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Container Throughput in Africa: A Regional Comparative Analysis of Trade Performance

Abstract

This paper investigates trends and regional disparities in container throughput across ten African countries from 2010 to 2021. The study uses secondary data sourced from United Nations Conference on Trade and Development (UNCTAD) and employs descriptive and trend analysis. Findings reveal wide regional performance gaps, with North Africa consistently leading and Middle Africa underperforming. Additionally, the findings highlight the significance of infrastructure, geographic positioning, and trade policy in shaping containerized trade volumes across Africa. The study recommends strategic investment in port modernization and multimodal connectivity as requirements to enhance Africa's competitiveness in global trade.

Keywords: container throughput, African countries, UNCTAD, maritime transport, trade

1. Introduction

Maritime transport is fundamental for moving people and goods via waterways. It is a significant component of the global economy, facilitating approximately 80% of international trade [1]. This mode of transport plays a vital role in distributing goods, capital, investments, and technological innovations, as well as creating employment opportunities within and beyond the maritime sector. Africa relies heavily on this transport mode, despite a third of its countries being landlocked. In 2020, Africa accounted for about 2.5% of global exports and 3% of imports by value but contributed significantly to global maritime trade volume.

In 2019, African ports handled nearly 7% of global maritime export trade and about 4.6% of import trade. This highlights the critical role of maritime transport in international trade flows and its contribution to national productivity. One of the most significant fulcrums offered by maritime transport is containerization, which involves

packaging goods into standardized shipping containers, enabling efficient mechanical transfer of freight between different transport modes and locations [2]. This concept has transformed world trade, offering efficient handling and movement of goods globally. Containerization is now linked with complex logistics networks that support global production networks, making it a critical enabler of international trade and economic growth.

In Africa, containerization holds immense potential for driving trade and economic development. However, its adoption has been hindered by the lack of integrated rail and road links, making it challenging to establish efficient container handling and multimodal transport corridors, leading to partial implementation and reduced efficiency. To fully leverage containerization, Africa needs to invest in developing and improving its infrastructure and logistics networks. Efficient container handling and intermodal transportation systems can unlock its true potential, enhancing trade and economic growth. The African Continental Free Trade Agreement (AFCFTA) and ongoing restructuring of the continent's trade network offer opportunities to boost containerized trade [3].

Container throughput growth in Africa has been uneven, with West and Central Africa accounting for 40% of seaborne container traffic, and Sub-Saharan Africa showing potential for further growth. Africa's Atlantic coastline, from Tanger Med to Cape Town, is a strategic trade unit with 26 ports engaged in international trade. Increased competition and collaboration among these ports are driven by multimodal transportation systems and land connections to landlocked nations. As containerization gains momentum, it will be a crucial driver of economic development and regional integration in Africa. The efficient movement of goods through standardized containers will facilitate trade, enhance Africa's participation in the global economy and eventual regional economic growth and integration. However, recent developments in Africa's maritime container trade networks reveal various problems and notable trends.

Despite Sub-Saharan Africa accounting for approximately 12.8% of the world's population, its contribution to global container volumes remains low at only 2.3% [4-5]. This disparity underscores the challenges the region faces in integrating containerization effectively into its maritime transport system. This paper analyzes container throughput data across ten strategically selected African countries representing five regions to examine the spatial variation and temporal trends in port performance between 2010 and 2021. This study is significant because it provides valuable insights into the dynamics of container throughput in Africa, identifying both the drivers of success and the structural barriers that need to be addressed.

The paper is structured as follows: section two is the literature review, three and four present the methodology and results of the study while five and six represent the discussion and conclusion.

