

BACKGROUND PAPER 8

# **AFRICA INFRASTRUCTURE COUNTRY DIAGNOSTIC**

## **Beyond the Bottlenecks: Ports in Sub-Saharan Africa**

**Ocean Shipping Consultants, Ltd.**

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## About AICD

This study is part of the Africa Infrastructure Country Diagnostic (AICD), a project designed to expand the world's knowledge of physical infrastructure in Africa. AICD will provide a baseline against which future improvements in infrastructure services can be measured, making it possible to monitor the results achieved from donor support. It should also provide a more solid empirical foundation for prioritizing investments and designing policy reforms in the infrastructure sectors in Africa.



AICD will produce a series of reports (such as this one) that provide an overview of the status of public expenditure, investment needs, and sector performance in each of the main infrastructure sectors, including energy, information and communication technologies, irrigation, transport, and water and sanitation. The World Bank will publish a summary of AICD's findings in spring 2008. The underlying data will be made available to the public through an interactive Web site allowing users to download customized data reports and perform simple simulation exercises.



The first phase of AICD focuses on 24 countries that together account for 85 percent of the gross domestic product, population, and infrastructure aid flows of Sub-Saharan Africa. The countries are: Benin, Burkina Faso, Cape Verde, Cameroon, Chad, Congo (Democratic Republic of Congo), Côte d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Uganda, and Zambia. Under a second phase of the project, coverage will be expanded to include additional countries.



AICD is being implemented by the World Bank on behalf of a steering committee that represents the African Union, the New Partnership for Africa's Development (NEPAD), Africa's regional economic communities, the African Development Bank, and major infrastructure donors. Financing for AICD is provided by a multi-donor trust fund to which the main contributors are the Department for International Development (United Kingdom), the Public Private Infrastructure Advisory Facility, Agence Française de Développement, and the European Commission. A group of distinguished peer reviewers from policy making and academic circles in Africa and beyond reviews all of the major outputs of the study, with a view to assuring the technical quality of the work.



This and other papers analyzing key infrastructure topics, as well as the underlying data sources described above, will be available for download from [www.infrastructureafrica.org](http://www.infrastructureafrica.org). Freestanding summaries are available in English and French.



Inquiries concerning the availability of data sets should be directed to [vfoster@worldbank.org](mailto:vfoster@worldbank.org).

## Summary

Shipping container and cargo traffic rates are important measures of economic health. During the decade from 1995 to 2005, world container traffic grew substantially, reflecting the expansion of world trade and rapid economic growth in the developing world. Nevertheless, outdated, inefficient ports acted as a brake on burgeoning trade. They will continue to do so unless port capacity and efficiency can be improved.

Sub-Saharan Africa has a proliferation of ports, few of which are large by world standards. They are generally poorly equipped and operated at low levels of productivity. Few are capable of handling the largest of the current generation of ships, and they are generally unprepared for the dramatic changes in trade and shipping patterns that are now occurring. While they are moving slowly from publicly owned service ports to so-called landlord port structures, often with embedded container terminal concessions, they are still behind other regions in the development of modern port-management structures. Additional momentum for modernization is coming from the growing presence of global shipping lines and international terminal operators in African ports.

This study is based on a detailed review of maritime ports in 17 countries of Sub-Saharan Africa, encompassing traffic development, institutional and regulatory frameworks, infrastructure development and investment, performance cost and quality, and security arrangements. The ports are grouped into three maritime trading regions: East Africa, southern Africa, and West Africa. Two important cargo modes—container traffic and general cargo—are emphasized. We look in less detail at the development of dry and wet bulk cargo traffic. General cargo constitutes a mix of non-bulk cargo types—among them palletized, break-bulk, and bagged.

### Burgeoning traffic in the region's ports

The region's ports saw substantial increases in both containerized (table A) and general cargo (table B) between 1995 and 2005. Both grew at around 7 percent per annum and, consequently, doubled in volume during the last decade. Container traffic growth was about double the regional average for West Africa, while general cargo traffic growth was about double the regional average for Southern Africa. Overall, container traffic growth has been slower than in other regions of the world, while general cargo traffic growth has been faster. These two trends are strongly related.

