



# Dry-bulk and break-bulk vessel anchorage waiting time in the Port of Durban's bulk terminal



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**Background:** The Port of Durban plays a pivotal role in South Africa's maritime trade. This article addresses a critical challenge faced by the Durban dry-bulk and break-bulk terminal, which is the excessive waiting time experienced by vessels at anchorage. Lengthy anchorage waiting time results in economic losses for shipping companies and affects the overall efficiency of the port.

**Objectives:** The study aimed to identify the factors that affect the anchorage of dry-bulk and break-bulk vessels while waiting for the berth (WFB) in order to recommend actions that should be taken to reduce vessel anchorage waiting time while WFB at the Port of Durban's bulk terminal.

**Method:** Qualitative data were obtained through semi-structured interviews, which lends itself particularly well to thematic analysis.

**Results:** The research findings reveal that multiple factors contribute to the extended waiting times experienced by dry-bulk and break-bulk vessels at the Port of Durban. These factors include inefficient cargo handling processes, inadequate infrastructure, congestion, adverse weather conditions, and port capacity constraints. In addition, vessels arriving at the same time while the berth is still occupied further intensify delays, resulting in vessels WFB at anchorage.

**Conclusion:** The study identified and prioritised these factors, which enabled the development of targeted solutions to mitigate the waiting time issue. The proposed solutions encompass both short-term and long-term measures.

**Contribution:** This research emphasises the importance of supply chain collaboration among key port stakeholders.

**Keywords:** anchorage waiting time; port efficiencies; Port of Durban; maritime supply chain; dry-bulk and break-bulk vessels; port terminals.

## Introduction

Sea transportation is used for the majority of global trade, with approximately 80% of international freight being transported by sea (UNCTAD 2023). According to UNCTAD (2023), global commerce and seaborne trade have increased steadily, even during the most difficult economic times, with maritime commerce showing quick recovery and growth. The Port of Durban is the busiest multipurpose port in sub-Saharan Africa. In 2022, 44 million tons of cargo were handled by the Port of Durban (TNPA 2023). It boasts 13 dry-bulk and 11 break-bulk berths with a total capacity of 16.1 million tonnes (Transnet National Ports Authority [TNPA] 2019). The Port of Durban leads the sub-Saharan African ports with other ports handling lower tonnages in the same period: the Port of Mombasa in Kenya handled about 33.9 million tonnes in the financial year 2021–2022 (KPA 2024); Port of Dar es Salaam in Tanzania handled 23.1 million tonnes in 2022 (TPA 2024); Port of Maputo in Mozambique recorded 26.7 million tonnes in 2022 following strong bulk growth (Maputo Port Development Company [MPDC] 2023); and the Port of Walvis Bay & Lüderitz in Namibia together handled ~6.6 million tonnes in the financial year 2022–2023 (Namibian Ports Authority [Namport] 2023).

Ship operators search for ports that offer optimal services, including fast turnaround times for vessels, clean cargo, few instances of equipment failure, efficient customs processing, minimal spills, and direct berthing (Kokila & Abijath 2017). Some costs, such as port charges, pilotage, towage, handling and inland haulage, are generic and often figure prominently in revealed-preference models of carrier behaviour (Rezaei, Van Roekel & Tavasszy 2019; Rezaei & Van Wulfften Palthe 2018). The capacity and port infrastructure directly affect the handling speed

and unit cost, and this can be highly associated with port attractiveness to ship operators (Rezaei et al. 2019). In the port performance studies, port efficiency, which includes vessel turnaround, berth productivity, minimal idle time, and predictability, is highlighted as a key differentiator when choosing a port or terminal (Rezaei et al. 2019). This is also supported by shippers' changing priorities; De Icaza (2017) stated that congestion, waiting times and queuing delays are also key deterrents. Shipping lines tend to avoid ports with excessive anchorage or berthing delay. It is linked to the vessel turnaround time (VTAT) and the waiting for berth (WFB) time, which can be reduced through efficient VTAT. Ming and Shah (2008) and Raj, Shrikumar and Saha (2024) explain that the length of time a vessel spends at berth is known as the VTAT. According to Kweon et al. (2022), 'VTAT is measured from the time a vessel enters a port to the time it exits, including berthing, unloading, and sailing'. The end users in break-bulk (industrial, commercial, or construction entities that require non-containerised, project-specific, or bulk-packed cargo for production, distribution, or infrastructure use) are plagued by uncontrolled rising expenses, which are seriously affecting trade agreements and transportation contracts (Gidado 2015). This situation contributes to escalating operational costs, as logistics companies are then compelled to absorb the additional financial burdens. As a result, the Port of Durban has become one of the most expensive ports in the region, which is also driven by high terminal-handling charges to carry out cargo operations (Mthembu & Chasomeris 2023a; Mthembu & Naude 2023; Raballand et al. 2012). The majority of the characteristics of dry-bulk and break-bulk vessel operations in the current world are moving away from only functioning on a spot market and towards set schedules and defined ports of call or set or defined trade routes. The performance of ports and terminals determines the general shipping line effectiveness and the trade performance is based on this effectiveness. Major dry-bulk and break-bulk operators follow strict sailing, maintaining minimum days at sea from berth to berth, while expecting that the cargo operations time in port will be quick, allowing the vessel to turn around back to sea.

