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Cross examinations of maritime trade disruptions in Africa during COVID-19 pandemic

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ABSTRACT

This study examined the influence of the disruption of COVID-19 on maritime shipping activities in Africa. Particular attention was paid to the variations in the performance of selected African countries in container ship calls, container throughput, and liner shipping connectivity between 2019 and 2020. Eighteen (18) African countries were selected from all the geographical regions of the continent based on data availability. Secondary data was drawn from records of maritime trade in the publications of the United Nations Conference on Trade and Development (UNCTAD) (2019, 2020, and 2021) as well as World Bank Development Indicators for the selected countries. Explorative data analysis was used to organize and present the data. Results showed that the North African region alone recorded an improved percentage of container ship calls in 2020 than in 2019. Results by individual countries showed that Ghana recorded the highest positive increase in ship calls in 2020 from her record in 2019. In addition, Morocco, recorded the highest container throughput in 2020 than the record in 2019 while all the countries exhibited a winding record of liner connectivity between the last quarter of 2019 through the last quarter of 2020.

The study concluded that the disruption of maritime activity by the COVID-19 pandemic had a mixed impact on African countries' performance. However, Africa has the potential to be more resilient to unforeseen shocks and become competitive if it is more integrated into the global supply chain and deploys modern and efficient technology and innovation to the shipping business more than it ever did.

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1 Introduction

Maritime transport is critical to global supply chain linkages and economic interdependence with shipping and ports estimated to handle nearly 90% of global merchandise trade by volume and more than 70% by value (Sok, 2016; Fugazza and Hofman, 2017; Dai et al. 2019). Thus, understandably, any disruption to port operations creates a disability to maritime trade flow. This is because seaports constitute a component within a global trade system that is easily vulnerable to any external shock (Sanchez-Rodrigues, et al., 2010; Mokhtari et al., 2012). As a result, when disruptive factors such as natural hazards, terrorist attacks, strike by port workers and pandemics occur, the effect and attendant consequences reverberate across supply chains and regions, causing a strain on interregional and international trade flows (Hosseini et al., 2019).

The most recent of such disruptions which is still very much with us is the coronavirus (COVID-19) pandemic which broke out from Wuhan in China in 2019 and was declared a Public Health Emergency of International Concern by the World Health Organization (WHO) on the 30th January 2020. This pandemic has produced one of the worst global crises since World War II with its disruptions cutting across every fabric of global systems (social, political, economic and environmental). However, different containment and suppression measures (such as work stoppages, restrictions on travel, and even city closures) were introduced to slow down the spread of the virus (Parodi and Liu, 2020). As a result, international trade especially via global seaports suffered a sharp decline both in volume and value (Luo and Tsang, 2020). Specifically, the COVID-19 pandemic negatively impacted the international

maritime trade and various shipping industries and submarkets experiencing different setbacks depending on the nature of merchandise they deal with. Pointedly, the volume of maritime trade slumped by 3.8 percent in 2020 to a total of 10.6 billion metric tons (United Nations Conference on Trade and Development, UNCTAD, 2021). And according to World Bank, merchandise trade appeared to have nosedived in the first quarter of year 2020 falling nearly by 20 percent year on year. Generally, however, it was observed that trade contraction caused by COVID-19 was deeper than what occurred during the financial crisis of 2008-2009 (UNCTAD, 2020).

Matter of fact, the nature, and intensity of shocks experienced by global seaports differ from port to port and region to region, depending on the orientation or operation of the seaports (domestic or international), on the nature of goods traded (e.g., container, bulk, tanker), ports' development status and ports resilience to shock and preparedness for recovery.

Various data and analyses have been provided by global agencies, and scholars in various economic and spatial sciences providing the magnitude of the consequences of the COVID-19 disruptions on the maritime and logistics sectors (UNCTAD, 2020; Organization for Economic Cooperation and Development, OECD, 2021). Such data and analyses include but are not limited to changes in volume of maritime trade, frequencies of port calls by ships, port traffic, liner shipping connectivity levels, turnaround time of ships, and vessels' absolute and observed capacities–all of which have given certain explanations on the magnitude of the impact of the pandemic on maritime transport and trade. However, no known study on the cross-regional examinations of the performance of African ports is available even with available data provided by some trade and development agencies across the world.

