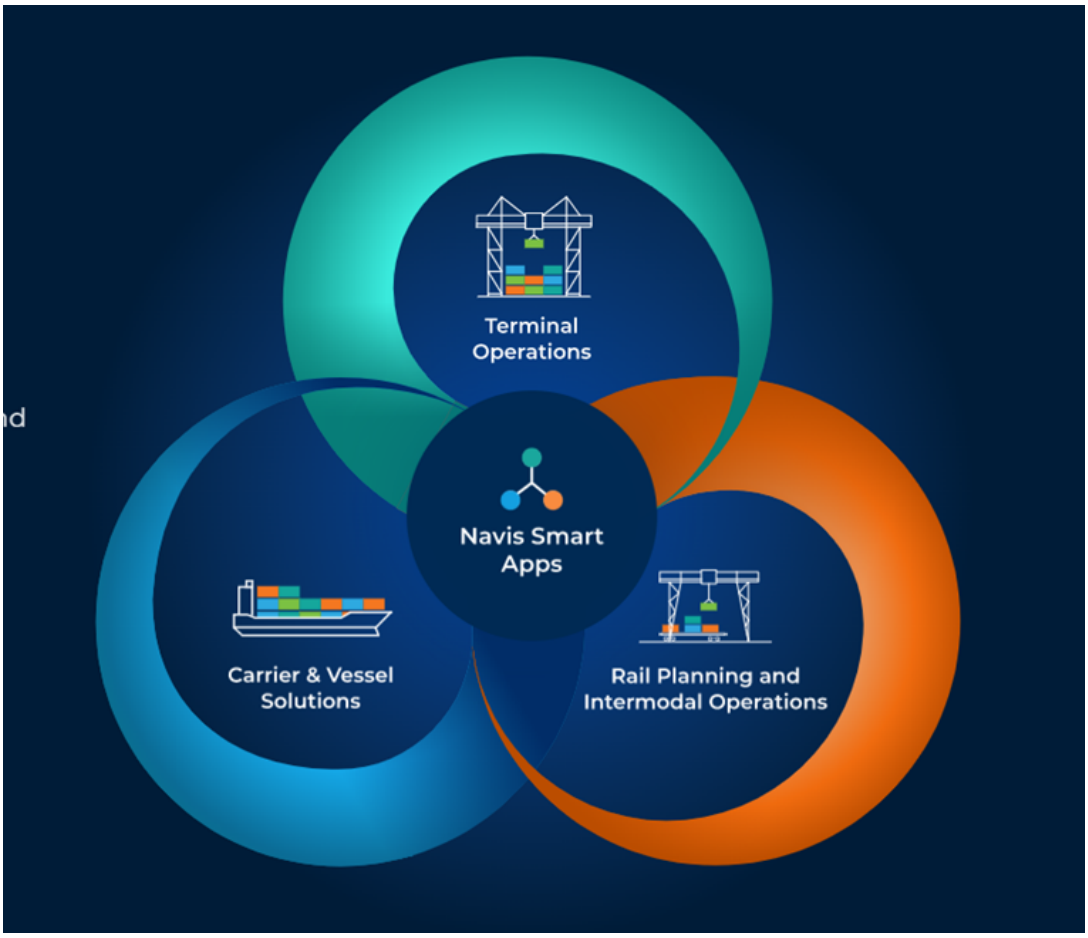


Figure 84: Navis Port Planning System

Navis provides a range of software solutions for ports and terminals, including appointment and booking systems, as well as automated gate systems. Navis consist of the following subsystems:

- **Navis Carrier & Vessel Solutions** offers ocean carriers, ship owners and technical managers with proven digital technology with its maritime solutions that meet the needs for safe, efficient and ocean transportation.
- **Navis terminal operating system (TOS)** and applications include a platform to optimise terminals or to operate at peak productivity and efficiency.
- The **Navis Rail** includes an integrated platform for planning and optimising freight railroads, operating intermodal rail yards.

The Truck book system (TBS/VBS), Figure 85, is a platform where trucks carrying containers are registered, and the container is pre-planned in a stack through NAVIS. At arrival at A-Check, all the information of the truck, transport company, and container number is available on a CTO or the Container number is registered by the gate operators and sent to NAVIS, which will then, in return, send the predefined position of the container in the stack or block. Finally, a slip is issued to the driver.

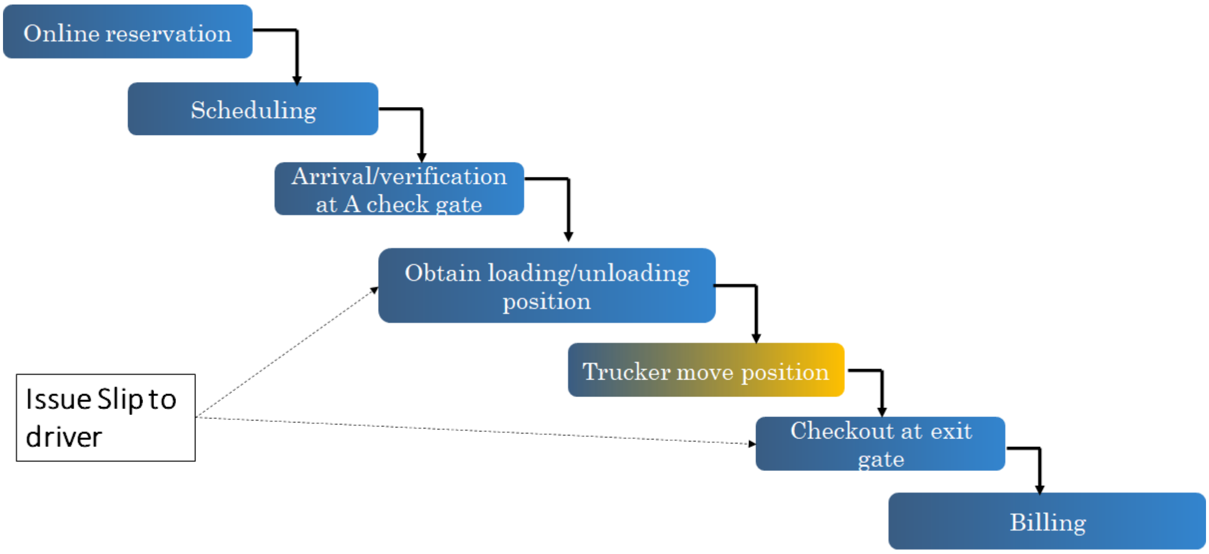


Figure 85: VBS process in a cargo terminal

The typical benefits of a TBS or VBS system are outlined below:

Data processing and analytics

- The gate metrics include the following:
  - number of arrivals,
  - type of containers,
  - type of incoming vehicles, and
  - cycle time in the Port,
  - etc.).
- The carrier metrics include the following:
  - number of bookings per carrier,
  - number of used/rescheduled/cancelled bookings and
  - number of no-shows,
  - etc.
- The TBS or VBS system enables the operator to get visibility, understand gate capacity and traffic patterns, and make informed decisions on their landside activities, asset utilisation, and further modernisation where applicable.

The current constraints of the process are as follows:

- Limited booking slots are available at a time, and causes trucks to queue in Marine Drive waiting for a booking
- Notification of when a booking opens is not available
- Trucks arrive at the gate without a booking
- The sequence of trucks in a queue is random instead of planned

Objective	Current situation	Possible Solution
To optimally arrange the loading and dropping of shipping containers	Port using software to place a container in the stack according to vessels arrangements	

To improve internal asset utilisation	Constraint: operating equipment is old and dated. High maintenance cost. End of life cycle	Replace equipment
To avoid congestion	Severe congestion in peak periods	Back of port staging area or new operating equipment
To increase throughput capacity	Port is underutilised Gate system underutilised	Delays in the import have an impact on the gate system
To decrease emissions	The operating equipment is old and dated	New hybrid equipment
To improve security	Security in the Port is not integrated. Security outside the Port is a problem	Integrate TNPA and TPT security. Traffic management plan

The systems will be benchmarked with a web-based system, such as ShipsGo and One-Stop VBS. Benchmarking is used to identify gaps in the current system and how to improve the current system.

2.6.1 One-Stop vehicle booking system

One-Stop is a truck booking system that is used at several ports around the world. One-Stop is a cloud-based platform that allows trucking companies and drivers to book appointments for picking up or dropping off cargo at ports. The platform provides real-time information about waiting times, traffic conditions, and other relevant information.

The One-Stop platform is designed to improve efficiency and reduce port congestion by providing a centralised system for managing truck appointments and cargo movements. The platform also allows for better communication between trucking companies and the port, helping to ensure that cargo is moved quickly and efficiently through the port.

The VBS system is:

- A web-based booking system enables transport carriers to book timeslots for pick-up and drop-off containers by road at terminal and depot facilities.
  It allows terminal and depot facilities with the ability to control the time slots offered for the drop-off and collection of containers based on their capacity and operational and business need.

VBS is a comprehensive terminal-to-landside interphase delivering efficiency gains to the entire port facility.

- It minimises manual data entry and effectively eliminates time-consuming and error-prone paperwork.
- Equipment, fleet and human resources can be accurately matched to demand, spreading incoming vehicles and container movements over full 24-hour periods and reducing queues – by managing the truck movement and container types.
- Users log on to make bookings with the terminal, while drivers can easily manage and view the status of their drop-offs and pick-ups.
- The Message Board notifications functionality keeps you a step ahead. Stay on top of any events that could impact your cargo. For example, the port authority and terminal

operators will alert users via the One-Stop VBS about vessel delays, road congestion or empty park redirections.

Finally, the One-Stop VBS harnesses technology to streamline operations from ship to gate, allowing facilities and terminals to adjust quayside and landside operations during the loading and unloading of a vessel. Figure 86 illustrates an automated gate system.

Figure 86: Port gate where a One-Stop Vehicle Booking System (VBS) in operations

The benefit of the VBS is very similar to the TBS system at Transnet to increase productivity, enhance haulage productivity, reduce costs for Cargo owners and contribute to improved safety in the port environment.

VBS provides appointment slots for truckers, and with the visibility of accurate landside demand (well in advance of trucks arriving at the terminal gate), the terminal operator may proactively regulate the resources required to satisfy the established demand. High-priority containers must be performed out of peak times or night-shift to reduce truck turn times.

One-Stop is used at several ports in Australia, including the Port of Melbourne, Port of Sydney, and Port of Brisbane. The system has also been implemented at the Port of Los Angeles in the United States, as well as several ports in the United Kingdom, including the Port of Felixstowe and the Port of Southampton.

The service providers for truck booking systems at ports can vary depending on the specific system and the port implementing it. Some examples of service providers for truck booking systems at ports are:

- Kuebix: Kuebix offers cloud-based transportation management software that includes a booking system for trucking companies.

- Cargotec: Cargotec provides a range of solutions for ports and terminals, including software for appointment and booking systems, as well as automated gate systems.
- WiseTech Global: WiseTech Global offers software solutions for the logistics industry, including a booking system for trucking companies and a range of other features for ports and terminals.
- Tideworks Technology: Tideworks Technology provides various software solutions for ports and terminals, including a booking system for trucking companies and automated gate systems.

Table 20 is a summary of international ports using truck booking systems or truck reservation systems for loading and unloading cargo and provides real-time information about waiting times and traffic conditions

Table 20: Type of truck booking systems

Port	Type of system
Port of Rotterdam, Netherlands:	TBS reduces congestion, improves efficiency, and provides real-time information about waiting times and traffic conditions.
Port of Los Angeles, USA	A truck reservation system allows trucking companies to reserve time slots for picking up or dropping off containers and provides real-time information about wait times and traffic conditions.
Port of Felixstowe, UK	TBS reduces truck-related congestion, improves efficiency, and provides real-time information about waiting times and traffic conditions.
Port of Singapore	TBS to reduce congestion and improve efficiency.
Port of Antwerp, Belgium	Truck appointment system to reduce congestion and improve efficiency, and provides real-time information about waiting times and traffic conditions.