Containerized traffic growth has been propelled by rapid economic growth in Sub-Saharan Africa, a rising tide of global trade, the privatization of ports, and the advent of modern container vessels.

Region	TEU		Growth	
	1995	2005	% change	AAGR
East Africa	505,100	1,394,956	+176	+5.8
Southern Africa	1,356,000	3,091,846	+128	+2.5
West Africa	673,400	3,126,901	+364	+13.8
Total	2,534,500	7,613,703	+200	+7.2

However, these same factors would have produced an even faster increase in container traffic, had it not been for some important constraints affecting the region's ports.

The first is the marked *imbalance* in container trade. Efficient container trade depends on balance—full containers in; full containers out. But in Sub-Saharan Africa 80 percent of incoming containers are reexported empty, compared with more typical values of 60–70 percent of containers sent back empty from Asia.

The reason is that the region's predominant exports of agricultural products and raw materials are better suited to general cargo traffic than to containerization. Consequently, general cargo trade is somewhat less imbalanced than container traffic.

Second, the lack of integrated rail and road links means that Sub-Saharan Africa's ports are poorly equipped to handle containers. As a result, adoption of containerized trade is often only skin deep. Containers are packed and unpacked in the vicinity of the ports, and the benefits of fully integrated multi-modal transport corridors associated with container adoption are not secured. As a result, there is still comparatively little containerized transit traffic into the landlocked hinterland, and most of these countries' imports are transported in the form of general cargo.

There is a great need for transshipment facilities to distribute cargo from regional hubs along the surrounding coastline. This role is played by Durban in Southern Africa, and by Mombasa and Dar es Salaam in East Africa, although Djibouti is also emerging as a new hub. In the case of West Africa, Abidjan has been a major transshipment center, but, owing to civil conflict, several shipping lines have shifted from Abidjan to Malaga in Spain. As a general rule, transshipment traffic tends to become a casualty as ports reach capacity constraints, as has recently occurred in a number of these hubs.

The variety of dry bulk cargo types makes it impossible to accurately measure the volume of trade in this category. Added to this is the fact that dry bulk cargo is handled at ports of widely varying type: common-user port terminals, industrial-style terminals, privately owned terminals, and general cargo facilities. While we assume that dry bulk traffic has increased significantly, it is difficult to say by how much.

Liquid cargo traffic in Sub-Saharan Africa is dominated by oil and hence concentrated in the region's 11 net oil exporters, of which Nigeria and Angola are by far the largest. No traffic data are available for this market segment, but substantial growth can be inferred from increasing volumes of petroleum trade. Port infrastructure for liquid cargo traffic has traditionally been developed outside of the mainstream sphere of port operations and integrated within the energy supply chain. This approach has worked well, since the stakes are too high for all concerned not to have the requisite capacity in place on time.

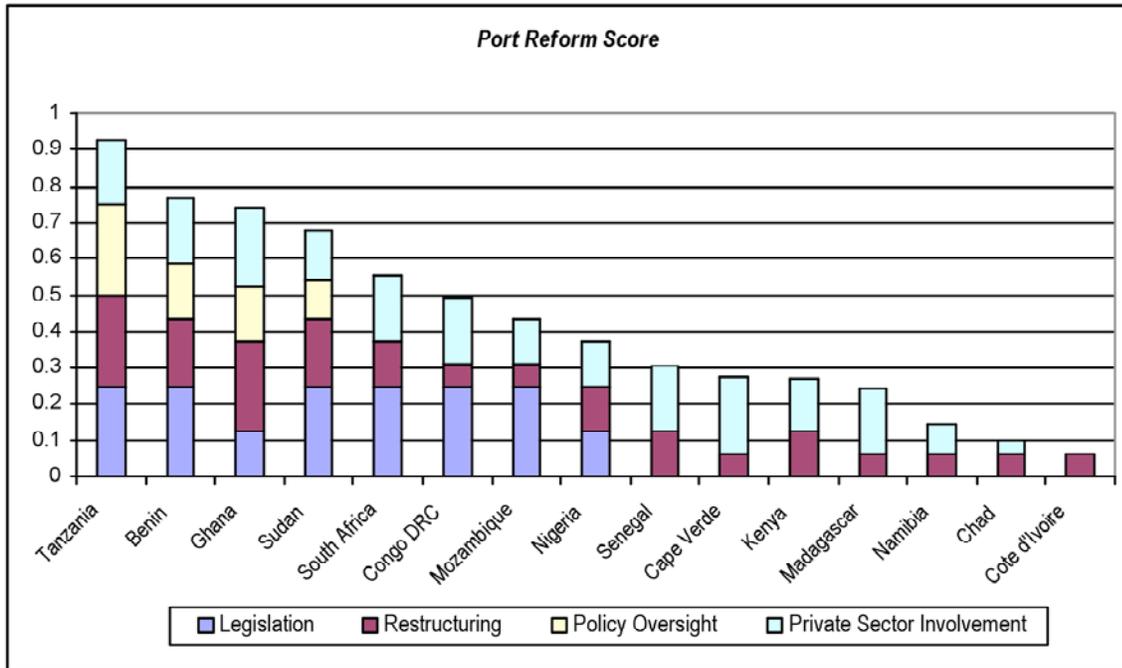
Region	TEU		Growth	
	1995	2005	% change	AAGR
East Africa	13.84	38.42	+177	+5.9
Southern Africa	2.73	14.52	+431	+15.7
West Africa	19.57	51.68	+164	+5.1
Total	36.14	104.62	+189	+6.6