With the aim of this study to provide an assessment of ports across all African regions, this paper targets the comparative examinations of the percentage change in throughput across regions, change in the number and frequency of ship calls as well as port connectivity index during the pandemic period. The rest of the paper is organized as follows: Section 2 is the literature review comprising three subsections that provide information on COVID-19 and container ship call, container throughput, and liner shipping connectivity. Section 3 introduces methods of study—type and sources of data as well as techniques of data presentation. Section 4 presents the results and discussion. Section 5 concludes the study with some careful suggestions.

2 Literature review

Africa's share of the world merchandise trade is small both in value and volume. For instance, in 2018, it was about 2.5% of exports and 3% of imports. The percentage is relatively more significant in volume and 7% in export and 4.6% in imports. The northern and western African regions contribute 36% and 27% (UNCTAD, 2019). Just as the COVID-19 pandemic has taken a toll on all fabrics of human endeavours globally, the African continent has not been spared. COVID-19 has negatively impacted Africa. Specifically, in the second quarter of 2020, UNCTAD estimated the drop in Africa's exports at -35% and the drop in imports at -25%. Though improvements were recorded around the second quarter of 2020, the drops in trade still showed some double-digit drops of -17% for imports and -21% for exports. Various studies have addressed the impact of the COVID-19 pandemic on seaport operations around the world. Most of these studies were conducted in ports of developed countries and developing countries with developed ports whose presence in the global maritime trade arena is conspicuous (Guerrero, et al., 2022; Notteboom, et al., 2021; Xu, et al., 2021a; Xu, et al., 2021b;). Apart from records of trade made available by UNCTAD and other international organizations on trade and associated activities, no known scholarly study was pointedly conducted on the effects of COVID-19 on port operations in Africa especially with consideration for certain port indices such as container throughput, number of port calls and liner ship connectivity.

However, this study presents its review of previous studies along three main concerns which are the container ship calls, container throughput, and liner ship connectivity.

2.1 COVID-19 and ship calls at ports

During the first quarter of 2020, global ship calls declined by 8.7% especially the moment COVID-19 was declared a public health concern by WHO. During this quarter, variations, though marginal, were recorded in ship calls across the ports of the world but this later changed greatly as a result of impositions of restrictions and various lockdown measures by various countries in their bids to contain and reduce the spread of the pandemic. The decline in port calls revealed different types of variations depending on cargo type. For instance, containership calls declined by 5.8% in the second quarter of 2020 following the initial minor drop of 1.1% in the first quarter of 2020. For the same period, port calls for wet bulk carriers, Ro/Ro ships, and break bulk ships dropped by 6.3%, 22.8%, and 8.5% respectively. These all conform to Notteboom and Haralambides's (2020) analysis of the impact of the pandemic on the general business activity of seaports and observed a general decline in transshipment volumes and the number of ship calls at ports, plus a generally reduced level of commercial and industrial activities within and around seaports. Notteboom and Pallis (2020) also reported a decline in the number of port calls made by container vessels when compared to relatively normal situations. In a similar but separate study, Notteboom et al. (2021) showed that most container terminals recorded lower or no demand which made them suspend business activities.

2.2 COVID-19 and Container throughput

It is unequivocally true that container shipping has formed an integral cliché for global maritime business and supply chain industries. A significant and increasing proportion of global merchandise is carried in containers. This makes container ports a backbone for global supply chains and trade facilitation, especially where there is a developed and efficient state-of-the-art container port infrastructure. However, container shipping faced a serious strain during COVID-19 because of disruption to the cargo flow system due to disrupted production capabilities occasioned by lockdowns and closure of many manufacturing industries which are sources of objects of trading for container shipping. Thus, the container volumes recorded by global ports amid pandemic declined, especially in the first quarter of 2020. The impact of COVID-19 on the trade volume of individual container ports, however was seen to be connected with cargo composition, and how a container port fits within a complex trading chain.