In conclusion, the following main observations can be made:

- The container is managed over the entire supply chain based on its capabilities.
- With the Message Board notifications functionality, the port authority and terminal operators can alert users via the One-Stop VBS about vessel delays, road congestion or empty park redirections, which are one of the constraints of the existing TBS system.
- The booking system is available for bookings on a 24 h basis.
- Most systems provide real-time information about waiting times and traffic conditions

2.6.2 The Future

The following are identified as requirements in the future to comply with international standards:

- The use of intelligent systems to manage and track containers in the supply chain
- Get intelligent tracking notifications and alerts which are already available in the trucker's associations
- The use of providing real-time information on the trucker to change direction.
- Manage shipments in one dashboard and get statistical and intelligent reports

- Use WhatsApp messaging where required to improve communications between different role players in the supply chain
- OCR (optical character recognition) software, OCR technology scans all the incoming and outgoing vehicles and automatically detects information such as:
    - container numbers,
    - ISO codes,
    - trailer numbers,
    - license plates,
    - chassis numbers,
    - IMDG dangerous goods labels,
    - door direction on the truck,
    - container position on the trailer, and
    - container state (full or empty).
    - VGM is scanned at the weighbridge
    - The OCR allows vehicle verification and enables efficient gate management

The Port Strategy magazine July/August 2021 - Norbert Kletter, Managing Director, RBS EMSA, says that the data delivered before trucks arrive is a significant benefit. " Gate automation coupled with slot bookings will drive gate efficiency because you can allocate the resources more efficiently."

Daniele Labata said that automation goes together with quality data. Knowing in advance the information about the traffic and peaks, container terminal and handling congestion proactively and smarter.

2.7 Transport Behaviour on TBS

Agri Hub has documented the drivers or factors influencing the movement of containers in the supply chain and, therefore, the behaviour of truckers by looking at Figure 87, where the time delays in the supply chain.

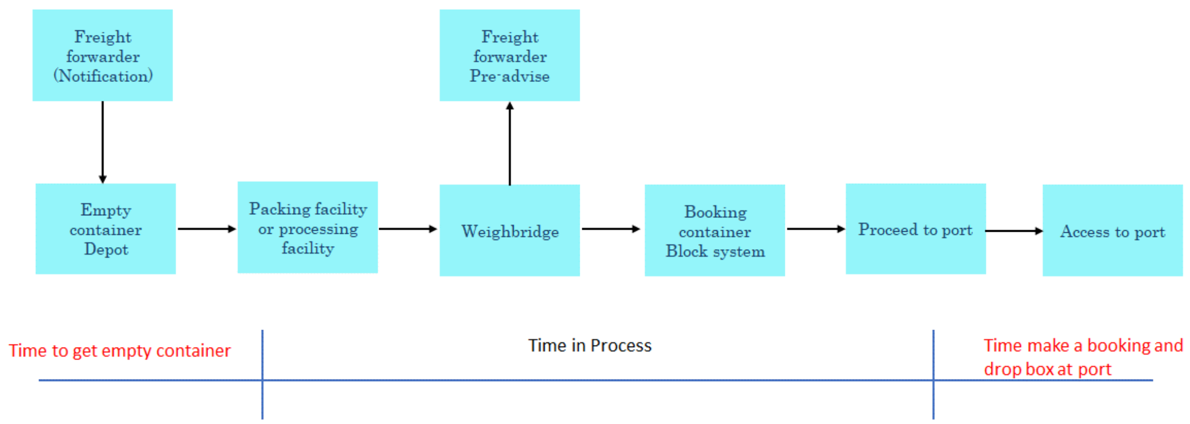


Figure 87: Time in an export container process

The process in Figure 84 above has been analysed in terms of "time" as outlined below:

- The clock starts ticking the moment when a trucker receives a notification from the freight forwarder.

- The trucker drives to the deport and stands in a queue to finalise all the documentation and load an empty container. This process can take up to four hours.
- The second time losses occurred at the packhouse, waiting for the container to be loaded.
- One of the most significant time losses occurs if a trucker wants to make a booking, but the system is full for a particular block. Then the trucker has to wait until the reservation re-opens. At that stage, the trucker is already in the port area and stands in Marine Drive, waiting for the system to re-open.
- One of the system's constraints is the time to process a vehicle at A-Check. It can take 20 seconds up to 4 hours (Based on interviews with trucker associations). This directly impacts the queuing of vehicles leading up to the A-check gate.
- There is no integration between the Security of TNPA and TPT. The impact is That TNPA has no idea which trucks they need to give access to. Therefore, the trucks with no reservation get access and park in the queue until they can make a booking. In some instances, it can be more than four hours.
- Independent truckers transporting containers from small suppliers end up in Marine Drive, waiting to get a reservation. In some instances, the large trucking companies must assist them in getting a reservation and transporting the container.
- Some truckers arrive during the night at the port and park at illegal parking spots waiting to make a reservation if the block allows it or waiting for the following block to make a reservation.
- The parking of trucks at illegal sites solicits criminal activities. The constraints with the block booking system directly contribute to parking illegal parking. It has also proved that keeping the reservation system open for a certain period negatively impacts traffic movement in the port area and enhances criminal activities.

In conclusion, the current block booking system is a derivative of the poor operating practices in the terminal. If the booking system is open for 24h, then the traffic flow can be managed, and criminal activities can be curbed.

2.8 The Process from Freight Forwarders to Port Terminal

Any supply chain has a push and pull system. For the container industry, it is no different. The sensitivity or fruit policies can drive a push system due to its short self-live, while citrus can be spread over a much longer period. Table 21 indicate typical factors which could influence the system.

Table 21: Factors Influence the container supply chain

Push	Pull
Stock age at the packhouses or production facilities	Stack dates at the port
Fruit protocol	Parcel size, vessel arrivals and berthing
International market window at different continents and window of opportunity to sell the products	Vessel destination

Capacity at a storage facility or no capacity to store reefers	Weather causes the biggest delays in the port. A proactive way is to keep containers in the port or in the back of port facilities for fast distribution of reefers or containers to vessels.
Fruit season in South Africa	Safety and Security

Figure 88 illustrates a truck process in the port, starting when a truck arrives at the TNPA gate. Access is allowed without knowing if the truck has an appointment. Random access at the port gates causes queuing of vehicles. The trucks can be staged in a temporary staging area where a principle of first in, first out applies.

The process at TPT is clear and the container number facilitates the container's position in a particular block or stack. The container number is transmitted from the A-Check gate to the NAVIS system, and in return, the block and stack number of the container is printed on a slip and given to the truck driver. The trucker proceeds to the offloading position, and after the RTG offloads the container

The empty truck moves from the drop-off point to the gate-out gate, where the trucker receives a second slip when the truck has completed the process in TPT. Both slips have a time and date stamp. The trucking companies should analyse the information on the slips and achieve it for further reference or studies.

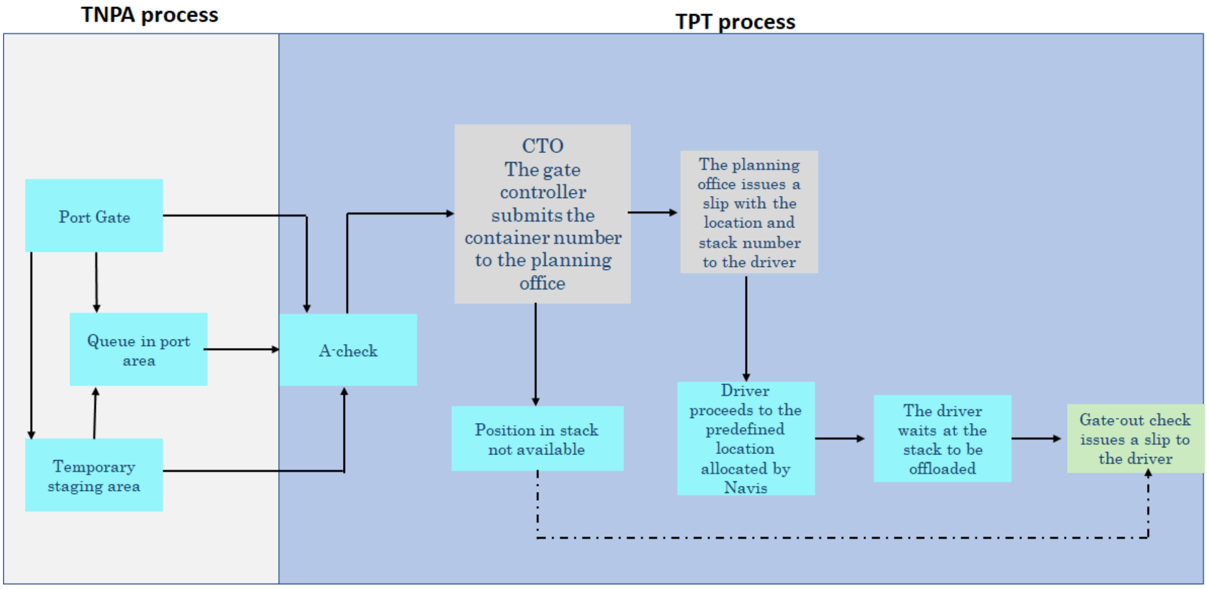


Figure 88: Truck process in the Port

Figure 89 illustrates the process of the trucker from the point when a notification from the freight forwarder activates the transaction. The trucker is responsible for transporting the containers and making the reservation in TBS for the container to be offloaded at the port. The trucker must work within the limitation of the current system, which leads to numerous frustration and the underperformance of the transport assets.

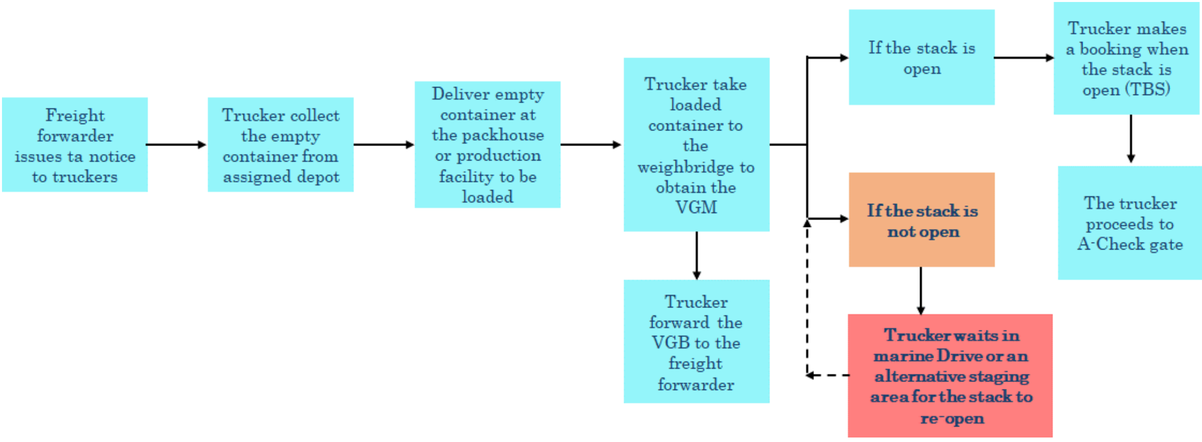


Figure 89: Truck process between freight forwarder and port

Figure 90 depicts the process of freight forwarders in the wine industry. The process starts when a new order is registered in a system. The freight forwarder sends a notification to a trucking company. The transporter will finally book a slot with TPT and take the container to the stack.

