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Lagos–Kano–Jibiya Transport Corridor Performance Analysis

Final Report

Global Food Security Response Trade and Transport Reform Program

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MAXIMIZING AGRICULTURAL REVENUES AND KEY ENTERPRISES IN TARGETED SITES

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Contents

Illustrations

Figures

Tables

Acronyms and Codes

ABTL	Apapa Bulk Terminal Limited
APMT	APM Terminal
BOT	Build Operate Transfer
CISS	Comprehensive Import Supervision Scheme
ECOWAS	Economic Community of West African Countries
FOB	Free on Board
GFSR	Global Food Security Response
GRT	Gross Registered Tonnage
ICD	Inland Container Depot
ERR	Economic Rate of Return
IMF	International Monetary Fund
IRR	Internal Rate of Return
MARKETS	Maximizing Agricultural Revenues and Key Enterprises in Targeted Sites (project)
MOWCA	Maritime Organization of West and Central Africa
NCS	Nigeria Customs Service
NGN	Nigerian Naira
NIMASA	Nigerian Maritime Administration and Safety Agency
NPA	Nigeria Ports Authority
NRC	Nigeria Railway Corporation
P&CT	Port and Cargo Terminal
RTG	Rubber-tired gantry
SON	Standard Organization of Nigeria

Abstract

At the request of USAID/Nigeria, the Trade and Transport Reform component of the MARKETS Program developed for the Global Food Security Response (GFSR) Program a comprehensive analysis of the transport corridor connecting Lagos with the northern region of the country up to the border with Niger. The Trade and Transport Reform component supports the GFSR program's goal of reducing trade, transport, and supply chain bottlenecks by helping implement plans to improve efficiency along the corridor, developing transport reform options, and designing stakeholder mechanisms to implement reforms. The effectiveness of the Lagos-Kano-Jibiya (Lakaji) corridor is vital to the food security of Nigeria and the greater region because so much of the country's and the region's food must travel along the corridor.

The Trade and Transport Reform team assessed the variables of cost, time, and reliability of the port, road network, and rail facilities along the Lakaji corridor using FastPath, a transport corridor diagnostic tool developed jointly by Nathan Associates Inc. and USAID. Three scenarios were analyzed to ensure that the direction of trade (i.e., import or export) and the type of cargo (containerized or noncontainerized) were factored into the analysis. Corridor performance was also compared with the performance of other developing-country corridors. Scores were generated for individual corridor links and nodes as well as for the whole corridor, through a comparison of the corridor's performance with international standards.

The analysis recommends several courses of action to improve corridor performance, ranging from moderate-cost actions to major investments to upgrade corridor infrastructure. Some recommendations require cooperation with government entities and other donor organizations.

This analysis will be critical for assessing investment options for Nigeria's and the region's food security plans.

Executive Summary

More efficient, less costly transport is essential for attracting investment and raising productivity and incomes in agriculture and industry in Nigeria. Easing constraints on the distribution of staple crops and grains will also help improve the availability of foodstuffs in Nigeria and the surrounding countries of West Africa, thereby strengthening food security in this vulnerable region. Improving the efficiency and reducing the cost of using of Nigeria's transportation system will increase its use, attracting traffic that high transport costs, high taxes, and cumbersome procedures in Nigeria have driven to transport corridors in Benin, including imports destined for illegal entry into Nigeria.

This study advances the objective of USAID's Global Food Security Response (GFSR) in Nigeria of reducing trade, transport, and supply chain bottlenecks. It does so by assessing the vital Lagos-Kano-Jibiya (Lakaji) corridor, highlighting costly bottlenecks, and making recommendations for improvement, including a preferred scenario for corridor development that was selected in consultation with Nigerian stakeholders and supported by a cost-benefit analysis.

THE APPROACH: FASTPATH

Transportation logistics includes infrastructure, regulations, users (such as truckers, terminal operators), and beneficiaries (shippers and the end consumer). This analysis examines all of these elements, using both official data, which were often dated or inadequate, and data we collected from surveys and interviews with users on transport conditions and regulations.

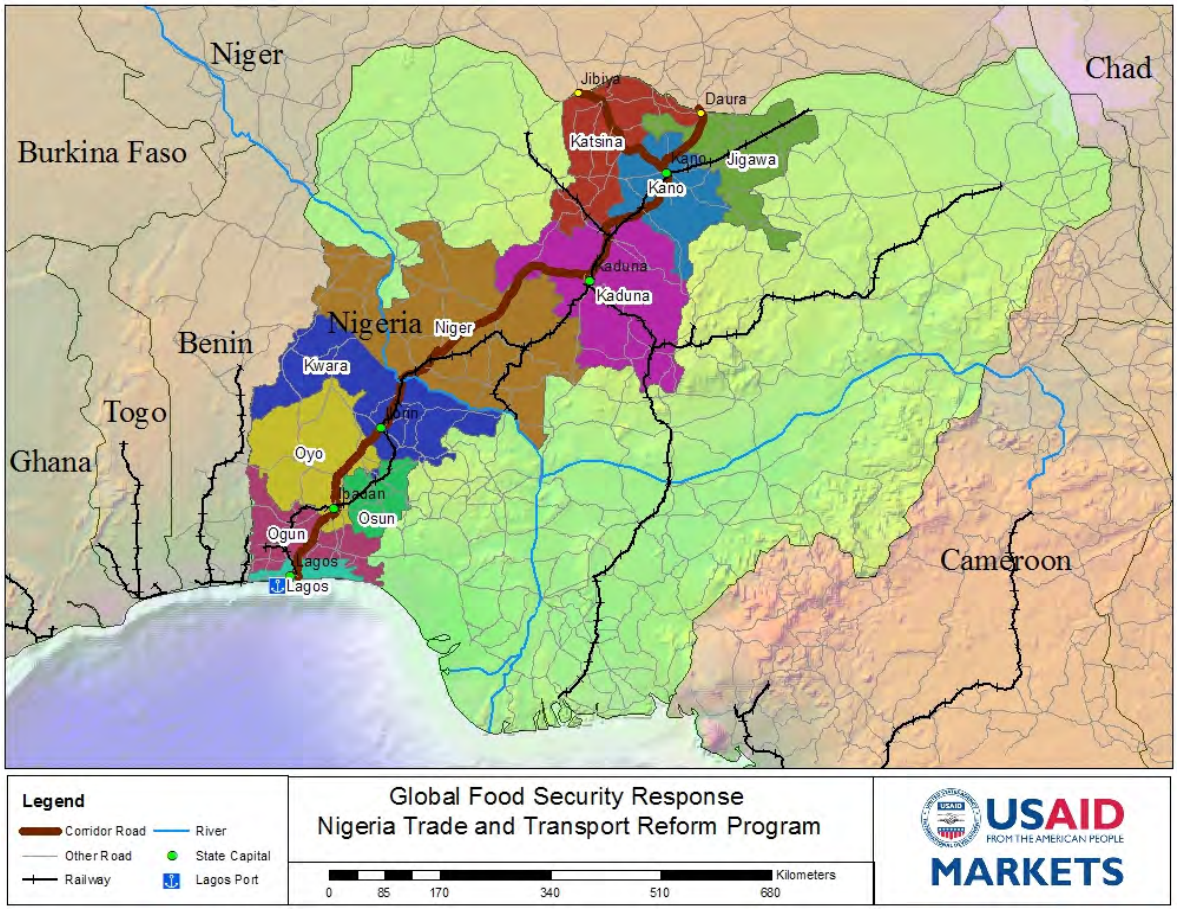
FastPath, the model used to assess the logistics chain, measures the main performance indicators of cost, time, and reliability. The FastPath software enables users to break down the logistics chain into nodes and links and measures the three performance indicators for each subcomponent—port, road, and rail. The scores for cost, time, and reliability are averaged to obtain the total score for a component—good, fair, poor, or very poor according to international standards. These results were used to generate a summary performance measure or "logistics score." A score of 70-80 indicates that the total supply chain is efficient and internationally competitive.

The FastPath model uses containers as the main unit of measurement because containers typically pass through similar procedures in all countries, which allows logistics scores to be compared among countries. To provide additional perspective, particularly with respect to food security in Nigeria, this assessment also includes performance measures for the handling of general cargo and bulk cargo, the typical mode for importing basic foods into Nigeria, using the results of other FastPath surveys to compare with Nigeria's performance.