2.3 COVID-19 and Liner shipping connectivity index (LSCI)

The liner shipping connectivity index (LSCI) is a measure of a country's accessibility to global trade. It is also a measure of a country's connectivity to maritime shipping, maritime competitiveness, and trade facilitation. The measure aims at capturing the level of integration of ports into the existing liner shipping network. The index is calculated by estimating scheduled ship calls, deployed capacity of ports, the number of shipping companies and liner services, average vessel size, and the number of ports that are directly connected to the ports being measured (Hoffmann, Seed, and Sødal, 2019). The higher the score of the index, the higher the integration of a given country to liner shipping networks. In all essence, in an increasingly connected world, an improved or higher index implies ease of access of a country to the global maritime freight transport system in terms of capacity, transport options, and frequency, and a consequential improvement in international trade and economic development of a given country. Thus, connectivity, whether at the country level or bilaterally, is becoming synonymous with national trade competitiveness (Hoffmann et al., 2017). Literature has emphasized the significance of LSCI in international trade's relevance of a country with seaports. For instance, UNCTAD (2019) emphasized the key role played by efficient and well-connected ports in transport cost reduction, linking the supply chain, and promoting international trade. Caballe et al., (2020) also noted the significance of maritime connectivity to a port choice decisions to and from specific hinterland locations. Wilmsmeier (2014), Fugazza and Hoffmann (2017), and Wilmsmeier et al., (2017), analyzed the effect of LSCI on transport costs and trade volumes. The implication of LSCI is such that the more centrally a trade route is located in the maritime liner service network, the lower the average costs. Also, studies have employed the use of LSCI to investigate port efficiency (Serebrisky et al., 2016; Schoyen et al., 2018). However, despite the array of positive nexus between maritime connectivity and maritime trade development, shipping networks are highly vulnerable to disruptions arising especially from regular and irregular occurrences such as extreme weather conditions, congestions, asset/infrastructure failures, the outbreak of epidemic among others (Earnest et al., 2012) which interfere with service schedule and trade options (Calatayud et al. 2017). During the COVID-19 emergence, the shipping network suffered a major blow threatening maritime stability and safety. Most liner shipping operators cancelled service commitment especially at the initial phase as a response to initial disruption in ports operations and subsequent decline in demand for international goods. Specifically, shipping capacity was reduced, congestion became critical, container turnover rate declined. By the end of 2020, the reliability of shipping based on the global schedule dropped to the lowest minimum since 2011.

In sum, this review brings to the fore a nexus between COVID-19 and ship calls, container throughput, and Liner ship connectivity. The following section outlines the performance of African countries in terms of the number of ship calls, container throughput, and liner ship connectivity during the COVID-19 pandemic in 2020.

3 Study method

The study utilized country profile data from the UNCTAD publications for 2019, 2020, and 2021 and World Bank data between 2019 and 2020. The data comprised the container throughput, for 2019 and 2020; the number of ship calls (container ship); as well as the Liner Ship Connectivity Index of the selected countries for 2019 and 2020. Eighteen (18) African countries were included in the study based on complete data available on all indices for the years under consideration. The countries were selected from North Africa (Algeria, Egypt, Morocco, Sudan, Tunisia); Central Africa (Cameroon and Congo); West Africa (Cote d'Ivoire, Ghana, Nigeria, and Togo); East Africa (Djibouti, Kenya, Mauritius, Mozambique, and Tanzania); and South Africa (Namibia and South Africa).

Exploratory data analysis was used to summarize the underline characteristics observed using tables and graphs and to emerge comparative examinations of the performance of the selected countries based on the maritime trade records available.

4 Results and discussion

4.1 Number of ship calls for selected African countries

This section presents information on container ship calls according to geographical regions in Africa as well as the country-by-country basis for 18 selected countries in

Africa between 2019 and 2020. Table 1 shows container ship calls for North Africa, Central Africa, West Africa, East and South Africa, respectively. All the regions altogether recorded a total of 22956 container ship calls in 2019 and 21791 in 2020 which is a 5.07% decrease from the record in 2019. North Africa recorded a 1.37% increase in container ship calls in 2020 to 10616 from corded in 2019. Whereas, all other regions within the continent recorded a decline in container ship calls between 2019 and 2020 with East Africa recording a very high decrease in 2020 from what it recorded in 2019. However, Table 2 is reflective of what individual countries selected from each region within the continent contributed to the regional ship call total. Algeria was the only North African country with an increase in 2020 from its record in 2019. Cameroon and Ghana from Central and West Africa, respectively also recorded an increase from their records in 2019. However, Djibouti was the only East African country with an unchanged record in 2020 from what it had in 2019 while others including their counterparts from South Africa (South Africa and Namibia) recorded a decrease in number of ship calls for the period under consideration.

Significantly though, the pandemic impacted container ship calls at most ports across the globe as global ship calls diminished by 3.5 percent in the first 24 weeks of 2020 when compared to the same period in 2019, nevertheless, decrease recorded by the majority of container ports in Africa may be due to lack of preparedness to meet the challenges of disruptions like pandemic, especially in terms of innovation and technology, infrastructural ade-

Table 1 Container ship call by region in 2019 and 2020

Region	2019	2020	Total	% Change
North Africa	10472	10616	21088	1.375095
Central Africa	1610	1594	3204	-0.99379
West Africa	5397	4902	10299	-9.17176
East Africa	3133	2634	5767	-15.9272
South Africa	2344	2045	4389	-12.756
TOTAL	**22956**	**21791**	**44747**	**-5.07493**

Source: Author's Analysis based on UNCTAD report.