In their analysis, Brilka and Clausen (2021) define shippers as 'entities that satisfy their transportation demand via the market rather than owning their own fleet'. Shippers face difficulties because of the just-in-time model of today's global supply chain, which results in high demurrage fees and late deliveries of cargo. The VTAT at the Durban Dry-bulk and

Break-bulk Terminal (Maydon Wharf) is poor when we compare it with its peers in the region, which has an average waiting time of 1–2 days. This is bearing in mind that VTAT is the sum of the WFB and berth time (EWC 2024; Freight News 2024; NAMRA 2023). Because of this calamity, other cargo owners and vessel operators have redirected their vessels to ports in nearby countries, including Mozambique, Tanzania, Kenya, and Namibia (Bowmans 2018). These are seen as alternative gateway ports, and this cargo will be easily moved because South Africa has a rail corridor agreement with four other countries (Bowmans 2018). The port is consequently losing business to these nearby nations (Bowmans 2018). This article examines the various factors affecting WFB by dry-bulk and break-bulk vessels, and how they can reduce WFB. This will be accomplished by examining port performance issues that the Port of Durban has encountered, how they can be reduced, and what infrastructural issues have contributed to the ongoing congestion issues resulting in the dry-bulk and break-bulk vessels having longer WFB time. The Port of Durban uses a system where vessels should be nominated to berth based on the first schedule – first serve (FS-FS). This is monitored by all vessels being lined on the basis of who will berth first. This is updated daily and published daily to promote transparency. The document is known as the bar chart, which is the berthing schedule. Table 1 is a sample of one of the berths at the Maydon Wharf Terminal, which shows WFB that can go up to 26 days.

Understanding the characteristics of bulk and break-bulk cargo is crucial for appreciating the unique challenges they present to port operations and, specifically, to waiting times for berths. Bulk cargo refers to goods transported unpackaged in large quantities, typically as liquid or granular, such as oil, coal, or grains (Casaca & Marlow 2007). Break-bulk cargo, on the other hand, is transported individually, often bagged, boxed, or crated, and loaded onto a ship or vessel separately. Typical examples include machinery, bagged or barrelled goods, and construction equipment (Song & Panayides 2008). The handling of bulk cargo can be relatively straightforward because of its uniform nature and the ability to use special equipment for loading and unloading. However, it can present challenges because of the large quantities involved and the need for significant storage space. Ensuring the safety and environmental sustainability of such operations, particularly for hazardous materials such as coal and Group A cargoes as per the IMSBC (International Maritime Solid Bulk Cargoes) Code, is also a concern (Haralambides 2017). Break-bulk cargo, however, can be more complicated and time-consuming to handle because of its diverse nature. This

**TABLE 1:** Maydon Wharf 14 example berthing schedule.

Vessel†	Berth	ETA	ETB	ETD	Dish commodity	Load commodity	WFB (days)
Vessel A	MW14	15-03-23	30-03-23	08-04-23	20 000 PROJECT CARGO/STEEL/GEN	-	15
Vessel B	MW14	27-03-23	08-04-23	20-04-23	-	60 500 COAL	12
Vessel C	MW14	17-04-23	20-04-23	30-04-23	13 900 CONTS/BAGS MINERALS/GEN	-	3
Vessel D	MW14	18-04-23	30-04-23	11-05-23	18 500 BAGS/PROJECT/STEEL	-	12
Vessel E	MW14	15-04-23	11-05-23	24-05-23	-	60 500 COAL	26

Source: TNPA, 2023, *Summary of cargo handled at ports of South Africa, Jan–Dec 2022*, Transnet Publications

ETA, estimated time of arrival; ETB, estimated time of berthing; ETD, estimated time of departure; WFB, waiting for berth.

†, Names of vessels were removed as a condition for agreed ethical clearance requirement.

diversity requires different types of handling equipment and often involves more manual labour than containerised or bulk cargo (Notteboom & Rodrigue 2009). Moreover, break-bulk cargoes, being less streamlined in their operations, often face longer waiting times for berths and can lead to congestion in ports (Casaca & Marlow 2007).

Both bulk and break-bulk cargo operations in the Port of Durban face challenges that exacerbate waiting times for berths. For bulk cargo, a key issue is the ageing infrastructure and equipment, affecting the cargo handling in the terminals (Transnet 2022). For break-bulk cargo, the port struggles with insufficient dedicated terminal space, leading to inefficient operations and increased waiting times (Botes, Gouws & Cronje 2013).

## Literature

Several studies (Hector et al. 2012; ITF 2013; Motau 2015) have reported on the factors that affect the VTAT and WFB of container ships, concentrating on the Port of Durban using various techniques and picking various locations. Whereas other researchers (Kokila & Abijah 2017; Kontovas & Psaraftis 2011; Premathilaka 2018) have studied the reduction of WFB via VTAT of container vessels throughout the world. However, there is a gap in research on the operation of break-bulk vessels and the factors that affect WFB at anchorage or VTAT. The authors have no knowledge of other studies that have looked into this effect. Through this research, the article hopes to fill that research gap. Although WFB has been treated as a single measurement, it is actually a summation of the time spent on various tasks performed during a ship's arrival at a port, tasks performed inside a port, and tasks performed during a ship's departure from a port (Premathilaka 2018). 'Those sub-activities include waiting time for a berth, manoeuvring time, mooring or unmooring time, idle time, cargo handling time, and other time components until the vessel leaves port limits' (Premathilaka 2018:3). While Mapotsi (2019) studied 'Factors Affecting VTAT at the Port of Richards Bay Dry-Bulk Terminal', Motau (2015) focused on 'An Assessment of Port Productivity at South African Container Port Terminals'. The findings from these studies are port-specific and cannot be applied directly to the Maydon Wharf terminal. Apart from the generic issues, such as the weather monitoring equipment needed and the breakdown of equipment, as highlighted by Mapotsi (2019), the terminal-specific information still needs to be investigated, as this is a gap in the literature. Motau (2015) was able to provide a number of important factors that lead to adverse vessel anchorage waiting time in the Port of Durban bulk terminal while WFB. Crane use has been found to be the primary factor influencing VTAT among many others, which is directly proportional to WFB, while the vessel is at anchorage. Several significant causes of unfavourable WFB, such as crane utilisation, have been named as one of many contributing factors to VTAT. It is inversely related to vessel waiting and anchorage while it awaits the berth to be available (Motau 2015). In order to bridge the gap, this study looks into the factors that affect the length of time vessels