LAKAJI CORRIDOR—LIFELINE OF THE NATION AND STRATEGIC LINK TO WESTERN AFRICA

The Lakaji Corridor is the main route for moving imported goods to northern Nigeria and exports to southern ports. It also feeds into local and regional markets and is a vital conduit for food supplies to neighboring nations (especially Niger) in times of crisis. The main route is from Lagos to Ibadan, Kaduna, Kano, and then Jibiya on the border with Niger. Average annual daily traffic on the corridor ranges from 17,000 vehicles between Lagos and Ibadan in the south to 5,000 vehicles between Abuja and Kano in the north. Heavy vehicles account for 10-14 percent of traffic. Figure 1 presents the extension of the Lakaji corridor.

Figure 1-1
Lagos-Kano-Jibiya/Daura Corridor



In the south the corridor begins at the Lagos Port complex, principally Apapa Port and Tincan Island Port, with nine marine terminals serving different types of cargo (container, bulk, and break-bulk). The marine terminals are operated by private companies operating under government concessions.

To relieve congestion at the Lagos Port Complex the Ministry of Transport created multiple customs-bonded terminals known as inland container depots (ICDs). These are some distance from the port, and using them adds to time and cost.

Corridor road conditions range from fair to poor. The Lagos metropolitan area is characterized by poor road conditions, with potholes, broken vehicles, and flooding, and heavy, disorganized traffic. Access arteries to the ports are blocked constantly, as many trucks are parked along the road, waiting for business. Local traffic includes transfers of containers from the port to ICDs.

Moving north from Lagos to Ibadan (115 km) is a dual carriageway in fair condition, but the leg from Ibadan to Kaduna (630 km) is very poor, a single carriageway with poor surfacing and no emergency lane. This means that broken-down vehicles block traffic. The northern section from Kano to Jibiya is also a single carriageway, but with a wide emergency lane.

Nigeria's rail system played an important role in developing the hinterland but is no longer price competitive with road transport and has fallen into disrepair. The Lagos-Kano-Kaura Namoda track (west extension toward Jibiya) is 1,130 km long, with connections to Apapa Port. Lack of capacity (because of dilapidated infrastructure, insufficient number of locomotives, lack of working capital) has resulted in annual rail freight shipments falling from their 3 million ton peak in the 1960s to under 50,000 tons, less than 1 percent of the freight along the Lakaji corridor. The Nigerian government made significant investments in the rail system in 2009. For 2010 the government plans to purchase additional equipment and rehabilitate track, including in Apapa Port, and has plans to link all ICDs to the rail system.

INSTITUTIONAL ARRANGEMENTS

The Nigeria Ports Authority (NPA) is responsible for the regulation and operation of the port system. The Federal Ministry of Transport is in charge of national policy for marine infrastructure and legislation. The Nigeria Customs Service has four zonal coordinators, one of which is responsible for the Lagos Port Complex.

The Ministry of Works, Housing and Urban Development is responsible for construction and rehabilitation, awarding some private concessions on high-volume segments of the corridor. The Federal Road Maintenance Agency covers maintenance on some sections. The Federal Road Safety Commission regulates, enforces, and coordinates all road traffic and safety management activities along the corridor. Enforcement of regulations falls to the Nigeria Police, and at the state level, Vehicle Inspection Offices enforce regulations of vehicles using the corridor.

The Nigeria Railway Corporation has sole responsibility for the provision of rail transport in Nigeria.

Legislation is pending to create a Nigerian Transport Commission. The proposed Commission would harmonize transportation issues, taking over the economic regulatory component of the NPA, Nigerian Railway Corporation the Nigerian Inland Waterways Authority, and to some extend the economic regulation of toll roads as necessary.

CARGO, FOOD SECURITY, AND TRAFFIC GROWTH

The Lakaji Corridor is the most active route for cargo in Nigeria. In a country where about 50 percent of rice and wheat is imported, Lagos is a gateway to the rest of the country for food and agricultural supplies such as fertilizer, equipment, and spare parts for farm machinery. Kano

in the north is a distribution hub for Nigeria and the West African subregion as well as a collection center for agricultural products such as grains and products destined for export, such as sesame seeds, hides and skins, sorghum, Arabic gum, groundnut cake, and cotton.

Freight surveys were used to supplement official data. They covered food commodities, containers, cement, and general cargo (i.e. break bulk cargo that is cargo that is loose and must be loaded individually rather than in bulk or in containers). The results of our analysis showed that during 2008 the Lakaji corridor handled about 27.2 million tons per year. About 90 percent was for the Lagos Metropolitan area—a high estimate because the survey suggested that some goods manifested for Lagos were actually shipped up country. About half of imports were general cargo, and containers and bulk cargo made up about a quarter each. Exports totaled 2.3 million tons, with an estimated two-thirds being general cargo.

Broadly speaking, the increase in freight volume in Nigeria follows a typical pattern—a rate of about 1.5 times the rate of growth in overall economic activity. With the IMF estimating that Nigeria will continue to enjoy modest economic growth in the medium term, freight along the corridor should continue to increase. To estimate the economic impact of proposed improvements, this assessment assumes annual traffic growth of 10 percent from 2010 to 2020, then 5 percent annual growth from 2020 to 2030.

ASSESSMENT RESULTS

In the six scenarios analyzed, Nigeria's performance was generally poor, presenting many opportunities for improvement. For example, the two scenarios that examined containerized import shipments (one starting at Apapa Port, the other starting at Tincan Island) revealed that operations at the yard (storage time at the port), border clearance, and waiting time in the channel were very long compared to the international norm and the performance in other selected African corridors. Total dwell time, which includes time for border clearance processing, averaged 20 days at Apapa and 29 at Tincan Island compared to three days in Maputo and Durban and 17 days in Tema.

Transfer costs to ICDs are high, at US$364 per 20-ft container (TEU), a high price to pay for a temporary solution to reduce congestion.

Imports are destined either for a short or long haul to the hinterland. Road congestion plagues the transit from the port to the Lagos metropolitan area, resulting in slow speeds (four hours to travel 12 km) and generating a high transport cost of US$22.14 per TEU/km, compared to a norm of US$0.05–0.15 per TEU/km. The weak link in the long haul transport is the Ibadan–Kaduna segment, where speeds slow to 22 km per hour, raising costs to US$2.70 per TEU/km and reducing reliability. The road segments between Kaduna–Kano and Kano–Jibiya achieved a good rating compared to international standards.

Two other transport issues were discussed with stakeholders. One was high container demurrage charges, about US$820 for a container going to Kano and US$490 for those going to Lagos metropolitan area. The other is multiple checkpoints by different government agencies at different levels of government, some of which are unauthorized. The general public cannot distinguish genuine from fictitious fines and generally pays whatever the cost is. Respondents were

understandably reluctant to quantify these expenses, but all indicated that these costs are incorporated as part of the price charged to their clients.

The long dwell times in the ports coupled with poor road performance brought the total logistics score for these corridors to 43 (Tincan to Jibiya) and 49 (Apapa to Jibiya), compared to a range of 51–60 for three other African corridors. Similar performance was registered for a scenario examining containerized exports.

Assessments of scenarios for imports of general cargo and bulk cargo yielded contrasting results. ENL at Apapa Port is the main terminal handling general cargo. The main cargo is bagged rice. ENL is the most congested terminal in Lagos Port. Unloading is done exclusively with ship's gear, which is typically much less efficient than using mobile harbor cranes. About 80 percent of cargo is placed directly on trucks. Long unloading times contribute to high berth charges and have a knock-on effect as ships incur costs waiting for a berth. Exports of general cargo are also burdened by slow operations at the berth due to lack of shore equipment.

In contrast, bulk cargo handled at the Apapa Bulk Terminal earned a satisfactory rating. This terminal is a modern dry bulk operation, handling items such as wheat and fertilizer. The operator is a wholly owned subsidiary of Flour Mills of Nigeria, which has a large mill behind the terminal. The terminal is not congested and uses hydropneumatic equipment that can unload a 45,000 ton ship in three days. A comparison between ENL and Apapa Bulk Terminal, although not strictly comparable, is illuminating: ENL's average cost per ton for channel operations and berth time are US$13.35 and US$6.22 respectively, contrasted with Apapa Bulk Terminal costs of US$1.35 and US$2.56.

