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Quality of Freight Mobility and Intermodal Connectivity in Sub-Saharan Africa

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Abstract: **The quality of intermodal connectivity is a measure factor that determines the ability to transport goods across the globe. This is the back bone of international trade. Supply chains are investing in a lot of research so as to optimize their total logistics cost. This can only be achieved when proper intermodal infrastructures are put in place to ensure the smooth mobility of freight. A country like China has developed so fast because it saw the importance of developing its transportation networks which boosted international trade hence leading to economic growth.**

This paper seeks to address the quality of intermodal connectivity in Africa especially in the Sub-Saharan African Region. The African continent is still lacking behind in trade and one of the principal reasons is due to poor transportation infrastructures. The paper looks at the different modes of transport with the challenges they encounter and how they can be improved. The various African government need to establish developmental policies that can help improve the different modes of transport and also to seek investments from foreign investors just like the Chinese have done.

Keywords: **Connectivity, Intermodal transport, Transport mode, Inland waterways, Infrastructures, Ports, Roads, Railways.**

1. INTRODUCTION

For decades now transportation has been one of the major back bones of any country's economic development especially in the developed countries of North America and European countries and now most Asian countries. There has been an enormous investments carried out on the various modal infrastructures especially on sea ports. This is mainly because ports serve has nodes to the various transport links. It is no secret that international trade cannot survive without transportation. Supply chains and logistics operations have become very successful in recent years due to continuous optimization of intermodal connectivity providing the best modal connections to reduce overall transport cost. Asia in the last decade has developed at a very fast rate especially China when it comes to economic development due to international trade and this has been possible because of the huge investment on the different transport infrastructures. They have constructed mega ports, good roads and rail networks and also inland waterways that have helped to enhance the movements of freights.

Since the mid-1980s, particularly subsequent to the revelation that investments in public infrastructure contributed to economic development in industrialized countries, transportation has reclaimed its place as a leading determinant of development. This suggests that a region's ability to succeed in the contemporary global economy depends largely on the effectiveness and efficiency of its transportation infrastructure. The effectiveness of a region's transportation infrastructure, including terminals, vehicles and networks, are capable of either facilitating or inhibiting trade, the movement of people, goods and services within the region and between the region and other regions.

The goal of a transport chain is to achieve overall cost efficiency and required logistics quality. The transport chain can be comprised of single modes or combinations of modes. The achievement of cost-efficiency and logistics quality is very

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much dependent upon the possibilities for a good match between demand characteristics of the material flows and the design components of the transportation system. Each transport mode has different inherent cost structures and operational characteristics. In addition, there are substantial differences between regions and countries when it comes to the usage of the different modes of transport. Some of the differences can be explained by geographical conditions, but other important facts are regulatory aspects, status of infrastructure, and occasionally technology.

Table 1: Freight transport in different regions

	FREIGHT TRANSPORT				
	EU-27	USA	JAPAN	CHINA	RUSSIA
billion tkm	2008	2007	2008	2007	2008
Road	*1 877.7*	1 922.9	346.4	1 135.5	216.3
Rail	*442.7*	2 656.6	22.3	2 379.7	2 116.2
Inland waterways	*145.3*	472.3		1 559.9	64.0
Oil pipeline	*124.1*	814.2		186.6 (5)	2 464.0
Sea (domestic / intra-EU-27)	*1 498.0*	333.0	187.5	4 868.6	85.0

Source: European Commission 2010a

When it comes to the African continent, a lot still needs to be done. The level of trade between African countries and other countries is still very low though there has been some significant improvement in the past years. Intermodal connectivity in Africa is still very poor. Roads and rail infrastructures are in a bad shape. Most African ports cannot accommodate large vessels; poor connectivity of ports to different transport modes, with a high level of congestion has made trading in Africa a little bit cumbersome. Never the less, there has been some new theoretical frameworks and policies that have been introduce by most governments that has triggered development in transport infrastructures that has shown significant improvement in the movement of goods within the African continent. This paper looks at the different modes of transport within the Sub-Saharan African Regional and the quality of its intermodal connectivity and tries to address the problems associated with it while looking at other policy implementations in countries like China.

2. A GLANCE AT INTERMODAL CONNECTIVITY IN CHINA AND IT'S ECONOMIC GROWTH

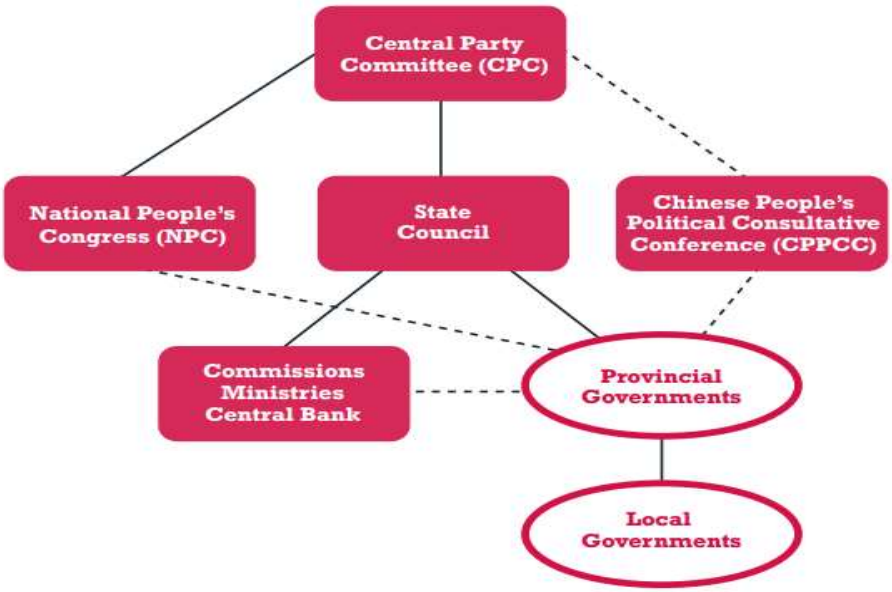
China built a transportation network in 10 years comparable to what the United States did in 50 years, and it has done so by learning lessons from more developed countries. Opening the Chinese market to foreign investment in the late 1980s and 1990s was a calculated step by the central Chinese government to speed up the process of modernizing and developing economic linkages to the rest of the world. China's rapid economic development has been reflected in the significant investment in the nation's transportation system and has devoted considerable resources that have attracted much more private investment to its transportation system. China is directing almost all of the funding into new constructions.

2.1 Transportation Planning in China

One of the reasons why China's transportation infrastructures are so developed today is because of its government policies and decision making process. With a strong centralized government and central planning authority, much of what happens in China is strongly influenced by central government policy. The Central Party Committee (CPC) is the most important participant in the broad policymaking process in China, providing leadership to the National People's Congress, State Council, and Chinese People's Political Consultative Conference. The CPC establishes national policy and often plays a critical role in making sure adopted policies are carried out. This is done primarily by having party members serve as heads of agencies (at the national level) or by having at least a party member and an administrator serve jointly as agency head (at the local level). Ministries and commissions report to the State Council. All ministries must submit an

infrastructure development plan to the National Development and Reform Commission (NDRC) for approval [1]. Infrastructure planning in China is really a combination of top-down and bottom-up processes. The national government provides its vision for national infrastructure through the development of 5-year plans. For example, it's 2006 to 2010 policies and targets relating to transportation in the 5-years plan included;

- A National policy which was aimed at supporting an economic expansion in the western provinces of China.
- Logistics for the first time was identified as a national issue, with reducing logistics cost defined as a governmental objective.
- Six new rail lines totaling 17,000 kilometers (km) (10,563 miles (mi)), six railway transportation hubs, 18 intermodal yards, 40 container handling stations, 150 intermodal substations, and 1 million km (621,371 mi) of rural roads were to be built.
- A 10 percent market share for rail intermodal traffic was established.
- All cities with more than 1 million people and 90 percent of cities with 200,000 to 1 million people were to be connected to the national road network [1].



SOURCE: Liu, Z., "Planning and Policy Coordination in China's Infrastructure Development"

Figure 1: Chinese government structure

China joined the World Trade Organization in 2001, with commitments to liberalize certain sectors of its markets. In transportation, the government established a timetable for allowing foreign investment in different sectors. For example, in December 2002, the Ministry of Communications established a policy that foreign investment can reach 75% in road transport enterprise joint ventures (that is, joint ventures relating to trucking firms, warehousing, and trucking terminals). For investments that relate to roads, bridges, and other large-scale infrastructure development, foreign investment was limited to 49%, thus maintaining government control. This is referred to as asset equitization versus asset monetization (in which the public sector gets money from selling or leasing infrastructure). Some flexibility is allowed in increasing the private share of a joint venture under special circumstances. In some cases, the Chinese government invests in infrastructure largely by itself (such as 18 freight intermodal yards). In other cases, provincial or municipal governments invest in facilities in combination with private investors. In still others, joint ventures have been formed with several partners to develop and operate a facility. In many of these investment cases, the return on investment is small, but the expectation is that future demand (for example, volumes for toll roads) will provide bigger returns later on. Thus, it becomes impossible to generalize about transportation finance in China, except to say that the Chinese take advantage of any private investment dollars they are able to secure.

