



Revisiting marine services pricing in South Africa's ports

Sphiwe Eugene Mthembu^{1,2} · Mihalis Chasomeris²

Received: 29 May 2022 / Accepted: 3 June 2023
© The Author(s) 2023

Abstract

Transnet National Ports Authority (TNPA) is the landlord and sole provider of marine services in South Africa's eight commercial ports. Historically, TNPA set port prices for marine (nautical) services below full cost recovery. Price regulation has improved the situation, but substantial reforms are still required. This paper revisits marine services pricing in South Africa's ports. The methodology employed content analysis to analyse 99 stakeholders' submissions to the Ports Regulator of South Africa from financial years 2013/2014 to 2021/2022. The results are discussed under four categories of themes: concerns about the above-inflation price increase, suggestions on alternative marine services pricing models, concerns about marine services provision and productivity, and the disputed cross-subsidization between ports and port user groups. Despite above-inflation price increases for marine services, tariffs remain 44% below the global benchmarked mean, whilst revenues from cargo owners subsidise port tenants and shipping lines. The relatively low prices for marine services may exacerbate the sub-optimal levels of investment and maintenance in marine services. The study recommends that marine services pricing reforms incorporate the user-pays principle, be founded on activity-based costing, and adopt a dual-till model. Activity-based costing is considered the international best practice, and it is the preferable approach recommended by several port users in South Africa.

Keywords Ports · Port Pricing · Marine Services · Maritime Services · Port Authority · Transnet

✉ Sphiwe Eugene Mthembu
Sphiwe.Mthembu@transnet.net

Mihalis Chasomeris
chasomerism1@ukzn.ac.za

¹ Port Manager, Transnet National Ports Authority (TNPA), Port of East London, Ganteaume Crescent, Quigney, East London, South Africa

² Graduate School of Business and Leadership, University of KwaZulu-Natal, Private Bag X54001, Durban 4000, South Africa

1 Introduction

In South Africa, the National Ports Authority (NPA), a division of Transnet SOE Ltd., is the landlord and sole provider of marine services in the country's eight commercial ports. As the NPA is a monopoly, it is under economic regulation by the Ports Regulator of South Africa (PRSA). Accordingly, the annual adjustments to the NPA tariffs (prices) are regulated. Presently, the NPA and PRSA use a Required Revenue (RR) model, essentially a rate of return methodology, to determine the annual total revenue that the NPA may raise through adjustments to the port authority tariffs (Gumede and Chasomeris 2017; Grater and Chasomeris 2022). The total revenue is presently raised from shipping lines (22%), cargo owners (46%), and port tenants (including terminal operators) (32%) (TNPA 2021). The tariff structure, as itemised in the TNPA Tariff Book, shows the actual tariffs applied; it may be adjusted annually and is effective from 1 April. Gumede and Chasomeris (2018) critique the TNPA tariff structure and show the substantial cross-subsidisation between commodities and different port users. Even though ad valorem wharfage was replaced with cargo dues in 2002, the legacy of ad valorem wharfage remains as the present NPA tariffs are still distorted, including relatively high tariffs for cargo dues, under-recovery on certain cost line items for marine services, and relatively low revenue from tenants and terminal operators when compared to other port authorities around the world (Van den Berg et al. 2017; Gumede and Chasomeris 2018). The Ports Regulator of South Africa (2021) port pricing benchmarking study used a sample of 25 container ports and shows that terminal handling charges and cargo dues are 55% and 166% above the average. In contrast, marine services are 44% below the benchmarked average. The relatively low prices for marine services may exacerbate the low levels of investment and maintenance in marine services.

TNPA and the PRSA have agreed to work towards a tariff structure that aims, within 10 years, to target an adjusted revenue contribution by shipping lines (41%), cargo owners (27%), and tenants (32%). The 41% targeted revenue contribution by shipping lines is planned to be sourced from marine services charges like port dues (15% contribution to the total of 41%), tugs (11%), Networks (5%), pilotage (2%), and so forth (TNPA 2021). This study will show the need to speed up the marine services pricing reforms to achieve the stated long-term end state where shipping lines contribute 41% towards TNPA revenues. In South Africa, due to the stakeholder consultative nature of the economic regulation of the NPA tariffs, the quality of the dialogue amongst port stakeholders, the NPA, and the PRSA can significantly affect adjustments in the actual applied tariff methodology and tariff structure allowed by the PRSA. Annually, the NPA submits their application to the PRSA for tariff adjustments. The PRSA calls for port users and other port stakeholders to submit comments on the NPA tariff application that the PRSA then considers before they make their decisions about changes to the tariffs (Chasomeris and Gumede 2022).

This study aims to revisit marine services pricing in South Africa's ports and contributes in several ways. Firstly, focusing on the pricing and provision

of marine services, it uses content analyses to analyse 99 port stakeholders' submissions to the Ports Regulator of South Africa over the past 9 years (from financial years 2013/2014 to 2021/2022). The results and discussion provide a constructive, evidence-based critique of the pricing and provision of marine services in South Africa's ports. Consequently, the study will allow port stakeholders to be better informed, provide constructive criticism, enhance the quality of the dialogue and decision-making, and enable stakeholders to hold TNPA and the PRSA to a higher level of accountability (Gumede and Chasomeris 2018). As a result, the study provides a contextual and evidence-based understanding of the port pricing of marine services that should help to contribute towards discussions around necessary reforms in the provision and pricing of marine services in South Africa's ports. Furthermore, the authors are not aware of literature that examines marine services pricing in conjunction with a review of the National Ports Authority Revenue Required model and its influence on cross-subsidisation, private investment, and performance of marine services. This article is organised as follows. Section 2 is a literature review on port pricing. It examines principles of port authority pricing and compares the evolution of TNPA revenues from port users with that of port authorities in other countries. Section 3 describes the case and research methodology that uses content analysis to examine 99 stakeholders' submissions to the Ports Regulator of South Africa (PRSA) for the financial years 2013/2014 to 2021/2022. The results and discussion are classified into four categories in Sect. 4: above-inflation price increase, alternative pricing models, marine efficiencies, and cross-subsidisation. Section 5 is the main conclusion and recommendations.