RECOMMENDATIONS AND CONCLUSIONS

On the basis of the assessment, a list of draft recommendations was provided to stakeholders for improving Nigeria's logistics operations, generating increased efficiency overall, which would also benefit imports and exports of food and agricultural goods. These recommendations covered operations, maintenance, capital improvements, and institutional and regulatory reform for ports, roads, and railways and improvement of customs procedures. The stakeholders selected six potential improvements that became a preferred scenario. These included

1. ***Establish a corridor management entity to bring public and private stakeholders to a common vision on initiatives to improve performance.*** This recommendation has been adopted already and is underway under the second part of the Trade and Transport Reform Program.
2. ***Develop a truck staging area and truck control system to reduce truck congestion at the Lagos Port Complex***, thereby reducing waiting time, increasing average truck speed and the efficiency of trucking operations in the port area, and mitigating pollution.
3. ***Promote the use of intermodal transport systems*** to increase cargo carried by rail in the Lagos Port Complex and then to the hinterland, providing faster, more reliable shipments and, if road conditions were improved, possibly reducing road congestion.

4. ***Reduce total dwell time to increase port efficiency*** by speeding and streamlining customs procedures, educating shippers about appropriate procedures, and increasing the relatively low yard charges to encourage quicker unloading.
5. ***Install mobile harbor cranes for general cargo*** to speed unloading and loading, thereby reducing port congestion and berthing times.
6. ***Improve road transport services and road governance program*** to identify duplication and legitimacy of checkpoints along the roads, thereby regularizing and limiting the number of checkpoints.

The costs and potential economywide benefits of these improvements are summarized Table 1.

Table 1-1
Summary of Improvement Evaluations

Improvement Action	Estimated Investment	Net Present Value of Benefits	Cargo Owners' Estimated Savings per TEU		Evaluation of Investment
			Import	Export	
Establish a corridor management entity	$0.51 million	No monetary value estimated	-	-	Feasible for policy actions
Develop a truck staging area and truck control system	$63.5 million	$122 million	$11.25/TEU, $0.38/ ton	$11.25/TEU, $0.38 /ton	Highly feasible
Promote the use of intermodal transport systems	$84 million	$2.5 million	$14/ton	$14/ton	Feasible
Reducing total dwell time	$25 million	$1.47 billion	$264/TEU average	-	Highly feasible
Promote the use of handling equipment at ENL terminal	$18 million	$50 million[a]	$3.8/ton[a]	-	Highly feasible
Improve road transport service	$0.3 million	No monetary value estimated	-	-	Feasible for policy actions

[a]For rice imports

The combined results of most of these investments are impressive, as suggested by the FastPath model. Benefits of a truck staging area would be a reduction of three hours of trip time or US$11.25 per container. Reducing dwell time by 10 days in would result in a savings of US$394/TEU in Tincan Island and US$135 in Apapa Port. Installing mobile harbor cranes would result in savings of US$3.8/ton. Although quantification of the benefits of a corridor management entity is not possible, experience suggests that stakeholders uniting in a common cause can influence positive change. Similarly, a road governance program could reduce costs and increase security.

Investment in intermodal transport, however, should be thoroughly assessed before proceeding. Stakeholders were unanimous in their support for rail linkages, and the government has already making significant investments in rail. The cost-benefit analysis suggests, however, that the payoff is small. Moreover, rail projects in other African countries have not lived up to expectations.

These recommendations would yield significant benefits in several industrial sectors, including agriculture and agribusiness. This assessment also focused on the movement of agricultural products and inputs key to improving food insecurity: strengthening of the operations of the ENL terminal and the development of a truck staging area in the Lagos Port Complex.

ENL is the main terminal for handling general cargo and is responsible for much breakbulk activity, including handling commodities significant for food security, particularly bagged rice. This terminal is highly congested due to inefficiency in handling operations. Investment in handling equipment, such as mobile harbor cranes, would improve handling performance and create a benefit of $3.8/ton, which would find its way to consumers in the form of more competitively priced food products.

Implementation of these recommendations could further help reduce the cost of agricultural imports by mitigating congestion in the complex and reducing the time it takes to move product from the port to final consolidation and distribution points. Furthermore, minimizing transit times in the supply chain for agricultural products is also vital from food safety and product quality perspectives, given perishability and related considerations. These recommendations also would strengthen Nigerian export operations, which is critical for enhancing the competitiveness of this sector to spur economic development and provide the access to food that local populations require.

1. Introduction

This is the final report of Phase 1 of the Transportation Corridors Subprogram of the Global Food Security Response (GFSR) Nigeria Trade and Transport Reform Program. It summarizes the findings and recommendations of the Trade and Transport Reform team for the Lagos-Kano-Jibiya (Lakaji) corridor. The findings are based on analysis of information collected from several stakeholders and data sources using FastPath, and the recommendations are derived from the stakeholder workshops held in Lagos November 24, 2009.

BACKGROUND

The purpose of the GFSR Program is to reduce the impact of high food prices on developing countries. Program goals include increasing food productivity in sub-Saharan Africa, especially production volumes, and easing constraints on food procurement and transport throughout sub-Saharan Africa. In Nigeria, the program is assisting the government and the agriculture sector in (1) doubling agricultural productivity and expanding the market supply of staple crops to reduce vulnerability to shocks, and (2) removing constraints on the movement of staple crops in Nigeria and the region. Under the USAID/MARKETS Program, Nathan Associates Inc. is undertaking the Trade and Transport Reform Program to ease trade and transport-logistics constraints on staple crops. The program has three components: Transport Corridors, Customs Modernization, and Trade Policy and Capacity Building.

The Lakaji corridor is the most active in Nigeria in terms of cargo flow. The port of Lagos is the natural gateway for imports entering the country and also for exports from the major cities along the corridor and other cities of the country. Lagos is also one of the largest industrial cities in Nigeria, handling the majority of food products imported into Nigeria to cover the deficit in volume between demand and local production. This is the case of rice, of which about 50 percent of the consumption volume[1] arrives from overseas, and the majority of which uses Lagos as port of entry. Some volumes enter the country illegaly from neighboring countries. Wheat also arrives at the port of Lagos before processing and hinterland distribution. Lagos is the gateway not only for food-related products but also for other critical agricultural supplies such as fertilizer, specialized agricultural equipment, and equipment spare parts.

The Transportation Corridors Subprogram supports GFSR's goal of reducing trade, transport, and supply chain bottlenecks by supporting efforts to raise efficiency in the Lakaji corridor,

[1] Rice consumption is about 4.6 million tons per year; 2.8 million are produced locally and the rest is imported.

developing transport reform options for the corridor, and designing stakeholder management mechanisms to implement reforms.

In a broader context, this work strengthens two of the three food security foundations—availability and access; the third, utilization, is not included in the scope of the assignment. The improved efficiency of the corridor will strengthen food supply chains and help humanitarian food assistance, when needed, flow more efficiently across the region and into neighboring countries, helping to avert potential food crises that could result from external shocks. The corridor is also a vital conduit—and a staging area—for Nigerian exports and the basis for economic growth and income generation, which are critical to ensuring that the local populace has the economic means to buy food.

OBJECTIVES

The FastPath analysis of the Lakaji corridor activity has three objectives:

- Identify infrastructure, services, processes, and policy and regulations that cause delays, raise costs, and erode service and reliability in the import and export logistics chains
- Quantify the impact of inefficiencies on Nigeria's economy and identify and evaluate potential interventions for improvement
- Create local capacity to analyze and monitor transport and logistics system performance.

FASTPATH

FastPath, developed by USAID and Nathan Associates Inc., is a model for assessing performance along transport corridors. The model focuses mainly on infrastructure—also referred to as the transport logistics chain. The variables measured to assess performance are cost, time, and reliability. Each variable represents an indicator of performance. The analysis generates a summary performance measure, or a logistics score. The FastPath software enables the user to break down the transport logistics chain into infrastructure nodes and links (e.g., port, road, rail road) and measures the three variables (cost, time, and reliability) for each.

The model allows analysis by commodity type using different modes of transportation (road, rail, inland waterways, and coastal), which are grouped into corridors serving a single port. Containers are used as the main unit of measurement for both imports and exports but when necessary, the analysis is undertaken on a per ton basis. Each corridor analysis is called a scenario and given a scenario name.

The performance data for a given scenario are compared with international norms during the input process and are used to create a logistics score for each component. Bar charts show the contribution of each mode to the price or time in the corridor and in comparison to the ideal case—international norms—for good performance. The economic importance of the corridor is calculated in terms of the value of freight traversing it and the total logistics price paid by shippers for the freight. All scenario data are stored in the model's database.

When the base case describing current conditions is created for the corridor, FastPath allows the user to create several alternative scenarios with potential performance improvements. The impact

of the improvements is estimated, and an improved scenario is created. FastPath compares the base-case price and time with the ideal case and with the improved scenarios. A cost-benefit analysis module compares the benefits of the improvements with the costs of the improvements (as estimated by the user). The cost-benefit framework is a spreadsheet that enables the user to project future traffic and evaluate the information to determine the benefits expected from a particular improvement and net present value and economic rate of return (ERR) for the improvement given an estimated cost.