Table 2 Container ship calls by countries between 2019 and 2020

Countries by Region	2019	2020	% Change
North Africa			
Algeria	1119	1131	1.10
Egypt	3913	3787	-3.58
Morocco	4130	4317	4.53
Tunisia	392	373	-4.87
Sudan	162	117	-27.78
Central Africa			
Cameroon	384	442	15.10
Congo	478	376	-21.34
West Africa			
Cote d'Ivoire	678	673	-0.74
Ghana	660	770	16.67
Nigeria	973	763	-21.58
Togo	807	815	0.99
East Africa			
Djibouti	425	425	0.00
Kenya	543	470	-13.44
Mauritius	593	442	-25.46
Mozambique	583	416	-28.64
Tanzania	359	330	-8.07
South Africa			
Namibia	225	205	-8.89
South Africa	2119	1840	-13.17

Source: Author Analysis based on UNCTAD report

Table 3 Container throughput for selected African countries (2019-2020) (in TEUs)

Country	2019	2020	% change
Algeria	688500	724991	5.30
Egypt	6306866	5928454	-6.00
Morocco	6068803	6980958	15.03
Sudan	469526	493002	5.00
Tunisia	424115	420098	-0.95
Cameroon	397024	395872	-0.29
Congo	557875	556579	-0.23
Cote d'Ivoire	918669	974872	6.12
Ghana	1100205	1050696	-4.50
Nigeria	1484000	1528520	3.00
Togo	1500611	1725270	14.97
Djibouti	932000	812569	-12.81
Kenya	1425000	1311000	-8.00
Mauritius	469011	438078	-6.60
Mozambique	427300	437128	2.30
Tanzania	405775	363024	-10.54
Namibia	185328	166795	-10.00
South Africa	4592200	4029000	-12.26
TOTAL	**27069808**	**28336906**	**4.68**

Source: Author Analysis based on UNCTAD report

quacy, quality and modernity, human capital and skill as well as government regulations during the pandemic. A specific example is the case of Mombassa port in Kenya where cross-border restrictions led to deterioration in performance. This restriction created a queue of trucks waiting for clearance at a common border to over 50 km by May 2020 leading to critical congestion. This thus increases transit time from an average of 3 days to 8 days for 648 km and a consequent delay in the return of empty containers to the Port of Mombasa. These delays often attract retention charges by the shipping lines thereby increasing the cost of doing business.

4.2 Container throughput for selected African countries

The impact of COVID-19 on port performance globally did not spare the container terminals. Major container terminals across the globe recorded a significant drop in their throughput in 2020 compared with what was recorded in 2019. This section presents the performance of container trade by container terminals in selected countries in Africa. Generally speaking, Out of the 18 countries of study, Morocco recorded a very significant increase of 15.03% in container throughput in 2020 higher than what was recorded in 2019. This was followed by Togo which recorded 14.97% higher than its record in 2019. Other countries with positive increase include Cote- d'Ivoire (6.12%), Algeria (5.30%), Sudan (5.0%), Nigeria (3.0%) and Mozambique (2.3%). On the other hand, Djibouti recorded decline of 12.81% from 2019 record in 2020. Others with decrease in container throughput are South Africa (12.26%), Tanzania (10.54%), Namibia (10.0%), Kenya (8.0%), Mauritius (6.6%), Egypt (6.0%), Ghana (4.5%), Tunisia (0.95%), Cameroon (0.29%) and Congo (0.23%), respectively (Table 3). However, generally speaking, the decrease in container throughput recorded by African ports was a reflective of global experience during the pandemic in 2020. For instance, global decrease in container throughput reached 11.4% in 2020 from what the record was in 2019. Also, across regions outside Africa, similar records of decline were recorded. In East Asia and The Pacific, a decrease of 3.89% from 2019 container throughput was recorded in 2020, North America (2.03%), Latin America and The Caribbean (19.0%) and European Union (3.48%) decrease, respectively.