2 Literature review

According to Meersman, Strandenes, and van de Voorde (2014), capital-intensive liner shipping businesses demand higher operation efficiencies to realise returns on investments leaving port authorities and port operators under pressure to improve efficiencies and labour productivity. Pricing by port authorities and port operators is complex and un-transparent (Haralambides 2015). The process is perceived as archaic (Meersman et al. 2003; Haralambides 2015). Port pricing is an important factor that influences the choice of port in which ships are to call (World Bank 2007). Significant in this respect is the generalised cost associated with port calls; this cost includes time costs, risk of losses, damages, and delays to ships (Meersman, et al. 2003). Pricing by ports should be proportional to the cost generated by calling ships, and generally, there are three cost items to consider, cargo handling, time in port along with port dues, and other services (Meersman et al. 2003; Strandenes and van de Voorde 2014; Haralambides 2015; Sikow-Magny 2003). According to Meersman, Strandenes, and van de Voorde (2014), the detailed menu presented to shippers reflects the complexity and diversity of services offerings and entities offering port infrastructure. The pricing strategy adopted contributes to the choice of port, operational efficiencies, and facility utilization (World Bank 2007). It is important to charge prices based

on internationally sound and recognised pricing principles (World Bank 2007; Gumede and Chasomeris 2018; Meyiwa and Chasomeris 2020). Whilst there are many studies conducted on the pricing of port services, similar emphasis is given to airport pricing (Bosso and Zhang 2008; D-Alfonzo et al. 2013; Bel and Fageda 2009; Ivaldi et al. 2015; Kidokoro et al. 2015; Choo et al. 2018).

2.1 Principles of port pricing

Port pricing models are an important element in driving competitiveness coupled with geographic position, multimodal connectivity, service reliability, and supply chain cost (Tangzon 2007). Previously, ports were viewed as providing general public services paid through government taxation; today ports are regarded as commercial firms expected to recoup operational costs from port users and ultimately generate a profit (Meyiwa and Chasomeris 2020). According to UNCTAD (1975), the first attempt to achieve this was made in the 1940s with the application of the Freas formula. The formula suggested the concept of charges to be related closely to the cost of the services rendered in the ports of the USA (World Bank 2007). UNCTAD (1975) further proposed a logical standard of undertakings to be executed during the establishment of the new port tariffs. This emphasised the identification of a price period over which port pricing will be calculated, identifying facilities or services to be charged for, identifying users of facilities and services, and identifying constraints which could affect the pricing process. Port system pricing objectives should be formulated and the manner in which the pricing arrangements will affect the capacity to generate revenues from the clusters of port users. Then the reference years should be selected from which the first estimates of charges should be calculated. Thereafter, the cost and revenue stream should be established so that they are clearly related to each other. Then, there should be a description of the price structure (type of charges and basic units) and a calculation of annual cost; knowing the minimum cost requires the computation of the revenue desirable taking into consideration the constraints along with objectives whilst looking into future provisions for funds to look after emerging investment requirements. Lastly, a consultative process is to determine charges that satisfy all necessary conditions (UNCTAD 1975). Talley (1994) and Meersman et al. (2003) view port pricing from a cost axiomatic structure with all attempts at port pricing to adhere to the axioms. Five axioms are explained below (adapted from Talley 1994):

Axiom-1: Cost sharing, all costs must be arranged and assigned to services provided in such a way that the final charge covers the total cost;

Axiom-2: Rescaling, if there is a change of scope or scale of services rendered, arrangements and assignment of charges should include such a change;

Axiom-3: Consistency, similar services, with similar charges are to be priced the same;

Axiom-4: Positivity, services with higher costs are to be priced higher than services with lower costs;

Axiom-5: Additivity, services with common cost allocations are to be assigned relative to the contributory cost as add-ons to contribute to the attributable cost of services.

The Economic and Social Commission for Asia and the Pacific (ESCAP) (2002) encourages ports' pricing strategies to satisfy essential requirements as follows: pricing strategy should permit for accurate reallocation of benefits, it should facilitate the process of comparing the actual charge and costs associated with services, and it should enhance the utilization of infrastructure and facilities. In South Africa, ports are priced in alignment with six strategic pillars as stated below:

Pillar-1: Comprehensiveness. It should cover all revenue and costs, address all charges, clarify all pricing modifiers, and provide sufficient detail for regulation.

Pillar-2: Dependability. Based on compliance with clear principles, aligned to regulatory directives and regulatory expectations, and supported by a robust methodology.

Pillar-3: Simplicity. Easy to understand and administer, rationalises charges, and simplifies charges for port users.

Pillar-4: Competitive. Prices comparable to those in ports worldwide. They should protect the regional market share, support South African economic development, be fair on all port users, and should allow for competition within ports.

Pillar-5: Implementable. There should be full legal and regulatory compliance, and the impact on port users should be addressed.

Pillar-6: Sustainable. It should allow for the maintenance of existing infrastructure and should allow for future expansion of infrastructure.

(TNPA 2012, 10)

There are several other categories of port pricing methods, port pricing principles, and port pricing strategies debated in the literature. Some are based on cost; others are based on performance, value-based pricing, competition-based pricing, and strategic port pricing. Cost-based pricing strategies are the easiest to understand and most popular in setting prices. The cost-based pricing tends to be common in most ports as it emphasises financial prudence (Haralambides 2015). This approach involves adding a profit margin onto the cost of products or services. Revenue levels are determined, unit cost is calculated, followed by a review of the firm's objectives, and finally, prices are established. Cost-based pricing strategies encourage the use of expenditure techniques with cost modelling.

Variable costing which is equivalent to material cost plus variable cost/ unit

Absorption costing which is equal to material cost plus variable cost-plus overheads cost/ unit

Activity-based costing which is equal to material cost plus variable cost plus overhead multiply by machine and labour hours (Cariou *Handout* 2010).

Cost-based and investment-based tariffs aim to achieve financial objectives (Carriou Hand Out 2010; Kurun and Erkmen 2017). *Value-based pricing strategies* are defined as benefit equal or superior to the value of the sacrifice incurred by customer for services/product. Value-based pricing is a practice by which pricing decisions are based on the customer knowledge of the benefit derived from using the product/service and how customers value these benefits in relation to the price they pay (De Toni et al. 2017). *Competition-based pricing*, on the other hand, uses critical information like the competitor's price levels, and expectation observed in actual competition and review primary sources to determine suitable real pricing levels to charge (Heil and Helsen 2001), the risk of a price war is eminent. *Performance-based pricing strategies* are implemented to maximise throughput and reduce congestion. It also promotes efficient behaviour on facility' users and it takes into consideration the time the facility is used and the time the users' queue for the facility (De Toni et al. 2017). *Strategic port pricing* is based on setting prices through reacting to market conditions. It considers proactive management of markets to extract most profitability (McMahon-Beattie 2002).