wait to anchor when they are WFB at the Maydon Wharf terminal in the Port of Durban.

Port efficiency plays a crucial role in the broader spectrum of the global supply chain and trade economy, significantly impacting a country's overall economic progress (Tongzon 1995). As the gateways to global trade, efficient ports can enhance a nation's competitiveness, facilitating economic growth and development (Low 2002). The concept of port efficiency is multidimensional and dynamic in nature. It typically encompasses the effectiveness and productivity of a port in facilitating cargo handling operations, including the VTAT, container dwell time, and waiting time for a berth, among other operational parameters (Cullinane & Wang 2006). The importance of efficiency extends beyond the basic movement of goods. Numerous parties are impacted, including transportation companies, cargo owners, logistics service providers, and, in the end, customers (Notteboom & Haralambides 2009). The phenomenon of waiting time for a berth is a pressing issue in ports around the globe, and its intricacies are dependent on a multitude of factors that vary from port to port (Tongzon 2009). The ramifications of prolonged waiting times, however, are consistently negative across all contexts, leading to increased costs, reduced efficiency, and broader supply chain disruptions (Ducruet & Lee 2006). Average waiting times for a berth can vary dramatically from one port to another. The physical infrastructure of the port, the quantity and size of ships that visit the port, the kind of cargo handled, and the effectiveness of the port's management and operations are some of the factors that cause this discrepancy (Bichou & Gray 2004). For instance, some major ports in developed countries have made significant infrastructure and technology investments that have reduced waiting times. In contrast, the lack of such investments in many developing nations often leads to longer waiting times (Talley 2009).

Exploring case studies of break-bulk terminals worldwide offers a wealth of insights into effective strategies to manage waiting times. Three such cases from the Port of Antwerp, the Port of Houston, and the Port of Rotterdam, known for their efficient handling of break-bulk cargo, are considered here.

The Port of Antwerp, one of the largest break-bulk ports in Europe, has successfully managed waiting times by implementing advanced technology and efficient management systems. Lamberts and Van Doorn (2007) detail how the use of a digital platform for real-time tracking of cargo and allocation of berths has significantly reduced waiting times. In addition, Antwerp's extensive infrastructure and well-coordinated labour force contribute to efficient cargo handling. Similarly, the Port of Houston, a major break-bulk terminal in the United States, has effectively reduced waiting times by expanding its berth capacity and improving its infrastructure. Woo and Moon (2004) attribute Houston's success in reducing waiting times to the port's investment in modern cranes and handling equipment specifically designed for break-bulk cargo.

Furthermore, effective collaboration among stakeholders and streamlined administrative procedures have significantly expedited the cargo-handling process.

The Port of Durban can learn from the experiences of Rotterdam and Bremerhaven by investing in well-planned infrastructure, strengthening inland connections, adopting advanced IT and berth allocation systems, implementing flexible scheduling, and improving labour management to reduce waiting times and enhance overall efficiency. Kurt (2018) stated that the Port of Rotterdam, renowned as Europe's largest port, also offers important insights into managing waiting times. Ugboma, Ugboma and Ogwude (2006) highlight how the port has managed to maintain low waiting times despite high volumes of break-bulk cargo. Factors contributing to this include a well-planned infrastructure, an extensive network of inland connections, and advanced cargo tracking and berth allocation IT systems. The Port of Bremerhaven, one of Germany's busiest ports, has a significant volume of break-bulk cargo operations. According to a study by Notteboom, Verhoeven and Fontanelli (2013), the port has successfully managed waiting times by focusing on flexible scheduling and efficient labour management. The port uses an advanced scheduling system that enables it to dynamically allocate berths based on cargo type, vessel size, and estimated time of arrival. This ensures that resources are utilised efficiently and waiting times are minimised. Moreover, the efficient utilisation of skilled labour for cargo-handling operations also contributes to reduced waiting times.

Further south in Europe, the Port of Piraeus, Greece's largest port, has made significant strides in managing waiting times for break-bulk cargo. Haralambides and Acciaro (2005) report that the port's success is because of strategic infrastructure investment, modern handling equipment, and a keen focus on stakeholder collaboration. The port has invested in state-of-the-art handling equipment designed specifically for break-bulk cargo, which has significantly reduced the time taken to load and unload vessels. Additionally, the port authority's collaborative approach, involving terminal operators, labour unions, and other stakeholders, has streamlined the cargo-handling process and reduced waiting times.