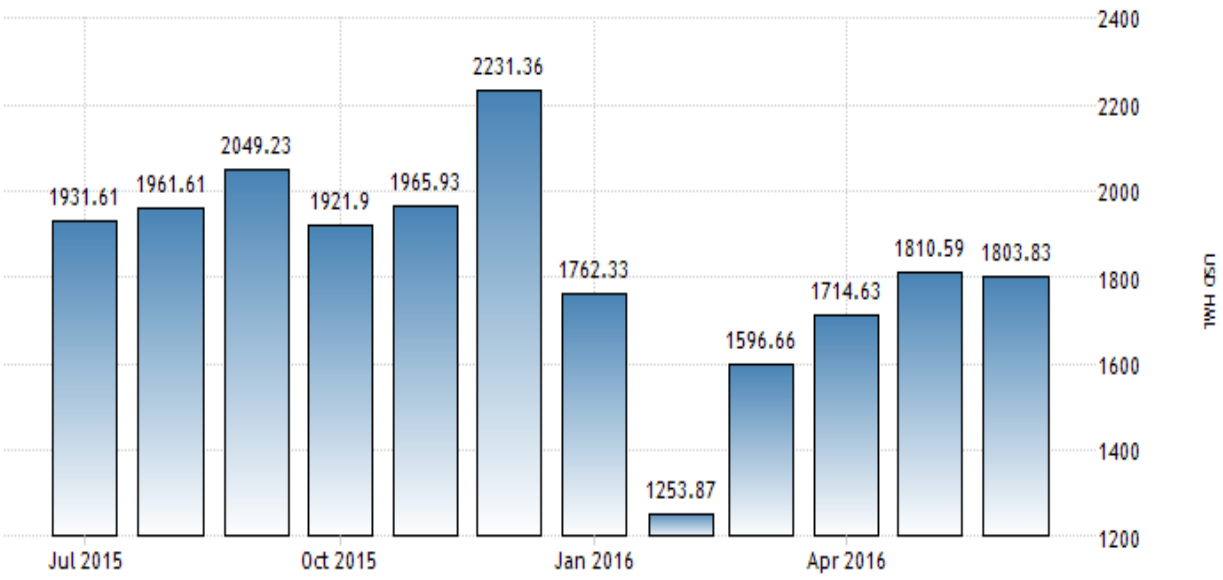
In summary, given the economic growth in China, the resources this places in the hands of the government, the governmental structure, the government's willingness to partner with private capital, private capital's interest in development opportunities, and the ability to use technological standards for roadway design and construction developed by the United States and European Union, it is not surprising to find that China has been able to expand its transportation infrastructure at such a rapid pace.

2.2 Economic Growth of China

Growth in foreign trade has been the major factor spurring Chinese economic growth. Although China is a dominant source of sea-based trade with the United States, the country has a much more diverse set of export destinations. Many in China expected this to continue in the future, with intra-Asian trade becoming more prominent for China and also with Africa.

The linkage between central planning and economic development that has important implications for the Chinese transportation system is the plan the State Council's Research and Development Center developed in early 2005 that divided China into four regions. These regions were divided into eight economic zones:

The northeast economic zone would mainly develop heavy industry, machinery, raw materials, and manufacturing, as well as become the national agriculture base.



Source: www. Trading economics.com/ General administration of customs

Figure 2: Chinese Export Statistics

The northern coastal zone would focus on high technology and manufacturing.

The eastern coastal zone would be headed by Shanghai and would be developed into a comprehensive manufacturing center, becoming the most competitive region.

The southern coastal zone would develop an outbound economy and a consumer commodity base.

The mid-Yellow River zone would be developed into a coal, energy, iron, and steel production zone.

The mid-Yangtze River zone would primarily develop planting and agriculture, with secondary emphasis on iron, steel, and automobile industries.

The southwest zone would be built into a heavy industrial, textile, and tourist zone.

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The northwest zone would mainly develop energy, farm and raise livestock, and develop the tourist industry.

An important characteristic of this economic structure is that much of China's economic production and growth originates in the coastal provinces. For example, 93% of China's exports originate in these provinces. Almost 40% of the exports originate in the Pearl River Delta region alone (the region including Hong Kong, Shenzhen, and Guangzhou), the first region opened to foreign economic development. The Yangtze River region (Shanghai) was the second region to experience substantial economic growth. Over the past 10 years, the government has attempted to spur economic growth in the northeast and northern coastal zones, and most recently it has adopted a national investment and economic policy to support economic progress in the inland western provinces [1]. This "Go West" policy has important implications to trade and logistics because goods manufactured in the western provinces will have to make their way to the ports on the coast, possibly increasing logistics costs.

Figure 3: The four economic regions of China

2.3 Transportation System of China and its Future Plans

The Chinese government had realized that investing in the transportation system is one of the country's most important investment priorities. Not only does a reliable and efficient transportation system support economic development, but it also provides mobility for an increasingly mobile Chinese population. The investment strategy in each modal network is very different, including who is involved, what type of investment is being contemplated, and the expected role each modal network is to play in the overall transportation system. Each modal network will be discussed in the following sections.

2.3.1 Highways

Out of all the various investments that have been carried out in China in the last 10 years, the largest amount has been dedicated to the nation's road network. Transportation officials and U.S. shippers pointed to overweight trucks as one of the most important challenges facing Chinese transportation agencies. Given that the trucking industry consists primarily of numerous one- to three-truck firms, many markets are highly competitive. In addition, Chinese manufacturers have the right to choose the carrier for the first move from the plant, which provides a strong incentive to load a truck as much as possible to maximize revenue. The national, provincial, and municipal governments have established enforcement programs, but the sense among transportation officials is that a large number of oversized and overweight trucks are still on the road.

Novelty Journals

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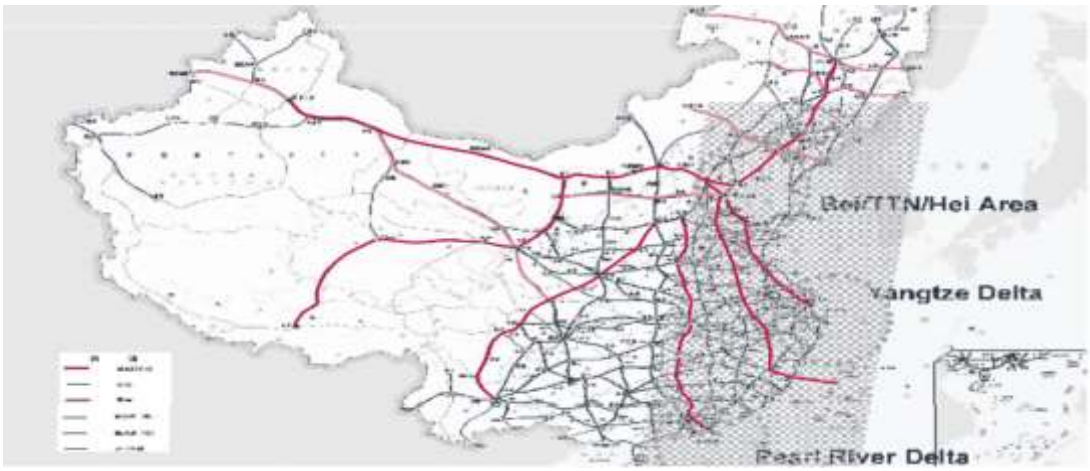

Source: HFA

Figure 4: Inter-city Express Network

2.3.2 Railway

The Chinese government also realized that, the rail network needed to be improved if it is to play an important role in international trade. Figure 5 shows the major rail lines in China. Container movements by rail face several challenges. Container movement on the rail network carries about 2.2 % of the national rail freight tonnage and 1.5% of the total container volume moved in the country. Three types of rail intermodal services are available: scheduled, unscheduled, and block trains. Scheduled and unscheduled trains have the least priority on the rail network, with military, passenger, coal, and foodstuffs coming first (the rail network is shared by freight and passenger rail services). Freight movements by rail are often unreliable and, in many markets, face stiff competition from trucking firms. Few ports have dockside rail access, so some form of intermodal transfer must occur before containers reach the port that enables them to be loaded onto a ship. Unlike many of the major road projects, private investors have not actively sought investment opportunities in the rail network. Government solicitations to participate in some of the intermodal rail yard projects, for example, did not attract much attention from the investment community.

Source: HFA

Figure 5: China's major rail network

Novelty Journals

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2.3.3 Navigable Waterways

Throughout China's history, rivers and coastal shipping routes have been major thoroughfares for commerce. The Pearl and Yangtze Rivers, in particular, have served as the commercial arteries for much of China's economic development. About 30% of the transshipments that occur in Shanghai involve barges. In the Pearl River Delta, the percentage is slightly higher. The exact percentage in the Pearl River Delta is hard to estimate because much transshipment occurs in midstream from one barge to another to avoid terminal fees. Also, some terminals have limited barge access because of capacity constraints, so barges must have a minimum of six containers to berth pier-side [1]. New river ports have been constructed in the Pearl River to cater to barge traffic, thus providing more convenient intermodal transfer although a large percentage of the transshipments occur midstream. Table 2 indicates why inland water transportation is so important for the supply chain in China. This table shows estimated costs and transit time to move a 20-foot container from Chongqing to Shanghai, a distance of 2,092 to 2,575 km (1,300 to 1,600 mi), depending on the modal network. Although barge transport takes a longer transit time than truck, it costs almost 80 percent less. For commodities that are not time sensitive, barge transportation is clearly the preferred mode on the basis of cost [4].

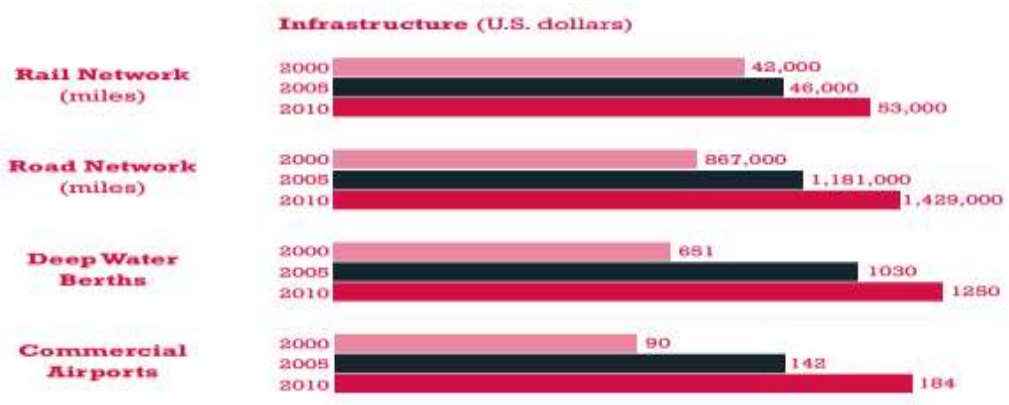
Table 2: Comparative costs and time to transport a TEU to Shanghai from Chongqing

Chongqing to Shanghai	Distance (miles)	Transit time (days)	Cost (US$ 20-ft container)
Road	1,300	3-4(40 hours)	$1,500
Rail	1,600	7-10	$540
Barge	1,500	8(11 upriver)	$315

Source: APL, Inc.