2.2 Airport pricing

The airport sector experienced a growing trend of airport congestion from the 1990s, requiring an improved management approach to airport operations (Zhang and Zhang 1997; Malavolti 2016; D'Alfonzo, et al. 2013). This phenomenon forced airport management to implement changes in the pricing models, structures, strategies, and policies to combat costs associated with airport congestion. Various pricing models have been tested in the airport industry, differentiation, Ramsey, profit maximisation, congestion, and Pigouvian. The activity-based costing (ABC) has, over time, been favoured for aeronautical activities of the airport sector. Implementing policy changes that set the landscape for improved structural architectures of airport operations and pricing models helped to shape the industry. The evolution from a traditional to a more vertical structure, along with the seclusion of concessional activities from aeronautical activities adopting the dual-till over a single-till principle, propelled the airport industry to greater heights (Basso and Zhang 2008; Kidokoro et al. 2015; Gillen and Morrison 2017; Malavolti 2016). Airports are considered as two platforms of operations, with one platform being the shops and restaurants and the other being aeronautical operations involving aeroplane landing and handling passengers (Kidokoro et al. 2015). According to Basso and Zhang (2008), dual-till pricing policy views both aeronautical and non-aeronautical activities as separate activities. It applies segregated pricing models, whilst single-till policy identifies both platforms as a solo operation and applies a similar pricing scheme for both sides. According to D'Alfonzo et al. (2013), greater emphasis has been placed on aeronautical activities neglecting the concessions (non-aeronautical activities), yet non-aeronautical activities generate high revenue. The majority of pricing models have a focus on profits rather than creating social welfare (Kidokoro and Zhang 2017). Bel and Fageda (2009) argue for airport price regulation; although it stifles investment, it has the potential to impact market competitiveness between airlines.

According to Wan et al. (2015), determinants for airport revenue lie in the competitiveness between airlines, the airport's hub status, the airline's share of domestic markets, the proximity of the nearby airport, and the availability of new slots. Adopting the dual-till principle and implementing activity-based costing would assist with reforms in the maritime sector, separating the provision of marine services pricing schemes from other port authority charges.

2.3 Marine services pricing

There is growing research on tug scheduling, towage operation, and towage modelling, yet there is limited research on marine services pricing models. Marine services costs refer to pilot charges, tug towage charges, aid to navigation charges, dredging charges, VTS charges, mooring/unmooring charges, wet infrastructure charges, and water-to-ship transfer charges (Gumede and Chasomeris 2012; Meersman et al. 2014a, b).

Aid to navigation is a device or system designed to enhance ships' safety and efficient navigation whilst navigating within ports' limits (IALA 2008). The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) provides guidance and recommendations on a global system of marks and lighthouses (IALA 2008). Vessel Traffic System (VTS) is aimed at increasing safety and efficient movement of vessels into and out of the port (Kang et al. 2020). In South Africa, VTS is operated by National Ports Authority under the harbour master department; the purpose is for safe and efficient navigation in ports and the protection of the environment. The main functions of marine services in ports are the provision of towage and pilotage services. The performance of marine services in South Africa is affected by outdated wet infrastructure and a shortage of marine crafts and critical skills (Mthembu and Chasomeris 2023b). Making maritime human capacity available has proven to be daunting due to cost and time requirements. To produce an open ticket pilot on an accelerated programme could take up to 10 years in South Africa resulting in high costs borne by the Port Authority (Lobrigo and Pawlik 2015). The overall cost of training pilots, tug masters, and chief engineers escalates exponentially as they progress in training for higher certificates of competency. According to Gumede and Chasomeris (2015), such costs should be borne by the industry or recovered from the government. The manning levels requirements are Tug Master, Chief Engineer, Second Engineer, and three general purpose ratings a total of six crew members creating operational cost (Merchant Shipping Act, No. 57 of 1951). Tugs are highly powered compact vessels consuming an average 250 L/h of fuel during operation and must comply with strict regulations to maintain seaworthiness (Merchant Shipping Act, MARPOL, SOLAS, etc.). Maintaining craft certification adds to craft daily running costs for the port authority. The growing size of ships forces the port authority to invest in newer tug technologies and greater bollard pull to ensure the safety of navigation in ports. The cost-based pricing and user pay principle would typically require shipping lines to pay for the marine (nautical) services and port infrastructure. Table 1 shows the distribution of port authority revenues from different types of port users and compares South Africa's TNPA with six other ports around the globe.

Table 1 Percentage distribution of revenues from different types of port users

Port users	South Africa	Melbourne	Vancouver	Rotterdam	Amsterdam	Hamburg	Singapore
Shipping lines	22.00	12.00	13.50	46.00	38.70	32.10	98.60
Tenants	32.00	16.00	63.50	51.90	56.40	54.50	1.40
Cargo owners	46.00	71.90	23.00	–	–	–	–
Barge/rail	–	–	–	2.20	4.80	13.40	–

Source: Van den Berg et al. (2017: p. 426) using annual reports of port authorities for 2015; and the author's updated record for South Africa from TNPA (2021)

Table 1 shows that for the port authorities in Rotterdam, Amsterdam, and Hamburg, the distribution of revenues from port users is similar in structure. Tenants contribute the largest percentage of revenue, followed by shipping lines. For the Maritime and Port Authority of Singapore, 98.6% of revenue came from shipping lines and only 1.4% from tenants. South African pricing strategy is similar to the one seen in the port of Melbourne; it is first cargo owners, then tenants, followed by shipping lines that contribute more revenues to the port (Van den Berg et al. 2017). Such a distribution is a consequence of the ad valorem wharfage (charges based on the cargo value) in Melbourne and the legacy of ad valorem wharfage in South Africa. Even though ad valorem wharfage was abolished in 2002, the legacy of ad valorem wharfage can still be seen in the distribution of revenues from port users with cargo owners still cross-subsidising shipping lines (Meyiwa and Chasomeris 2020). Indeed, the controversial NPA pricing structure has resulted in several issues and themes that are raised by port users in their annual submissions to the PRSA. The main themes are identified and discussed, in Sect. 4, under four categories: concerns about the above-inflation price increase, suggestions on alternative marine services pricing models, concerns about marine services provision and productivity, and the disputed cross-subsidization between ports and port user groups. The next section introduces the research methodology and describes how port authority charges are determined in South Africa.

3 Research methodology and case description

In South Africa, since 2009, the TNPA and PRSA adopted a rate of return pricing methodology called the Required Revenue (RR) model and return on assets methodology to determine annual average tariff increases. The present formula to calculate the RR is given by (equation adapted from TNPA 2021):

$$RR = (v - a + w)r + d + o + t + c + e + g$$

where: RR = revenue required; v = value of the assets used in the regulated services; a = accumulated depreciation on such assets; w = working capital; r = regulated return on capital; d = depreciation accounted for in the period of the tariff; o = operating costs; t = taxation expense; c = claw-back; e = excessive tariff increase margin credit; g = weighted efficiency gains from operations.

Port users and other port stakeholders (including private sector industry representatives, government departments, and academia), through their annual submissions to the PRSA, have expressed concerns about the RR pricing methodology and the TNPA tariff strategy (TNPA 2012). Chasomeris (2015), Gumede and Chasomeris (2017), and Meyiwa and Chasomeris (2020) provide a detailed explanation and critique of the RR model. Meyiwa and Chasomeris (2020) used content analysis to review 137 stakeholders' submissions submitted between 2009/2010 and 2018/2019 and found that revenues are unjustifiable and arbitrary, and the requested tariff increases are higher than inflation. Furthermore, incorrect investment returns on capital, and inflated returns on an inflated regulatory asset base, are raising NPA revenues and profits. As a result, Meyiwa and Chasomeris (2020), Gumede and Chasomeris (2017), and Chasomeris (2015) argue that the current RR pricing methodology needs to be reviewed and revised. Opportunity exists for TNPA to justifiably reduce port authority tariffs and increase investments in infrastructure and marine services (Chasomeris and Gumede 2022). Indeed, Grater and Chasomeris (2022) calculated that there is a potential to enhance South Africa's trade competitiveness through a decrease in NPA weighted average tariff by as much as 20%.