4.3 Liner shipping connectivity index across African regions

COVID-19 has caused a variegated influence on port connectivity globally and induced unexpected changes in the observed improved patterns in port connectivity index over time and space. Records (Table 4 and Fig. 1) show mixed trends in terms of impact of the COVID-19 on connectivity in Africa. Of the countries under consideration, 10 of them showed a positive change in liner ship connectivity index between the last quarter of 2019 and the first quarter of 2020 (example includes Morocco—North Africa, Congo—Central Africa, Mozambique—East Africa, Nigeria—West Africa, and South Africa—Southern Africa) with Morocco having the highest connectivity index; while

8 of them showed a decline from the rate in 2019 (example include Tunisia—North Africa, Cameroon—Central Africa, Cote d'Ivoire—West Africa, Kenya—East Africa and Namibia—South Africa), with Namibia showing the highest decline in connectivity.

However, similar mixed trends were recorded in the second quarter of 2020 when compared with the first quarter of the same year, as almost half of the countries of study exhibited increasing connectivity. Specifically, continental records showed that Egypt recorded the highest connectivity index of 68.08 as against 60.60 recorded in the first quarter of 2020. This was followed by Cameroun with 15.33 and 18.17 in the first and second quarters of 2020 respectively. On the other hand, Morocco in the second quarter of 2020 recorded the highest level of decline in connectivity. However, Sudan maintained the same con-

Table 4 Liner shipping connectivity index for the selected countries between 2019 and 2020 (Reported in Quarters of each year)

Country	Year/Quarters							
	2019Q1	2019Q2	2019Q3	2019Q4	2020Q1	2020Q2	2020Q3	2020Q4
Algeria	11.52	11.88	12.51	12.6	12.24	12.08	13.57	12.84
Egypt	63.56	63.97	60.57	61.17	60.6	68.08	67.83	68.51
Morocco	61.83	60.04	62.65	62.04	68.91	68.28	67.44	68.05
Sudan	9.99	8.87	8.93	8.91	9.14	9.14	9.32	9.52
Tunisia	7.12	7.19	6.84	7.18	6.6	6.59	6.27	6.15
Cameroun	24.56	16.02	15.65	15.41	15.33	18.17	19.08	18.95
Congo	23.34	29.57	29.52	29.57	29.8	29.97	30.3	24.83
Cote D'Ivoire	18.88	18.89	19.03	19.97	19.96	19.64	20.13	19.98
Ghana	20.19	20.2	20.51	36.65	37.04	39.09	40.05	39.99
Nigeria	21.21	21.07	20.69	21.53	21.91	21.75	29.18	21.25
Togo	34.86	33.13	33.38	34.61	35.31	36.47	36.48	36.57
Djibouti	31.01	30.28	32.91	32.7	32.53	34.42	32.58	32.5
Kenya	24.7	17.41	17.41	17.38	17.35	16.89	17.67	16.73
Mauritius	33.64	32.09	32.1	33.68	34.25	35.52	33.99	33.73
Mozambique	10.43	11.17	12.08	12.08	13.22	13.67	16.19	14.55
Tanzania	23.92	16.19	16.19	16.03	16	15.83	16.43	15.66
Namibia	14.34	14.82	15.28	15.69	15.43	15.42	14.28	14.59
South Africa	40.05	38.23	38.12	39.87	40.23	41.34	41.93	41.26

Source: Generated based on data from UNCTADStat (2021)