## Waiting for the berth at the Port of Durban

Despite its impressive capacity and strategic position, the Port of Durban faces several unique challenges that impact its operational efficiency (The Business Year – Interviews & News from Around the World 2024). These include congestion, ageing infrastructure, and extended waiting times for berths, particularly for break-bulk vessels (Peters 2014). These issues are compounded by external factors such as volatile international trade conditions and changes in global shipping networks (Bertram 2019). The culmination of these factors has placed considerable pressure on the port's

ability to maintain operational efficiency and meet growing demands. Addressing these challenges requires a thorough understanding of the factors influencing waiting times and an exploration of effective strategies to enhance operational efficiency. As the economic role of the Port of Durban continues to grow, it is essential to address these issues to ensure the port remains competitive and continues to facilitate regional economic growth effectively (Mapotsi 2019). The Port of Durban is a multicommodity port that handles automotives, containers, liquid bulk, break-bulk, and dry-bulk cargo. The port has five port precincts, namely, the Point & Leisure Precinct, Maydon Wharf Precinct, Bayhead Precinct, Durban Container Terminal Precinct, and Island View Precinct (TNPA 2023). The Maydon Wharf precinct handles a variety of commodities, including minerals (manganese, chrome ore, etc.), agricultural commodities (wheat, sugar, rice, grain, maize, soya bean, sunflower, fertiliser, paper, pulp products, etc.), a small percentage of containers, break-bulk (steel, cement, timber, etc.), and project cargo (Transnet 2022).

The bulk sugar terminal operated by the South African Sugar Association at berth 2 of Maydon Wharf is one of the port segment's notable facilities. This terminal is one of the biggest in South Africa, with three storage silos that can hold 520 000 tons and two ship loaders that can sustain a combined loading pace of up to 800 tons per hour (tph). South African Bulk Terminal (SABT) at Maydon Wharf, berth 5, has 28 silos with a capacity of 80 000 tons (maize basis) and 23 flat storage bins with a capacity of 70 000 tons. The SABT has two discharging equipment (mechanical with discharger) – a combined design capacity of 750 tph and a discharge capability peak (free flowing) 18 000 tph, and this berth is also fitted with a conveyor belt for loading with a design load rate of 450 tph (SABT 2023).

The issue of extended waiting time for berths is a significant concern for the Port of Durban. Despite its high cargo handling capacity and crucial role in global maritime trade, the port has been grappling with increasing waiting times, affecting its efficiency and reputation (Ng, Park & Meng 2015). In this context, it is necessary to delve into the average waiting times, the causes behind these delays, and their impact on the port's overall operation and the wider supply chain. The Port of Durban has observed growing waiting times for vessels, particularly for break-bulk cargo ships. According to a study by Botes et al. (2013), the average WFB at the port is approximately 18 h, although this can extend to several days during peak periods. Break-bulk vessels tend to experience longer waiting times than container or bulk cargo vessels because of lower prioritisation and limited terminal capacity. The factors contributing to these extended waiting times are manifold and complex. One key issue is the ageing port infrastructure, which struggles to accommodate the growing volume and size of vessels (Peters 2014). This is compounded by inefficient port operations, limited terminal capacity for break-bulk cargo, and the lack of adequate resources for vessel traffic management (Mhlongo 2022).

Another significant issue is port congestion, particularly within the break-bulk terminal. The congestion is often a consequence of inefficient cargo-handling processes and poor coordination among port stakeholders (Ng et al. 2015). Furthermore, changing weather conditions, such as high winds and swells, often delay vessel berthing, adding to the waiting time (Transnet 2022). Extended waiting times have far-reaching implications for the Port of Durban's operations and the wider supply chain. They lead to increased operational costs for shipping companies, reduced vessel utilisation, and lower port productivity (Ng et al. 2015). This not only affects the port's competitiveness but can also disrupt regional and international trade flows (Bertram 2019). The knock-on effect is felt across the supply chain, affecting importers and exporters, logistics providers, and ultimately the end consumer.

According to Mthembu and Chasomeris (2023b), the top 15 reasons for marine services delays in South African ports are as per Table 2. It displays the total hours lost because of marine service delays each year, as well as the proportion that each delay contributes to the overall shipping delays at the port. Examples of delays include tie-down crew setbacks, weather-related disruptions, tug unavailability, shipping movements, tug outages, shift changes, berthing crew hold-ups, terminal-related interruptions, and tidal vessel constraints.

Several strategies have been implemented in various ports worldwide, including the Port of Durban, to alleviate the waiting times for a berth. A review of these strategies provides an insight into their effectiveness and the lessons learned from them. Terminal expansion and modernisation are one of the most common approaches employed to improve port efficiency and reduce waiting times (Ducruet & Lee 2006). This strategy typically involves expanding

terminal space, upgrading berths and quays, and installing modern handling equipment to increase the port's ability to handle goods. For instance, in the Port of Durban, significant investments have been made in modernising the port infrastructure and facilities, including the building of new berths and the acquisition of modern cargo-handling equipment (Transnet 2022). These efforts have led to some improvement in waiting times, although challenges remain because of the continuing growth in cargo volumes and vessel sizes. Advanced information systems and port automation are another set of strategies increasingly being used to enhance port efficiency (Lee, Yang & Yang 2018). These technologies facilitate real-time information exchange between port stakeholders, automate cargo-handling processes, and enable efficient scheduling of vessel arrivals and departures. While such technologies have shown promise in reducing waiting times, their implementation in the Port of Durban has been limited, and more efforts are required to fully leverage their potential benefits (Botes et al. 2013).

Port collaboration and stakeholder coordination have also been identified as crucial for reducing waiting times (Vanelander, Van der Horst & Notteboom 2012). This involves fostering collaboration between shipping companies, port authorities, terminal operators, and other stakeholders to streamline port operations and improve berth allocation. Initiatives to enhance stakeholder coordination and collaboration have been implemented in the Port of Durban, but because of competing goals and a variety of stakeholder interests, the results have been uneven (Notteboom & Rodrigue 2009).