REPORT STRUCTURE

Chapter 2 describes the transport logistics system of the Lagos-Kano-Jibiya corridor. Chapter 3 describes cargo characteristics and presents the FastPath transport scenarios that are analyzed and interpreted in Chapter 4. Chapter 5 presents the recommendations and conclusion.

2. Lagos-Kano-Jibiya Transport Corridor

Nigeria is the most populous country in Africa, with a population estimated at 140 million. Although economic activity is concentrated in the south of the country, around and near the ports, significant population and economic activity are located in the central and northern areas 300 km to 1,100 km from Lagos. Here we describe the components of the Lagos-Kano-Jibiya transport corridor, including both institutions and infrastructure facilities. A brief analysis of each component introduces the diagnosis presented in Chapter 4.

The Lakaji transport corridor consists of the Lagos Port Complex, which includes Apapa and Tincan Island ports, inland container depots (ICD) for temporary storage of containers, the road connecting Lagos with communities to the north, and the rail network from Lagos via Kaduna to Kaura-Namoda (close to Jibiya).

LAGOS PORT COMPLEX

The Port of Lagos is Nigeria's leading port. It has three main sections:

- Apapa Port, site of the main container terminal
- Tincan Island Port
- Lagos Port in the main channel next to Lagos Island.

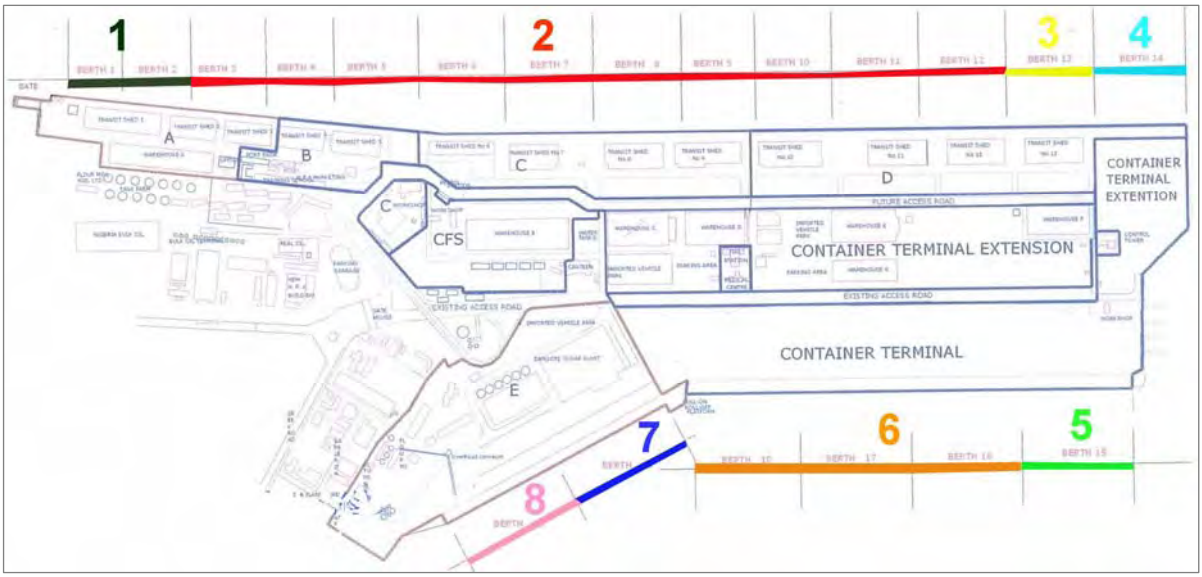
Apapa and Tincan Island ports are located in Badagry Creek, which flows into Lagos Harbor from the west.

The port complex is administered by the Nigeria Ports Authority (NPA). The National Council on Privatization is responsible for sector reform and privatization of government enterprises, and through its implementing agency, the Bureau of Public Enterprises (BPE), implemented port restructuring and concessions for terminal management and operations. The concession program subdivided Apapa and Tincan Island ports into five terminals each and concessioned all marine terminals in both ports in 2006.

Apapa Port

NPA manages the main Apapa entrance and grants access to all terminals. Apapa has a rail connection, but it is inoperative. Figure 2-1 shows the layout of the terminals at Apapa.

Figure 2-1
Apapa Port Facilities Layout



Source: Exaf

The original terminals were concessioned as follows**:**

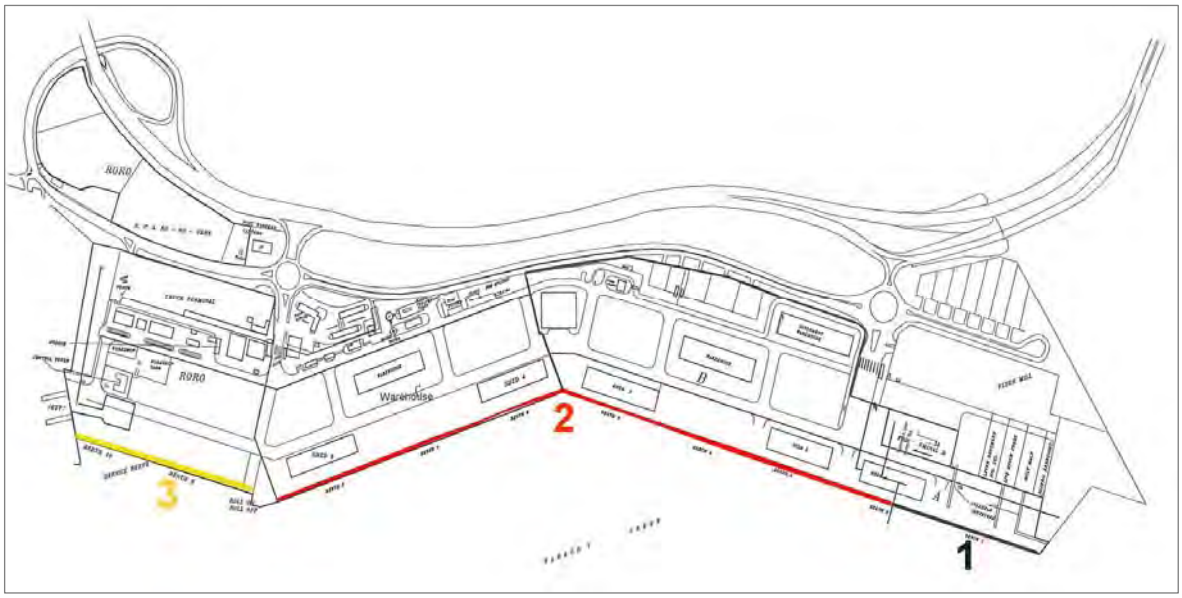
- **Apapa Bulk Terminal Ltd.** is the concessionaire in areas designated Terminals A and B and using Berths 1–5. It handles bulk and general cargo, including commodities such as cement, clincker, wheat, and fertilizer. The terminal uses hydropneumatic unloaders and a conveying system around the clock in three shifts to move bulk cargo from ships' holds to silos and processing plants.
- **ENL Consortium** is the concessionaire for Terminals C and D (Figure 2-4), which include Berths 6–14. ENL handles and stores all types of cargo, including bulk, break-bulk, and containerized product. Major commodities serviced include bulk cement, bulk salt, frozen fish, steel products, bulk fertilizer, bagged rice, line and shipper's own containers, rolling vehicles, and all other break bulk[2] products, including liquid bulk.
- **APM Terminal** is the concessionaire for the container terminal and Berths 15–18. This terminal is the largest dedicated container terminal in West Africa. It started operating in 2006 but was not formally commissioned until June 2008. It can operate four vessels of up to 250-meter length overall at the same time. It operates at the berth with five ship-to-shore cranes and four mobile harbor cranes and can serve geared and gearless vessels. APM recently installed four rubber-tired gantry (RTG) cranes in the yard and four more should be operational before the end of 2009. It also has 34 fully operational yard trucks, 30 reach stackers, and 8 empty handlers.
- **Green View Development Nigeria Limited**, a subsidiary of the Dangote Group, acquired the management of Terminal E and Berths 19-20. The terminal handles bulk and general cargo.

[2] The terms "break bulk" and "general cargo" have the same meaning and are used interchangeably.