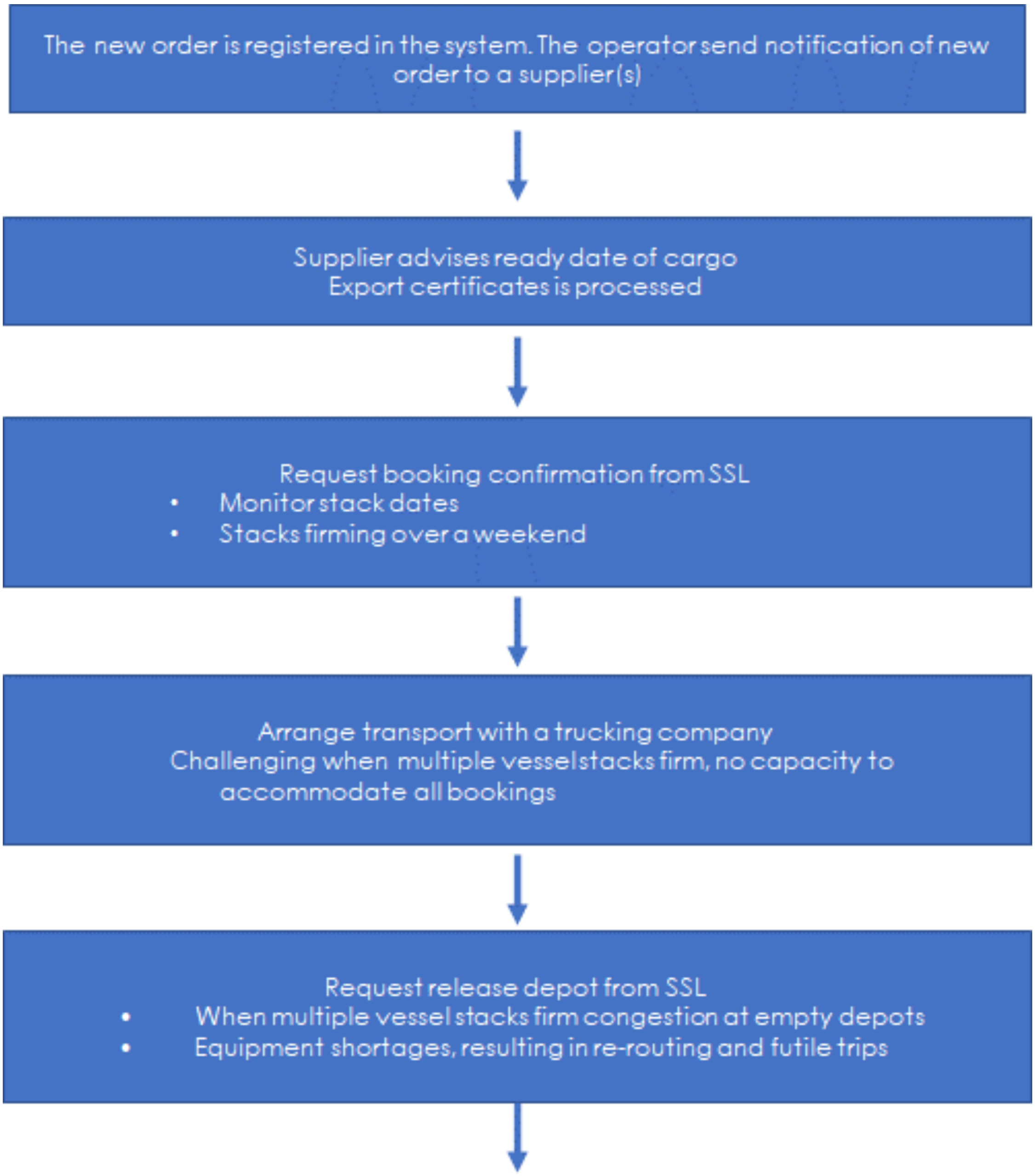
The process, in reality, is not different for the fruit industry. However, the following key elements in the supply chain are important for the industry:

Route optimisation: Using efficient routes and scheduling can minimise travel time and reduce fuel consumption. Implementing a GPS tracking system can help monitor and adjust routes in real-time to avoid traffic congestion, roadblocks, and other delays.

Collaboration and communication: Collaboration and communication among all parties involved in the supply chain, including growers, transporters, distributors, and retailers, can help streamline the process and reduce inefficiencies. Great progress has been made in terms of WhatsApp groups and they should be developed further.

Quality control and inspection: Regular quality control checks and inspections can help detect any issues with reefers standing on trucks for long times.

Figure 90 illustrates the freight forwarder process followed from where the new order is registered in the system to the point where the transporter is notified and a slot is reserved at the point. This process is mainly for the export of fruits and wines


The new order is registered in the system. The operator send notification of new order to a supplier(s)
Supplier advises ready date of cargo
Export certificates is processed
Request booking confirmation from SSL
• Monitor stack dates
• Stacks firming over a weekend
Arrange transport with a trucking company
Challenging when multiple vessel stacks firm, no capacity to accommodate all bookings
Request release depot from SSL
• When multiple vessel stacks firm congestion at empty depots
• Equipment shortages, resulting in re-routing and futile trips

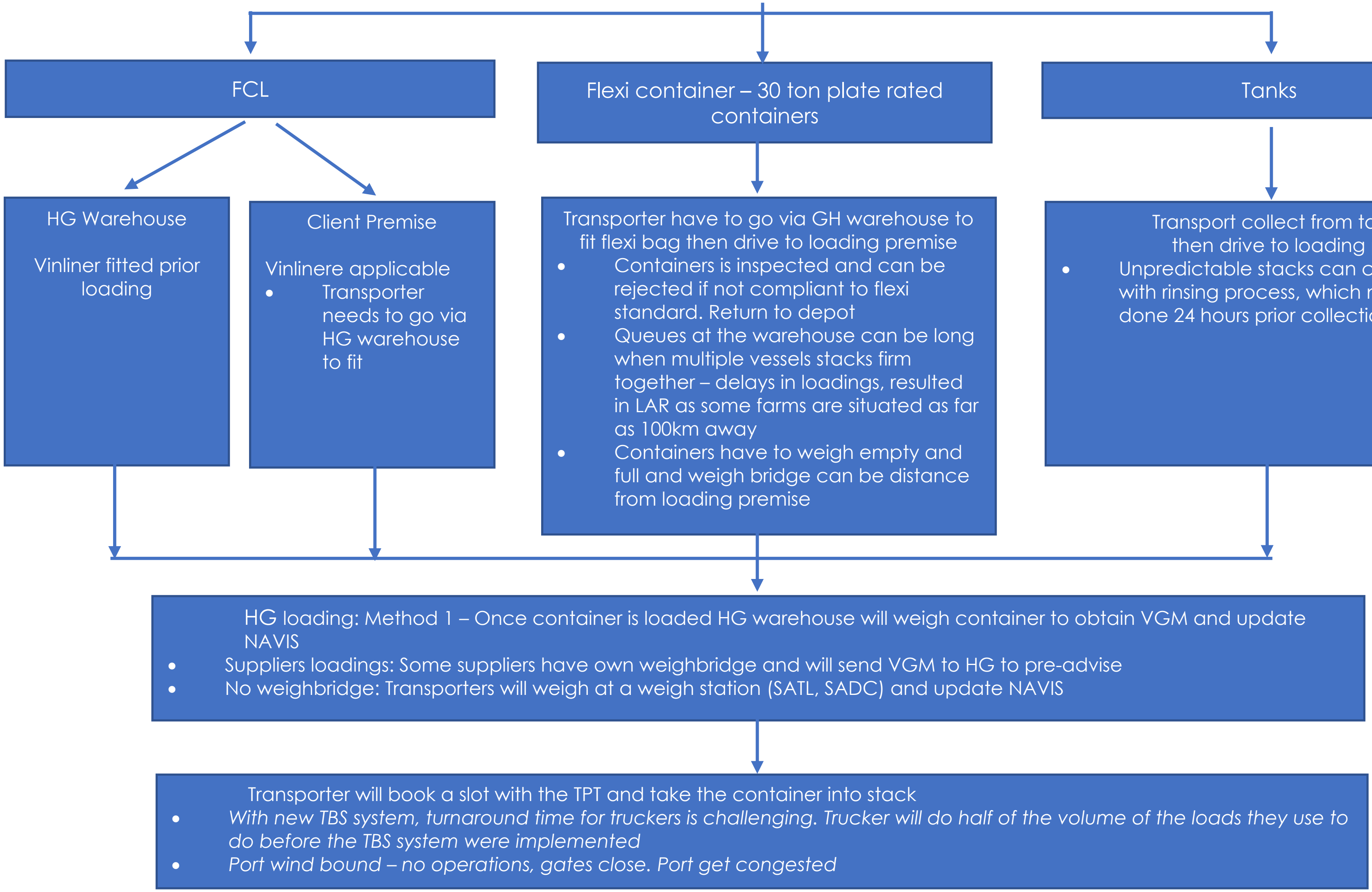


Figure 90: Freight forwarder process

3 CONCLUSIONS

The following conclusion can be made based on the fieldwork, data analysis and interviews:

2.9 Operations in the Port

The following conclusions were made about the operation in the port:

- The single biggest constraint of the supply chain is the status of the RTGs and other operating equipment. Only 4 of the 23 RTGs are fully operational. This directly impacts the throughput time of a truck in the terminal and ultimately leads to the queueing of trucks at the A-Check gate. Further delays in the port occur when an RTG breakdown and RTGs must operate between multiple stacks, resulting in queueing trucks in the port.
- Four RTGs are equipped with anti-sway equipment, but at the time of the surveys, it was never utilised when the port shut down due to strong wind.
- A number of RTGs standing out of service waiting for spare parts
- In the interviews with the truck drivers, the productivity of the RTG drives was highlighted, especially during shift changes. The impact is that trucks start queuing in the port, waiting to be offloaded.
- New truck drivers to TPT did not always know where to drop containers and caused traffic flow problems in the port area.
- Night shift pulls approximately 10% of the traffic and is under-utilised and, therefore, not cost-effective due to the resource required for a night shift according to Transnet.
- TNPA and TPT security operate as two independent systems with limited communication.
- Handover between shifts is a problem and the procedures need to be tightened, i.e. formal written handovers.
- The TNPA security has no list of truckers who has a booking or not and therefore allows access to the port randomly.
- It was observed that the scanners at the gate did not always work, and access was manually granted.
- The number of gates which allows access to the trucks and traffic management in the port is a matter of concern and should be investigated. In addition, trucks turning on Duncan Road could lead to incidents and should be resolved.
- The temporary staging area generates a lot of dust and is against the policy of the port and needs to be resolved.
- TNPA has identified Culemborg as a potential back-of-port facility and the land was transferred from Transnet Properties to TNPA recently.

2.10 Gate Systems

The following conclusions were made about the gate systems in use:

- The TBS system is similar to systems used internationally and is integrated with NAVIS.
- Compared with One-Stop (VBS), the TBS is limited and needs to be investigated for future expansion.

- Making bookings when a block is open is a major constraint and the number of gate-booking you can do in that time is limited. The impact is that trucks start queueing in Marine Drive, waiting for a block and TBS to open to make a booking.
- No notification is sent to freight forwards and truckers when a block opens.
- One-Stop(VBS) is a web-based.
    - The use of intelligent systems to manage and track containers in the supply chain.
    - Get intelligent tracking notifications and alerts which are already available in the trucker's associations.
    - The use of live positioning of the trucker to change direction making
    - The system is open 24 hours per day
    - Manage shipments in one dashboard and get statistical and intelligent reports
- The impact of the current process is that truckers start to make block bookings which are then cancelled or not utilised.

2.11 Stakeholder Engagement

The following conclusions can be made from the stakeholder engagement:

- The productivity of the trucker's assets went from three loads per day to one load per day due to the queuing of vehicles in the port and the low productivity of the TRG operators.
- The queuing of vehicles on Marine Drive resulted in criminal activities.
- One truckers' association already has a web-based system to manage around 600 trucks which is the way forward but needs to be adapted for other users.
- A truckers' association has proposed a truck stop and holding area at Culemborg, which might be the best back-of-port facility available.
- The wind factor has been highlighted as the single biggest factor for delays in the terminal and ways should be investigated to limit the impact thereof.
- The stakeholders have pointed out that the low-performance TPT operations have a significant impact on the delays and resulting queuing of vehicles.

2.12 Diagnostic Analysis

The following conclusions can be made from the diagnostic analysis:

- The project team did not manage to get historical data in time from TNPA and TPT.
- The literature review has highlighted the impact of port delays, particularly delays caused by the wind. For example, in February 2023 alone, 237 minutes were lost and approximately ten vessels could not get access to the port.
- The grapes and deciduous fruit peak period are generally in the summer months and are directly affected by port delays.
- The unavailability of cranes and RTGs in the Port seems to be a bigger concern than windbound and TBS challenges.
- Communication and transparency can mitigation of the weather's impact on the port stakeholders' supply chain and it seems that the various WhatsApp groups are playing a part in achieving this.

4 KEY INTERVENTIONS

The following key interventions have been identified from the interviews with the different stakeholders and the assessment of current operations:

- Operating equipment in the terminal.
  It would be to the benefit of Transnet and the Economy of South Africa to approach the industry for:
  - Private investment to upgrade or replace operating equipment with the option to lease equipment from the private sector.
  - Increase the number of RTGs equipped with anti-sway systems and drive systems.
  - Call for a PSP to operate the container terminal.
- Transnet to consider expanding the TBS/NAVIS to make provision for a web-based system similar to one-stop.
- Trucks stop facility.
  - Transnet and the truckers could jointly invest in a truck stop facility. The facility is:
    - A purpose-designed truck-stop facility with possible plugin points for reefers
    - Access to the port via the old railway line and as indicated in Figure 40 and on the West via the City road network, as per Figure 40
    - Intelligent systems to identify and manage trucks in the facility. Figure 91 below shows a futuristic waiting area in a port or dry port equipped with intelligent technology, including RFID.
    - Value-added service which includes a truck maintenance facility for independent truckers to ensure the roadworthiness of the vehicles.
    - Call trucks in from the truck stop facility to the TPT terminal.
    - Operated 2 x 12m containers road train from the trucks stop facility to the Terminal in the Port. This would require a permit for abnormal loads due to the length of the truck.
    - The truck stop facility will be a safe and secure facility.