### Growing pace of institutional reform

Institutional reform is a prerequisite for the modernization of Africa’s ports. Positive signs of reform have appeared, and the pace is increasing, but much remains to be done. The “port reform index” (figure A) provides a rapid overview of the situation as of 2006. Based on a questionnaire covering numerous aspects of sector reform, the index provides an overall score of progress on four key aspects of port sector reform. These are legislation, restructuring, policy oversight, and private sector involvement. The maximum possible score is 100 percent.

The evolution of the reform process differs markedly across countries, with top reformer Tanzania scoring more than 90 percent, compared to scores of less than 10 percent in Côte d’Ivoire. While just about all countries have made some progress with restructuring and development of basic regulatory tools, only about half have introduced appropriate sectoral legislation, and only a quarter have established some kind of policy oversight.

Figure A Port reform score across countries



Three models of port management are common: (a) the management concession model, in which the public sector hands over the entire management and operation of the port to the private sector; (b) the service port model, where the port authority is also the operator of the cargo-handling and other frontline functions under a centralized organizational structure and private participation is circumscribed to secondary services; and (c) the landlord port model, in which the public sector withdraws from front-line cargo-handling operations, allowing these to be concessioned to the private sector, while the port authority, functioning on a corporatized autonomous basis, focuses on estate management, navigation, and planning. In an intermediate model popular in francophone countries the port authority rents on-dock

storage and warehouse space to privately owned, licensed stevedoring companies, which are contracted by shipping lines to provide handling equipment, hire casual labor, work the vessels, and store and deliver cargo.

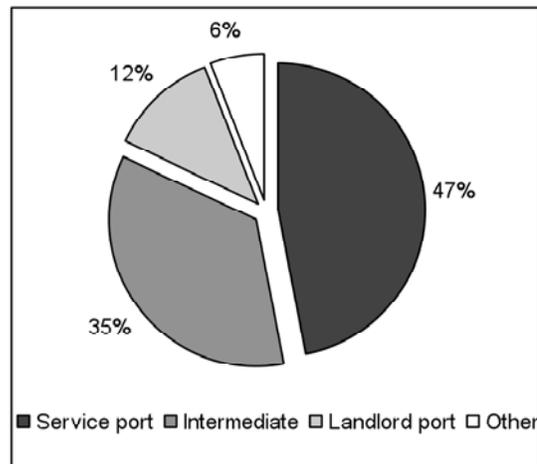
The landlord model is now widely regarded as the preferred institutional set-up for the sector. However, its adoption in Sub-Saharan Africa has so far been confined to Nigeria and Ghana alone. The service port model remains the prevalent mode, and the intermediate model a close second (figure B).

Private participation in Sub-Saharan Africa has been widespread, affecting a total of 26 ports in the region. The volume of ports deals surged in 2005, the year of major reform in Nigeria. There is so far only one reported instance of a cancelled concession contract: the Mombasa container terminal.