2.3.4 Ports

China has experienced an economic growth over the past two decades and it has been driven primarily by international trade. This trade could not have occurred without port capacity to handle the ever increasing flow of containers coming from mainland factories. Ten of the top 30 container ports are located in China, as are three of the top four being Hong Kong, Shenzhen, and Shanghai. Shanghai port, in particular, plays a significant role both in the Chinese economy and the global market. Shanghai Yangshan deep sea port is an example of the type of investment the Chinese are making in port infrastructure. The first two phases of the US$14.5 billion Yangshan deep-sea port has been operational for some few years now, with a 2020 target year for achieving the full capacity of the port (33 to 50 deep-sea berths) at 25 million TEUs per year. The port is located about 32 km (20 miles) offshore and is connected to the mainland by a highway bridge and there is no direct rail connection to the port, although there is a new intermodal rail yard on the mainland near the bridge gateway. One of the most impressive aspects of the Yangshan Port, and indeed other Chinese ports, is its operational productivity. The terminal can handle 35 TEU operations per hour per crane, with a daily throughput record of 23,044 TEUs. The terminal is open 7 days a week, 365 days a year. The terminal operator commits to loading and unloading a barge within 5 hours and a vessel within 20 hours, and it has a posted truck turn time of a maximum 30 minutes. Some ports can use seven cranes per vessel in the loading and unloading process, greatly speeding up the vessel turnaround time. The Yangshan Port has not only created a modern facility to export goods to the world, but it has also spurred local growth [1].



Source: APL, Inc.

Figure 6: Average annual total investment in Chinese transportation infrastructure (US$).

Novelty Journals

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3. AFRICA'S TRANSPORT SYSTEMS

3.1. A brief historical introduction

The relationship between transportation and economic development has always been contentious. Colonial authorities in Africa believed that investments in transport infrastructure led invariably to economic development. This explains the preoccupation of these authorities with road- and railway-building projects throughout the continent. Colonial authorities were informed by regional and industrial development theories, which assigned a critical role to transport costs. At the time, transport costs were viewed as a leading determinant of the location of economic activity [5]. Since the mid-1980s, particularly subsequent to the revelation that, investment in public infrastructure contributed to economic development in industrialized countries [6], transportation has reclaimed its place as a leading determinant of development [7]. This therefore suggests that a country's ability to succeed in a global economy will greatly depend on the efficiency and effectiveness of its transportation infrastructure. Hence, the effectiveness of a country's transportation infrastructure, including terminals, vehicles and networks are either going to inhibit or facilitate trade, movement of people, goods and services with the country and other countries. Africa's transportation infrastructures are incapable of improving the continent's position within the global economic system. Africa lacks the quality and quantity of transport infrastructure necessary to connect it to the global arteries of commerce and industry [5].

By the time the first European explorers arrived Africa in the 1400s, Africans had domesticated some animals to help address the growing need of moving people, goods and services over land. At the same time, a number of innovations, such as the construction of rafts and canoes capable of providing water-based transportation services, had been made. Thus, the transport infrastructure in Africa at the time consisted largely, but not exclusively, of tracks for pedestrian and animal traffic, and natural navigable waterways. Some evidence suggests that a number of the ancient empires and city – states of the region had developed a system of well-aligned roads and streets, as opposed to meandering footpaths [8]. This extensive series of roads, footpaths and waterways later served to facilitate the transportation of slaves during the infamous trans-Atlantic slave trade era. The colonial authorities were interested in penetrating the hinterland primarily to extract and transport raw materials to the seaports for onward shipment to the colonial master's nations. Rail transportation presented itself as the optimal means of accomplishing this objective as well as that of militarily defending the colonial territory. For one thing, the cost of developing the rail transportation facilities was far less than that associated with developing road transportation infrastructure. For another thing, it was easier and cheaper to freight heavy and/or bulky goods by rail than by road [5]. A significant portion of investments in transportation during the colonial era also went to the development of seaports. Seaports were extremely important in efforts to evacuate resources from the colonial territories and export them to the colonial master's nations. This explains the fact that sea ports constitute the terminuses for all the railways that were constructed during this period. Colonial efforts to develop railways and other transportation infrastructures made hardly any attempt to link the colonies. Rather, conscious efforts were made to discourage interactions among the colonies. This was particularly true when two colonial territories were under the colonial auspices of different colonial powers. It is noteworthy that the heydays of European colonialism in Africa coincided with a period when there was extreme rivalry, and sometimes, severe animosity amongst European countries [5].

3.2 Africa's trade and its Policies

If one looks at the factors influencing transport costs, one major element is Africa's extensive infrastructure deficit. The 2009 World Bank report [10] concludes that poor transport infrastructure, including inefficient functioning of ports, represents a major bottleneck to sustainable growth.

Seaborne transshipment is the main mode of transport for international trade, accounting for about 80% of the total global volume. The maritime nexus is particularly important for African countries that specialize in low-value goods, which are rarely transported by air. Improving logistics to reduce trade costs is thus essential for African countries to improve their competitiveness, and since the bulk of African trade is extra-continental and transits through ports, maritime costs are crucial. Improving efficiency in ports is one way to reduce these costs. Because of the importance of connectivity in the trade logistics supply chain, overall trade costs are largely determined by the weakest link in the chain. This fact is acknowledged by the African Development Bank in its selection of projects in the transport sector. Good connectivity to the hinterland is recognized as a major factor in port development; it contributes to reducing freight costs, and boosts trade and economic growth [9].

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Currently, 30% of Africa's trade is with Asia, which has become as important as its traditional trading partners, the European Union (EU) and the United States (US). The volume of trade between Africa and China has grown, exceeding US$100 billion in 2008. This was an increase of around 45% since 2007 and a tenfold increase since 2001. The share of manufactured goods in developing countries' merchandise trade has increased from 20% to 80% over the past two decades [9]. It is these goods that are largely shipped in containers and which require state-of-the-art port infrastructure. Given that most Asian countries especially China imports raw materials and exports manufactures, which is an opposite trade pattern to African countries, complementarities between the two regions are great and the scope for an expansion of trade is strong. Intra-African trade has also grown, but at a slower pace, for a number of reasons. Among them, the lack of complementarities between African countries is well-known. Trade barriers other than tariffs, such as rules of origin that accompany Free Trade Areas (FTAs), as well as a host of behind-the border measures may also act as obstacles to the free flow of goods. A low level of hinterland and interregional trade is one factor underlying the poor level of investments (including maintenance) in infrastructures like ports, roads and railroads, which carry high fixed costs. The poor condition of most of the infrastructure results in high rehabilitation costs. Moreover, the substandard state of the infrastructure network results in delays, the slow movement of goods, and high maintenance costs.

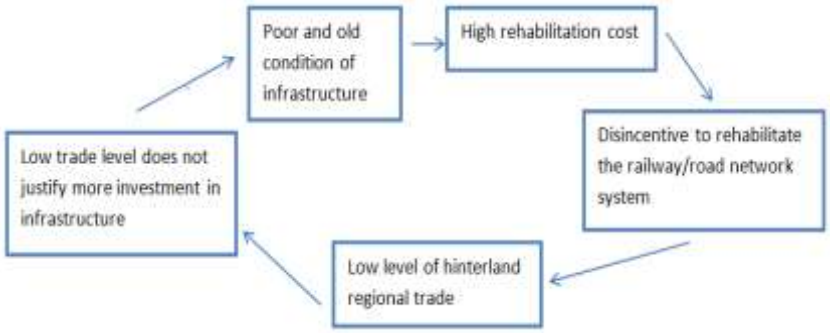
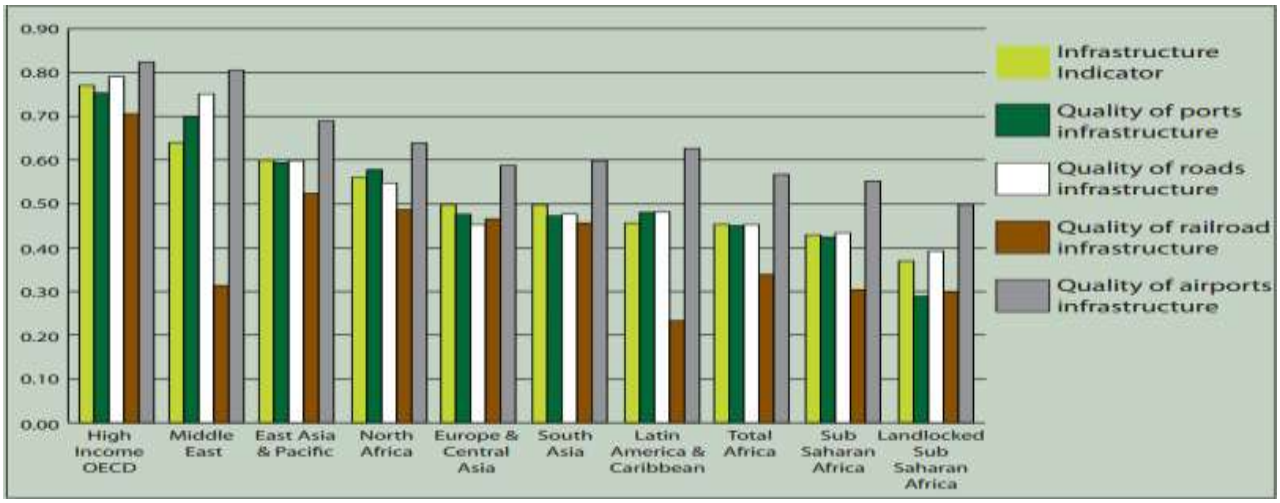


Figure 7: The vicious circle of African infrastructure network

The standard reform package for the infrastructure sectors, calls for market restructuring through divestiture, increased private sector involvement and the establishment of independent regulators. This package has been applied in several African countries to the port subsector as well as to the other infrastructure subsectors such as utilities, water, roads, railroads, and airports. The expected results from implementing this package of reforms are enhanced competition and increased efficiency. However, as shown in Figure 8, Africa still lags behind other regions in terms of efficiency indicators for the trade logistics chain (ports, roads, railroads, and airports). The regional averages in Figure 8 ranked in descending order indicate a strong correlation across regions for each indicator. While North Africa ranks fourth, close behind the East Asia and Pacific region, Africa as a region ranks last, particularly for the landlocked countries in Sub-Saharan Africa (SSA) [9].