The RR model determines the total revenue to the TNPA can raise from port users annually. The tariffs strategy was developed in July 2015 as a drive towards establishing cost-reflective tariffs in the ports system, aligning with strategic pillars. The new pricing strategy seeks progressively to eliminate unfair cross-subsidization (PRSA 2016). Some of the critical goals of the new tariff strategy were to shift port costs from cargo owners to shipping lines and tenants. Table 2 shows the distribution of port costs among port users over the last decade compared to the long-term end state proposed by the PRSA. Table 2 shows that in 2012 the distribution of revenues among port users was calculated differently by the TNPA and the PRSA as well as the proposed long-term end state. Both Table 2 and Fig. 1 show the revised tariff strategy, now agreed upon between the TNPA and PRSA, that envisages a long-term end-state distribution of TNPA revenues received from tenants (32%), cargo

Table 2 Distribution of port costs among port user groups in South Africa

Port user groups	2012		2018/19FY	2019/20FY	2020/21FY	2021/22FY	2022/23FY planned	Proposed long-term end state	
	TNPA	PRSA	TNPA	TNPA	TNPA	TNPA	TNPA	TNPA	PRSA
Cargo owners	61%	60%	55%	52%	51%	46%	46%	46%	27%
Tenants and terminal operators	19%	22%	23%	27%	27%	32%	30%	33%	32%
Shipping lines	20%	18%	22%	21%	22%	22%	24%	21%	41%

Source: Author created Table 2 using information from TNPA 2012; Gumede and Chasomeris 2018; and TNPA 2021

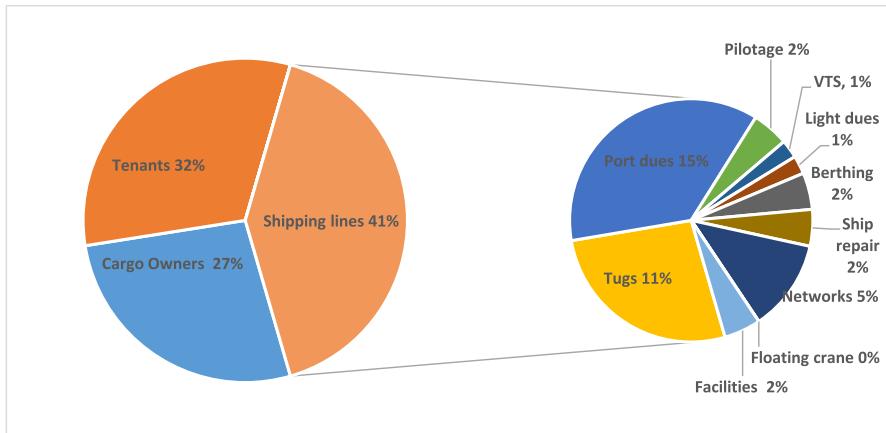


Fig. 1 Envisaged long-term end state revised tariff strategy revenue from port users 2020. Source: Authors created using TNPA (2021)

owners (27%), and shipping lines (41%). The 41% targeted revenue contribution by shipping lines is planned to be sourced from marine services charges like port dues (15% contribution to the total of 41%), tugs (11%), Networks (5%), pilotage (2%), and so forth. Table 2 shows that for fiscal year 2021/2022, the actual distribution of TNPA revenues received from tenants was (32%), from cargo owners (46%), and from shipping lines (22%). FY2022/23 is merely proposed, not being implemented. The original plan was to achieve the end state in 10 years. Comparing the shifts in the revenue distribution between 2012 and FY2021/22 shows that cargo owners have benefitted from a reduced revenue contribution from 60 to 46%, tenants' contribution to revenue increased from 22 to 32%. Shipping lines have only risen from 18 to 22%. There is a need to speed up the pricing reforms to achieve the stated long-term end state where shipping lines are to contribute 41% towards TNPA revenues. However, for the next few years, the present reality of the COVID-19 lockdowns, the constrained economic environment, with an economic recession, and reduced port volumes that, in turn, will drive up TNPA tariffs (as calculated by the RR model) but this is not conducive to the steep rises in marine services tariffs that would be required to achieve the stated long-term goal of shipping lines contributing 41% of TNPA revenues.

Annually, TNPA applies to the PRSA to consider adjustments to the port authority tariffs. The NPA application is published on the PRSA website and port users, and stakeholders are invited to comment on the tariff application through written comments and at roadshows held around the country near the major ports. PRSA explains that there are difficulties presented by the unstandardized format and structure of stakeholders' submissions about tariff increases. Nevertheless, stakeholder comments remain essential to the tariff determination in South African ports. After considering the NPA application, the stakeholders' comments, and PRSA's research, the PRSA published their decision in a record of decision that takes effect from the start of the new tariff year starting on 1 April.

In assessing the submissions made to PRSA, Gumede and Chasomeris (2017) found it difficult to identify the total number of stakeholders interested in the tariff changes. The complexity arises from collective submissions by several stakeholders under a single association instead of each member making their submission. Regular annual submissions are made by organisations like the South African Association of Ship Operators and Agents (SAASOA), South African Association of Freight Forwarders (SAAFF), and Southern Africa Shippers Transport and Logistics Council (SASTLC), and some stakeholders are members and associates of the National Port Consultative Committee (NPCC). Table 3 shows the number of non-confidential tariff comments submitted to PRSA since the 2013/2014 tariff period.

Content analysis is a systematic and scientific process of analysing and interpreting written, verbal, and visual data (Mayring 2000; Creswell 2007; and Bouvier and Rasmussen 2022). The method uses a systematic and transparent procedure of collecting, preparing, categorising, coding, and analysing themes for sense-making from the volume of qualitative material to identify consistencies and meaning (Kibiswa 2019). Content analysis is a subjective yet scientific method that can be applied to qualitative and quantitative research. Content analysis draws its validity and reliability from the random selection of data and a clear and transparent data collection procedure (Bouvier and Rasmussen 2022). Studies like Gumede and Chasomeris (2015) and Meyiwa and Chasomeris (2020) used content analysis to examine port stakeholders' comments regarding South Africa's port pricing and governance issues. This study employed qualitative content analysis to examine 99 stakeholders' submissions to the PRSA for financial years 2013/2014 to 2021/2022. Submissions were gathered from the PRSA website and saved on a computer device ready for the data preparation process. The preparation involved examining all submissions to identify stakeholders that have commented about marine services with a particular focus on the pricing of marine services. The submission list was further prepared, categorized, coded, and thematically analysed to identify consistencies and meanings to derive conclusions about stakeholders' views on marine services pricing in South Africa.