2. Background and literature review

Container trade in Africa has drawn increasing scholarly attention due to its relevance to international trade and economic development. Numerous studies emphasize that containerization (standardized packaging and transportation of goods) has transformed global trade by improving efficiency, security, and cost-effectiveness (Brooks, 2019). In the African context, the adoption of containerization has been uneven across regions. Ports such as Durban, Mombasa, and Lagos have undergone significant upgrades to support container traffic while others still face infrastructural constraints [6]. The importance of port infrastructure in shaping throughput volume is well-documented with evidence that links investments in port capacity and intermodal transport to meeting growing trade demands [7]. In another vein, study has shown that harmonization of trade policies across African countries is critical for optimizing port operations and increasing regional competitiveness [8-10]. There are also issues of security in relation to container throughput. For instance, [11-12] highlight the impact of piracy, particularly in the Gulf of Guinea, on maritime operations and trade reliability. Increased insurance costs and rerouting of vessels have affected the attractiveness of certain ports. Technological innovation is viewed as a critical enabler of improved container handling. Recent research supports the adoption of digital tools, including tracking systems and port management software, to streamline logistics and improve turnaround times [13-14]. Regionally, the African Continental Free Trade Agreement (AfCFTA) is seen as a potential driver for increased intra-African container trade. Scholars have argued that regional integration, improved connectivity, and coordinated investment strategies will enhance Africa's participation in global maritime trade [15-16]. Empirical studies such as [17-18] use statistical models to evaluate port performance and trends in container throughput, with findings supporting the link between containerization, port efficiency, and trade volume.

3. Methodology and resources

Secondary data on container throughput was collected from the United Nations Conference on Trade and Development Statistics (UNCTADStat), covering the years 2010–2021. Ten countries, as shown in Fig. 1, were selected across Africa, two from North, South, East, West, and Central Africa, respectively. The data was limited to 2021 because of unavailability of data for some of the countries beyond 2021. This is considered as one of the limitations of the study. However, the study used descriptive statistics to examine historical container throughput data, enabling the identification of key patterns, trends, and relationships. This analysis provides a foundational understanding of port performance across selected African countries between 2010 and 2021, highlighting inward and outward throughput movements and uncovering influential variables over time. Frequency tables and graphical representations were

used to illustrate the distribution and flow of container throughput across countries for comparative assessments. In addition, trend analysis was performed to evaluate changes over time, uncover influencing factors, and assess port strengths and weaknesses within each region. A trend analysis model summary table was used to further present the relationship between the dependent variable (container throughput) and the independent variable (time). This included using correlation coefficient to indicate the strength and direction of the linear relationship.