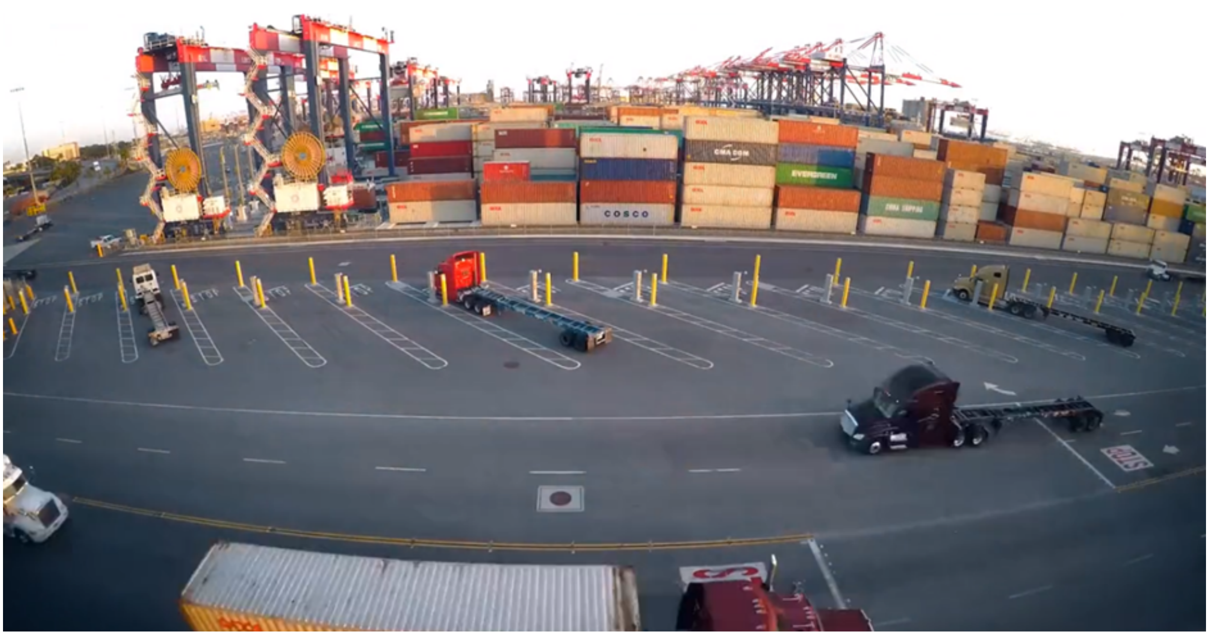


Figure 91: Staging Area in Port

- Establish Additional inland plugin points in the port, close to the port precinct or Belcon.
- Night shift working.
    - o To Accommodate backlog (utilise WhatsApp group to communicate).
    - o To accommodate priority containers and reefers.
    - o In support of the industry and possible expansion of the packhouse to regulate traffic.
- Develop a traffic management plan for the Port and reduce the number of truck gates.
- Utilise nano-materials to manage dust at the temporary staging areas in the port.
- Surface area, adjacent Marine drive between President Kruger Street and tank farm (Adjacent to the railway line).
- Introduce new generation technologies such as GPS, Active tags to track and identify a truck or container in transit.
- Review the existing web-based system available at the transport association and integrate it with all the transport service providers and industry to manage the traffic flow and enable decisions throughout the supply chain.
- Expand WhatsApp communication with the possibility of integrating it into a web-based system.
- Improve traffic control measures by the metro police on Marine Drive
- The use of intelligent systems to manage and track containers in the supply chain
- Get intelligent tracking notifications and alerts which are already available in the trucker's associations
- The use of providing real-time information of the trucker to change direction.
- Manage shipments in one dashboard and get statistical and intelligent reports
- Use WhatsApp messaging and notifications where required to improve communications between different role players in the supply chain
- Integrate OCR (optical character recognition) on the web-based system. OCR technology captures all the incoming and outgoing vehicles and automatically detects information such as:
    - o container numbers,
    - o ISO codes,
    - o trailer numbers,
    - o license plates,
    - o chassis numbers,
    - o IMDG dangerous goods labels,
    - o door direction on the truck,
    - o container position on the trailer, and
    - o container state (full or empty).
    - o VGM is scanned at the weighbridge
    - o The OCR allows vehicle verification and enables efficient gate management

5 RECOMMENDATIONS

The following recommendation can be made from the study:

- Transnet and Industry to explore the possibility or opportunity of private investment to accelerate the procurement of new RTGs and/or to assist in procuring critical spare parts for the RTGs as a high priority.
- Transnet and Industry to explore the possibility of a PSP to operate the terminal.
- The industry and Freight forwarders to engage with Transnet to utilise a night shift for priority containers/ reefers. This will be in cooperation with freight forwarders and packhouses.
- Set up a workshop with TNPA and TPT.
    - To address the lack of a traffic management plan and how such a traffic plan should look.
    - To relook at the traffic flows in the temporary staging area and turning points,
    - To investigate the possibility of identifying trucks at the port gate that are registered before granting access to the port (possible integration with TBS or enabling the functionality of the scanner to identify registered trucks)
    - To address operational issues at the existing staging area before A-Check
    - To reconfigure the movement of trucks at A-Check
- Set up a workshop with the WC government, trucker associations, freight forwarders and industry.
    - To develop a platform based on the existing web-based system to manage a container or consignment between the port and pack houses.
    - Implement a pilot site with a few truckers to test the effectiveness thereof.
    - Integrate the web-based system with TPT systems.
    - Record keeping of when a truck is moving through the different gates at the port.
- WhatsApp groups can be further enhanced by manually introducing notifications or by using a system to notify when a stack is open or closed for a booking. Moving a container and managing a trucker from the packhouse to the port will be much more effective. This can be read with the previous point but can be implemented and tested earlier.
- Truck turnaround times (a critical supply chain measurement) should be extended beyond gate-in and gate-out at the Port to, as the closure of the port is not calculated currently in the metric and the impact on the industry.
- Terminal intelligence should be improved by increasing the level of data coordination between the port's terminal stakeholders and performing calculations that enable appropriate trade-offs, which will inform better decision-making related to the terminals.
- Integrate OCR (optical character recognition) software with existing software. OCR technology can scan all incoming and outgoing vehicles or value-added attributes as determined.
- Compared with One-Stop (VBS), the TBS system is limited and needs to be investigated for future expansion.

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ANNEXURE

Overview of the port's freight flows' (TFUSA data) for more detailed visualisation of the data. Overview of truck turnaround times

Figures 92 and 93 show that the distribution of the discarded anomalies in the TFUSA is similar and that the remaining data wasn't biased with regard to an arrival time at the port.

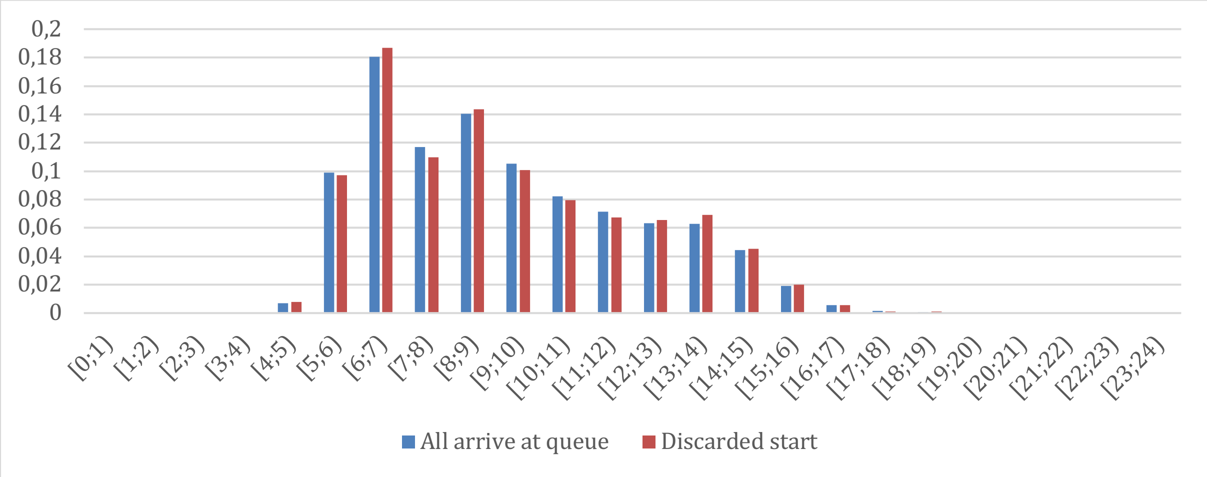

Figure 92: Arrival times

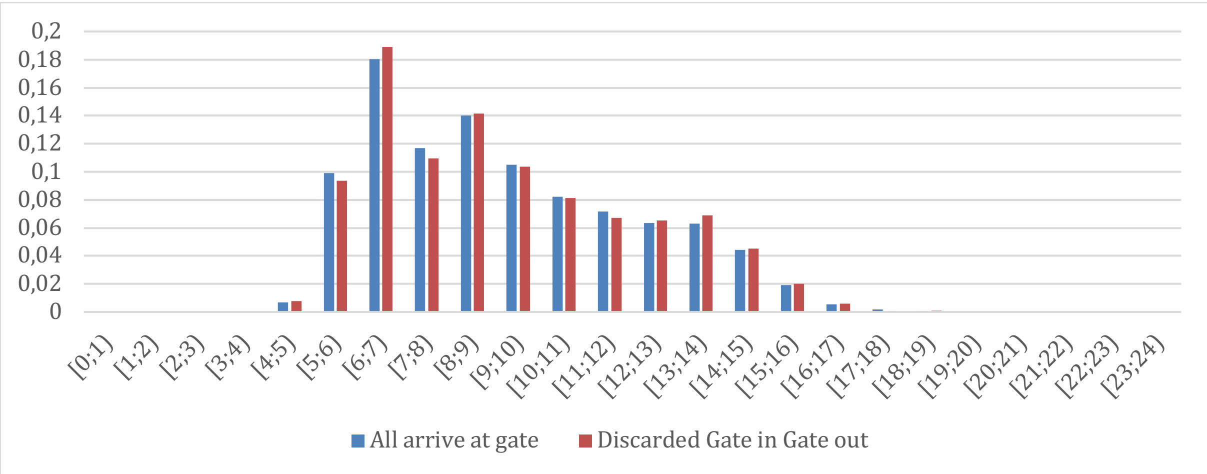

Figure 93: Gate entry times

Despite the large variance in queueing and TTT times for trucks arriving at the port when it is windbound. As can be seen in Figures 94, 95 and 96, because it only affected 3% of trucks, the impact on the average on a monthly basis, is limited.