4 Results and discussion

Over the period 2013/2014 to 2021/2022, the most prominent marine services themes emerging from submissions to the PRSA are stated as, price increases above inflation (21 submissions); marine efficiencies and productivity issues (14 submissions); cross-subsidisation between ports (9 submissions); proposal for alternative pricing models (27 submissions); lack of transparency on the makeup of cost (8 submissions); and TNPA lack of investment in infrastructure (11 submissions). These themes are discussed below.

Table 3 Number of tariff comments submitted to PRSA each year

Tariff periods	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
Number of stakeholders' comments	6	15	11	8	7	8	14	15	15

Source: Author created using data from Port Regulator of South Africa's website

4.1 Above inflation marine services price increases

Port users have blamed TNPA for regularly proposing increases in marine services significantly above the country's Consumer Price Index (CPI). According to fourteen submissions, irrational and unjustifiable increases are imposed on marine services. Such charges continue to be imposed on port users affecting the cost of doing business in ports. Cape Chamber of Commerce and NPCC cautions TNPA about sharp tariff increases in ports, especially increases above the inflation rate, as they can potentially diverge vessels from South African ports to Maputo and Walvis Bay ports, but such a claim has not yet been proven. Eight submissions proposed that PRSA should pay attention to marine services increases as historically they have risen above inflation, even though the country experiences adverse economic conditions affecting the port users. There is superficial cost information shared and a lack of clarity and transparency on the actual marine costs that contribute to the tariff increases. The South African Association of Ship Operators and Agents (SAASOA) propose that TNPA should mirror the price charged for marine services to the cost incurred in providing marine services. South African Association of Freight Forwarders explain that the industry remains burdened with charges that do not reflect the true cost of providing marine services and argues for cost transparency.

A shared sentiment is the view that marine increases should be below the inflation rate, with fourteen respondents citing difficulty confronted by the industry due to economic conditions worsened by the COVID-19 pandemic. Indeed, from 2013/2014 to 2021/2022, all of the TNPA tariff applications for an increase in marine services are above the actual annual CPI inflation. Over the same period, except for 2016/2017, the marine services price increases allowed by the PRSA are all above inflation. Such an approach is consistent with the agreed tariff strategy approved by the PRSA, but it is not necessarily desirable or sustainable, especially in times of economic recessions (as South Africa has recently experienced) and the present COVID-19 pandemic lockdowns globally that are affecting South Africa's trade volumes and hence the tariff level that the RR model calculates.

4.2 Marine services productivity

Critical factors of port competitiveness are productivity and efficiency. Twenty-one submissions to the PRSA mentioned issues with productivity and inefficiencies in providing marine services. Availability of marine infrastructure, skills, and efficiencies in providing marine services were observed to be below average by SAASOA, NAAMSA, the Department of Trade, Industry and Competition, and the Cape Chamber of Commerce and Industry. CMA CGM, in their 2019 and 2020 submissions, are opposed to marine services increases, citing delays that have affected their business in South Africa's ports and appealed to the PRSA to keep marine service charges unchanged. The concern is that the maritime industry suffered financially due to delays while awaiting the availability of resources in ports, which has hindered the seamless flow of cargo in ports. The limited availability of marine service resources is

cited as negatively contributing to cargo flow. According to Gumede and Chasomeris (2012), old technology, machinery, and equipment may be the source of inefficiencies and under-production observed in South African ports. A lack of dredging leaves berths out of depth or with limited depth in the Port of Durban, and this is viewed as a lack of critical maintenance and infrastructure required by ships cited by NPCC. Thirteen submissions cited the need for TNPA to ensure consistent marine infrastructure and equipment availability as stated in the *National Port Act 12 of 2005*. When viewed with marine performance, marine services cost is currently a cause for concern in the ports system (Mthembu and Chasomeris 2023a; b). Thirteen submissions recommended that the emphasis should be placed on improving marine services in ports. During the port performance monitoring reforms of 2013, monitoring tools were introduced (MOPS, TOPS, HOPS, ROPS), including the recent introduction of WEGO into the RR model, but those are still insufficient to affect the necessary productivity improvements. Maersk, the City of Cape Town, and SASTALC complained about the TNPA passing on the cost of their inefficiencies to port users through tariff increases that are way above inflation. SAAFF, DoT, and Maersk raised concerns regarding TNPA being both the referee and the player, which compromises the objectivity of the TNPA in matters about terminal performance and marine services provision.

4.3 Alternative marine services pricing models

Pricing methodology and tariff structure have been central to discussions between the PRSA, the TNPA, and port users in general. Twenty-seven submissions have contributed to the debate regarding pricing methodology. Alternative pricing models for marine services operations were recommended by stakeholders, linked to the cost of providing services (with calls for activity-based costing) and applying the user-pays principle.

A submission by Anglo American explained that a problem with South Africa's marine services pricing is that they are charged based on Gross Registered Tonnage, rather than on being charged by the number of tugs and pilots used by the vessel. The NPCC suggest that TNPA should account for marine service charges due to the limited detailed explanation of costs associated with providing services. SAASOA proposed a price cap and rate of return to be calculated into the increase that TNPA request from the PRSA for providing marine services. According to Gumede and Chasomeris (2017; 2018), stakeholders argued that the tariff methodology does not incentivise TNPA to reduce costs. The authority should strive to manage its costs like any other firm and avoid passing on its internal cost management inadequacies to the port users. HL Lebrand and Maersk submitted concerns about the RR model's lack of incentives for TNPA to reduce costs in the ports as a cost added to the revenue required by TNPA over and above operational inefficiencies that are a cause for concern. According to the City of Cape Town, the Cape Chamber of Commerce, and SAAFF, the RR model is a monopoly tariff system commonly practised globally especially when the environment is highly regulated like the South African one. Eight submissions scrutinised the full implementation of WEGO and questioned mechanisms to be used to ensure that the TNPA drives efficiencies and that TNPA should be proactive in reducing operational costs.

Eighteen submissions proposed a pricing model founded on the activity-based costing model. In addition, a tariff structure that reflects true cost is based on a cost recovery approach and underpinned by user-pay principles. Submissions further propose reducing the Port of Ngqura charges as the port is earmarked to promote transshipment in the region. The City of Cape Town, the NPCC, and NAAMSA propose removing marine services from TNPA as this will bring marine costs in line with international standards. They continue to propose a single transport economic regulator in South Africa to regulate the transport system.