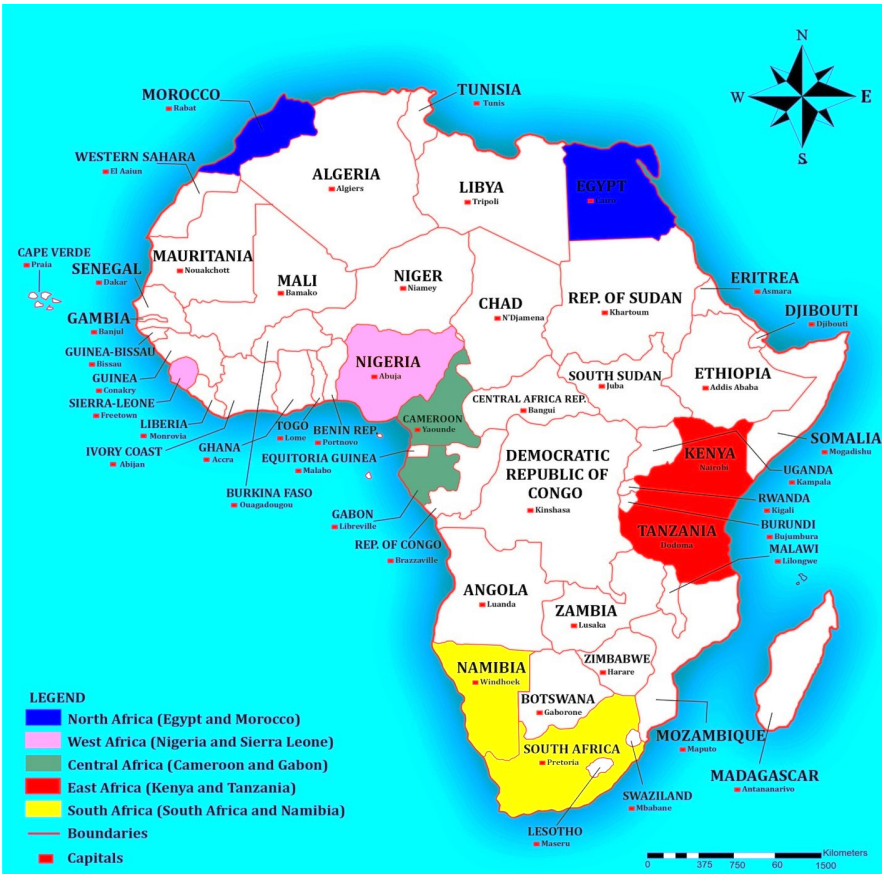

Figure 1. Study area.

4. Research results

4.1. Comparative overview of container throughput in selected African countries

Table 1 and Figure 2 show the illustration of ten African countries selected for the study and their associated throughput: Morocco and Egypt (North Africa), Kenya and Tanzania (East Africa), Cameroon and Gabon (Central Africa), Namibia and South Africa (Southern Africa), and Nigeria and Ghana (West Africa). In 2010, Egypt recorded the highest container throughput among the selected countries, handling 6,715,321 TEUs, representing 39.04% of the group's total volume. In contrast, Gabon had the lowest throughput at 153,657 TEUs (0.9%), likely due to its limited port infrastructure and a relatively undeveloped trade sector.

Egypt's upward trend continued in 2011, reaching 7,181,079 TEUs, a notable increase from the previous year. This growth is attributable to improved operational efficiency and competitiveness in Egypt's container terminals. Gabon, however, remained at the bottom with minimal growth, underscoring its infrastructural challenges. From 2012 to 2015, Egypt consistently led in container throughput across the region. Although its 2012 figure (6,424,921 TEUs) marked a slight decline, it rebounded by 2014 with 6,979,807 TEUs and continued to dominate in 2015 with 6,490,063 TEUs. South Africa often followed as a distant second, while Gabon consistently recorded the lowest figures due to persistent infrastructural constraints and limited international trade engagement. Between 2016 and 2019, Egypt maintained its leadership position. In 2016, it processed 5,887,541 TEUs and grew to 7,403,472 TEUs by 2019. This growth reflects continued investment in logistics and port modernization. Gabon, on the other hand, struggled to surpass 150,000 TEUs annually, indicating ongoing challenges in developing its maritime trade capacity. In 2020, Egypt once again emerged as the top performer, handling 7,564,385 TEUs. Despite the global trade disruptions caused by the COVID-19 pandemic, Egypt's ports remained operational, aided by the strategic location of the Suez Canal and recent upgrades in port infrastructure. Meanwhile, Namibia recorded the lowest throughput that year with 154,207 TEUs, hindered by limited port capacity and dependency on neighboring countries for transshipment. A notable shift occurred in 2021 when Morocco surpassed Egypt, recording 8,457,129 TEUs compared to Egypt's 7,226,065 TEUs, a 17.04% lead.

Morocco's strategic location at the northwestern edge of Africa, close to key European markets, and its investment in the expansion of the Tangier-Med Port positioned it as a regional hub. Tangier-Med's advanced container handling capacity, streamlined operations, and supportive trade policies significantly boosted throughput. This performance was underscored by World Bank's Container Port Performance Index (CPPI) which ranked Tanger-Med Port in Morocco fifth among the top 25 in capacity to handle containers for export, import and trans-shipment. Egypt's temporary lag in 2021 was partially due to ongoing expansion work on the Suez Canal, which affected port

operations. The COVID-19 pandemic had varying impacts across the selected countries. While Egypt and Morocco experienced increased volumes due to the rising demand for essential goods, others faced sharp declines. For instance, Kenya and Tanzania saw moderate setbacks in 2020 but began recovering in 2021 thanks to infrastructure improvements and expanded trade with Asian markets. Kenya's throughput declined by 12% in 2020 but rebounded in the following year. Tanzania saw an 18% drop due to decreased demand for commodities like gold and tobacco but benefited from ongoing expansion of the Dar es Salaam port.