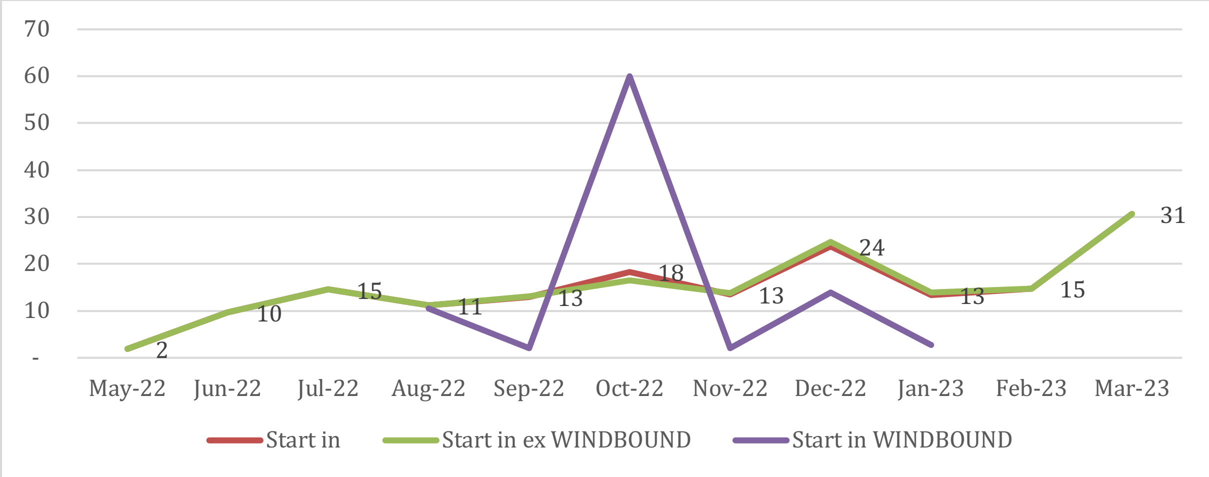

Figure 94: Average Queue to get to A-Check gate

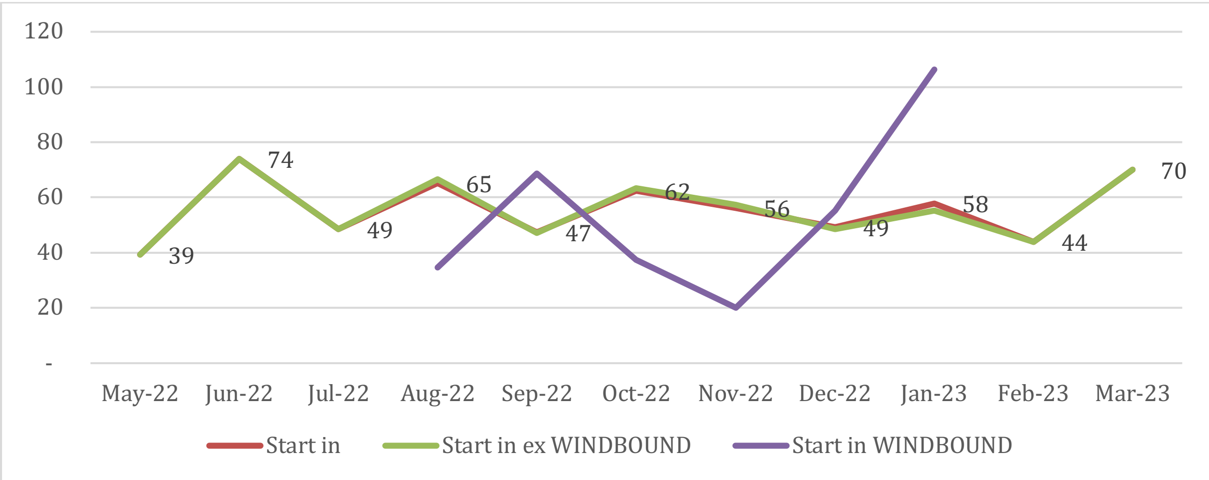

Figure 95: Time spent in port after passing A-Check Gate

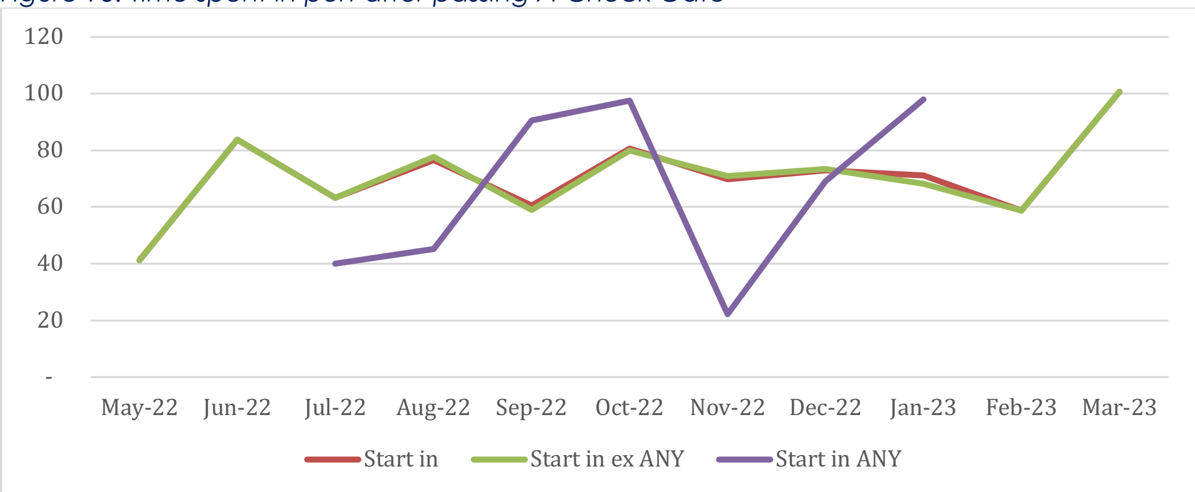

Figure 96: TTT – Start of queue to out of the gate

Figures 97, 98 and 99 show the same data, but on a weekly granularity. When looking at the bifurcated set of trucks arriving at the port when there are no windbound closure events, it appears that there are systemic operating constraints present at the port as the gate-to-gate TTT spikes periodically.

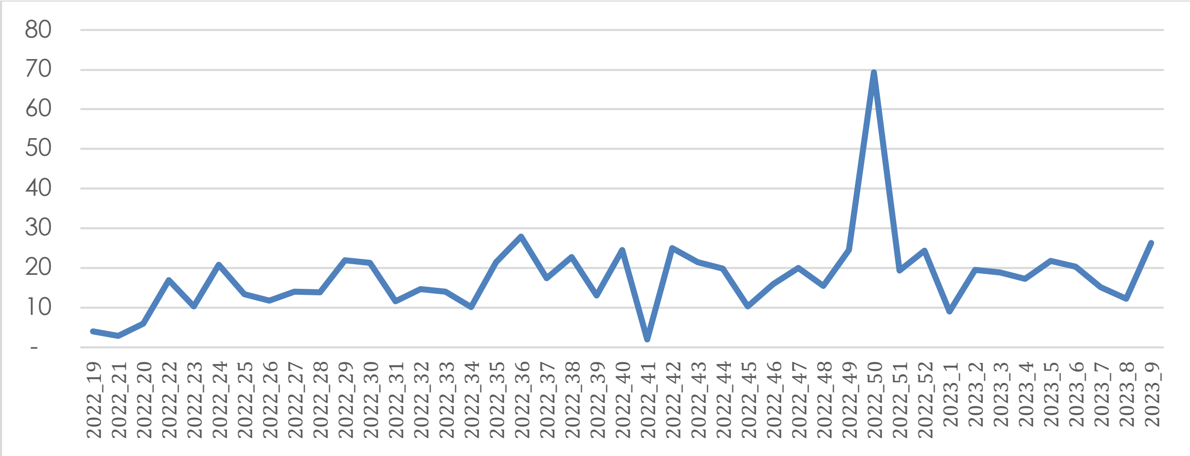

Figure 97: Weekly Average - Start to gate – Excluding windbound closure events

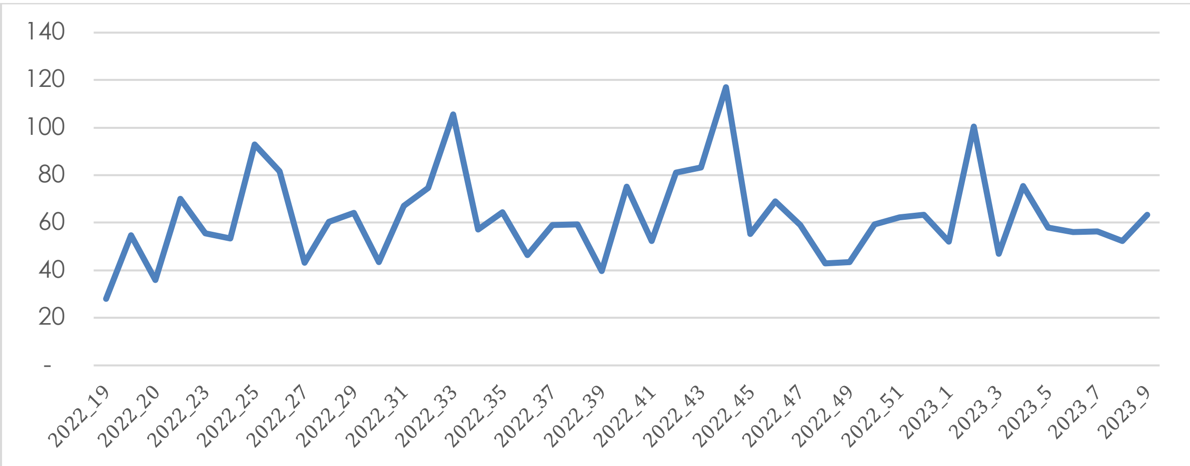

Figure 98: Weekly Average - Gate in Gate out

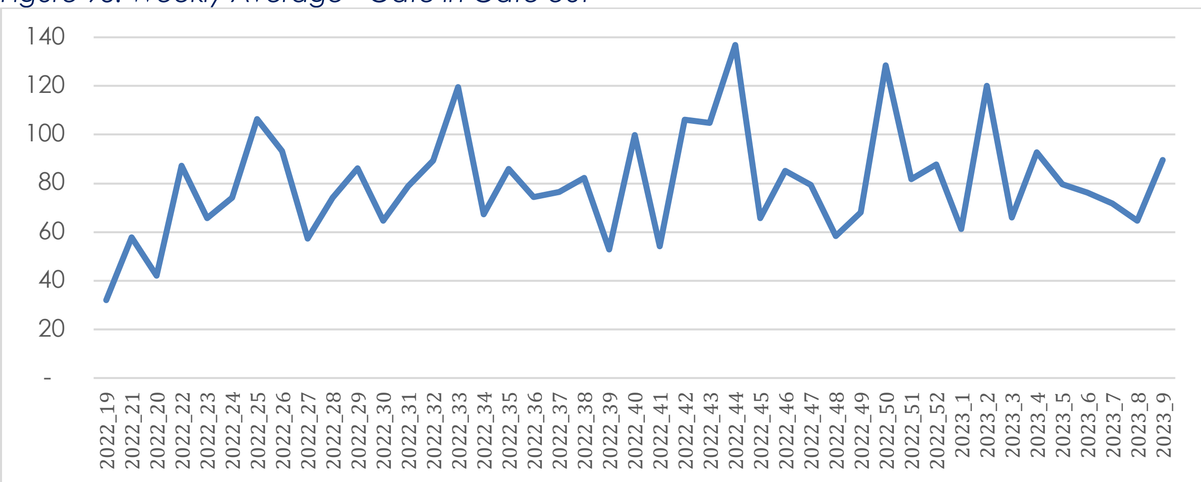

Figure 99: Weekly Average - start to gate out

When overlayed with the set of trucks arriving during windbound port closures in Figures 100, 101 and 102 it appears as if there is a variance in the consistency that windbound port closure events will result in a higher TTT for import containers at the CTCT. Although the times are more often higher than when the port isn't windbound, in some cases the TTT is lower which indicates that there are other variables which impact TTT more than port closures, this could also be due to the small sample of trucks which arrive at the port during a closure event.