Source: Portugal-Perez and Wilson (2009, table 2)

Figure 8: Quality of infrastructure across regions

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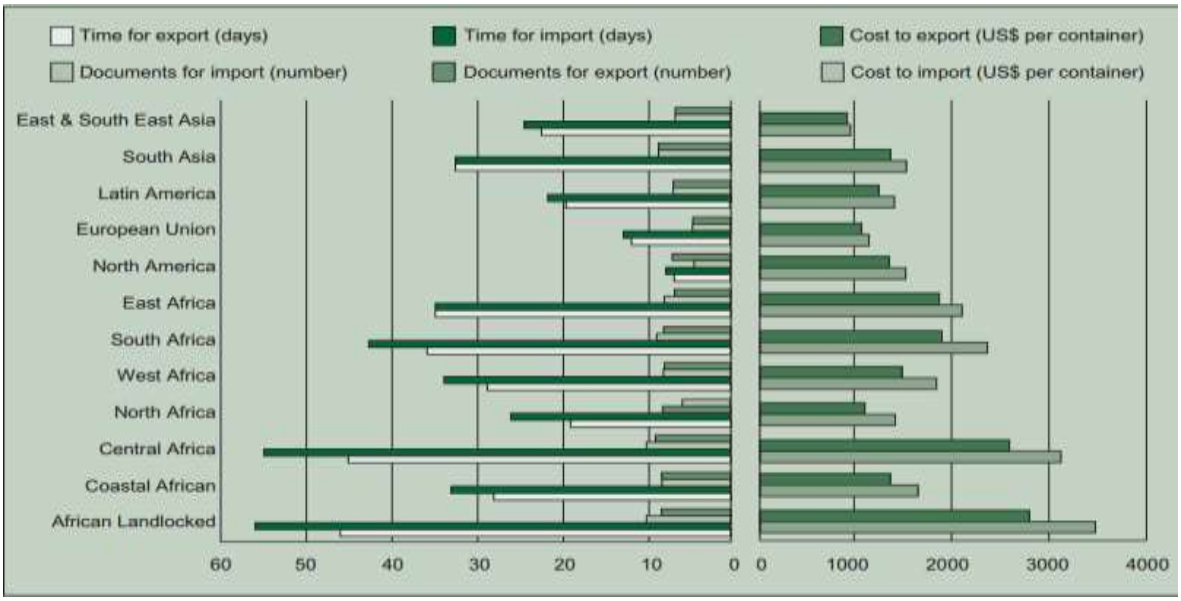
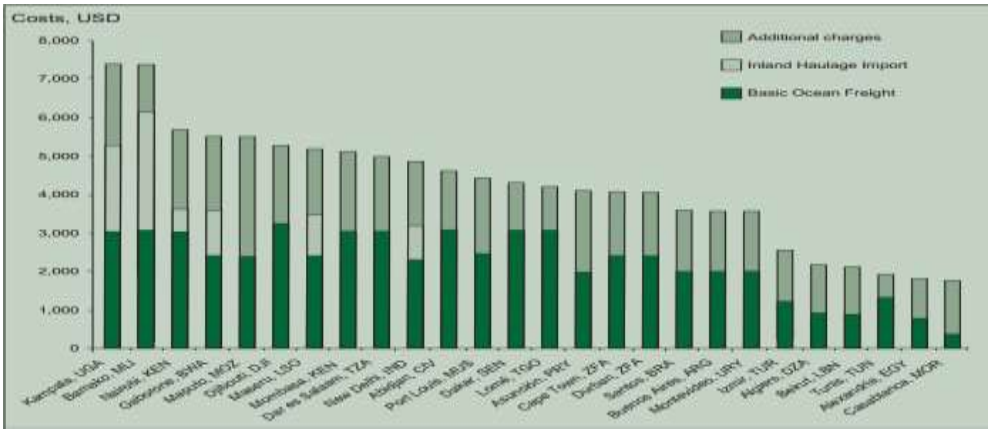
A similar pattern emerges from Figure 9, which shows that in 2008, North Africa was the best performing sub-region in the continent for cross-border trade fluidity indicators. For example, in Morocco in 2008 it took about 14 days for exports to clear customs procedures and 19 days for imports, compared to the Central African Republic's record of 57 days for exports and 66 days for imports. However, more recent data indicate that in 2008–2009, 14 Sub-Saharan African countries were rated as "most active" in the World Bank's global Doing Business league for cross-border trade policy reforms. This was in part due to enhanced donor support for aid-for-trade initiatives [10].The report gives many examples of improvements as a result of institutional reforms. For example, Ghana, Mozambique and Uganda reduced average processing time through customs from several weeks to only a few days and North African countries are making serious efforts to reform their customs systems in conformity with the Kyoto Convention and the agreements on international transport.



Source: Time, number of documents, and costs computed from World Bank Doing Business data (2008)

Figure 9: Cross-border trade fluidity indicators, per TEU container

Africa is the continent with the highest concentration of Landlocked Developing Countries (LLDCs), 15 in total. All estimates show significantly higher trade costs for LLDCs. Estimates for a standard 20-ft container show that the median landlocked country's transport costs are 46% higher than the equivalent costs for a median coastal economy. Moreover, distance explains only 10% of the change in the transport costs between coastal and landlocked countries. Poor road infrastructure represents 40% of the transport costs for coastal countries and 60% for landlocked countries. These estimates are collaborated with freight charges from different global countries to Rotterdam as posted by Maersk, a global shipper on their website in 2008.



Source: Maersk. Transport costs corresponding to July 2008

Figure 10: Transport costs from selected cities to a European port (Rotterdam)

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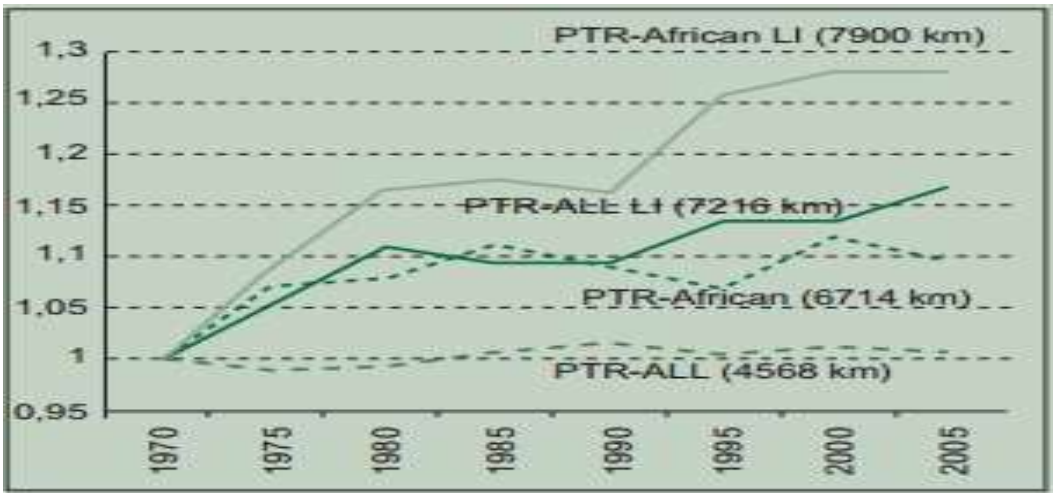
3.3 The Gravity Model

The gravity model is the preferred approach for analyzing the volume of trade and is especially suitable for trade costs and the efficiency of trade ports. In essence, the gravity model predicts that the volume of trade between two countries i and j is proportional to the size of those countries' GDPs and inversely proportional to the trade costs (TC) between the two countries:

$$T_{ij} = \frac{(GDP_i)(GDP_j)}{tc_{ij}} \approx \frac{(GDP_i)(GDP_j)}{\overline{DIST}_{ij}}$$

Where trade costs are usually proxied by the bilateral distance (DIST), (relative to the average distance across all trading partners) between the trading partners. The gravity model predicts that a relative fall in border related costs (as happened under the current wave of globalization that has reduced communication and transport costs, and barriers to trade imposed by governments) should lead countries to increase the volume of international trade relative to internal trade. This prediction is largely borne out by the data: since 1980, world production has increased by 75% while international trade has increased by 300 % [14]. The gravity model also predicts that a reduction in all costs related to distance (including better information about distant markets) will lead countries to increase their volume of trade with distant partners. Conversely, if the relative costs associated with distance increase, countries will shift their trade toward closer partners. Moreover, the model predicts that the patterns of bilateral trade will depend on the evolution of trade costs between the partners relative to the evolution of all trade costs. Consequently, an all-round decrease in trade costs will not necessarily lead to an increase in bilateral trade for all countries if the trade costs between groups of countries (for example, African countries) are falling less rapidly than elsewhere. Figure 12 tests this prediction by computing the evolution of the Potential Trade Ratio (PTR), that is, the average distance of trade that would be observed in a frictionless world according to the gravity model divided by the actual average distance of trade. If the gravity model is an approximate description of the determinants of aggregate bilateral trade, an increase in this ratio is then an indirect indicator that the average costs of trade is rising. As expected, Figure 11 shows that for the low income (LI) group of countries (the 40 countries with the lowest per capita income), the bulk of their trade is with more distant partners. This is especially the case for the LI African group, whose average distance of partners was almost twice that of the entire sample of countries in 1970 (7,900 km vs. 4,568 km). Since potential trade, as predicted by the gravity model, has not increased significantly for the LI countries (the effect of the increasing weights of relatively close Asian partners is small), the rising PTR for these countries -especially African LI countries - means that bilateral trade is taking place with geographically closer partners. According to the gravity model, this is an indication of increasing trade costs in relative terms. Since the PTR is constant for the whole sample, this means that it has been decreasing for high-income countries, as one would expect of falling trade costs under globalization. For African countries, the average distance of trade fell approximately 25% over the period [9].