In Central Africa, Cameroon experienced a 20% decline in 2020 as oil demand dropped, affecting export volumes. Gabon, heavily reliant on oil, saw a 25% drop, though recent investments in port infrastructure helped reduce the long-term impact. South Africa recorded a 15% decrease but demonstrated resilience due to its diversified economy and robust logistics sector. West African nations also faced setbacks. Nigeria and Ghana saw throughput declines of 25% and 20%, respectively, largely due to falling commodity demand and logistical disruptions. Ghana's diversified economy and steady infrastructure investment, however, helped cushion the impact, while Nigeria faced more severe trade flow interruptions. Namibia's container throughput remained the lowest among the selected countries for most of the study period. Despite efforts such as the expansion of Walvis Bay port, the country continues to struggle with geographic isolation, limited trade volume, and over-reliance on external transport corridors.

Table 1. Container throughput per country

YEAR	Morocco	Egypt	Kenya	Tanzania	Cameroun	Gabon	Namibia	S/Africa	Nigeria	Ghana
2010	2946000	6715321	695600	359010	290000	153657	247743	3985535	1162000	643188
2011	3032679	7181079	771000	439462	333834	162415	220178	4392791	1456000	813494
2012	2790692	6424921	903443	507185	351099	168192	334410	4352727	1583460	882877
2013	3526437	6456469	894000	553940	339268	130700	301817	4693942	1696000	894362
2014	4076488	6979807	1012002	612551	333555	197998	253052	4588327	1867409	793582
2015	3987251	6490063	1076118	639230	379915	145700	237546	4662479	1544183	840595
2016	4106683	5887541	1091000	630290	370000	146000	203071	4354666	1272000	942463
2017	4509580	6337413	1190000	617266	386367	156000	176335	4563618	1408000	1009755
2018	4715747	6701763	1306283	705231	387000	156000	144109	4892423	1560000	1056785
2019	6068803	7403472	1417000	726431	370685	192998	142957	4529034	1627142	1079247
2020	7000928	7564385	1359579	709881	366667	180000	154207	4075618	1548622	1324504
2021	8457129	7226065	1435565	700000	0	0	166545	4415223	1566109	1604724

Source: Unctad (2011-2022)

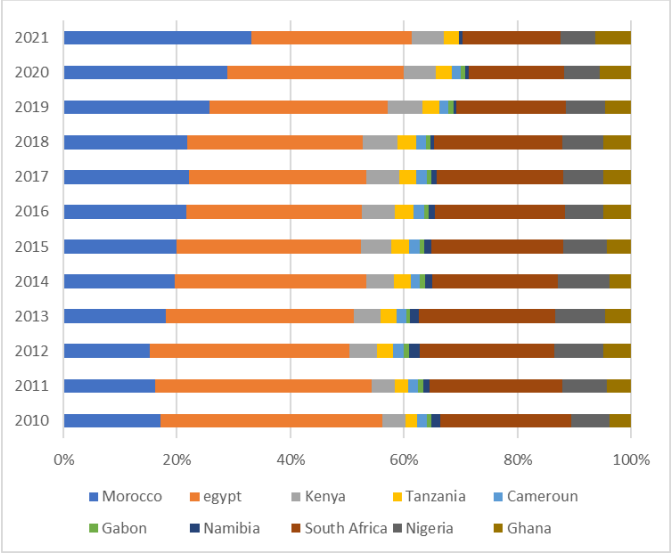

Figure 2. Container throughput by percentage. (author's analysis, 2025)

4.2. Trend analysis for selected countries by region

Table 2 indicates that Morocco's container throughput demonstrates a strong positive linear relationship with time, with an estimated annual increase of approximately 440,283 units. The model provides a good fit, explaining about 84% of the variance in throughput data. In contrast, Egypt's container throughput shows a weak positive linear trend, increasing by approximately 64,485 units annually. However, the model accounts for only 14% of the variance, indicating a poor fit and limited explanatory power.