Tincan Island Port Complex

Tincan Island Port Complex resulted from the merger of roll-on, roll-off (ro-ro) services and Tincan Island Port during the reform of 2006. Four terminals are under concession and one was developed under a BOT scheme operated by Ports and Terminal Multiservices Ltd. (PTML). Figure 2-2 shows the layout of facilities.

Figure 2-2
Tincan Island Port Facilities Layout



Source: Exaf

Under a 10-year concession, **Joseph Dam and Sons Nigeria Limited** handle bulk and general cargo at Berths 1 and 2 with about 480 m of quay length and a terminal area of about 6 hectares.

- **Tincan Island Container Terminal** operates containers at Berths 3–5 with a total quay length of 770 m (of which only 550 m are operational) and a terminal area of 25 hectares. The terminal operates mainly geared vessels, with one mobile harbor crane and 19 reach stackers and top loaders. The concession to operate the terminal was granted for 15 years.
- **Ports and Cargo Logistics**, a subsidiary of Sifax Group, operates containers and general cargo at Berths 6–8 with more than 790 m of quay deck and about 17 hectares of terminal area. The terminal owns and operates 4 mobile harbor cranes, 30 terminal trucks, and 26 reach stackers. The concession was awarded for 10 years.
- **Five Star Logistics Ltd**, a consortium of Comet Shipping Agencies Nigeria Ltd and its partners, operates the ro-ro terminal using Berths 9–10 with a total length of 440 m and a terminal area of 19 hectares. The terminal handles vehicles, containers, and break bulk cargo. Five Star Logistics will operate it for 15 years.
- **PTML**, a subsidiary of the Italian company Grimaldi Lines, agreed with the government of Nigeria to build, operate, and transfer a new terminal in Tincan Island. PTML funded terminal construction, and in return it will operate the terminal for 25 years before transferring the concession to the NPA. Construction included one new berth of 220 m, the paving of 220,000 sq m, a second 200-meter berth, the reclamation of 40,000 sq m of

terminal area, and the provision of all other necessary infrastructure. The multipurpose facilities handle vehicles, containers, project cargo, and less-than-container-load cargo.

Port Facilities Operational Assessment

The analysis of the operational performance and capacity of Lagos port is similar to a master plan study in its discussion of capacity but is limited in scope and depth. In fact, one of the preliminary recommendations of this study is to conduct a comprehensive master plan study for the Port of Lagos that could draw on the findings presented here. The operational assessment was undertaken on the basis of discussions with terminal operator personnel and representatives of NPA and major shipping lines calling Lagos and of a review of professional literature and websites.

Lagos port has nine marine terminals serving different types of cargo; for our analysis we assessed the most representative terminals for each type of cargo—container, bulk, and breakbulk. The following marine terminals were selected for each type of cargo:

- Container
  - APM Terminal
  - Tincan Island Container Terminal
  - Port and Cargo Logistics
- Bulk
  - Apapa Bulk Terminal
- Breakbulk
  - ENL

We assumed that the performance in these terminals is a representative sample of the performance of the port as a whole for each type of cargo.

APM Terminal at Apapa Port

APM Terminal (APMT) is a sister company of Maersk Lines, the largest container shipping line in the world. It operates the largest and most modern container terminal in Lagos and has the longest concession—25 years instead of the 10 years of other concessions. The reason for the longer lease is to allow APMT to recover the greater investment required for this terminal—one amounting to $100 million.

Terminal Facilities and Equipment

The terminal has the following main facilities and equipment:

- ***Berthage—***1,005 m, or four berths of 250 m each, with depth alongside of 12.5 m (Berths 15 and 16) and 10.5 m (Berths 17 and 18)
- ***Terminal area—***55 ha total, of which 29 ha are fully operational and the rest under development
- ***Ship-handling equipment—***three older ship-to-shore gantry cranes and four mobile harbor crane, two Liebher LHM 250s, and two LHM 500s.
- ***Yard-handling equipment***—four six-high RTGs, 30 reach stackers, and eight empty handlers.

The berth structure is insufficient to support modern gantry cranes. To overcome this problem, APMT installed secondhand cranes of older design, commonly called Charleston cranes in reference to their source port in the United States. The Charleston cranes have limitations:

- Their leg design requires a two-hatch separation between adjacent cranes (instead of one).
- Their limited back reach means they cannot stage two-wide hatch covers.
- They require a 30-second delay between trolley and gantry movements.
- Because of their structural design, they cannot gantry past the vessel house.

The yard has a special inspection area of about 5 ha. According to a report prepared by Cotecna, the destination inspection company providing services in the port of Lagos, the static yard capacity includes 9,500 ground slots, about half served by the six-high RTGs and the rest by four-high reach-stackers.

APMT, to take advantage of its entire concession area, is in the midst of a yard reconstruction project. Deepening the access channel and berth to 13.5 m is being discussed, and Customs facilities are being constructed by Cotecna under the seven-year contract for destination inspection agency, which ends at the end of 2012. The new facility will include fixed scanners that replace the mobile ones now in use. Starting 2013, Nigeria Customs Service (NCS) will be responsible for scanning operations, and therefore planning for the training of NCS personnel is required to ensure operations of the scanners and avoid having to outsource these operations.

Operational Performance

Table 2-1 presents key performance indicators taken from APMT's 2008 annual report submitted for the NPA's and the Bureau of Public Enterprises' review. The indicators used by APMT are common in container terminals. The most important for the operator is gross crane productivity—which is a very low 6.3 moves per hour. Such excessive crane waiting may be due to yard congestion, lack of yard equipment, or inadequate skilled labor. Productivity data are not broken down by type of crane.

The report also indicates that for the first three quarters of 2008, continuous vessel operations with two ship-to-shore cranes and two light cranes were not achieved because of the unreliability of the former NPA equipment, which caused the operator to resort to using slower ship's gear. Low crane productivity and inability to deploy enough cranes per ship are also reflected in low berth productivity (14.03 moves per hour). A recent study of the main container terminal in Tema, Ghana, undertaken by the USAID Worldwide Support for Trade Capacity Building (TCBoost) project, showed productivity of 13.0 moves per hour for ship-to-shore cranes and 8.1 moves per hour for ship's gear in the third quarter of 2007—about twice the productivity of Lagos.[3] Vessel operating reports from Tema indicate berth productivity reaching 30 moves per hour for larger ships (1,000+ moves per call) served by two ship-to-shore cranes and one ship's crane.

[3] APM is a partner in the terminal, which is known as MPS.

Table 2-1
APM Terminal Operational Performance

Key Performance Indicator	Unit	Apr–Dec 2006	Full Year 2007	Full Year 2008
Vessel berth productivity	Moves per hour	9.52	13.69	14.03
Gross crane productivity	Moves per hour		6.18	6.3
Number of vessel calls	Vessels per month	23	34	33
Average anchorage time	Days per vessel call	7.05	1.68	4.9
Average monthly throughput	TEU per month	31,398	34,146	45,198
Import dwell time	Days	29.7	31.7	27.83
Berth occupancy	% of avail berth hours	63.93%	68.35%	82.43%

SOURCE: APMT Annual Report 2008.

APMT did not provide organized data for 2009 but APMT staff reported that productivity has improved considerably since the new RTGs and mobile harbor cranes were introduced. Recently, berth productivity has averaged 22 moves per hour with two ship-to-shore cranes, or 11 moves per hour per crane. Moreover, the new managing director recently said

> The company also set a new operation record at the Apapa Container Terminal as its personnel performed 2,249 moves in 47.3 hours working the 2,890 TEU Maersk Pembroke, setting a new terminal record of 47.26 Moves per Hour (MPH). The Maersk Pembroke was the 14th consecutive vessel to have been worked at the Nigerian facility with productivity exceeding 30 MPHs, and the third vessel over the past two weeks in which productivity has surpassed 40 MPHs[4].

Although improvement has been substantial, performance is still short of that expected of modern container terminals, where ship-to-shore crane productivity is 25 or more moves per hour for similar ships and total berth productivity is 60–80 moves per hour. Although APMT has made significant improvement since taking over operations in 2005, performance is still far from satisfactory.

One impediment to ship handling productivity is yard congestion. Lagos is notorious for its long dwell time for containers and related yard congestion. Congestion eased recently, however, after a steep hike in storage tariffs and lower throughput because of the recession. In 2009, average dwell time at APMT was about 20 days, compared to the 32 days reported for 2007. This is close to dwell times in neighboring ports such as Tema but much longer than dwell times in other developing countries. Recent studies in South America, for example, indicate dwell times for import containers of 7–10 days.