Source: Adapted from Carrère et al. (2009)

Figure: 11

Novelty Journals

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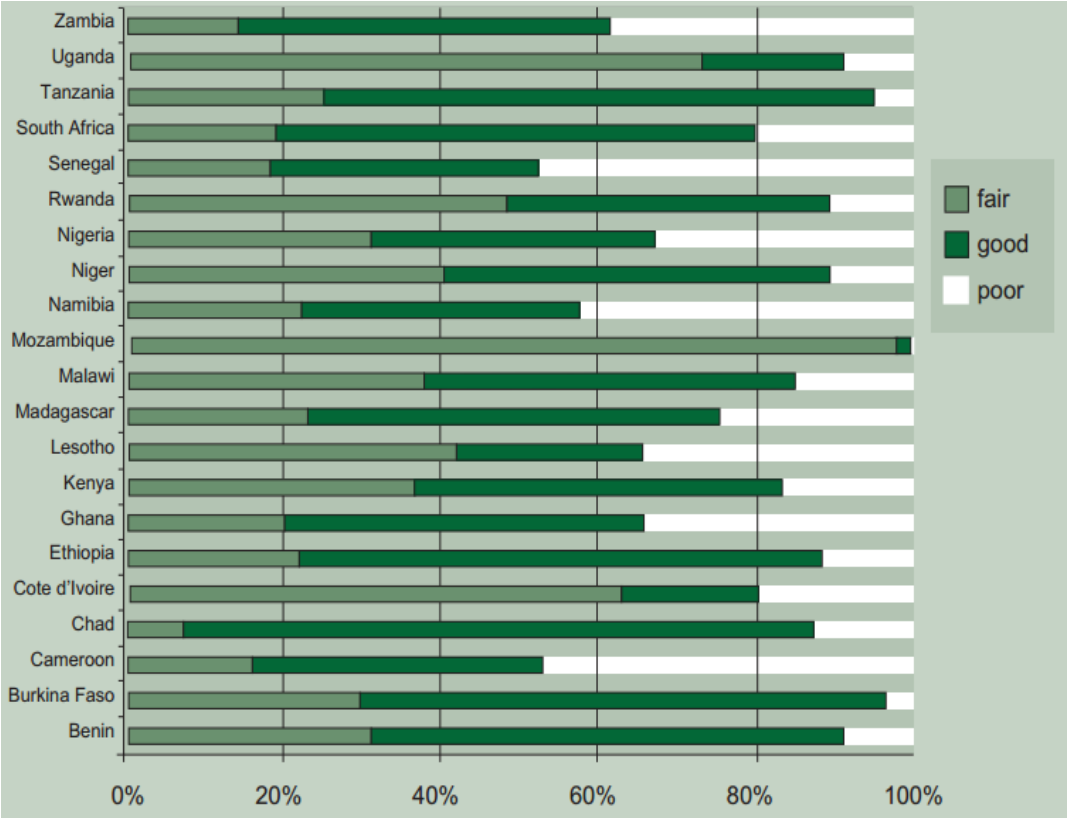
Vol. 3, Issue 4, pp: (108-130), Month: July – August 2016, Available at: www.noveltyjournals.com

3.4 Quality of Intermodal Connectivity in Africa.

The transportation of goods involves several modes of transport to connect producers and consumers in Africa to foreign markets. Ports are the main nexus for the bulk of African international trade. To connect ports to the markets, there are three principal modes of transport: roads, railroads, and inland waterways. All three demonstrate low network densities, mirroring the low population density across the continent. In this respect, Africa fares worse than low-income countries in other global regions. The substandard state of the road and railroad networks results in delays, the slow movement of goods, and to high maintenance costs for the rolling stock on the railroads, and the trucks on the road. All of these characteristics contribute to high trade costs, which in turn lead to a low volume of trade and low per capita income. Yet, in a number of countries, the asset value of the road network exceeds 30 percent of GDP and road density is high relative to the continent's income and hence its ability to pay for maintenance [10].

3.4.1 Roads

Roads are the predominant mode for freight and passenger transport in Africa and there are the main connections between the other modes of transport. According to recent estimates (see Figure 12), 80% of the main road network is in good or fair condition and the current value of the national road network is at least 70% of its potential [10].



Source: AICD Database (World Bank, 2009)

Figure 12: Condition of the African road network

The main trunk network, which is comprised of trading corridors that link seaports to the hinterland, only includes 10,000 km of road. According to estimates for a Trans-African Highway (TAH), between 60,000 and 100,000 km of new roads are required to provide intra-continental connectivity. This would cost about US$ 47 billion over 15 years with estimated benefits of about US$ 250 billion [9]. Buys et al. (2006) investigate the potential trade benefits of investing in upgrading and maintaining this TAH network. The proposed network would link 83 major cities with a length of about 100,000 km. Buys et al. estimate that intra-African trade, as a whole, can be expected to increase from US$ 10 billion to about US$ 30 billion per year, while initial investments and annual maintenance costs would be relatively moderate over the course of the investment cycle. For instance, an upgrade of the road from Bangui in the Central African Republic to Kisangani in Congo DR is expected to increase the volume of trade by 7.9% [9].

Novelty Journals

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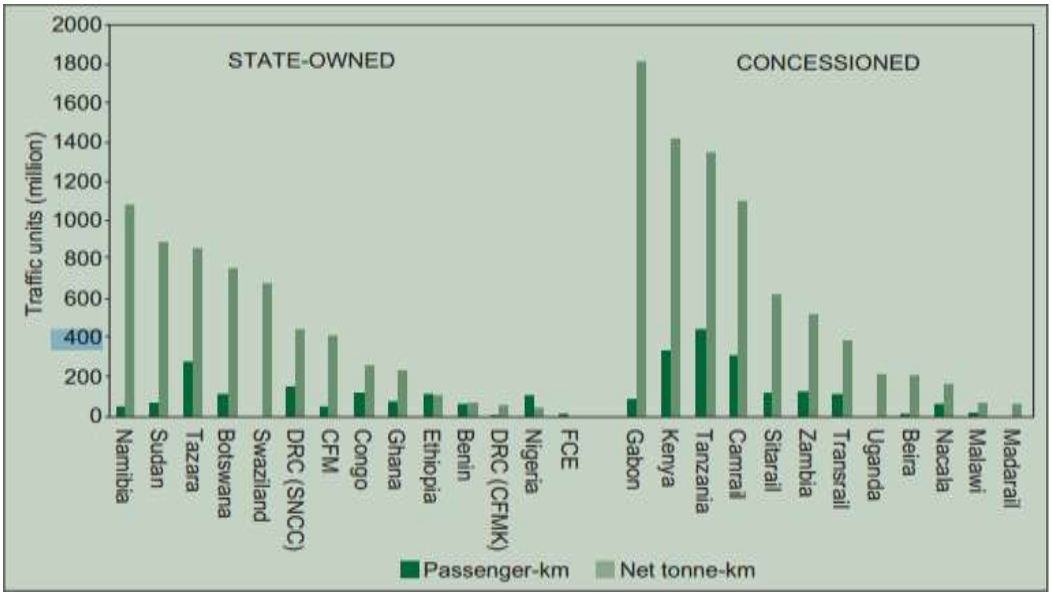
Vol. 3, Issue 4, pp: (108-130), Month: July – August 2016, Available at: www.noveltyjournals.com

Source: nTIC Africa

Figure 13: Road network in Africa

3.4.2 Railways

There are approximately 89,000 km of railroads in Africa. These are usually single lines going inland from coastal seaports, with few rail interconnections. The railroad networks in Africa are historically linked to ports, as they were originally built between seaports and mining sites. For this reason they were usually state-owned, or developed and owned by mining companies. Even though concessioning has met with some success and has increased traffic volumes (see Figure 14) as well as labor productivity, railroads remain poorly developed across the continent.



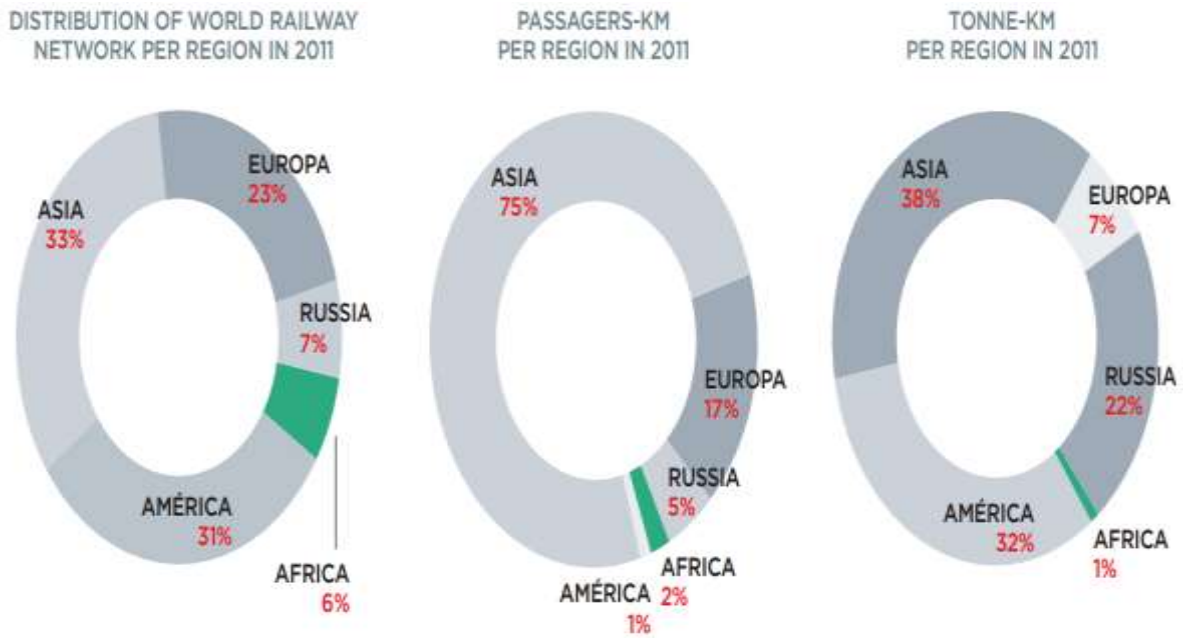
Source: AICD database (World Bank, 2009)

Figure 14: Railroad traffic volumes

Some few African railroads (apart from the network in East Africa and the network extending North in South Africa) traverse international borders. Almost all carry passenger traffic on end-to-end traffic. The level and quality of the railroad infrastructure are very weak. Without financing asset renewal and rehabilitation, competition from road networks will jeopardize the survival of railroad networks for passenger traffic and general cargo. The railway network in Africa lacks density and still has a massive potential to be realized in terms of productivity, which can only be harnessed through clear and energetic public action. There are many positive signs despite this situation: railways are going through a revival across the world, evidenced by the large number of major, pivotal projects either being planned or underway. Africa is very much part of this new lease of life for railways, and has much to gain from the undeniable advantages railway technology can offer. Statistics from the past years clearly show that there has been no notable growth in railway traffic in the region. As a result, the overall volume carried by rail is still around 200 billion unit-km, of which 30% is passenger and 70% freight. This volume accounts for only 2% of global railway traffic, placing Africa last in terms of performance for this indicator [16]. This low level of traffic and quasi-stagnant structural development in both passenger and freight are a symptom of the railways struggling to take up and fulfil the role they should be playing in the social and economic development of the continent.