These transactions have led to private investment commitments totaling \$1.3 billion, and a further \$1.7 billion in royalty payments to governments. About 62 percent of the reported investment commitments relate to container terminals, and a further 32 percent to multipurpose terminals, with very little investment going to bulk facilities. Nigeria alone accounts for 55 percent of total private investments in Sub-Saharan African ports.

In addition to the Nigerian program, container-terminal concessions have been adopted for Abidjan, Dakar, Dar es Salaam, Douala, Luanda, Takoradi, Tema, and Toamasina. Djibouti has also awarded a much rarer *whole-port concession* that includes substantial greenfield development commitments. It is worth noting that container-terminal concessioning has been only partial in several cases, and that some concessioning processes have generated controversy. In several cases, the port authority or government agency has been reluctant to divest itself completely of operating assets, remaining a partner in the port or terminal operating company. Concentration in the hands of a few operators is another concern. Container-terminal concessions have gone to a small handful of global operators: notably, APM Terminals, DP World, and ICTSI. The award process itself has sometimes been complicated by legal challenges, as took place in Dakar and Luanda.

Figure B Prevalence of alternative institutional models



Independent port regulators are rare in Sub-Saharan Africa, and the regulatory framework is generally underdeveloped. Presently, most regulation is done by a ministry of transport, government agency, port authority, or port-management body. The system creates conflicts of interest, since an agency such as the port authority cannot be objective about grievances because it is an interested party. South Africa is the only country to have adopted an independent port regulator, through the National Ports Authority Act. For the rest of the region, independent regulation remains a distant goal.

A strong focus on institutional reform promises to play a major part in the modernization of Sub-Saharan African ports. This is the key path to overhauling port-management organizational structures;

modernizing labor employment arrangements and efficiency levels in both the frontline and backup areas of port operation; and increasing the amounts of private investment that ports can attract.

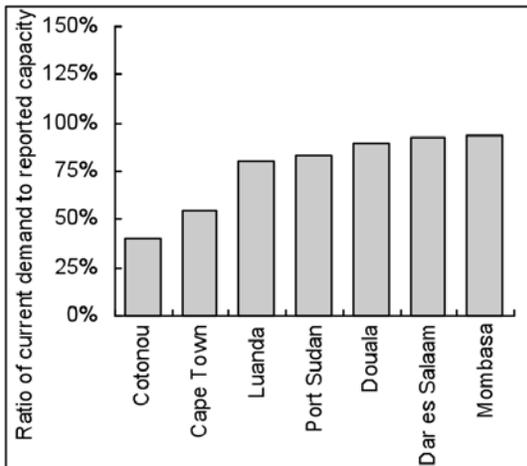
### Raising capacity to meet demand

The capacity of ports to meet growing demand is in doubt throughout much of the region. Measuring the gap between demand and capacity is difficult for two reasons. First, future demand is subject to some uncertainty, for obvious reasons. Second, and more important, the cargo data collected at many ports are inadequate for capacity-planning purposes. Historically, ports have invested in new infrastructure only after it was abundantly clear that their existing capacity was strained. Lack of funds and insufficient political will often added to delays. Port authorities and governments need to remember that better ports will allow them to capture new trade opportunities, while retaining existing traffic.

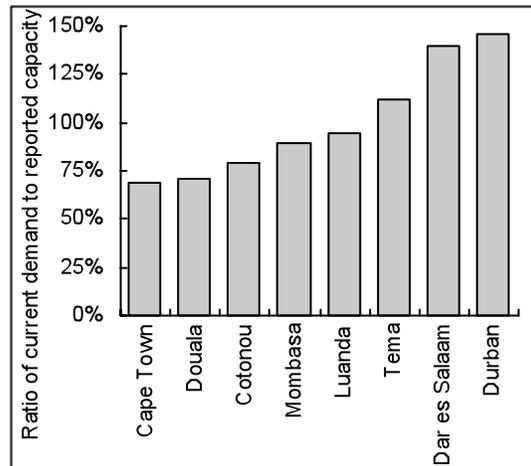
A global benchmark is that any port operating at beyond 80 percent of its capacity is facing gridlock and will suffer a progressive decline in efficiency. Assessed against this standard, the ports of Dar es Salaam, Douala, Luanda, Mombasa and Port Sudan all appear to be facing capacity constraints for general cargo traffic (figure C). At the same time, the ports of Cotonou, Dar es Salaam, Durban, Luanda, Mombasa, and Tema all appear to be facing capacity constraints for container traffic. Pressure on capacity is, overall, higher for container traffic, with current demand substantially exceeding 100 percent of capacity in a number of cases.