Terminal Capacity and Congestion

Berth waiting times for ships at the APMT have declined dramatically because of declining throughput due to the recession and enhanced berth productivity. The yard has been decongested,

[4] www.apmterminals.com, APM Terminals Client Newsletter, Summer 2009, Page 4

and only a few ships are being sent to ICDs. More yard space is expected to be available when terminal expansion is complete and more RTGs are introduced. Usually, the storage density of RTGs is about twice that of reach stackers because of the higher stacking height, condensed footprint, and narrower aisles of RTGs. Thus, terminal storage will expand considerably. Finally, future improvement in customs or border clearance may shorten dwell times and further enhance storage capacity.

In 2008, APMT handled about 510,000 TEU and in 2009 the expected throughput is about 10 percent less. APMT's estimate for the built-out capacity of the terminal is about 1.2 million TEU, giving it considerable excess capacity.

APMT declined to provide a detailed layout of the terminal, considering it commercially sensitive, so APMT's capacity estimates cannot be confirmed. Nevertheless, on the basis of limited data, rough calculations of berth and yard capacity were made. The terminal yard's capacity depends on the expected dwell time of import containers. Table 2-2 presents a rough yard static capacity calculation based on an all-RTG layout, assuming only partial storage of empty containers on terminal.

Table 2-2
APMT Yard Static Capacity

Description	Unit	Quantity	Explanations/Assumptions
Total terminal area	Ha	54	Concession
Berth area	Ha	5	1000 m x 50 m
Auxiliary areas	Ha	8	Gate, inspection, administration, maintenance
Yard area	Ha	41	
Empty storage	Ha	5	Restricted to next ship
Full storage	Ha	36	
Storage density	TEU/Ha	250	Standard RTGs, 1-over-6
Ground slot	TEU	9,000	
Maximum storage height	Container	6	
Maximum static capacity	TEU	54,000	
Effective storage height	TEU	4.5	6th tier for shifting; 0.5 tier for selectivity
Effective static capacity	TEU	40,500	

Table 2-3 presents a rough calculation of the yard throughput (dynamic) capacity. Capacity estimates vary from 328,500 TEU per year to 985,500 TEU per year, depending on dwell time assumptions. Current dwell time is 19 days, indicating a capacity of about 500,000 TEU per year, which is equal to present throughput. Dwell times can be expected to shorten to 15 days or even to 10 days in a short- to medium-term time horizon. The capacity at 15 days is 657,000 TEU and at 10 days 985,000 TEU. Accordingly, the terminal has the potential to double its throughput if the dwell time is reduced. One assumption in this calculation is that the directional imbalance will continue, and most of the empty containers will be stored elsewhere, as is done today.

Table 2-3
Estimates of APMT Yard Throughput Dynamic Capacity as a Function of Average Dwell Time

Static Capacity		Days				
Maximum	Effective	30	20	15	10	2009 Est.
54,000	40,500	328,500	492,750	657,000	985,500	500,000

Note: The calculation refers only to imports/full containers. The terminals are expected to provide only partial storage for empty containers (next ship load only).

Table 2-4 presents the calculation of berth capacity, which assumes that the berth is equipped with modern gantry cranes performing at a faster pace than today.[5] We also assume that in the next five years the dominant vessels will still be sub-Panamax berth of 250 m (3,000 TEU). Using standard assumptions for productivity and utilization, we estimate that berth capacity will be 351,000 TEU per year, or for the four-berth terminal, 1.4 million TEU per year.

Table 2-4
Capacity Estimates for Ship-to-shore Berths

Description	Unit	Estimate
Moves/call	Boxes/Call	1,200
Crane productivity	Moves/Hour	25
Cranes/vessel	Cranes	3
Berth productivity	Boxes/Hour	75
Berth handling time	Hours	16
At-berth preparations	Hours	4
Total berth time	Hours	20
	Days	0.83
Available berth time	Days	360
Berth utilization	Percent	65
Useful berth time	Days	234
	Calls/Year	195
Throughput	Boxes/Year	234,000
	TEU/Boxes	1.5
Throughput in TEU	TEU/Year	351,000

As expected, yard capacity is the greater constraint and hence the determinant of terminal capacity. Accordingly, assuming development continues as planned, the terminal will be able to handle about twice its present throughput.

[5] The assumed handling rates are based on similar terminals in South America.

Ports and Cargo Terminal—Tincan Island Port

Ports and Cargo Terminal (P&CT) is the smaller of the two container terminals on Tincan Island. It is under a 10-year concession to a partnership of Sifax, a Nigerian logistics provider (70 percent), and Mediterranean Shipping Company (30 percent), the world's second-largest shipping line. P&CT handles mainly containers, but it also handles general cargo—mainly steel products—and project cargo. All general cargo is direct delivery to trucks. The terminal also provides limited container freight station operations.

Terminal Facilities and Equipment

The terminal has the following main facilities and equipment:

- ***Berthage—***760 m, or three berths of 250 m each with depth alongside of 10.5 m (officially 11.5 m)
- ***Terminal area—***total area of 17.4 ha, including two sheds
- ***Ship-handling equipment—***four LHM 400s mobile harbor crane
- ***Yard handling equipment—***Twenty four-high reach stackers and six five-high empty handlers

Operational Performance

According to the operations manager, typical mobile harbor crane productivity is about 10 moves per hour. Because most ships are served by two mobile harbor cranes, berth productivity is 20 moves per hour. The terminal has three berths, and the four mobile harbor crane are not sufficient to handle three ships simultaneously, which is what this terminal usually has to serve. Consequently, some ships still use ship's gear, resulting in lower productivity. Considerable progress has been made at this terminal since concessioning, but productivity is still unsatisfactory.

Terminal Capacity and Congestion

Like all Lagos terminals, the P&CT suffered congestion in 2008 as imports surged. In the second half of 2008, for example, the terminal handled 36,000 import containers, 44 percent more than the 25,000 handled in the first half of 2009. Throughput in the second half of 2009 is expected to reach 32,000 import. Despite this rise in throughput, the terminal is not expected to be congested.

P&CT decongestion was attributable to (1) increased storage rates, which reduced dwell time; (2) a reduction in the number of empty containers allowed on terminal; (3) faster responses to repositioning-for-inspection requests by cargo owners, which reduced dwell time; and (4) organized transfer of entire or part shiploads to ICDs.

The reduction in dwell time due to increased storage rates was similar to that undertaken by APMT. The reduction in empty containers stored inside the marine terminal has been equally important in easing congestion. The containerized trade of Nigeria is mainly one way—imports, with about 80 percent of outbound containers empty. In the past, shipping lines used marine terminals to store empty outbound containers. To reduce congestion, Lagos terminals limit the number of empty containers a line can store on terminal to the number of import containers on the

next ship, forcing the lines to use empty depots outside the port for storage. Using off-dock depots for empty containers requires double handling, but this arrangement still saves the shipping lines money by curbing congestion. Moreover, having fewer containers at the terminal facilitates access and repositioning for inspection, which further reduces dwell time and the need for storage.

P&CT handled about 157,000 TEU and about 500,000 tons of general cargo in 2008. According to its manager the terminal is working at full capacity. The yard has 8,000-TEU slots for full containers using four-high reach stackers and 1,500-TEU slots for empty containers using five-high empty handlers. Yard capacity determines terminal capacity, given that berth capacity, according to the terminal manager, is 350,000 TEU, assuming four mobile harbor cranes.

Storage capacity can be expanded if additional area becomes available after the terminal sheds are demolished. A more drastic expansion measure would be conversion of the yard layout system into six-high RTGs, which would double the storage density. Table 2-5 presents the related capacity calculation.

Table 2-5
Ports and Cargo Yard Capacity Estimates

Static Capacity		Dynamic Capacity as a Function of Average Dwell Time (Days)				2009 Est.
Maximum	Effective	30	20	15	10	
18,000	13,500	109,500	164,250	219,000	328,500	160,000

Note: The calculation refers only to imports/full containers. The terminals are only expected to provide storage for empty containers (next ship load only).

With a 10-day dwell time, capacity could reach 328,500 TEU, or about twice the expected 2009 throughput. Table 2-6 presents the berth capacity calculation assuming that mobile harbor cranes are the only type of crane at P&CT. Converting P&CT berth to ship-to-shore gantry cranes seems too costly, because doing so would entail building a new quay structure. Also, a gantry-based layout requires a wide dock area, which may reduce the yard area in this narrow terminal. Berth capacity for the type of ships expected to call at Tincan Island is 203,000 TEU per year. Accordingly, the three-berth terminal would have a berth capacity of about 609,000 TEU, much larger than the yard capacity of 328,500 TEU if dwell time is reduced to 10 days.