Through this literature review, we have built a comprehensive understanding of the complexities surrounding port efficiency and waiting times, specifically

**TABLE 2:** Analysis of ship delays for the period of 2014 to 2021.

Category	Y1: 2014		Y2: 2015		Y3: 2016		Y4: 2017		Y5: 2018		Y6: 2019		Y7: 2020		Y8: 2021		Ave 8 years	
	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Hours	%	Ave hours	Ave %
Tug occupied	786.42	34.00	668.10	34.0	600.84	36.0	485.76	33.0	485.94	39.0	317.13	29.7	327.69	36	331.08	29.0	425.12	29.0
Shipping movements	531.99	23.00	451.95	23.0	358.00	21.0	382.72	26.0	224.28	18.0	225.06	21.0	228.39	25	224.28	20.0	330.83	22.0
Tug OOC	208.17	9.00	176.85	9.0	116.83	7.0	137.28	9.0	74.76	6.0	112.53	11.0	139.02	1.6	168.00	15.0	141.68	10.0
Shift change	47.00	2.00	39.30	2.0	16.69	1.0	44.16	3.0	37.38	3.0	30.69	2.9	19.86	2.0	21.36	1.9	32.10	2.0
Adverse weather	115.65	5.00	98.25	5.0	124.26	7.0	88.32	6.0	74.76	6.0	61.38	5.7	29.79	3.0	53.40	4.6	73.00	5.0
Pilot boat OOC	44.00	1.90	37.00	1.9	16.69	1.0	44.16	4.0	37.38	3.0	30.69	2.9	19.86	2.0	10.68	0.9	30.00	2.0
Slot over booking	92.52	4.00	81.00	4.1	62.00	3.7	44.16	4.0	37.38	3.0	30.69	2.9	19.86	2.0	0.00	0.0	46.00	3.0
Reasons not captured	93.00	4.00	78.60	4.0	92.00	6.0	83.00	6.0	74.76	6.0	48.00	4.5	9.93	1.0	0.00	0.0	60.00	4.0
Berthing staff occupied	43.00	1.90	39.30	2.0	23.00	1.0	16.00	1.0	25.62	2.0	5.12	0.5	29.79	3.0	32.04	2.8	27.00	2.0
Port meetings	48.00	2.00	58.95	3.0	61.00	3.7	23.00	1.6	49.55	3.9	8.00	0.7	9.93	1.0	42.72	3.7	37.60	2.6
Pilot occupied	49.00	2.00	19.65	1.0	68.00	4.0	58.00	4.0	74.76	6.0	9.00	0.8	29.79	3.0	38.00	3.3	43.30	3.0
Terminal delays	92.52	4.00	78.60	4.0	72.00	4.0	29.44	2.0	12.46	1.0	79.00	7.4	59.58	7.0	51.00	4.4	59.30	4.0
Wind delays	94.00	4.00	98.25	5.0	18.00	1.1	13.00	0.9	24.92	2.0	29.91	2.8	59.58	7.0	53.40	4.6	49.00	3.3
Tidal vessel	46.00	1.90	21.00	1.0	16.69	1.0	12.00	0.8	8.32	0.7	30.69	3.0	19.86	3.0	31.36	2.7	23.40	2.0
Day light shipping	21.73	0.94	18.00	0.9	23.00	1.4	11.00	0.7	3.738	0.3	5.115	0.5	9.93	1.0	10.68	0.9	13.00	1.0
<b>Annual total hours ships delayed</b>	<b>2313</b>	<b>-</b>	<b>1965</b>	<b>-</b>	<b>1669</b>	<b>-</b>	<b>1472</b>	<b>-</b>	<b>1246</b>	<b>-</b>	<b>1068</b>	<b>-</b>	<b>896</b>	<b>-</b>	<b>1153</b>	<b>-</b>	<b>-</b>	<b>-</b>

Source: Mthembu, S.E. & Chasomeris, M., 2023a, 'An assessment of the capacity and the performance of marine services in South Africa's ports', *Journal of Transport and Supply Chain Management* 17(0), a879. <https://doi.org/10.4102/jtscm.v17i0.879>

Ave, average; OOC, Out of Commission Report; Y, year.

focusing on the Port of Durban and bulk and break-bulk cargo handling. The review revealed that multiple factors, ranging from port infrastructure, operational effectiveness, and vessel traffic to technological innovations and workforce management, play a significant role in influencing the waiting times for a berth. Furthermore, we identified the gaps in the current literature, particularly relating to the unique challenges posed by bulk and break-bulk cargo at the Port of Durban. This paves the way for our research to contribute to filling these gaps.

## Methodology

The focus of this study was the dry-bulk and break-bulk terminal at the Port of Durban, known as Maydon Wharf. Maydon Wharf stands out as a key node for the transit of dry-bulk and break-bulk cargo inside this port, making it an excellent location to look at berth waiting times (Raballand et al. 2012). Maydon Wharf is a crucial part of international trade because it acts as a highway for commodities travelling from South Africa to the rest of the globe. It has established itself as a prominent participant in global commerce thanks to its advantageous position on South Africa's east coast and its considerable cargo-handling capabilities (Havenga, De Bod & Simpson 2016).