Freight and logistics in 2011 reached approximately 140 billion tone-km, revealing a small reduction of 2% in relation to 2006 and amounting to 7% of the global total. Countries such as Russia and China alone produce about 4700 billion tone-km [16]. It should nonetheless be realized that this somewhat weak performance cannot be applied to all railway networks in Africa. In North and South Africa, traffic figures have made significant progress thanks to the effort and money invested in improving the product offering and adapting to customer expectations, as well as meeting business needs. What can be said overall is that railways have still not managed to tap into spectacular economic growth in Africa over the past decade and have not yet managed to carve themselves a significant place on the international stage.

Although railways have a distinct competitive edge over other modes of transport, railway volumes in Africa are still lagging behind those found on networks elsewhere in the world. Freight traffic in Africa accounts for only 7% of the global total, and for passenger traffic this share falls to 2%. This situation is testimony to the difficulties faced by rail in winning its share of the transport market and in turn in acting as an engine for development. Surveys of the situation all point to the fact that existing infrastructure and transport services still have a long way to go before reaching what is required for making socioeconomic development and continental integration a reality.



Source: International Union of Railways

Figure: 15

Novelty Journals

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Source: nTIC Africa

Figure 16: Railroad network in Africa

3.4.3 Seaports

It is generally recognized that the African continent lacks natural ports, while its artificial seaports have been poorly developed [17]. African ports became more congested following the rise in GDP growth and levels of global trade witnessed in most African countries in the years leading up to the global financial crisis of 2008. Over the last decade, the amount of cargo transiting through Africa's ports has tripled, but containerization is still low and the inland transportation linkages remain weak [10]. Governments are now demonstrating the political will necessary to confront this challenge, in a drive to improve port and other infrastructure. For example, several ports have introduced, or renovated, container and cargo transshipment and bulk terminal (for coal, oil, food and mineral) facilities. This has greatly improved port performance and efficiency. Improvements in port logistics and, more generally, infrastructure, are urgently needed. However, port development in its broadest sense covers not only the development of infrastructure and superstructure, but also environmental concerns. Africa has some 40,000 km of coastline, extending over 32 countries. Port development and activities should not have a harmful environmental impact on land, nor lead to a deterioration in the marine environment through pollution. Ports are categorized based on their functions and the type of goods they handle, e.g. general cargo ports, hub ports, feeder ports, bulk ports, transshipment terminals, dedicated oil terminals, and river ports. African ports often work beyond their capacity limits. Indeed, capacity shortfalls are reported for all Sub-Saharan maritime trading areas. This is partly due to the fact that demand for resources such as oil -which have also led to growing economic activity - have scaled up the demands being placed on ports. However, port capacity and port logistics have not kept up with increasing traffic across most of Africa, causing severe challenges such as congestion. This congestion is attributable to several factors, including deficient physical infrastructure, malfunctioning regulatory systems, and poor management. These factors translate into poor port efficiency, raising trade costs in Africa. The growth in global trade over the past decade, together with increasing containerization and an improved policy framework in Africa have boosted demand for African port capacity. With 80% of the volume of world trade carried by maritime vessels, the importance of ports in the

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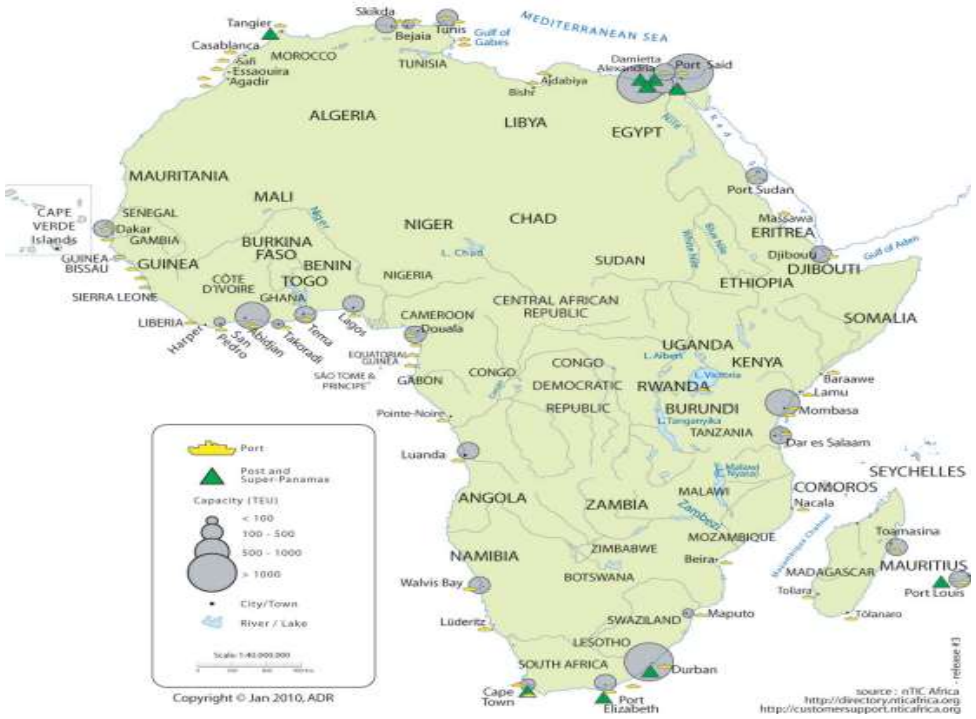
logistics supply chain is paramount. However, trade imbalances, congestion, low productivity/efficiency, and low connectivity to other regions impede Africa's full integration into the world trading system.



Source: nTIC Africa

Figure 17: African ports and their characteristics

3.4.4 Inland Waterways

There are a few inland waterways in SSA and the few that are available are not really utilized as a suitable mode of transport. However, this mode of transport offers an alternative for landlocked countries in terms of the transit of primary products. This is an inexpensive, environmentally friendly and energy-efficient form of transport, particularly for the 29 African countries with navigable waterways. However, this mode of transport in Africa is in decline [10].

The main African inland waterways comprise of four rivers (Nile, Congo, Niger, and Zambezi Rivers) and three lakes (Victoria, Tanganyika, and Malawi). In East and South Africa, lakes Victoria, Tanganyika, and Malawi used to be crucial for transit and intraregional trade. Lake Victoria was of particular importance, offering services that formed part of the railroad system, linking the rail heads at the inland ports of Kisumu (Kenya), Bell (Uganda), and Mwanza (Tanzania). In Kenya and Uganda, lake operations were concessioned together with the railroad system, while in Tanzania lake services were separated from the railroads. On Lake Victoria, only one service is currently operating and some of the railroad track linking to the ports is in poor condition.

The renewed interest in this mode of transport in Southern Africa led to the redevelopment of the Shire–Zambezi Waterway Project, which was adopted as a priority project by both the SADC and COMESA. The overall objective of the project is to develop a waterway at the heart of regional transport corridors, to foster regional integration and open up new outlets to the sea for SADC countries.

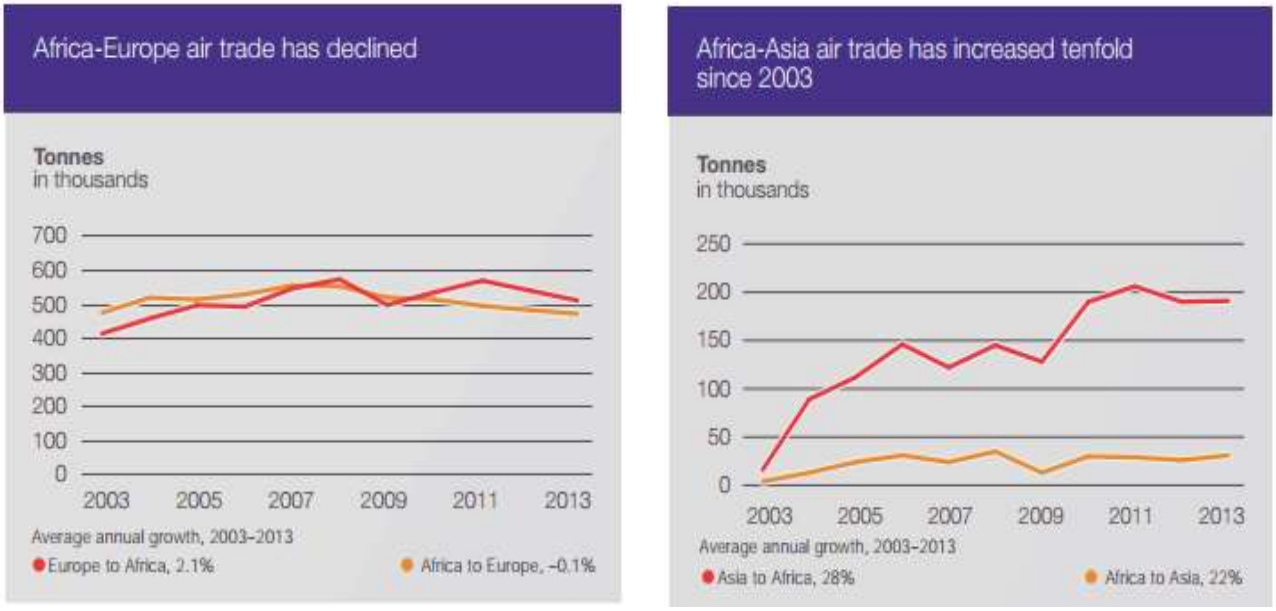
A comparable situation prevails in West and Central Africa, where the Congo basin has a navigable network of 12,000 km, covering nearly 4 million sq. km across nine countries. In principle, this could be a very valuable resource in a multimodal transport network. To tackle this missed potential, the Executive Secretary of CEMAC took action in 2005 and invited the Cameroon, Congo, DRC, and CAR governments to establish the Commission Internationale du Bassin Congo-Oubangui-Sangha (CICOS) with the aim of improving the physical and regulatory arrangements for inland navigation. With sufficient trust and supranational delegation of authority, and drawing on the example of the Shire–Zambezi Waterway Project, this cooperative effort could prove to be successful [9].

3.4.5 Air Transport

Africa is the smallest region when it comes to air services in the world, reflecting its low income and lack of air transport infrastructure. It accounted for only 4.1% of total world passenger traffic in 2002 and just 1.6% of the world air cargo traffic. Moreover, the use of air services is very concentrated within Africa. The 10 biggest national markets account for 70% of the total number of passengers travelling by air in the region and 90% of cargo flights. However, aviation is the main transport mode in international flows in the continent and its importance relative to other modes of transport is increasing. The use of air transport expanded by 7.2% a year on average during the 1990s, compared to a rise of 4.4% per annum in the use of road transport [21].