Tincan Island Container Terminal

Tincan Island Container Terminal is the larger of the two container terminals on Tincan Island. It is under a 15-year concession to a partnership of SDV International Logistic, whose parent company is Bollore, and Gold Star Lines, a subsidiary of Zim Integrated Shipping.

Terminal Facilities and Equipment

The terminal has the following main facilities and equipment:

- ***Berthage—***775 m, or three berths of 250 m each with depth alongside of 10.5 m (officially 11.5 m)
- ***Terminal area—***total area 24.6 ha, of which about 20 ha are used for container storage
- ***Ship-handling equipment—***one LHM 250 and two or three LHM 400s to arrive at the end of 2010
- ***Yard handling equipment—***four-high reach stackers and six-high empty handlers.

Table 2-6
Capacity Estimates for Mobile Harbor Crane Berths

Description	Unit	Estimate
Moves/call	Boxes/Call	800
Crane productivity	Moves/Hour	18
Cranes/vessel	Cranes	3
Berth productivity	Boxes/Hour	54
Berth handling time	Hours	14.81
At-berth preparations	Hours	4
Total berth time	Hours	18.81
	Days	0.78
Available berth time	Days	360
Berth utilization	Percent	60
Useful berth time	Days	216
	Calls/Year	169.33
Throughput	Boxes/Year	135,467
	TEU/Box	1.5
Throughput in TEU	TEU/Year	203,200

Tincan Island Container Terminal plans to purchase two or three LHM 400s to be operational at the end of 2010. In parallel, it will enhance yard capacity after ordering six RTGs and making the associated change in layout. The yard has static capacity of 11,000 TEU of full containers and 2,000 TEU of empty containers. If the entire yard converted to RTGs, which would require 14 of them, full capacity would double, to 22,000 TEU.

Cotecna is installing fixed scanners in Tincan Island as it has done in the Apapa terminal. Scanning operations are currently carried out by mobile scanners, but only until the completion of the fixed scanners. This operation will also be transferred to NCS at the end of 2012.

Operational Performance

No operational performance data were provided for Tincan Island Container Terminal. According to the operations manager, typical berth productivity is about 19 moves per hour, based on three ship's cranes. Similar productivity rates were also reported during interviews with shipping lines served at this terminal. This is considered unsatisfactory.

Terminal Capacity and Congestion

Tincan Island Container Terminal, like other Lagos terminals, suffered severe congestion in 2008. The surge in cargo imports forced the operator to use block storage for import containers, which makes access to containers difficult. This, in turn, made positioning of containers for inspection very difficult, lengthening the clearance process and lengthening dwell time, which in turn added to congestion. At some point the terminal could not accept ships because the yard was full and cargo owners could not reach their cargo. The many empty containers stored on terminal contributed to congestion as well. The terminal overcame the congestion problems using measures similar to those used at P&CT.

Table 2-7 presents the estimated capacity of the terminal according to the associated dwell times. For 30 days, the capacity is about 133,883 TEU, but if the dwell time falls to 10 days, a viable target within three years, yard capacity will increase to 401,500 TEU. Berth capacity is higher for this three-berth terminal, reaching 600,000 TEU, similar to the capacity of P&CT.

Table 2-7
Estimate of Tincan Island Container Terminal Yard Dynamic Capacity as Function of Average Dwell Time

Static Capacity		Days				
Maximum	Effective	30	20	15	10	2009 Est.
22,000	16,500	133,833	200,750	267,667	401,500	250,000

Note: The calculation refers only to imports/full containers. The terminals are only expected to provide storage for empty containers (next ship load only).

ENL Consortium, Apapa

ENL terminal in Apapa is the main general cargo terminal in Lagos. ENL Consortium is composed of a Nigeria-based public utility management company, Haastrup Line WA, GSI, and Dublin Port Company.

Terminal Facilities and Equipment

The terminal's main facilities and equipment include the following:

- ***Berthage*—**1,144 m, or seven berths of about 150 m each with depth alongside of 9.5 m
- ***Terminal area*—**total area of about 15 ha, including several transit sheds and open storage areas behind and between them
- ***Ship-handling equipment*—**None.

The terminal has two nonoperational LHM 250s mobile harbor cranes. NPA ordered these cranes, then transferred them to ENL during the privatization program, but without the parts (apparently, the parts were stolen). The terminal is in the midst of a rehabilitation program, which includes demolishing sheds and replacing them with concrete pads for storage of steel products. The program includes paving currently unpaved sections of the terminal.

Operational Performance

ENL handles a combination of breakbulk and bulk cargo, all using ship's gear. No performance data was available, considering that all breakbulk cargo is handled by vessel's gear and the performance varies considerably depending on the product handled and the characteristics of the equipment of the vessel. Nevertheless, for the main cargo, bagged rice, berth productivity ranges from 1,500 to 2,800 tons per day, for 12-hour days. Usually ship handling is performed during daylight. There is much irregularity in the handling of rice imports. The rice is handled directly to trucks, which are arranged by the agent, not the terminal. The waiting for trucks interrupts other operations. The rice is imported from Thailand and India in ships of 30,000–40,000 tons, calling

several ports in West Africa. Typically, the discharge at ENL amounts to 15,000–20,000 tons. Accordingly, the ship stays at berth for about 10 days.

Other types of cargo handled at ENL include bulk cement, frozen fish, steel products, and bagged chemicals, all imported. The bulk cement is handled by a screw conveyor (the operation is sublet to Dangote). The frozen fish is handled mainly to small trucks, with about 20 percent of the handling to a small on-dock reefer room. Steel products are usually stored at the terminal. The terminal also has bagging equipment for fertilizer.

Terminal Capacity and Congestion

The terminal is congested, with several ships always waiting on anchorage for berth. As recently as October 2009, ENL was reported as congested, with a waiting time of 8–10 days. The waiting time during 2009 was well below that experienced in 2008, when local media publications reported 14 vessels waiting for discharge at ENL, or equivalent waiting time of 100+ days.

The terminal throughput in 2008 was 4.2 million tons; it is expected to reach 5.0 million tons in 2009. Despite the increase in tonnage, the terminal's operations manager expects congestion to ease after the construction of storage areas for general cargo and improvement in road conditions inside the terminal.

Apapa Bulk Terminal

Apapa Bulk Terminal is the main dry bulk terminal of Lagos. It is operated by Apapa Bulk Terminal Limited (ABTL), a wholly owned subsidiary of Flour Mills of Nigeria, which has a large mill right behind the terminal.

Terminal Facilities and Equipment

The terminal has the following main facilities and equipment:

- ***Berthage*—**735 m, or 3 berths of about 250 m with depth alongside of 12.5 m (the entrance channel is only 11.6 m)
- ***Terminal area*—**total area of 13.5 ha, including transit sheds and open storage areas behind and between them
- ***Ship-handling equipment*—**several pneumatic and mechanical systems for discharging wheat and cement, including two modern 600-ton per hour Siwertelle Screw systems.

The terminal is in the midst of a development program that includes construction of seven silos with 46,000 tons of capacity and rehabilitation of three transit sheds for future handling of bagged and bulk rice. APBL plans to also handle bulk sugar imports in the near future.

Operational Performance

The main cargo handled is wheat imports. If the two Siwertelles are used, berth productivity can reach 12,000 tons per day, and if the two pneumatic systems are added, productivity can reach 15,000 tons per day. With such productivity, a 45,000-ton bulk ship can be handled in three days.

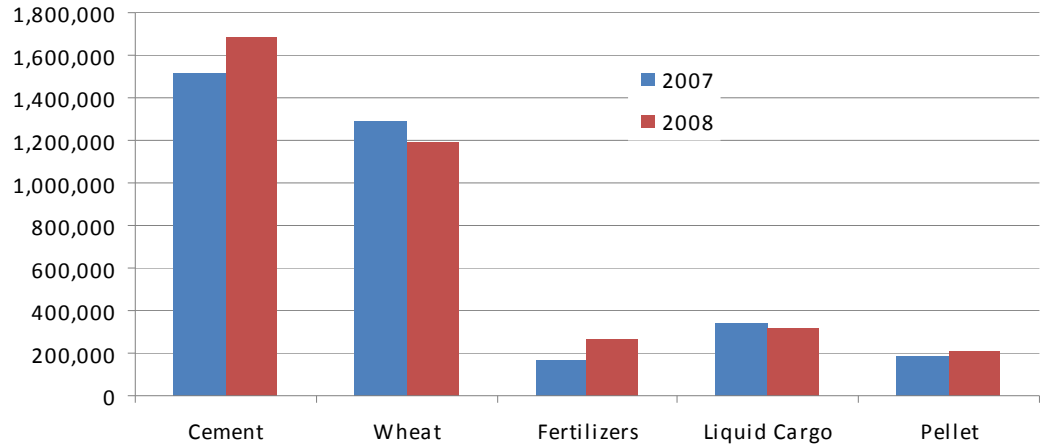
The cement is also handled mechanically, with a rated capacity of 800 tons per hour. The terminal also handles bulk import fertilizers, using ship's gear and hopper trucks to a storage and blending facility. Handling takes place continuously (day and night).