4.4 Marine services cross-subsidization

Several studies, including Meyiwa and Chasomeris (2020) and Gumede and Chasomeris (2015), identify cross-subsidisation as an issue in South Africa's ports. PRSA states that tariffs should avoid cross-subsidisation save where cross-subsidisation is in the public interest (PRSA 2016). Nine stakeholder submissions to the PRSA cited cross-subsidisation between divisions of Transnet as a problem affecting investment in infrastructure in the ports. SAASOA, Maersk, the City of Cape Town, and the National Association of Automobile Manufacturers of South Africa (NAAMSA) raised their concerns strongly regarding the tariff structure and methodology that promote cross-subsidisation between Transnet divisions and ports citing challenges about investment that should be executed in ports. Still, funds are being redirected to other divisions of Transnet. The current required revenue tariff methodology has been blamed for not incentivising TNPA to reduce operational costs and improve efficiencies (Chasomeris 2015; Meyiwa and Chasomeris 2020). UNCTAD (1975), advocates for port charges linked to the cost of providing services to ships, and proposes reinvestment of revenues into port infrastructure. Nine submissions criticise TNPA for not investing in ports. Three submissions suggest that marine services cost is not allocated as part of the port cost in other ports around the world as this cost lies between the shipping lines and marine services provider.

Submissions by the City of Cape Town and Maersk argued that marine services like pilotage, towage, and dredging are generally not considered as a part of port costs worldwide. They proposed that these costs should be covered by a government department and not the TNPA as this model leads to cross-subsidisation that is not desirable. As part of the culture of cross-subsidisation between ports, TNPA embarked on a tug building programme around 2006, building ten 65-ton bollard pull tugs, and once again in 2015 building nine 75-ton bollard pull tugs. An investment of R1.4 billion was made in construction of nine harbour tugs generating over 500 direct and 3500 indirect jobs (Sheila 2017). The investment was made in line with the TNPA's strategic investment directed towards the replacement of the old fleet in ports. Two tugs were built for Richards Bay, two for Durban, one for Ngqura, two for Port Elizabeth, and two for Saldanha. Observed deployment deviated from this plan when one tug destined for the Port of Richards Bay was sent to the Port of Cape Town. The Port of Durban soon released one tug to the Port of Cape Town. The transfer of tugs between ports provides evidence supporting the inter-port cross-subsidisation claim.

Fresh Produce Exporters, the Cape Chamber of Commerce, NPCC, and SAASOA recommend different tariffs for different ports to eliminate the legacy of cross-subsidisation across the port system as this phenomenon creates distortions and undesired burden of cost on other ports. The introduction of competition between ports would bring much-needed advantages that will boost efficiencies.

4.5 Further discussion and reflections on marine services pricing in South Africa

The discussion of marine services pricing in South African ports is premised on the analysis of stakeholders' submissions and a critical review of the literature to yield this critical reflection. The South African business environment has suffered from a depreciating local currency, shrinking gross domestic product (GDP), rising inflation, fuel hikes, and diminishing per capita income. Seaport's operations and supply chains generally are not immune to these global business turbulences and deteriorating economic environment. State-owned enterprises play an essential role in moderating the effect of global economic factors, creating much-needed employment and providing incentives for foreign direct investment. The poor performance of the state-owned enterprises has worsened the situation resulting in several small businesses disappearing because of a lack of much-needed logistics infrastructure (rail capacity and load shedding). This phenomenon has resulted in increasing the costs of doing business in South Africa. The most important costs for port operations are energy (electricity and fuel), labour, and infrastructure maintenance. The impact of the ZAR:US\$ exchange rate in the context of Rand depreciation over time has plunged marine operations into chaos. PRSA decisions on tariff increases are based on the local currency (the rand), but the maritime logistics business is largely conducted in US dollars; marine services tariffs increase calculated based on the rand wanes the value creation in the provision of marine services and worsening revenue recovery, eroding the ability of the NPA to provide efficient marine services. As interventions, the introduction of a currency and a bunker adjustment levy is to be strongly considered to develop marine services and increase competitiveness. The depreciating rand phenomenon compensates the shipping lines that have historically benefited from below global benchmarked mean prices in South African ports. The authors argue for currency and bunker adjustment factors to compensate for higher fuel prices and the depreciation of the South African rand. Globally, big-sized ships are often allocated up to four small to medium-sized tugboats of between 35- and 50-tonne bollard pull manned with crew members resulting in less expensive tugboat operations when compared to South Africa where there is an operating allocation of two 55- to 75-tonne bollard pull per ship with minimum manned of six crew members on board. The cost of operating a tugboat in South Africa is not competitive. Implementation of marginal cost pricing will help to alleviate the cost burden embedded in this operation. The National Port Act (2005), in principle, encourages resource sharing between ports, and as a result, it promotes cross-subsidisation. This phenomenon refers to the embeddedness of the subsidisation across all eight South African commercial ports and the lack of competition between ports. Leaning in the direction of the airline industry that adopted a dual till policy to address challenges

of airport pricing between aeronautic and concession activities, the ports sector may benefit from such lessons. The incorporation of TNPA to become a subsidiary of Transnet, rather than the present status as a division, should have associated benefits like improved economic regulation, enhanced governance, pricing, and investment into the ports (Meyiwa and Chasomeris 2020; Chasomeris and Gumede 2022), but it is not a panacea. Further research is necessary to investigate the feasibility of removing marine services from the NPA and the potential for public–private partnerships and the private provision of marine services in South Africa's ports (Mthembu and Chasomeris 2023a).

5 Conclusion

This study contributes to the debate on marine services pricing challenges by examining suitable pricing models to charge for marine services. The study further contributes to the literature on the port authority model's impact on investments in port infrastructure, cross-subsidisation, productivity, and pricing transparency. The study examined literature from general port pricing, airport pricing models, and cost accounting principles. Marine services charges in South Africa are 44% below the average of a benchmarked sample of container ports (Port Regulator of South Africa 2021). Consequently, NPA revenues from cargo owners are still cross-subsidising shipping lines. Significant underinvestment in marine services and a lack of maintenance affect marine services productivity. The presently applied RR pricing methodology and the tariff structure are not able to adequately address port users' and port stakeholders' concerns about the pricing of marine services and the lack of productivity and investment in marine services. The NPA has been increasing marine services tariffs above the consumer price index to bring marine charges on par with the cost of providing services, yet some revenue streams operate at a loss. Intra-port cross-subsidisation remains a concern for many port users, especially in marine services and real estate functions. South African provision of marine services in terms of equipment, infrastructure, and marine expertise has failed to keep up with the requirement for larger ships whilst ports in developing countries evolved. TNPA invested ZAR1.4 billion into building nine new tugboats, yet the industry continues to experience shipping delays in South Africa's ports resulting in a cost burden to the ships. The introduction of Marine Operations Performance Standards has not yielded the kind of performance impact expected by the maritime industry; hence, the proposal from port users that an independent organ of the state should regulate these key performance indicators as TNPA is both a player and a referee taking away impartiality in the process. Comprehension, transparency, and clarity of operational costs for marine services are still a cause for concern for the port users. Therefore, this study recommends that TNPA implement the user-pays principle linked to activity-based costing and adopt a dual-till model, which has been perfected in the airport environment. Activity-based costing and the user pays principle are considered international best practices (World Bank 2007). Likewise, port users and stakeholders advocate for a clear activity-based costing principle tied to user-pays principles. Such reforms would contribute towards the justification and monitoring of

more reasonable, justifiable, and cost-reflective pricing of marine services in South Africa's seaports.