**Figure C Ratio of current demand to reported capacity**

(a) General cargo



(b) Container traffic



Source: AICD Ports Database, 2008.

In a step toward delivering efficient and timely port capacity, new national port plans that emphasize the development of physical infrastructure as well as institutional and regulatory reform are being undertaken in 40 percent of the countries studied. A salient example is the Port Modernisation Action Plan in Nigeria. Many other port development works are under way or planned in Sub-Saharan Africa. Several feature frontline cargo handling by private firms. Important examples are the new container

terminal facilities underway for Dakar, Djibouti, Durban, Mombasa, and Suakin, as well as new port developments in Benin, Cameroon, and Ghana.

Port modernization plans must look beyond the immediate port infrastructure and foster coordinated efforts to improve road and rail systems that provide linkages with hinterland markets. Addressing such bottlenecks will reduce widespread congestion around ports and ensure more effective use of container trade along integrated transport corridors.

Another key concern is the modernization of cargo-handling systems. A number of major ports—including Dakar, Onne, Pointe Noire, and Port Harcourt—lack crane equipment and continue to rely on ships' gear, seriously limiting their productivity. In other cases, outmoded container gantries remain in use. In South Africa and Kenya, the private and public sectors have invested heavily in modern handling systems, bringing vastly improved performance.

New equipment is not a solution in itself—equipment has to be introduced into a system designed to achieve the best performance and supported by proper staff training. This has become clear in certain public sector ports that, despite having purchased new equipment, continue to deliver less-than-satisfactory performance. In addition, there is evidence of failures with respect to ensuring proper and timely maintenance. There is a clear need for more training and organization in this important area.

Finally, the development of information systems, information technology, modern customs practices, and so on represents a major goal for Sub-Saharan African ports. Soft infrastructure has traditionally been underfunded, thereby contributing to poor port efficiency. It is important to pay more attention to this issue alongside physical port development.

## The performance gap

It is easy to measure and compare the performance of cargo handling in both the container and general cargo sectors, as they enjoy a certain degree of commonality; but, in the bulk sector, the diverse range of commodities and handling systems make comparisons nearly impossible.

For *container handling*, the presence of private operators, of specialized container-handling equipment, and the overall caliber of terminal operations all help improve the quayside performance of a port. Ship-to-shore, gantry-equipped container terminals representing the state of the art execute up to 30 moves per hour. Performance in Sub-Saharan Africa ranges from 7 to 20 moves per hour. There are systematic differences in performance between ports with container gantries (14 moves per hour) versus those using only ships' gear (7 moves per hour), as well as between those that have been concessioned (16 moves per hour) and those that have not (10 moves per hour) (figure D).

Two other measures of assessing container terminal performance are the cycle times of trucks dropping off and picking up containers in the terminal, and the average time that containers lie in the terminal, known as “dwell time.” An efficient truck cycle time is less than 1 hour, but in West Africa it can exceed 10 hours. Southern Africa, at 4 hours, boasts relatively better average truck cycles. Efficient management of terminals, use of prebooking and IT management systems, and better port access infrastructure could all improve cycle time.

The international standard dwell time is 7 days or less. But in West Africa, most containers spend more than two weeks in the terminal. The result is terminal congestion and port inefficiencies. Incentives for speedier pick-ups might include a daily storage charge after a given number of free days, and specific rules to prevent the dumping of empty containers at the terminal.