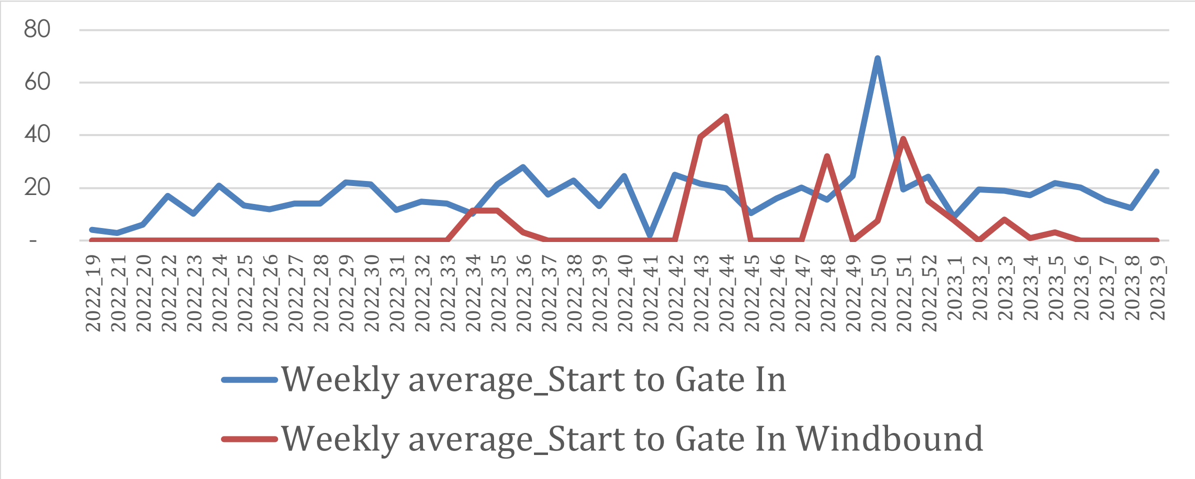

Figure 100: Weekly Average - Start to gate

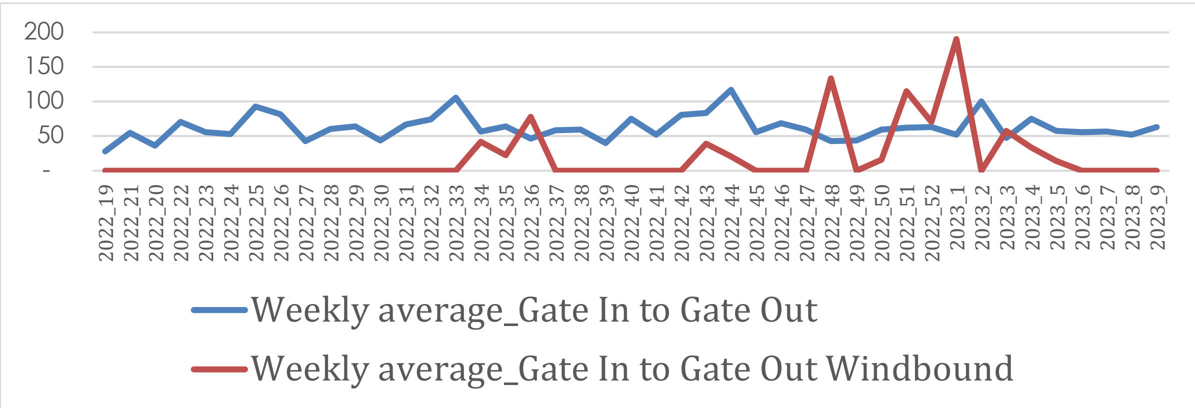

Figure 101: Weekly Average - Gate in Gate out

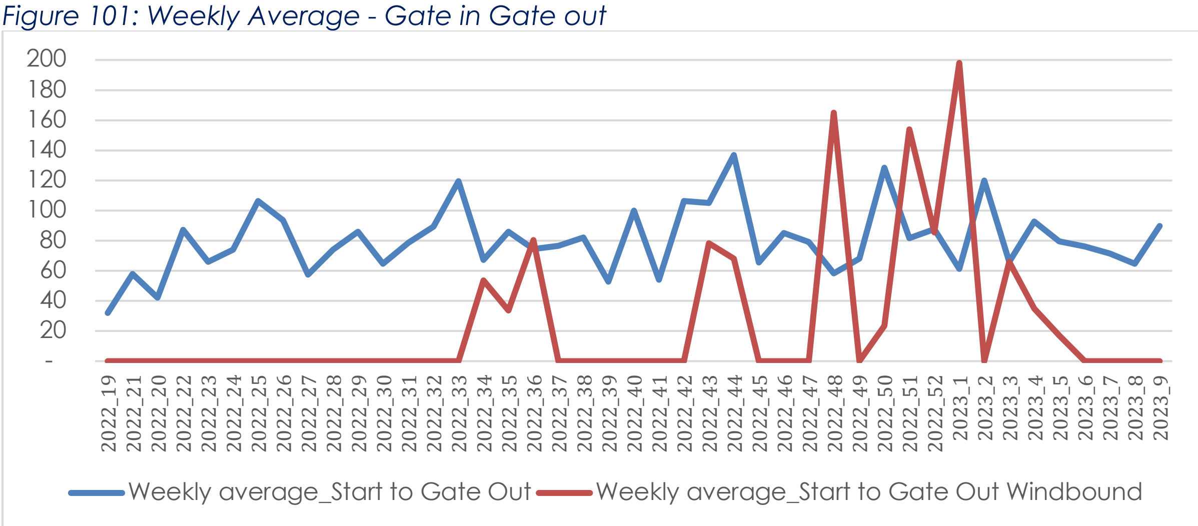

Figure 102: Weekly Average - start to gate out

Figure 103. 104 and 105 show that, in general, more hours of windbound port closure lead to longer queueing times at the port entrance for trucks picking up import containers at the CTCT.

In weeks 43 and 44 the gate-to-gate TTT appears to be separate from the number of port closure hours.

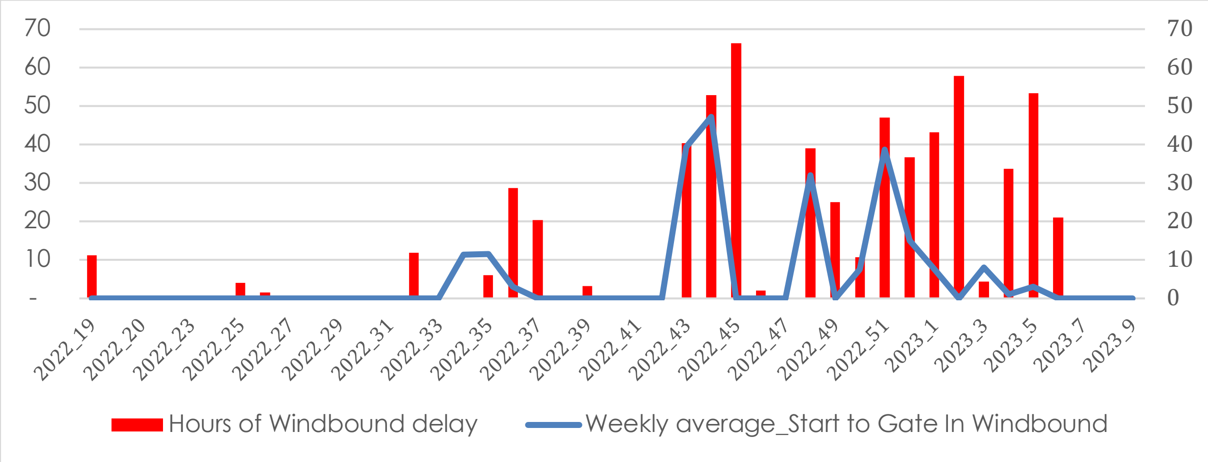

Figure 103: Weekly Average - Start to gate

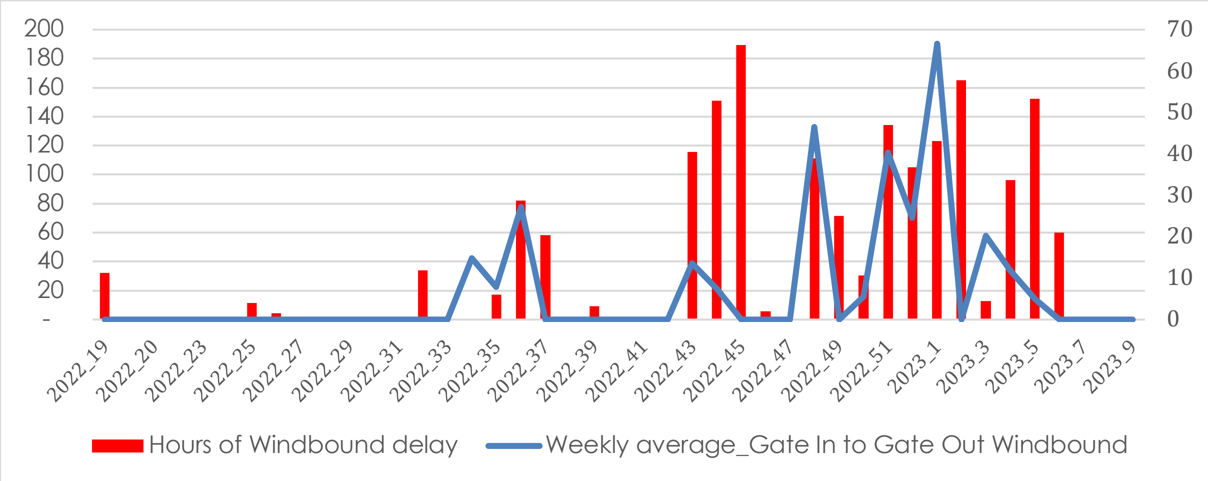

Figure 104: Weekly Average - Gate in Gate out

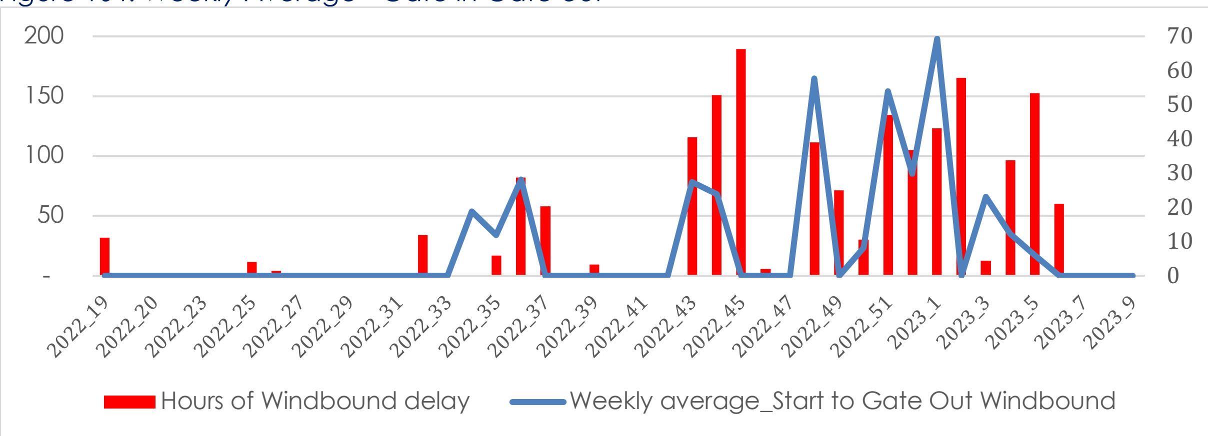

Figure 105: Weekly Average - start to gate out

When this analysis is repeated in Figures 106 to 114, the outcome remains largely the same when all port closures are taken into consideration.