The population in this research includes a number of significant figures from the Port of Durban, particularly from the Maydon Wharf. This comprises stevedoring managers and directors, shipping agents (branch managers and directors), terminal operator managers, and Maydon Wharf storage facility managers. These stakeholders directly participate in or are impacted by port operations, particularly the length of berth wait periods. Purposive, judgemental, or selective sampling was used in this study. The researcher can select participants or instances with appropriate knowledge, experience, or expertise via purposeful sampling (Ahmad & Wilkins 2025). Terminal operators, shipping agents, cargo owners, shipping liners, and relevant storage facilities would be the researchers' target participants. Researchers can gain significant insights from port operations and vessel anchorage waiting time experts (Lavrakas 2008). To be specific, 10 people were sampled: two managers of a stevedoring company in the terminal, branch managers and dedicated directors (one manager and one director per shipping agent) of the top two shipping agents, two terminal operator managers, and two Maydon Wharf Storage facility managers. Data saturation was the limit to the number of selected participants.

Semi-structured interviews are one of the main techniques used in this study to collect data. Semi-structured interviews provide the researcher with the freedom to go into certain subjects while also keeping some flexibility to examine any additional pertinent subjects that may come up (DiCicco-Bloom & Crabtree 2006). In this technique, the interviewer and the interviewee engage in a back-and-forth using a set of predefined open-ended questions and any extra questions that arise during the dialogue.

## Data analysis

Data analysis is a crucial phase of the research process, which involves the inspection, cleaning, transformation, and modelling of collected data to discover useful information, informing conclusions, and supporting decision-making. The initial data obtained are turned into insights throughout this process, allowing the researcher to answer the research questions, support or disprove the hypotheses, and interpret the findings (Creswell & Plano Clark 2011; Tracy 2024). Data were gathered, examined, arranged, categorised, and tallied using interviews. By using this technique, the researcher was able to thoroughly assess the current situation, draw conclusions, and offer suggestions for reducing vessel anchorage time. One of the primary data analysis methods used in this study is thematic analysis, a widely used qualitative research technique. Finding and analysing recurrent themes in the data is the focus of this strategy. To provide a rich, detailed, and, perhaps, complex description of the data, thematic analysis is a versatile and strong approach of inquiry (Braun & Clarke 2006; Christou 2022). Grouping the data and then investigating its similarities is a key part of this process. The study also used descriptive statistics, a subfield of quantitative analysis, to offer an appropriate description, display, or summary of the data. Descriptive statistics provide straightforward explanations of the sample and the measurements. A simple or complex statistical analysis is provided to summarise the data. This research uses a comprehensive and methodical approach for analysing the complex dynamics of berth waiting times at the Port of Durban by combining thematic analysis and descriptive statistics as data analysis approaches.

## Ethical considerations

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number HSSREC/00006664/2024). Participants have given their written informed consent. To maintain confidentiality, we have removed the names of the participants; we refer to them as numbers.

## Results and analysis

The participants in the study have observed that there is a congestion committee in place, which the participants have highlighted is in place; however, there is little to no change that has been made. The proposed solution by all participants was that the terminal needs to have truck traffic management on the quay side, while some suggested decongesting the traffic in the Maydon Wharf precinct, and the need to have a back-of-port staging area where trucks will be staged and wait until they are required in port, thus allowing free flow of trucks in the terminal. On the other hand, some of the participants consider that the congestion will only be reduced by the reintroduction of rail in the port, as they highlighted that the terminal was designed to be operated with rail as the primary mode of transport and trucks supplementing as the secondary mode of transport. The Maydon Wharf

Precinct Committee consultation is to be continued and recommendations are to be reviewed by the harbour master, and the published Harbour Master instructions for Maydon Wharf berths are to be updated, effective 15 December 2022. The strategies that the Port has put in place talk to the factor of berthing and scheduling, which also gives measures for agents not to manipulate the system to have their vessels berth first in favour of their principals. However, some participants mentioned that there is nothing in place as they do not see any changes, and the vessels are delayed and waiting at anchorage, not forgetting the congestion in the Maydon Wharf terminal.

Opening up marine services to the private sector at South Africa's ports is usually needed to promote private investment in the supply of marine services. The enhanced competition will also help the port system's efficacy and efficiency in providing marine services. One challenge is the size of the marine services sector in South Africa. Some interviewees claim that it is too small to accommodate several players. The nation's economic development agenda (boosting private sector investment in the ports system and encouraging previously marginalised group participation in the economy) should be complemented by the private sector's efforts to participate in (provide and invest in) marine services in South Africa's ports.

### Factors affecting the vessel turnaround time and waiting for the berth in the Port of Durban

There are five major factors mentioned by the participants:

- The participants involved in the interview highlighted the issue that the size of the designed berth from Maydon Wharf 1–15 is not suitable for the modern-day vessel length. This has resulted in underutilisation of the berth according to Transnet (2022). According to berthing procedures, berths are being designated by large numbers as opposed to berth numbers, which results in approximately nine berths or fewer. Larger ships need specialised berthing facilities, which not all ports have.
- The other factor was the availability of marine services in the Port of Durban to sail the vessels, which has resulted in vessels spending time at anchorage or berth while waiting for marine services. Mthembu and Chasomeris (2023b) highlight that there is a major concern with the shortage of marine craft. This shortage is a huge factor in effective berthing efficiency. The Port of Durban requires eight tugboats, two pilot boats, and two pilot transfer helicopters. Currently, it has five operational tugboats, one pilot boat, and one pilot helicopter operating, which results in inefficiency (Mthembu & Chasomeris 2023b).
- The other factor that is directly proportional to marine traffic is the availability of pilots. According to Mthembu and Chasomeris (2023b), pilots are local mariners with extensive knowledge about the port. The participants showed that there is a lack of pilots on different shifts, adding to the vessel staying at anchorage. In the Port of Durban, we have seen that the pilot ratio is one pilot per pilot boat, while in developed countries, the ratio is one

pilot per half boat and in developing countries, one tugboat per one pilot, that is, a ratio of 1:1 (Mthembu & Chasomeris 2023b; Özbaş & Or 2007).