The *general cargo* sector is steadily growing in Sub-Saharan Africa, in contrast to other parts of the world, where the container trade is steadily replacing it. Because of the variety of cargo types grouped under the general category, measuring performance in this sector is not easy. But according to estimates, the quay-handling rates in Sub-Saharan Africa, which average

12 to 16 tons per hour per crane, fall substantially short of values of 30 tons per hour per crane found in the developed countries. Improving performance will depend on investment in modern handling systems and the rate at which modern cargo-handling practices are adopted.

Measuring performance in the handling of *dry and liquid bulk cargo* is inherently difficult because of the diversity of cargo handled, the handling systems involved, and the types of facilities handling these cargo types. Dry and liquid bulk cargo is not exclusively handled by the public port system; it is also handled at privately owned and managed terminals that achieve global standards in performance but do not divulge the volumes traded for reasons of company confidentiality. As might be expected, the more modern the handling and operating systems in place, the better the performance.

The per ton cost of handling cargo is closely correlated with the age and condition of facilities and equipment, with management practices, and with the ratio of capacity to demand—all of which can be improved by efficient planning. Other factors that drive up costs or increase inefficiency are the presence of public or private monopolies, insufficient or

misdirected regulation; and outdated pricing systems and structures. Handling charges in Sub-Saharan Africa often are twice those typically applied for the same service in other parts of the world (table C).

### A note on security

In today’s threatening global security environment, increased attention is being paid to security in the region’s ports, especially oil-export terminals and the seven commercial ports of South Africa. In the

Figure D: Container handling performance across different ports in the region

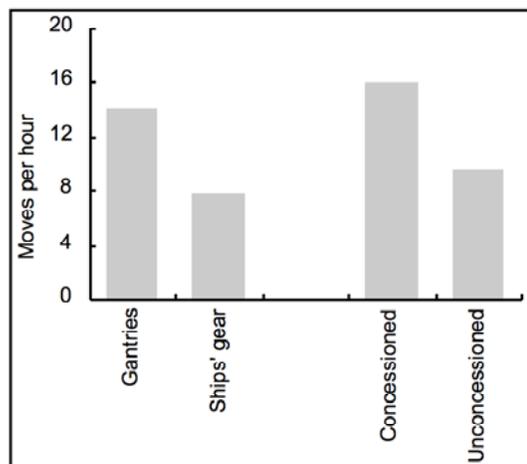


Table C Gateway container-handling and general-cargo costs for ports in Africa and the world

Region	Container handling (ship-to-gate), \$	General cargo (over-the-quay per metric ton), \$
East Africa	135–275	6–15
Southern Africa	110–243	11–15
West Africa	100–320	8–15
Rest of world	80–154	7–9

major ports, the security systems and technologies employed are fairly modern, but much remains to be done to improve security arrangements in secondary ports.

## Conclusions

Except in South Africa, the port systems of Sub-Saharan Africa have not kept up with the rising volume of international trade, or with regulatory and technological practices related to trade. The performance of the region's ports lags substantially behind that of other world regions. Several of the ports in the study group have exceeded their designed capacity limits, while others are approaching those limits. Although international container liner operators have proved a strong catalyst for port development in the region, slow progress in institutional and regulatory reform has stifled the efficiency gains that might otherwise be expected from the new practices introduced by operators.

The economic contribution of modern infrastructure to move growing volumes of trade is well illustrated by the region's oil-export terminals, which are globally competitive in terms of their costs. Generalizing that level of performance through the implementation of modern supply-chain processes could greatly expand the contribution of the region's ports to efficient transport and overall economic activity.

Institutional and regulatory reforms hold great promise for increasing port efficiency. Without them, technical improvements can yield only a fraction of their potential. But few of the needed reforms have moved beyond the planning stage. As of 2007, only two countries (Ghana and Nigeria) had adopted the favored landlord port model, and only one country (South Africa) had a truly independent port regulator. A third area of reform—the concessioning of container terminals to the private sector or international terminal operators—is delivering positive results.

A Herculean effort will be required to provide port services of the caliber found in developed nations. But the potential rewards of effort are compelling: the present inefficiencies of Africa's ports weigh heavily on trade, severely compromising competitiveness and siphoning off revenues into non-economic uses such as idling trucks, idle employees, delayed ships, and monopoly rents. The faster the bottleneck can be removed, the more quickly the continent will reap the full rewards of growing trade.