Table 2. Trend analysis model summary for North Africa

VARIABLE	MOROCCO	EGYPT
Included Observation	12	12
Linear Trend Equation	Yt = 1.7232E+06+4.4283E+05*t	Yt = 6.4485E +51100*t
R	0.917216	0.370430
R-Squared	0.841285	0.137218
R-Squared Adjusted	1.000000	0.999999
Sum Square Error (SSE)	5290289265090.000000	2347819160802.250000
Mean Squared Error (MSE)	529028926509.000000	234781916080.225000

Source: Author's Analysis (2025)

Table 3 reveals that Nigeria's container throughput also exhibits a weak positive linear relationship with time, with an estimated increase of 145,030 units per year. The model explains merely 5% of the variance, suggesting it is not a strong fit for the data. On the other hand, Ghana's container throughput shows a strong positive linear trend, increasing by approximately 57,882 units annually. The model fits the data well, explaining 78% of the variance, with a high adjusted R-squared value confirming its reliability. This implies a steady and consistent growth in Ghana's container throughput over time.

Table 3. Trend analysis model summary for West Africa

VARIABLE	**NIGERIA**	**GHANA**
Included Observation	12	12
Linear Trend Equation	Yt=1.4503E+11378*t	Yt=5.788E+05+63332*t
R	0.221191	0.881703
R-Squared	0.048925	0777401
R-Squared Adjusted	0.999998	0.999999
Sum Square Error (SSE)	359884332879.344000	164235283248.912000
Mean Squared Error (MSE)	35988433287.934400	16423528324.891200

Source: Author's Analysis (2025)

From Table 4, both Kenya and Tanzania demonstrate strong positive linear relationships between container throughput and time. Kenya's throughput is increasing by approximately 68,678 units per year, while Tanzania's is growing at about 29,654 units annually. The models explain 97% and 86% of the variance, respectively, indicating excellent fits. The high adjusted R-squared values suggest that these models are suitable for forecasting future container throughput in both countries.

Table 4. Trend analysis model summary for East Africa

VARIABLE	**KENYA**	**TANZANIA**
Included Observation	12	12
Linear Trend Equation	Yt = 6.4956E+ 05+68678*t	Yt = 4.0729E+05 +29654*t
R	0.987141	0.926064
R-Squared	0.974448	0.857595
R-Squared Adjusted	1.000000	0.999999
Sum Squared Error (SSE)	17686624667.275400	20880663314.248000
Mean Squared Error (MSE)	1768662466.727540	2088066331.424800

Source: Author's Analysis (2025)

As shown in Table 5, Cameroon's container throughput exhibits a weak negative linear relationship with time, declining by approximately 1,364 units per year. However, the model explains less than 1% of the variance, making it unreliable and likely overfitted. Similarly, Gabon shows a moderate negative trend, with throughput decreasing by approximately 11,687 units per year. Here, the linear model offers a more reasonable fit, suggesting a downward trend over time. Finally, Table 6 shows that the model indicates a strong negative linear relationship for Namibia, with throughput declining by about 13,567 units annually. In contrast, South Africa shows a weak negative trend, with an estimated annual decline of 12,995 units. The weaker relationship in South Africa suggests limited reliability in using this model for future predictions.

Table 5. Trend analysis model summary for Middle Africa

VARIABLE	**CAMEROON**	**GABON**
Included Observation	12	12
Linear Trend Equation	Yt=3.4957E+05-1364.4*t	Yt=2.1017E+05-11687*t
R	0.085050	0.417684
R-Squared	0.007234	0.174460
R-Squared Adjusted	0.999995	0.999997
Sum Squared Error (SSE)	36536010050.142300	92427838552.603700
Mean Squared Error (MSE)	3653601005.014230	9242783855.260370

Source: Author's Analysis (2025)

Table 6. Trend analysis model summary for South Africa

VARIABLE	**NAMIBIA**	**SOUTH AFRICA**
Included Observation	12	12
Linear Trend Equation	Yt= 3.0335E+05 -13567*t	Yt= 4.3744E +06 +12995*t
R	0.784706	0.183567
R-Squared	0.615763	0.033697
R-Squared Adjusted	0.999997	0.999999
Sum Square Adjusted (SSE)	16425168497.869400	692513213191.000000
Mean Squared Error (MSE)	1642516849.786940	69251321319.100000