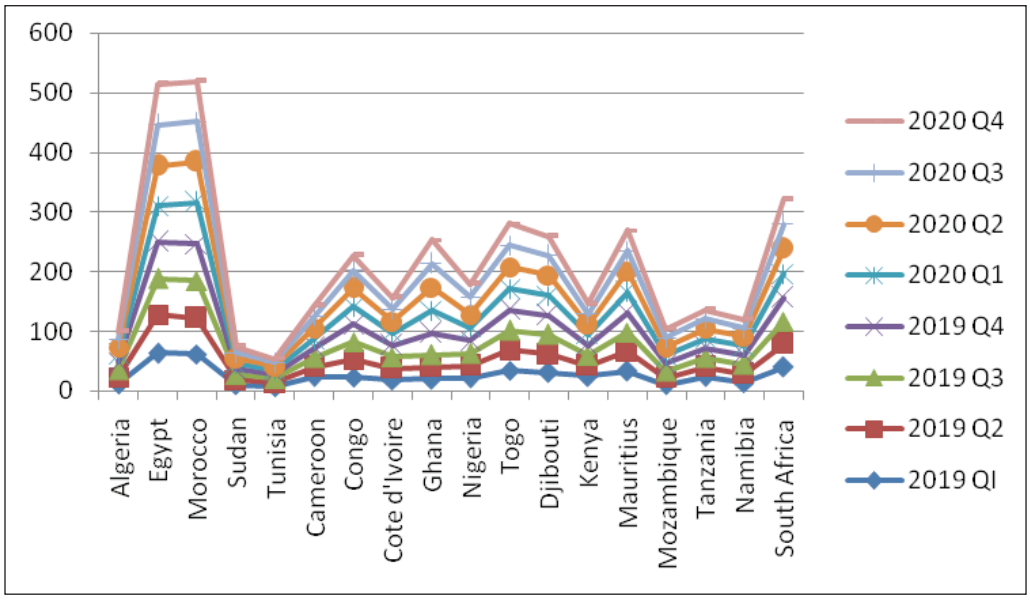

Fig 1 Liner shipping connectivity index for the selected countries between 2019 and 2020 (Reported in Quarters of each year).

Source: Author's Analysis (2022)

nectivity index of 9.14 in the first and second quarters of 2020. By the third quarter of 2020, Djibouti, Egypt, Mauritius, Morocco, Namibia, and Tunisia recorded a decline in connectivity rate while Nigeria recorded the highest rate (29.18) among other countries with increasing rates in the third quarter of 2020. However, by the last quarter of 2020, only five (Egypt, Morocco, Namibia, Sudan and Togo) recorded increased connectivity rate among all the eighteen countries of study. While the remaining countries recorded decreasing rate of connectivity.

When compared with the regions outside African continent, Canada experienced a mixed trends in connectivity between the last quarters in 2019 up to the last quarter of 2020 whereas, the United States recorded initial drop in connectivity in the first quarter of 2020 from what it recorded in the last quarter of 2019 but this was followed by increasing connectivity throughout the remaining quarters in 2020. In the United Kingdom, increasing connectivity was experienced in the first quarter of 2020 from what was obtained in the last quarter of 2019 but this was followed by an immediate fall in connectivity in the second quarter of 2020 and a subsequent rise for the remaining quarters in the year. In the Asian continent, China, which has the highest connectivity index globally also, experienced an increase in the first quarter of 2020 above the record in the last quarter of 2019. This was followed by an immediate drop in the second quarter of 2020 before a sharp increase in the third and the last quarter of 2020.

The mixed trends in liner shipping connectivity recorded in Africa during this period were caused by growing lockdowns and restrictions on economic activity and movement of people and goods as well as reduced importation of foreign goods by the majority of African countries which are significant users and importers of maritime transport services. However, it must be noted that before this time, shipping connectivity in Africa has been below the global average even considering its location on one of the busiest global sea routes. This is due to the very insignificant participation of Africa in the global supply of shipping services, its limited integration into the global manufacturing and trading networks as well as being a continent with limited fleet ownership in the world (UNCTAD, 2018).

5 Conclusion

The COVID-19 pandemic has impacted hugely on all fabrics of human life and with specific major disruption to economic activity across the world. Restrictions on movement—especially transboundary mobility, lockdowns, and closure of many manufacturing industries resulted in significant shrinkage in maritime trade performance throughout the world. Significantly affected were ship calls at various port facilities, container goods volume, and country and ports' maritime connectivity. Africa as a continent and countries in Africa were all significantly affected though at different scales when compared with countries of other continents especially those with developed ports around the world. Though the initial shock and disruption created by COVID-19, were attributed to various downscaling of performance of African countries during the pandemic, it was observed that African countries which are significant users and importers of maritime transport services have limited integration into the international maritime network, with a below average contribution to the global supply of shipping services. In addition, the lack of preparedness to meet the challenges of disruptions like the pandemic, especially in terms of innovation and technology, infrastructural adequacy, quality and modernity as well as presence of adequate human capital are significant factors reducing African resilience to the disruption of maritime trade activities during COVID-19.

However, Africa's role in international maritime trade especially in terms of the importation of maritime services makes it a significant continent with growth prospects for future competitiveness. Thus, Africa must increase its participation in the global supply chain must be enhanced, and ownership of shipping fleet must be aggressively pursued and achieved in other to foster African visibility in the global shipping networks. More so, relevant shipping technologies and digitalization must be aggressively adopted to facilitate trade, increase efficiency, and reduce the cost of doing business in Africa. Investment in efficient shipping technology and digitalization is especially needed to cater for the occurrence of future disruption of maritime activities as witnessed in 2020, either at local, regional or global.

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