Air cargo traffic carried to and from Africa totaled 1 million metric tones in 2002 (up 1.8% on the previous year), the lowest among the world regions, accounting for only 1.6% of the world total [22]. Air trade among African countries was estimated at 66 thousand tones in 2001, only 6.4% of the overall African cargo market [23]. The low level, both in absolute and relative terms, of the intra-Africa cargo traffic illustrates an underdeveloped intra-regional trade pattern and deficiencies in air infrastructure.

Western and Eastern Africa are the sub-regions that recorded the highest number of international cargo flights in 2001 (including inter-continental flights and flights between sub-regions in Africa), with their combined traffic flows accounting for nearly 60% of the African total. Flights between countries in a sub-region are excluded from these data, which significantly lowers the figure for Southern Africa. Compared to the international market, the intra-regional cargo market (including flights within a country and between countries in a sub-region) saw little activity in 2001, with most of it concentrated in Central Africa. This is a direct consequence of the landlocked geography of this region that precludes the use of maritime transport - the most common means used for freight transport [21].



Source: Boeing (2013)

Figure 18: Average annual air trade growth

3.5 Transit and Trade Corridors in Africa

A corridor is the geographical concentration of transport infrastructures and transit activities between two or more economic centers, linking them to one another and to international markets Ports are one of the gateway nodes on corridors, as they constitute a direct link to external markets. The trade corridor is one of the approaches to enhance intermodal connectivity and most of the transport sector strategy in Africa is based on the development of transport corridors.

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Vol. 3, Issue 4, pp: (108-130), Month: July – August 2016, Available at: www.noveltyjournals.com

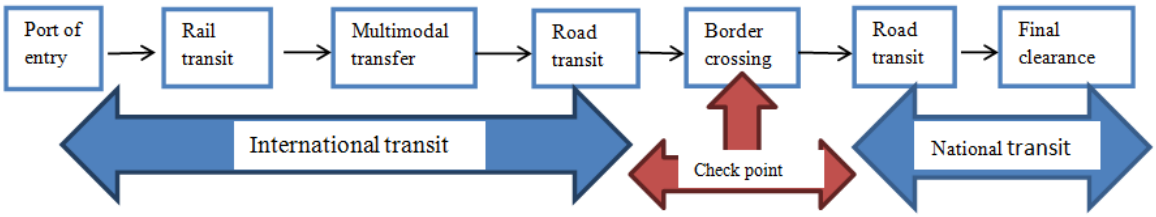

Figure 19: Transit of freight through a Corridor

There are five major transport corridors in Africa and there are:

- Africa-wide: The Trans-Africa Highway (TAH) project;
- West Africa: The Abidjan–Lagos and the Bamako–Ouagadougou–Lomé Corridors;
- Central Africa: The CEMAC Corridor;
- East Africa: the Northern Corridor;
- Southern Africa: the North–South Corridor, the Maputo Corridor, and the Wallis Bay Corridors.

Regional corridors are vital for Africa's landlocked countries, as they provide them with access to the sea and to export markets; but benefits from transit traffic through corridors can be as substantial for coastal countries. For example, in Kenya in 1990, transit traffic yielded a net value added of US$ 53 million, while Tanzania could increase its annual foreign exchange earnings by 12–18% if it were to improve the management of its transit traffic system. All corridors face the same kind of barriers to transit: long transport delays, high costs, poor infrastructure level, and a lack of institutional harmonization between the countries involved. The users along the corridor may also be subject to extortion along the multiple roadblocks and checkpoints. Table 4 indicates the large number of checkpoints on selected road corridors in West Africa. The Lagos–Abidjan highway, in particular, has a very high number of checkpoints (7 per 100 km)[9].

Table 3: Corridors linking landlocked countries (LLCs) and ports

	Regional Corridors			
	West Africa	**Central Africa**	**East Africa**	**Southern Africa**
Main ports of entry	Abidjan, Tema, Lomé, Cotonou, Dakar	Douala	Mombasa, Dar-es-Salaam	Durban, Maputo, Bera, Dar-es-Salaam
LLC served	Mali, Burkina Faso, Niger	Chad, CAR	Uganda, Rwanda, Burundi, East of DRC	Botswana, Malawi, Zambia, Zimbabwe, South of DRC

Source: Teravaninthorn and Raballand (2009).

Table 4: Checkpoints on selected road corridors in West Africa

Highways	Distance (km)	No. of Checkpoints	Checkpoints per 100 km
Lagos–Abidjan	992	69	7
Cotonou–Niamey	1,036	34	3
Lomé–Ouagadougou	989	34	4
Accra–Ouagadougou	972	15	2
Abidjan–Ouagadougou	1,122	37	3
Niamey–Ouagadougou	529	20	4

Source: ECOWAS Official Site (2003)

3.5.1 Trans-Africa Highway (TAH)

The Trans-Africa Highway is the most ambitious road program in Africa. It was formulated in the early 1970s by the African Union (AU), the African Development Bank (AfDB), United Nations Economic Commission for Africa (ECA), and Africa's Regional Economic Communities. Its aim was to establish a network of all-weather roads of good quality which would:

(a) As much as possible provide direct road links between capitals of the continent;

(b) Contribute to the political, economic, and social integration and cohesion of Africa;

(c) Ensure road transport facilities between important areas of production and consumption.

The Trans-Africa Highway network is conceived of as nine interlinked highways with a total length of 56,683 km.

TAH 1: Cairo–Dakar Highway: 8,636 km. TAH 1 joins with TAH 7 to form an additional north–south route around the western extremity of the continent.

TAH 2: Algiers–Lagos Highway: 4,504 km.

TAH 3: Tripoli–Windhoek–(Cape Town) Highway, 10,808 km. This route has the greatest number of missing links and requires the greatest amount of new construction.

TAH 4: Cairo–Gaborone–(Pretoria/Cape Town) Highway, 10,228 km.

TAH 5: Dakar–Ndjamena Highway: 4,496 km. Also known as the Trans-Sahelian Highway, this links West African countries of the Sahel.

TAH 6: Ndjamena–Djibouti Highway: 4,219 km: contiguous with TAH 5, continuing through the eastern Sahelian region to the Indian Ocean port of Djibouti.

TAH 7: Dakar–Lagos Highway: 4,010 km. This highway joins with TAH 1 to form an additional north–south route around the western extremity of the continent.

TAH 8: Lagos–Mombasa Highway: 6,259 km.

TAH 9: Beira–Lobito Highway: 3,523 km [20].

3.5.2 West African Transport Corridors

The West African Transport Corridors link six coastal countries (Ghana, Benin, Côte d'Ivoire, Senegal, Guinea, and Togo) and three LLCs (Burkina Faso, Mali, and Niger). The landlocked countries of West Africa have traditionally been dependent on the ports to their south. According to the Web Atlas on Regional Integration in West Africa, 14 between 1999 and 2003, transport operations to and from Mali, Burkina Faso, and Niger rose by nearly 70%, from 2.0 to 3.4 million tonnes of goods, which represents approximately 7.5% of total traffic at the ports of Dakar, Abidjan, Takoradi, Tema, Lomé, and Cotonou. These transactions consisted principally of imports of consumer products and exports of agricultural products (mainly cotton) [9].

3.5.3 The CEMAC Transport Corridor

The CEMAC Transport Corridor links all the CEMAC country members: Cameroon, Central African Republic (CAR), Chad, the Republic of Congo, Equatorial Guinea, and Gabon. A Trade and Transport Facilitation Program was adopted in March 2006 by the CEMAC member states. It is aimed at implementing a regional institutional framework; harmonizing national regulations; fostering customs interconnectivity and information technology systems within the region; and implementing a pilot trade and transport facilitation project on the N'Djamina-Douala (about 1,850 km) and Bangui-Douala (about 1,450 km) surface transport corridors.

The major international trade routes in the CEMAC area consist mostly of the N'Djamina-Douala and the Bangui-Douala corridors, which link the port of Douala by road or by a combination of rail and road to landlocked CAR and Chad. Alternative corridors carry only limited traffic. Some of the road sections are currently being rehabilitated by other development partners (EC, Arab donors, France, Japan, etc.). However, the committed funding remains insufficient to secure an all-weather road network between the main CEMAC trade centers, which was one of the stated objectives of the "Réseau Intégrateur CEMAC 2000"[9]

3.5.4 The Northern Corridor

The Northern Corridor is the transport corridor linking the Great Lakes countries of Burundi, DRC, Rwanda and Uganda to the Kenyan seaport of Mombasa. The corridor also serves Northern Tanzania, Southern Sudan, and Ethiopia. The Northern Corridor is administered by the Northern Corridor Transit Transport Coordination Authority (NCTTCA), created in the mid-1980s, following the signing of the Northern Corridor Transit Agreement by Burundi, Kenya, Rwanda,

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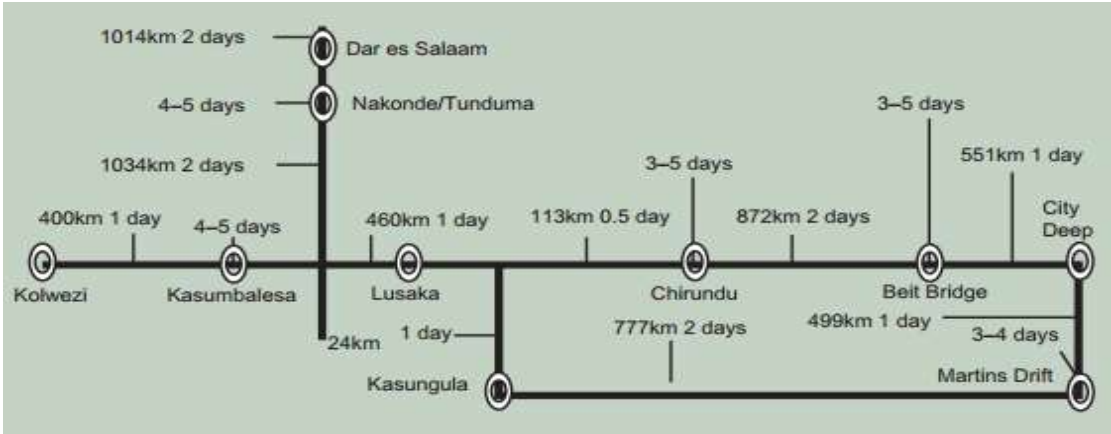
and Uganda. The Democratic Republic of Congo became a contracting state of the NCTTCA in 1987 after ratifying the Treaty.