- Most of the participants touched on the fact that the other factor is the berthing rule for the Maydon Wharf terminal, which works as first scheduled – first berthed, and the rules can be summarised as follows. According to the Berthing Guidelines of Maydon Wharf Terminals (Transnet 2022), vessel to be nominated Day 30 to 14 for ID100/vessel nomination at Day 14 to firm up nominated vessel then at Day 4 firm up final ETA Durban – any ETA changes thereafter result in the vessel falling back in the line up while vessels berthing subject to 80% cargo in port. Note there is a Penalty for changing your ETA, which the subject vessel can lose the 'senior' vessel priority. The berthing rules make it hard for shipping liners to adjust their ETA for the 'Just-in-Time' model, as they will lose their berthing if they do not arrive at the stipulated time even though they are only scheduled to berth 15 days later (the average).
- The weather was raised often as the main factor affecting vessel anchorage time. The Maydon Wharf terminal catering for bulk and break-bulk vessels results in most commodities not working cargo because they are sensitive to rain. Climate changes, such as heavy rains and flooding, have affected the port's operations, while strong winds have negatively affected the port, and we have seen frequent closures. One of the participants raised this concern: 'In Maputo, they have recently battled bad weather, but it takes 3–7 days, and the backlog is resolved, thus reducing vessel waiting at anchorage. The question is, why is that not happening in Durban?' Adverse weather conditions such as storms, heavy rainfall, or fog can disrupt port operations and lead to long WFB, resulting in a lot of vessels at anchor awaiting a berth. This is a major concern as weather-related delays can be unpredictable and challenging to manage (Smith & Brown 2016).

### Short- and long-term plans which port management needs to put in place to reduce waiting for the berth

The participants have suggested the following short- and long-term plans that the management needs to consider in order to reduce WFB (See Table 3).

In interview and documentary results, it was found that VTAT and vessel anchorage waiting time at the Port of Durban dry-bulk and break-bulk terminal (Maydon Wharf Terminal) can be characterised as poor when it is benchmarked against regional comparators and the industry expectations. We can see this in the Port of Mombasa (Kenya); empirical data show that dry break-bulk vessels experienced an average of 1.4 days at anchorage waiting for a berth (CEIC Data 2023).

While the Port of Durban Maydon Wharf terminal documentary results reveal that the mean time of vessel

**TABLE 3:** Study participants' short- and long-term solutions.

Proposed short-term plans	Proposed long-term plans
<ul style="list-style-type: none"> <li>• Training of shipping agents and employees</li> <li>• Proper planning and maintenance</li> <li>• Better coordination among planning, technical, and operations</li> <li>• Analyse the underlying reasons and put corrective measures in place.</li> <li>• Share co-management of all national contracts in the port and make sure service providers are held accountable for any violations of the terms of the agreements.</li> <li>• Implement daily route cleaning and route walks or inspections.</li> <li>• Ensure that the shore scale is calibrated daily.</li> <li>• Give long-term contracts to OEM for repairs and maintenance.</li> <li>• Ensure there is skill development by exposing the Transnet technical team to different expertise, such as knowledge sharing with OEMs.</li> <li>• Have traffic management and tracking of all trucks in the port, ensuring strict compliance.</li> <li>• Introduce an automatic booking system with real-time tracking.</li> </ul>	<ul style="list-style-type: none"> <li>• Invest in a rail network that was decommissioned because of vandalism</li> <li>• 'Fill up vacancies in the port and stop acting in critical positions'.</li> <li>• Enhance the procurement and supply chain processes for spare parts and external services needed for efficient plant maintenance.</li> <li>• The port must have a weather-monitoring system to make sure that any vessel preparing to load or unload is free of obstructions for the anticipated port call. Berth any weather-sensitive cargo vessel only when the weather clears.</li> <li>• Scale testing and calibration every 3 months</li> <li>• Comply with terminal TOG.</li> <li>• Relook at the berthing rules to allow the vessel to adjust the ETA to shipping lines to berth just-in-time</li> <li>• All Maydon Wharf berths are to be dragged deeper to allow vessels to increase depth, resulting in vessels being able to load up to maximum or summer draft.</li> </ul>

ETA, estimated time of arrival; OEM, original equipment manufacturer; TOG, terminal operating guidelines.

waiting for anchorage can go up to 30 days above the general average anchorage time for bulk carriers, which the documentary results show to be 50–67 h. These results are concerning as they suggest that the Maydon Wharf terminal is performing poorly. Optimising VTAT requires good planning and cooperation among stakeholders, as well as effective port management techniques. Delays can be reduced and operational effectiveness can be increased with effective management (Johnson 2017). Documentary results showed that there is a relationship between fleet availability and age of the fleet, which leads to tugboats not being available because of breakdown and lack of spares. Breakdowns in equipment and maritime services vessels can occasionally take a long time to fix because of the technical staff's skill level and the lack of replacement parts. Historical data show that in the months with high rain and wind, productivity in terminal berths is reduced. Vessel turnaround time and the time the vessel spends at anchorage are directly impacted by terminal productivity, which is determined by variables such as berth productivity, crane productivity, and container stacking efficiency. Quicker turnaround times and short anchorage times are the outcome of higher productivity levels (Lee & Chen 2016).