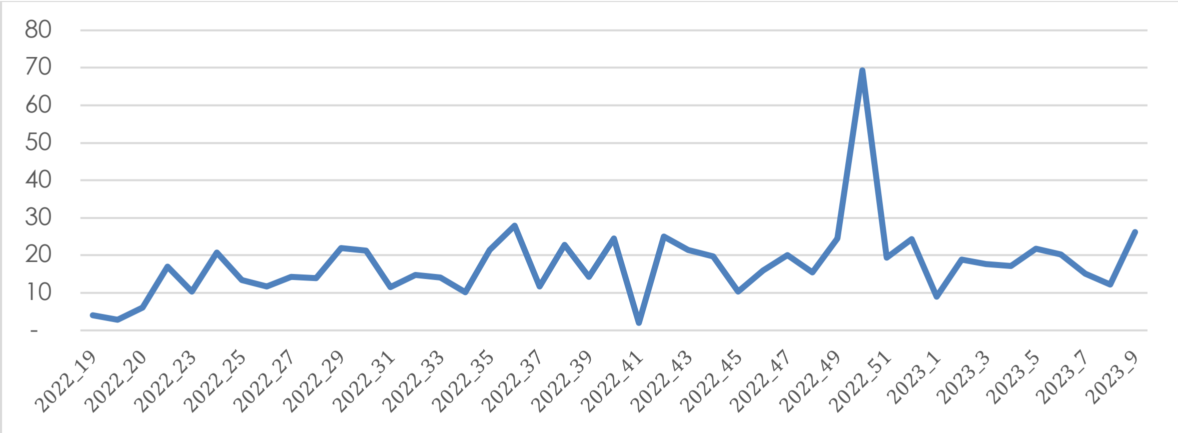

Figure 106: Weekly Average - Start to gate excluding any closure events

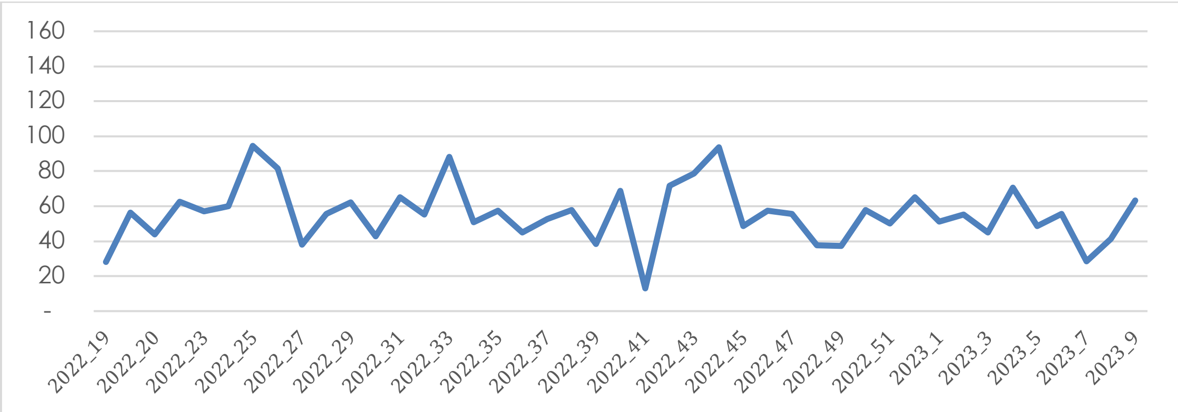

Figure 107: Weekly Average - Gate in Gate out

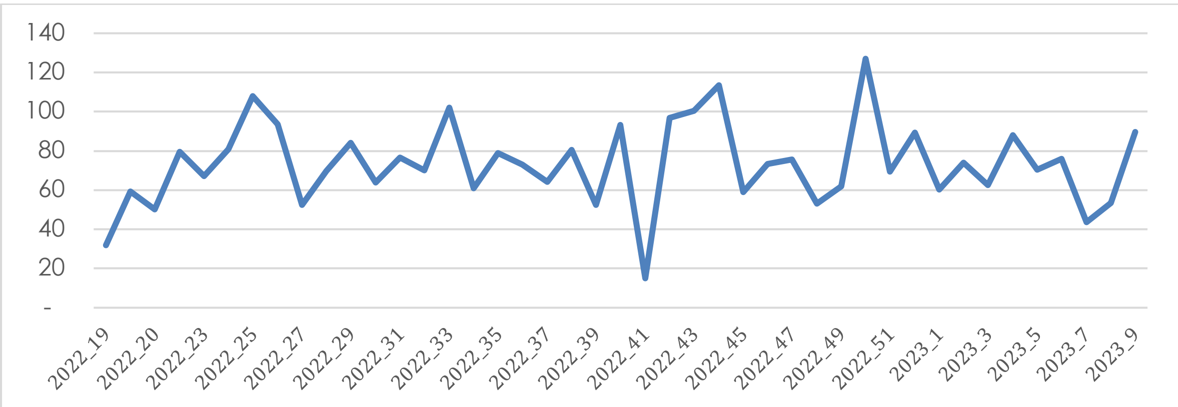

Figure 108: Weekly Average - Start to gate out

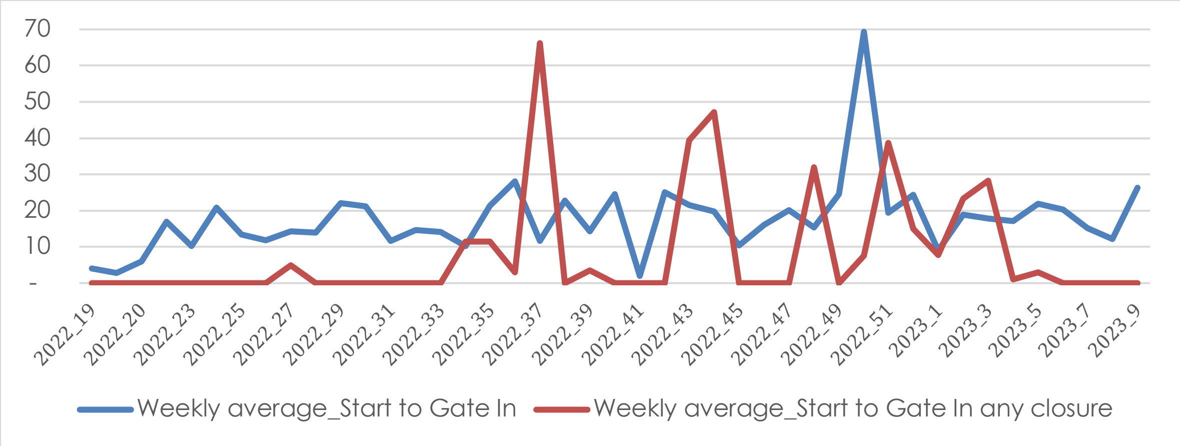

Figure 109: Weekly Average - Start to gate

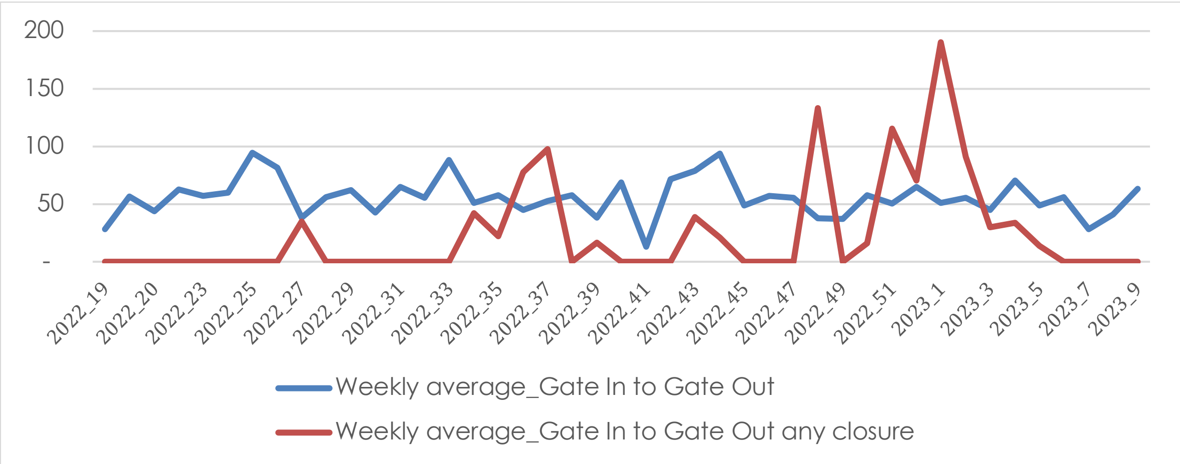

Figure 110: Weekly Average - Gate in Gate out

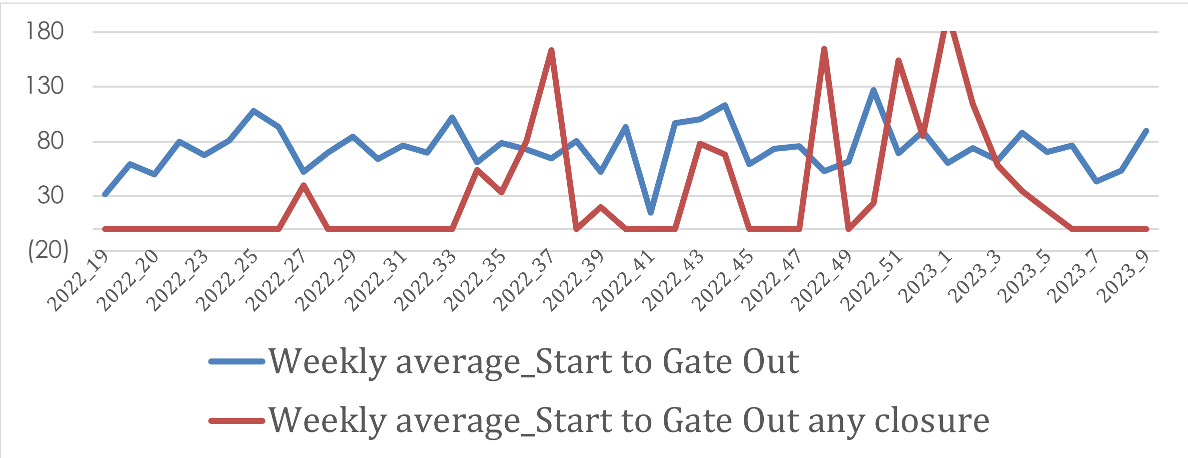

Figure 111: Weekly Average - Start to Gate out

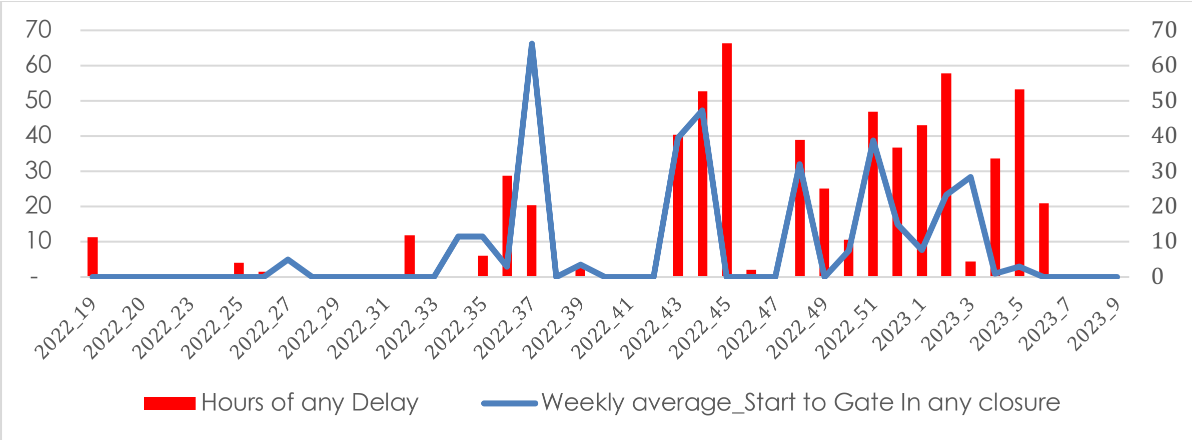

Figure 112: Weekly Average - Start to Gate

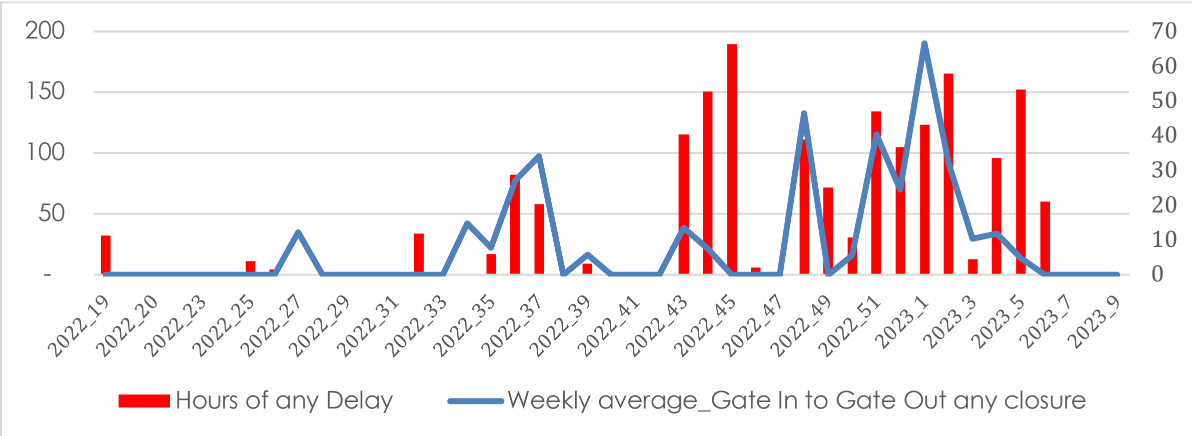

Figure 113: Weekly Average - Gate in Gate out

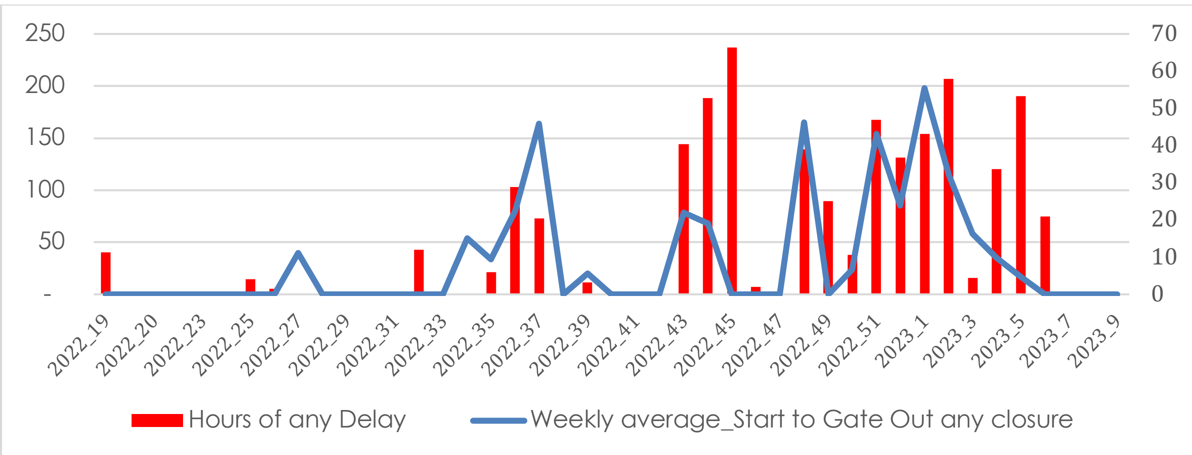

Figure 114: Weekly Average - Start to Gate out

Figure 115 and 116 shows the contribution of queueing outside the port and TTT inside the port, the average daily TTT for the whole TFUSA dataset. In general, there are a lot of variances regarding the truck queuing time outside the port and TTT inside the port on a day-to-day basis.