Acknowledgements Thank you to Dr Megane Jane Morgan for assistance with formulating the Revenue Equation.

Funding Open access funding provided by University of KwaZulu-Natal.

Data Availability The 99 stakeholders' comments are available on the Ports Regulator of South Africa website "<https://portsregulator.org/npa-tariff-applications/>". Further analysis and compilation of stakeholders' comments and records of decision are available from the Author upon request.

Declarations

We authors' wish to declare that this work has *not* been published by any journal before. This work in *not* under any consideration for publication anywhere. Mr. Sphiwe Mthembu is currently under the employment of Transnet National Ports Authority (TNPA) as Marine Operations Manager and in the process of completing PHD with University of KwaZulu Natal. By no means had Transnet funded this work. Prof Mihalis Chasomeris is a Professor at University of KwaZulu Natal and a supervisor to Mr. Sphiwe Mthembu. According to both our knowledge, there are *no* known conflicts of interest pertaining to this work and that there has not been any financial support received for this work. There is no financial support that could influence the outcome. Both authors confirm approval of the work and agrees on its publication. The research was also approved by University of KwaZulu Natal ethical committee (Ref No: 00001673). We would like to confirm that there are no impediments to the process of publication that is foreseeable. We would like to confirm that the publisher with not be held reliable or responsible.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Basso LJ, Zhang A (2008) On the relationship between airport pricing models. *Trans Res Part B Methodol* 42(9):725–735. <https://doi.org/10.1016/j.trb.2008.01.005>
- Bouvier G, Rasmussen J (2022) Qualitative content analysis. *Qual Res Soc Media* 25–38. <https://doi.org/10.4324/9780429319334-2>
- Bel G, Fageda X (2009) Privatization, regulation and airport pricing: an empirical analysis for Europe. *J Regul Econ* 37(2):142–161. <https://doi.org/10.1007/s11149-009-9110-7>
- Cariou P (2010) The impact of the financial crisis on shipping industry, *International Forum for Education, Training and Maritime Transport Industry*, March 29–30, Arab Academy, Alexandria. Egypt
- Chasomeris M (2015) Port infrastructure pricing: a critique of the revenue required methodology. *International Journal of Transport Economics*. Vol XLII. No2 June 2015. pp 153–170. Publisher: Fabrizio Serra editore: Rome. <https://www.jstor.org/stable/43744148>. Accessed 13 June 2023
- Chasomeris M, Gumede S (2022) Regulation, governance and infrastructure pricing in South Africa's ports sector. In: Ferrari C., Haralambides H., Prete S., Tei A. (eds) *Regulation and finance in the port industry*. Palgrave Studies in Maritime Economics. Palgrave Macmillan Cham. https://doi.org/10.1007/978-3-030-83985-7_4.

- Choo YY, Carbo L, Wang K (2018) Joint impact of airline market structure and airport market power and profit margin. *Transport Policy* 72:67–78. <https://doi.org/10.1016/j.transpol.2018.09.017>
- Cresswell JW (2007) *Educational research: planning, conducting and evaluating quantitative and qualitative research*. NJ: Prentice Hall Publishers. Upper Saddle River
- D'Alfonso T, Jiang C, Wan Y (2013) Airport pricing, concession revenues and passenger types. *J Trans Econ Policy* 47(1):71–89. <http://www.jstor.org/stable/24396353>. Accessed 13 June 2023
- De Toni D, Milan G, Saciloto E, Larentis F (2017) Pricing strategies levels and their impact on corporate profitability. *Revista De Administração* 52(2):120–133. <https://doi.org/10.1016/j.rausp.2016.12.004>
- Economics and Social Commission for Asia and the Pacific (2002) *Korea Maritime Institution: comparative analysis of port tariffs in the ESCAP Region*. Korea Maritime Institution, United Nations. New York. <https://hdl.handle.net/20.500.12870/2916>. Accessed 13 June 2023
- Gillen DW, Morrison W (2017) Airport pricing, financing and policy: Report to national transportation act review committee. *Econ Regul Airports* 45–62. <https://doi.org/10.4324/9781315240145-3>
- Grater S, Chasomeris M (2022) Analysing the impact of COVID-19 trade disruptions on port authority pricing and container shipping in South Africa. *J Trans Supply Chain Manag* 16:a772. <https://doi.org/10.4102/jtscm.v16i0.772>
- Gumede S, Chasomeris M (2012) Port governance in South Africa. *Interdisc J Econ Bus Law* 1(4):82–98
- Gumede S, Chasomeris M (2015) Maritime port pricing and governance in South Africa: trends and stakeholder comments. *J Econ Financ Sci* 8(1):47–62. <https://doi.org/10.4102/jef.v8i1.83>
- Gumede S, Chasomeris M (2017) A critique of South Africa's National Ports Authority's revenue required pricing methodology. *Int Journal of Transport Economics* 44(4):61–632.44. <https://doi.org/10.19272/201706704006>
- Gumede S, Chasomeris M (2018) Pricing strategy and tariff structure for a port authority: a case study of South Africa. *Marit Policy Manag* 45(6):756–769. <https://doi.org/10.1080/03088839.2018.1446103>
- Heil OP, Helsen K (2001) Toward an understanding of price wars: their nature and how they erupt. *Int J Res Mark* 18(1–2):83–98. [https://doi.org/10.1016/s0167-8116\(01\)00033-7](https://doi.org/10.1016/s0167-8116(01)00033-7)
- Haralambides HE (2015) Competition, excess capacity and the pricing of port infrastructure. *Port Manag* 221–252. https://doi.org/10.1057/9781137475770_11
- IALA (2008) *IALA vessel traffic manual (4th edn)*. International association of marine aids to navigation and lighthouse authorities. https://www.puertos.es/Documents/vts_manual_2008_final_v2_0.pdf. Accessed 13 June 2023
- Ivalde M, (2015) "DP10658 Airport Prices in a two-sided market setting: major US airports". <https://cepr.org/publications/dp10658>
- Jia S, Meng Q (2021) Equitable vessel traffic scheduling in a seaport. *SSRN Electron J*. <https://doi.org/10.2139/ssrn.3808857>
- Kang L, Gao S, Meng Q (2020) Capacity analysis of ship-tugging operations in a large container port. *Asian Trans Stud* 6:100011. <https://doi.org/10.1016/j.eastsj.2020.100011>
- Kibiswa N (2019) Directed qualitative content analysis (DQICA): a tool for conflict analysis. *Qual Rep*. <https://doi.org/10.46743/2160-3715/2019.3778>
- Kidokoro Y, Lin MH, Zhang A (2015) A general equilibrium analysis of airport pricing, capacity and regulation. *SSRN Electron J*. <https://doi.org/10.2139/ssrn.2735775>
- Kidokoro Y, Zhang A (2017) Forms of airport regulation and privatization: effects on airport charge, capacity and welfare. *SSRN Electron J*. <https://doi.org/10.2139/ssrn.3029683>
- Kurun E, Erkmen T (2017) The impact of global financial crisis on the financial structure of shipping industry in Turkey and analysis of normalization process during 2008–2015. *Pressacademia* 6(1):43–47. <https://doi.org/10.17261/pressacademia.2017.744>
- Lobrigo E, Pawlik T (2015) Maritime policy and the seafaring labor market. *WMU J Marit Aff* 14(1):123–139. <https://doi.org/10.1007/s13437-015-0086-0>
- Malavolti E (2016) Single till or dual till at airports: a two-sided market analysis. *Trans Res Proc* 14:3696–3703. <https://doi.org/10.1016/j.trpro.2016.05.489>
- Meersman H, Strandenes SP, Van de Voorde E (2014) Port pricing: principles, structure and models. *SSRN Electron J*. <https://doi.org/10.2139/ssrn.2432939>
- Mayring P (2000) Qualitative content analysis. *Forum: Qualitative Social Research*, 1(2). Retrieved November 2022, from <http://www.qualitative-research.net/fqs-texte/2-00/02-00mayring-e.htm>
- McMahon-Beattie U (2002) The strategy and tactics of pricing: a guide to profitable decision making. *J Rev Pricing Manag* 1(3):286–287. <https://doi.org/10.1057/palgrave.rpm.5170032>
- Meyiwa A, Chasomeris M (2020) South Africa's port doctrine: dilemmas and the way forward. *Marit Stud* 19(2):179–191. <https://doi.org/10.1007/s40152-020-00166-2>