## Conclusions and recommendations

The study assessed the factors influencing the amount of time ships spend anchored at the Port of Durban while waiting for the dry-bulk and break-bulk terminal, Maydon Wharf. Using a critical literature review relevant to the research question, the researcher could relate and connect components from the findings of other study fields. This study looked into the variables influencing the length of time a vessel spends anchored at the Port of Durban Bulk and Break-bulk Terminal. Both primary and secondary data were employed in the investigation. The Maydon Wharf Terminal workforce, which comprised stevedores, shipping agents, and cargo owners, provided the primary data. The statistical data, daily bar charts, daily shift reports, and observations were the sources of secondary data. The study asked three questions: What are the factors that affect anchorage WFB at the Port of Durban dry-bulk and break-bulk terminal, and what is

their relative significance towards bulk or break-bulk vessels? What are the ways in which WFB and anchorage waiting time could be decreased? What causes the increase in WFB at the Port of Durban dry-bulk and break-bulk terminal?

It was discovered in this study that a number of factors influence the waiting time for anchorage, also known as WFB, at the Port of Durban dry-bulk and break-bulk terminal. These factors include marine services equipment failures (craft), a lack of pilots, inclement weather (such as strong winds and rain), an excessive number of draft surveys, route preparations, a shortage of cargo, the unavailability of spares, and delays in berthing and sailing. The excessive number of shift changes and tea breaks, the alteration of loading instructions, the contamination of dust and cross contamination of cargo, the route inspections and preparations, the spillage of cargo, the incompetent workforce, the poor scheduling of the vessels, the wet cargo and cargo blockages, the non-adherence to standard operating procedures (SOPs), and incidents were other factors. The study discovered that the factors most influencing WFB, were weather, route preparations, incompetent crew, tug, pilot, equipment malfunctions, berthing schedule, and berthing and sailing. This study found that the main causes for the increase in WFB at the Port of Durban dry-bulk and the break-bulk terminal were the scheduling and berth allocation, which has a loophole and usually gets misinterpreted or not followed, causing longer waiting together with the ruling that vessels over 190 m can only berth at daylight hours, which has increased WFB time while the vessel is at anchorage. It was discovered that the lengthy procedures required to obtain spares and services when required, as well as the neglect of outdated infrastructure and equipment, were other causes of the rise in vessels waiting at anchorage. Helicopters and tugs are often untrustworthy and similarly tied up with the availability of pilots and marine service staff for manning the tugs and pilot craft, such as helicopters and pilot boats.

Reducing WFB and anchorage waiting time at the Port of Durban dry-bulk and break-bulk terminal was determined to be possible with the following recommendations:

- Perform midlife overhauls and appropriate maintenance (refurbishment).
- Among other things, fill open vacancies and cease acting on behalf of personnel in crucial roles.
- Enhance the procurement and supply chain processes for acquiring external services and spare parts needed for efficient maintenance.
- Offer long-term contracts to OEMs for repairs and maintenance and have an SLA with them for support during equipment breakdowns.
- Assist in co-managing all contracts under the Transnet group involved in the port (TNPA, TPT, and TFR) and make sure that service providers are held accountable for any violations of their contractual obligations.
- Install weather monitoring equipment to make sure all vessels scheduled for loading or unloading are free of obstructions. Berth vulnerable cargo vessels only when the weather clears.
- Make sure the shore scale is calibrated every day, do testing and calibration on the scale every 3 months, and buy extra scales as a backup in case the primary scales become unusable.
- Fleet renewal of old marine services craft
- Make sure there is skills development by exposing the Transnet technical team to different expertise, such as knowledge sharing with OEMs.
- Proper planning and maintenance (scheduling), and the introduction of an automatic booking system with real-time tracking
- Training of shipping agents and employees on berthing guidelines
- Update the berthing guidelines to allow slow steaming and for the vessel to arrive just in time for berthing.
- Allow non-weather-sensitive cargo such as granite to be pre-stacked at the quayside before the vessel arrives, thus increasing productivity and reducing congestion of trucks.
- Have traffic management and tracking of all trucks in the terminal precinct, ensuring strict compliance.
- Implement a penalty system for poor performance (WEGO).
- Better coordination among planning, technical, and operations
- Implement a long-term plan for cargo storage that considers weather patterns that make it possible to operate with wet cargo.
- Conduct regular route inspections by technical and operations staff, assign route walkers to the route to halt the plant if any cargo spills, and clean the path once the vessel has finished its operations (loading or discharging).
- After every vessel is finished loading or discharging, hold a debriefing meeting at the Maydon Wharf Terminal with the personnel from the technical, operations, commercial, planning, shipping agent, and stevedores departments. Issues that arise during the loading and unloading of the vessel are reviewed during this discussion, along with

the necessary remedial actions that ought to be implemented to prevent such incidents in the future. All these need to be documented.

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## Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

## Credit authorship contribution

Rotondwa Tsabuse: Conceptualisation, Methodology, Formal analysis, Investigation, Writing – original draft, Project administration, Data curation. Sanele Gumede: Visualisation, Software, Resources, Writing – review & editing, Supervision. All authors reviewed the article, contributed to the discussion of results, approved the final version for submission and publication, and take responsibility for the integrity of its findings.

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## Data availability

The raw data are not publicly available due to restriction of confidentiality. They contain information that compromise the privacy of research participants.

## Disclaimer

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