Source: Author's Analysis (2025)

5. Discussion

The study investigates container throughput trends in Africa from 2010 to 2021, focusing on comparative performance among selected countries and regions. The findings indicate a steady increase in container trade on the continent, with an average annual growth rate of 5% (World Bank, 2020). This growth reflects expanding international trade and rising economic activity across Africa. Significant regional disparities exist in container throughput. For instance, North Africa and Southern Africa emerged as the leading contributors, with countries like Morocco, Egypt, and South Africa dominating in trade volumes [19]. These countries have made substantial investments in port infrastructure and trade facilitation, contributing to their strong performance [20]. Egypt consistently recorded the highest container throughput, leveraging its strategic location and modern ports such as Port Said and Damietta. In contrast, Gabon posted the lowest throughput throughout the period, primarily due to underdeveloped port infrastructure and limited trade capacity.

The contrast underscores the crucial role of infrastructure development and efficient trade systems in enhancing competitiveness [21]. In 2021, Morocco surpassed Egypt in container throughput, a shift attributed to Morocco's proactive port development strategy, competitive tariffs, and favorable logistics policies. Meanwhile, Egypt's trade was temporarily disrupted by the ongoing Suez Canal expansion and the impacts of the COVID-19 pandemic, which diverted cargo to alternative routes. Nevertheless, Egypt's adaptability and continued relevance in global shipping helped mitigate these setbacks. The pandemic had mixed effects across the continent. While countries like Egypt and Morocco experienced increased trade due to heightened demand for essential goods, others, including Kenya and Nigeria, witnessed declines, largely driven by reduced international trade with Europe and Asia. Nigeria, in particular, experienced a marked drop in throughput due to pandemic-induced disruptions and economic constraints [22-24].

Country-specific trends further highlight the importance of resilience in trade systems. Egypt's rapid post-pandemic recovery and Nigeria's struggles illustrate how flexible infrastructure and diversified economies can buffer against global shocks. The study emphasizes the need for African nations to invest in modernization, adapt to shifting trade patterns, and strengthen economic diversification to sustain container trade growth. The analysis also points to the broader importance of regional integration. Countries with stronger regional ties, such as Egypt and South Africa, tend to outperform those with weaker connections, like Gabon [25]. Collaboration across borders could help reduce throughput disparities, improve operational efficiency, and enhance collective economic development [26]. Additionally, the study sheds light on container trade's potential to support landlocked African countries. Through improved intermodal connections and regional cooperation, these nations can gain access to global trade routes despite their geographic limitations. Containerization, by improving transport efficiency and reliability, offers a viable path for economic growth

even in less accessible regions (World Bank, 2020). In conclusion, this study highlights the pivotal role of port infrastructure, trade facilitation, and regional cooperation in driving container throughput in Africa. Policymakers and stakeholders must prioritize investment in modern infrastructure, streamline customs processes, and foster regional partnerships to unlock the continent's full trade potential.

6. Conclusion and policy recommendations

Containerization is a vital component of global shipping and represents a transformative development in global maritime logistics, with Africa playing an increasingly important role. However, most African container ports are facing numerous challenges ranging from infrastructural deficits, congestion, low turnaround time which translate to high costs for shippers. This generally reduces operational efficiency and competitiveness of African ports at the global maritime arena. As such, this study reinforces the critical importance of containerization in facilitating African international trade and economic development provides valuable insights into the dynamics of container throughput in Africa, identifying both the drivers of success and the structural barriers that need to be addressed. Achieving sustained improvement in Africa's maritime logistics sector will require a coordinated approach involving infrastructure upgrades, policy reforms, enhanced regional integration, and robust stakeholder collaboration which will significantly boost Africa's trade capacity, reduce costs of doing business, promote sustainable port practices and strengthen its role in global supply chains, and economic growth across the continent.

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