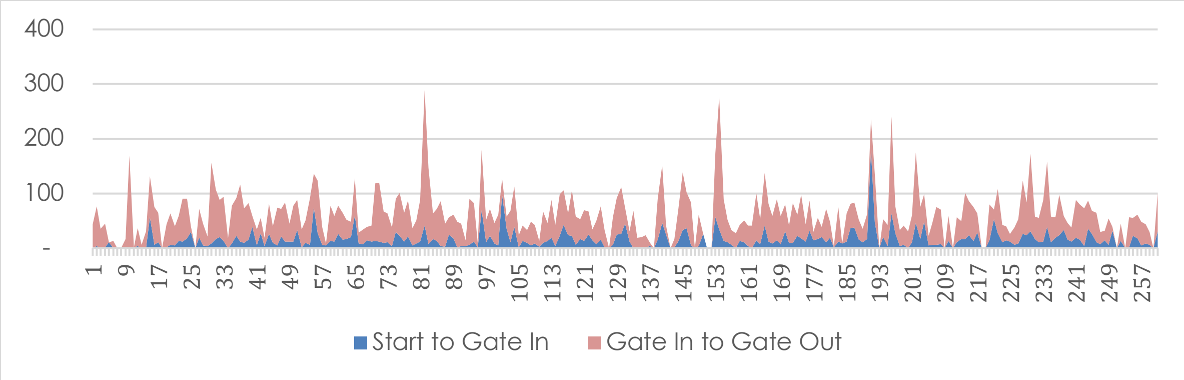

Figure 115: Excluding closure

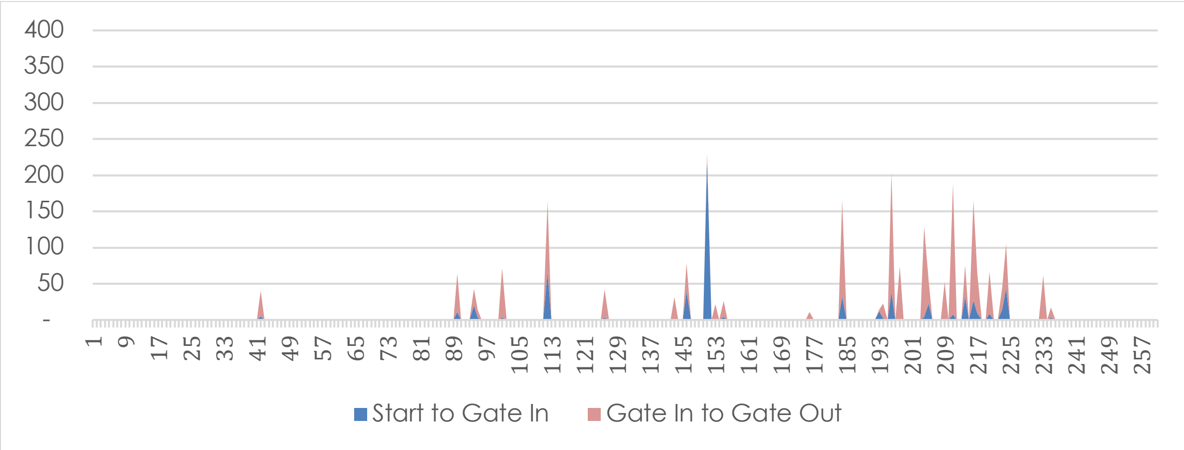

Figure 116: Including closure

However, when looking at the distributions of waiting times at the port entrance (Figures 117 and 118) and the TTT once a vehicle has entered the CTCT (Figures 119 and 120), it appears though port closure has a more pronounced effect on queueing outside the port.

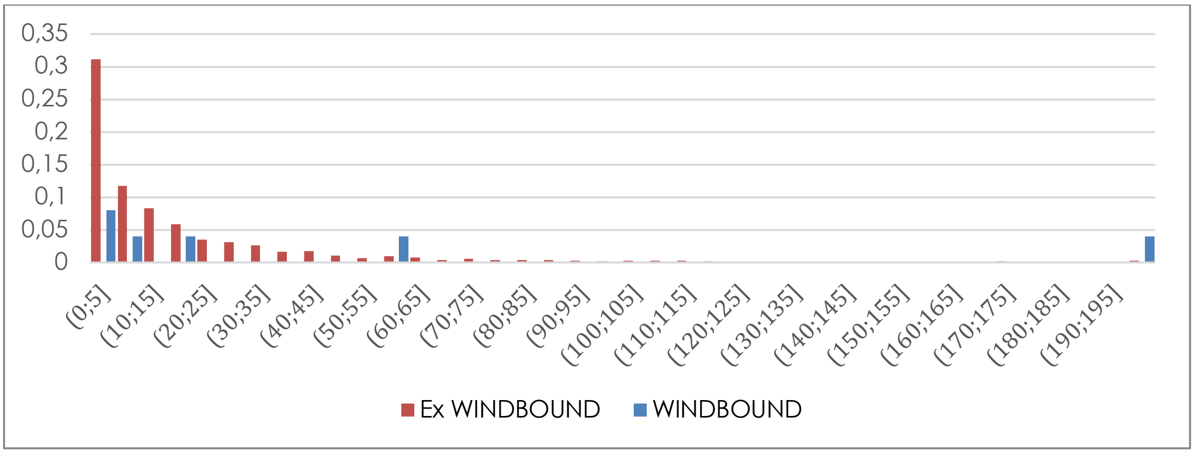

Figure 117: Start In – Arrival at the back of the queue.

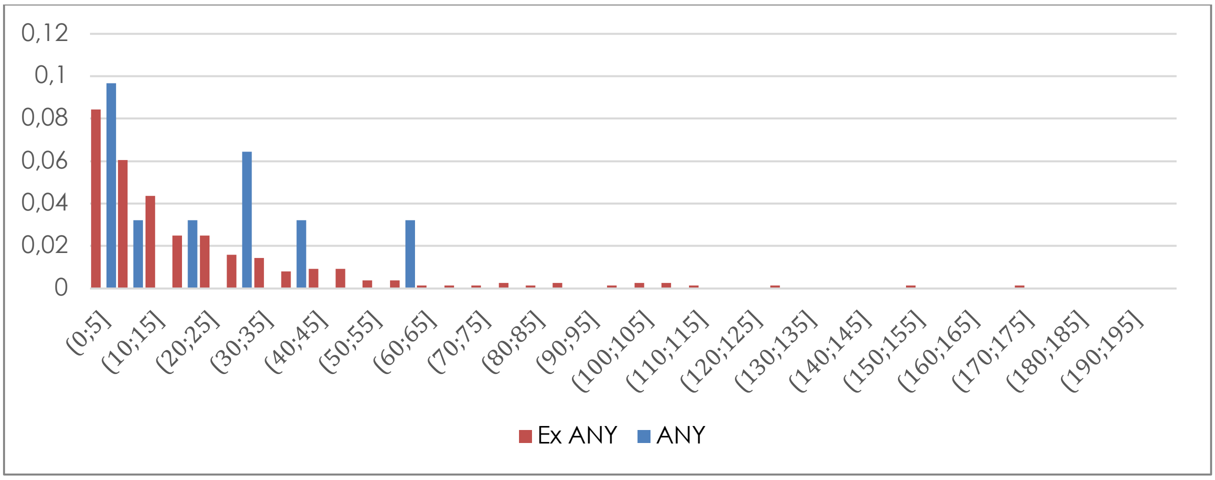

Figure 118: Start In – Arrival at the back of the queue

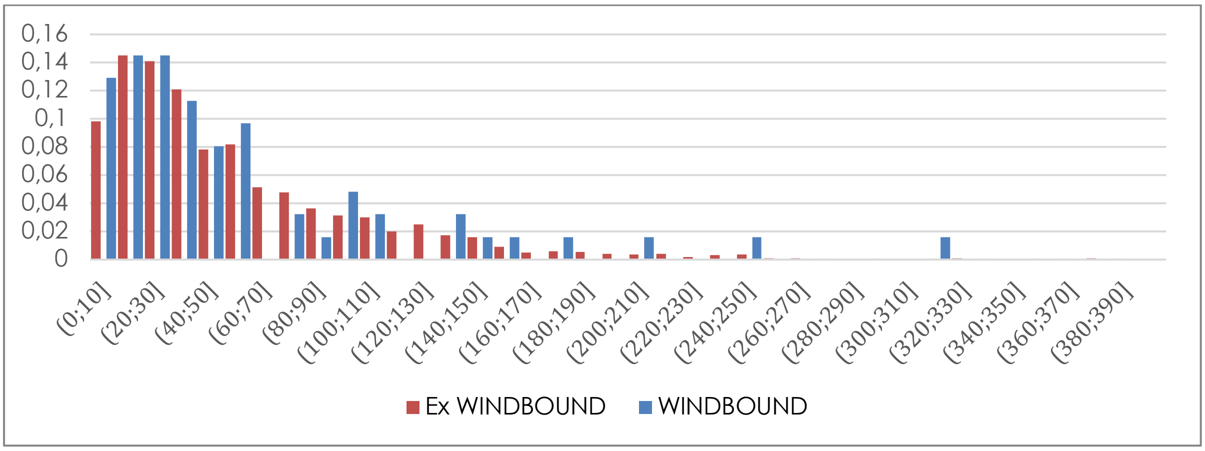

Figure 119: TTT: Gate in – Gate out

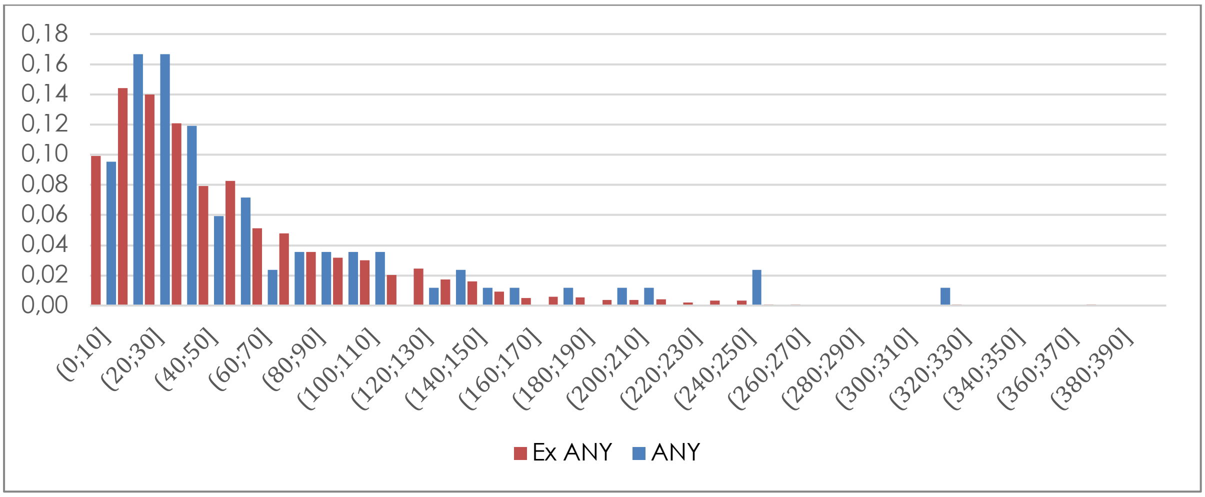

Figure 120: TTT: Gate in – Gate out