The corridor includes the Mombasa port, which is the largest and busiest port in eastern Africa. The main roads network totals nearly 7,000 km, of which only 60% is paved. The main axis is the Mombasa-Nairobi- Kampala-Kigali Bujumbura road. Eastern DRC links extend from Kigali through either Goma or Bukavu to Kisangani. From Uganda, Eastern DRC is linked via Bunagana, Mpondwe, Ishasha, Goli and Aru border posts, with the main axis going through Kasindi, Beni, Komanda, and Niania to Kisangani. The railroad network comprises the Kenya/Uganda sections from Mombasa through Nairobi, Nakuru, Eldoret, Malaba, Jinja, and Kampala to Kasese in western Uganda (a distance of approximately 1,660 km). A branch line runs from Nakuru to Kisumu on Lake Victoria (217 km), where there is a wagon ferry link with Jinja and Port Bell in Kampala. There are inland waterways on Lake Victoria, Lake Albert, Lake Kivu, the River Nile, and the River Congo. The landlocked countries of Uganda, Rwanda, Burundi and Eastern DR Congo access their fuel supplies from the oil pipeline, initially between Nairobi and Mombasa but then extended to Kisumu and Eldoret [9].

3.5.5 The North–South Corridor

The busiest traffic occurs on the North-South Corridor (NSC), which is the most efficient in Africa. The NSC serves as an example for other sub-regions of the gains that can be anticipated from "deep" regional integration (i.e. regional integration that goes beyond establishing free trade by taking measures to reduce behind-the-border costs). In spite of the need for further improvements, the North-South Corridor (NSC), linking Kolwezi in DR Congo to the southern ports (mainly the port of Durban in South Africa) more than 3,500 km away and to the port of Dar es Salaam, serves as an adequate connector for all the southern and east Africa regional transport corridors and ports. Travel times along the NSC vary considerably according to a number of factors: type of cargo (whether break bulk, containerized, tankers, perishable goods, etc.); the direction of travel; whether the cargo is in transit or not; and by the quality of the "soft" infrastructure (i.e. whether the computerized systems are functioning and papers are cleared rapidly). It can be seen that the journey from Kolwezi to City Deep (in Johannesburg which is an Inland Container Depot) takes on average 15–20 days, with 10–15 days of downtime at the border crossings. The journey time is longer and the time saved at border crossings is minimal, if any. The same is true if a transporter chooses to cross into Botswana at Kasungula and into South Africa at Labatse (Gaborone) instead of Martins Drift. The easiest and quickest way to reduce transport costs along the North-South Corridor is to reduce the time taken at border posts by converting them into one stop border posts (OSBPs). If all the necessary steps were to be carried out (infrastructure upgrades, systems upgrades, streamlining of procedures), waiting times at borders could be cut by at least half. Upgrading the road and bridge infrastructure along sections in disrepair would save additional time. Likewise, new bridges are needed at river crossings (at Kasungula and at Tete in particular). These upgrades would produce multiple benefits: savings brought about by reducing queues (since there are long queues at both the ferry crossing at Kasungula and the bridge at Tete) and savings in running times for trucks, lower costs for truck maintenance, and less accidents[9].



Source: Pearson and Giersen (2009, diagram 1).

Figure 20: Distances, journey times (and waiting times at borders) between the main towns on the North–South Corridor

4. CHALLENGES OF INTERMODAL CONNECTIVITY IN SUB-SAHARAN AFRICA

- Most African ports infrastructures are in a poor state and this account for consistent inefficiency in the ports productivity hence cannot accommodate the increasing containerization of trade. The share of manufactured goods in developing countries' merchandise trade has increased from 20% to 80% over the past two decades. It is these goods that are largely shipped in containers and which require state-of-the-art port infrastructure. Given that China (and Asia more generally) imports raw materials and exports manufactures, which is the opposite trade pattern to African countries, complementarities between the two regions are great and the scope for an expansion of trade is strong. However, this trade cannot sustain growth if the logistics, especially the maritime nexus, which is currently under stress with bottlenecks in many African countries, is not improved.
- Intra-African trade has also grown, but at a slower pace, for a number of reasons. Among them, are the lack of complementarities among African countries is well-known. Trade barriers other than tariffs, such as rules of origin that accompany Free Trade Areas (FTAs) as well as a host of behind-the-border measures, may also act as obstacles to the connectivity of free flow of good.
- Policy-imposed barriers to trade within landlocked countries contribute significantly to high trade costs. Many African countries have reacted to the adverse conditions they face in the World Trading System between landlocked countries leading to poor connectivity to major maritime routes.
- African transport infrastructure networks (including ports) are caught in a vicious circle resulting in poor quality infrastructure. Transport infrastructure networks in Africa are weak whether it is ports or the infrastructure that connects ports to the markets (roads, railroads, and inland waterways). A low level of hinterland and interregional trade is one factor underlying the poor level of investments (including maintenance) in infrastructures like ports, roads and railroads, which carry high fixed costs. The dilapidated condition of much of the infrastructure results in high rehabilitation costs. Moreover, the substandard state of the infrastructure network results in delays, the slow movement of goods, and high maintenance costs.
- Most African ports are small and always congested. The lack of inland container ports makes it difficult for these ports to be able to handle the increase in container throughputs.
- Landlocked countries are strongly handicapped. Transit and trade corridors to improve connectivity deserve further development. Trade facilitation measures at the national, regional, and international levels are needed to relieve the plight of landlocked countries.
- Other major modes of transport such as pipe line and inland water ways are not really exploited to enhance modal connectivity.
- There are not so many professionals in the industry with the technical skills which causes a huge gap in intermodal operations.
- African still lacks behind when it comes to transportation technologies being diploid on the different modes of transport which makes it easier to monitor the movement of goods, infrastructure status and handling of goods.
- Most road networks are narrow leading to a high rate of accidents, which in turn leads to a high level of road destruction and also congestion which affects smooth modal connectivity.
- Despite significant technological improvements, the environmental impact of the expansion of air transport continues to be a source of concern. Aviation causes air pollution and noise at ground level, together with ozone layer depletion and global warming effects due to emissions in the troposphere. However, in Africa the beneficial impacts of the expansion of air services on economic growth and poverty alleviation are most likely to outweigh costs in terms of climate change, noise and congestion.

5. RECOMMENDATIONS AND CONCLUSION

Ports are the main maritime nexus that links the other modes of transport into the hinterland. African government need to enter into more partnerships with the private sectors or foreign investors so as to increase not only the capacity of the small ports, but also increase productivity so as to help facilitate the movement of container throughputs from the ports

into the hinterlands by investing on modern container throughput management system to enhance intermodal connectivity operations.

The African Union should re-emphasize on establishing trade liberation within the continent and the governments belonging to a particular economic community such as the ECOWAS, CEMAC etc. should reconsider policies on border transit so as to facilitate the movement of goods between countries thereby facilitating modal connectivity. One of the major reasons why China's transportation net-work is so development is because their central government understood the importance of transport to international trade. This is why they were open to foreign investment mostly on their roads and ports. African governments should emulate the same and be open to private investors especially in the roads, railways and inland water ways. If all these transport modes are well developed, it will translate into economic growth because movement of freights will become much easier hence a reduction in transportation cost which is high because of poor transport infrastructures.

More inland ports should be constructed so as to reduce congestion at the main sea ports. This therefore means that, containers will no more be stacked at the seaport terminals but would rather be transported directly to the inland port once there have been offloaded from the ships. This will dramatically reduce container dwell time at the seaports creating less congestion at the port terminals. Customs clearance can then be carried out at the inland port terminals. These terminals will also facilitate the connectivity of the different transport modes into the land locked countries. There should be training programs that are organized periodically to train employees in the transport industry so as to always keep them updated to the changing trends of information communication technology within the transport sector and also to obtain new skills on how to maintain and operate the various transport infrastructures. Most of the high the highways in Africa are two lanes. More lanes should be added to the existing lanes to facilitate the movement of vehicles. This will reduce the rate of accidents on the roads. Also high technological equipment's should be installed on the highways to monitor and track the movement of vehicles and goods.

5.1 Conclusion

It is clear that the transport problems of African countries severely limit their ability to actively participate in the globalization process. For Africa to improve on its trade, we have seen that it is a requisite for the different countries to improve on the intermodal transportation networks. Most of the African countries are land locked countries which rely on mostly road and rail networks and air transport for the shipment of their goods. These modes of transports are mostly in bad shape and if there are properly maintained, it will facilitate intermodal connectivity which will increase intra-regional and international trade. An important step in this direction will entail broadening the transport sector's scope in both geographic and institutional terms. In this regard, African countries must seek to link their transport networks. This means that, policymakers in these countries must view their transportation systems in an international, rather than simply in a national context. The importance of doing so is amplified by the fact that globalization is increasingly effacing international boundaries leading to the establishment of free trade agreements between regions and countries.

The importance of international and interregional linkages is further underscored by the need for regional economic integration on the continent. African economies are generally small and fragmented, thus necessitating integration. Such integration promise to "help African countries reap the benefits of scale economies, foster strong competition, which could improve the quality, quantity and diversity of output; and provide a better environment for attracting domestic foreign investment. African transport authorities will also do well to ensure the integration of transport networks throughout the continent. This is especially because active participation in the globalization process invariably depends on effective and efficient intermodal systems of transportation. Such systems permit not only travelers, but also, and perhaps more importantly, "shippers to enjoy the seamless synergy of multiple modes of transportation operating as one.

Finally, authorities in Africa cannot afford to ignore the essence of transportation safety. Necessary steps should be taken to ensure the safety of all modes of transportation on the continent. It is logical to expect a significant increase in access to automobiles and/or use of other motorized means of transportation. Unless appropriate steps are taken to ensure transportation safety, this will lead to dramatic increases in transport- related accidents, especially automobile accidents. These accidents do not only cause the loss of lives but also the destruction of the roads. Specific actions in this regard include, at a minimum, collecting and analyzing relevant data to identify causes of accidents. Results of such analyses can then be used as the basis for remedial actions, which must be undertaken in conjunction with training, education and publicity campaigns to reduce accident rates.

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