- Meersman H, Van de Voorde E, Vanelander T (2003) Port pricing. Considerations on economic principles and marginal costs. *Europ J Trans Infrastruct Res* 3(4):371–386. <https://doi.org/10.18757/ejtir.2003.3.4.4248>
- Meersman H, Strandenes PS, van de Voorde, E (2014b) Port pricing, structure, and models. Institute for Samfunnsokonomi, Department of Economics, SAM 14,2014b. ISSN:0804–6824
- Merchant Shipping Act, No57 (1951) South Africa, seafarers. Safe Manning, Training and Certification, Regulations of 2013, Pretoria: Government Printers. https://www.ilo.org/dyn/natlex/natlex4.detail?p_isn=74098&p_lang=en. Accessed 27 Jul 2022
- Mthembu SE, Chasomeris M (2023) An evaluation of the governance structure of marine services in South Africa's Ports System. *J Shipp Trade* 8:17. <https://doi.org/10.1186/s41072-023-00148-7>
- Mthembu SE, Chasomeris MG (2023) An assessment of the capacity and the performance of marine services in South Africa's ports. *J Trans Supply Chain Manag* 17:1–13. <https://doi.org/10.4102/jtscm.v17i0.879>
- National Ports Act, (2005) National Ports Act No. 12 of 2005. Government Gazette. Vol 482 no 27863. August 4, Cape Town, South Africa. Available at: https://www.transport.gov.za/documents/11623/114625/National_Ports+Act_a12_051.pdf/4f9f271c-3c79-44f8-be7a-e5e0fdb676d7 [Accessed: 18 March 2023]
- Ports Regulator of South Africa (2016) Tariff Strategy for the South African Ports System 2015/16. Available at http://www.portsregulator.org/ports_reg [Accessed 22 March 2020]
- Ports Regulator of South Africa, (2021) Global Pricing Comparator Study 2020/21. Port Tariffs. Benchmarking South African port administered prices against a sample of international ports. Report No. 9. https://ports.isitehosting.co.za/doc/Global-Pricing-Comparator-Study-2020_21.pdf [Accessed 26 March 2021]
- Sikow-Magny C (2003) Efficient pricing in transport—overview of European Commission's transport research programme. *Accept Trans Pricing Strateg* 13–26. <https://doi.org/10.1016/b978-008044199-3/50002-5>
- Sheila B (2017) Creamer Media Research Coordinator & Senior Deputy Editor. Available at: <https://www.engineeringnews.co.za/article/tug-building-project-south-africa-2017-11-24> [Accessed 9 December 2021]
- Talley WK (1994) Port pricing: a cost axiomatic approach. *Marit Policy Manag* 21(1):61–76. <https://doi.org/10.1080/03088839400000017>
- TNPA (2012) Transnet National Ports Authority. Position Paper on Tariff Methodology for the setting of Tariffs by Ports Regulator, available at: https://www.portsregulator.org/images/documents/Position_paper_on_Transnet_National_Ports_Authority_18_Sep.pdf [Accessed: 6 October 2018]
- TNPA (2021) Transnet National Ports Authority Tariff Application FY 2022/23 to FY 2024/25, Roadshow Presentation 14 – 16 September 2021, Accessed at: <https://portsregulator.org/tariffs-2022-23-tnpa-tariff-application/> [Accessed on 24 February 2022]
- Tongzon J (2007) Determinants of competitiveness in logistics: implications for the ASEAN region. *Marit Econ Logist* 9(1):67–83. <https://doi.org/10.1057/palgrave.mel.9100172>
- UNCTAD (1975) Port pricing report by the united nations conference on trade and development secretariat. New York. https://unctad.org/system/files/official-document/tdbc4d110rev_en.pdf. Accessed 13 June 2023
- Van Den Berg R, De Langen PW, Van Zuijlen PC (2017) Revisiting port pricing: a proposal for seven port pricing principles. *WMU J Marit Aff* 16(3):421–438. <https://doi.org/10.1007/s13437-017-0127-y>
- World Bank (2007) Public-Private Partnership Legal Resource Center, Second Edition http://regulationbodyofknowledge.org/wp-content/uploads/2013/03/WorldBank_Port_Reform_Toolkit.pdf [Accessed: 12 July 2019]
- Wan Y, Jiang C, Zhang A (2015) Airport congestion pricing and terminal investment: effects of terminal congestion, passenger types, and concessions. *Trans Res Part B Methodol* 82:91–113. <https://doi.org/10.1016/j.trb.2015.10.006>
- Zhang A, Zhang Y (1997) Concession revenue and optimal airport pricing. *Trans Res Part E Logist Trans Rev* 33(4):287–296. [https://doi.org/10.1016/s1366-5545\(97\)00029-x](https://doi.org/10.1016/s1366-5545(97)00029-x)