Terminal Capacity and Congestion

The terminal is not congested, and surplus capacity is evident in the plans to add the handling of rice. Throughput statistics for 2007 and 2008 indicate that bulk cement and wheat are the main cargo and that throughput is stable at about 3.5 million tons (Figure 2-3). The terminal also handled a small number of containers, mainly parts for its parent company.

Figure 2-3

Apapa Bulk Terminal Throughput by Cargo Type, 2007–2008



No capacity calculation is provided because calculation depends on storage capacity, which is a function of investment in vertical storage installation. Nevertheless, assuming that the access channel is deepened soon as planned to allow handling of larger and more efficient ships, the terminal has sufficient capacity.

Port Institutional Framework

Ministry of Transport

Several institutions are involved in the management of the port sector; some have responsibilities in other transport sectors as well. The Federal Ministry of Transport is responsible for marine transport (ports and inland waterways), railways, and federal mass transit. It has the mandate to formulate policy, set guidelines, provide and supervise the provision of infrastructure, develop and supervise the development of management and professional manpower, ensure the maintenance of security and standards, and work with domestic stakeholders and international organizations in developing the transport sector. The ministry has two service departments, one for maritime and the other for land transport, and three technical departments providing transport planning and coordination, human resources management, and finance and accounts

management. Other units are dedicated to press, legal, internal audit, servicom (social contract between the federal government and its people) and anticorruption matters.

The Maritime Services Department (MSD) is responsible for coastal and inland waterways and all aspects of marine transportation. It is headed by a director and has four divisions headed by deputy directors: Maritime Services, Ports, Shipping Development and Management, and Marine Pollution. The MSD is responsible for coastal and inland waterways and all aspects of marine transportation. The MSD supervises the five maritime parastatals, including the Nigerian Port Authority (NPA), Nigerian Maritime Administration and Safety Agency (NIMASA), National Inland Waterways Authority (NIWA), Nigeria Shipping Council (NSC), and the Maritime Academy of Nigeria (MAN). Below we describe the parastatals relevant for the Lakaji corridor.

Nigerian Ports Authority

The Nigerian Port System is regulated by the Nigerian Ports Authority Act No. 38 of 1999. The act created the NPA and gave it powers and duties to manage and administer Nigerian ports. According to the act, the NPA's functions are to

- Provide and operate port facilities and services;
- Maintain, improve, and regulate (technically and economically) the use of ports; and
- Ensure efficient management of port operations.

NPA, a 100 percent public entity, owns and administers land and water within port limits and is responsible for planning and development of port operational infrastructure, leasing and concession of port infrastructure, making recommendations on tariffs, nautical and harbor operations and hydrographic surveys, marine incidents and pollution, safety and security in common areas, port regulation and bylaw enactment and enforcement, day-to-day monitoring of operations, and enforcement of sections of the concession agreements.

Although NPA is responsible for regulation and operation of the port system, the Federal Ministry of Transport is still in charge of national policy formulation and planning for basic marine infrastructure and for the development of related marine legislation.

Although the NPA Act did not envision landlord ports,[6] it does provide for "concessions,"[7] and a considerable de facto concessioning of port facilities has taken place. But the reform started in 1999 cannot be achieved without further legislation. The proposed legislation defines the new role of the stakeholders and makes provisions for the protection of the private investor.

The NPA determines and sets the tariffs for all port services, subject to the approval of the minister of Transport. After a tariff is approved it is published in the booklet "Simplified Tariff Structure" for port stakeholders. But, in preparing the concessions, issues of conflict of interest and NPA's lack of capacity to carry out economic regulatory functions with the increased

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[6] In a landlord port the port authority owns the land and regulates the port while private companies carry out day-to-day operations.

[7] Section 8 (J, I, X)

participation of the private sector came to the fore. Consequently, the tariff chargeable by the terminal operators (concessionaires) was determined during negotiations for the concession and inserted in the lease agreement. The lease agreement also establishes the process for changing the tariff by applying for and obtaining the approval of the regulator.

This solution for tariff setting was reached in the expectation that a new legal and regulatory framework—establishing a National Transport Commission for tariff setting instead of the NPA—was imminent. The NPA was not expected to be the regulator when the time came for concessionaires to request changes in tariffs. But the new laws have yet to be enacted, and the NPA Act of 1999 still governs the management and administration of Nigerian ports.

Nigerian Maritime Administration and Safety Agency

NIMASA was created by the merger of National Maritime Authority and Joint Maritime Labour Industrial Council (former parastatals of the Ministry of Transport) in 2006. The agency's mandate derives from the Nigerian Maritime Administration and Safety Agency Act of 2007, the Merchant Shipping Act of 2007, and the Coastal and Inland Shipping (Cabotage) Act of 2003. The responsibilities of NIMASA combine regulatory and promotional maritime mandates. NIMASA has three divisions: Finance and Administration, Maritime Labour and Cabotage Services, and Maritime Safety and Shipping Development.

Nigerian Shippers Council

The NSC, was established by the Nigerian Shippers Council Act of 1977 to promote and defend Nigerian shippers' interests in matters affecting the shipment of imports and exports to and from Nigeria. NSC is a corporate body with an 11-member board with representatives from the Ministry of Transport, the Commodity Board, the Nigerian National Petroleum Company, the Nigeria Chamber of Commerce, the Nigeria Export Merchants Association, and the Manufacturers' Association of Nigeria. It also carries out a form of economic regulation by determining and approving tariff and rates in the port industry. The council has the powers to determine and fix tariffs and rates in the industry, though the council is not very effective because there was no prior consensus among stakeholders on this power. Furthermore, the council, like the NPA, lacks the capacity to carry out this function. This underscores the urgent need for the creation of an entity with the capacity to oversee the economic behavior of the port sector and the transport sector as a whole.

National Transport Commission

The reform of the transport sector entails introduction of the landlord model in one form or another in the various modes of transport, including ports. The landlord model allows for continued ownership of infrastructure assets by the government while commercial operations are ceded to private operators in a deregulated tariff regime.

To ensure harmonious relations with stakeholders and efficient operations, the reform also entails:

- Exclusion of economic regulatory functions from the NPA, Nigerian Railway Corporation (NRC), and Nigerian Inland Waterways Authority;

- Review and harmonization of economic and other regulatory functions in road transport after the concessioning of federal highways;
- Development of an economic and safety regulatory framework for the provision of services in the transport industry, including port services.

The legal framework calls for a National Transport Commission under the supervision of the Federal Ministry of Transport. The National Transport Commission Bill was drafted and went through review by stakeholders and quality control and is now awaiting the consideration and approval of the Federal Executive Council before being forwarded to the National Assembly for deliberation and passage into law.

CUSTOMS

NCS is the government agency responsible for collecting Customs and excise duties and other fees, charges, and levies associated with international trade. It is also responsible for the implementation and enforcement of some government trade and fiscal policies. NCS is headed by a comptroller-general who is assisted by five deputies, who head the departments of Tariff and Trade, Enforcement and Inspection Department, Service Support, Strategic Research and Policy, Human Resources and Development. Four of the five deputies are also zonal coordinators. Zone A's zonal coordinator is responsible for customs operations in Lagos Port Complex, including Apapa, Tincan Island, Kirikiri, and Lilypond. Customs commands are independent revenue centers. They compete with each other for resources and in reaching goals set by the central office.

Our analysis examined only the steps in the Customs clearance process that occur at the port terminal.[8] Figure 2-4 presents the steps after Customs receives the required documentation. The process depicted in this diagram—the process analyzed in this study—was in place until the end of 2009, when a new procedure was established.

Several steps must be completed before Customs receives an import declaration, including the release by a local bank of the final invoice, the bill of lading, and packing list, as well as the generation of a risk assessment report by the container-scanning contractor and the preparation of the single good declaration (SGD) by the clearing agent.

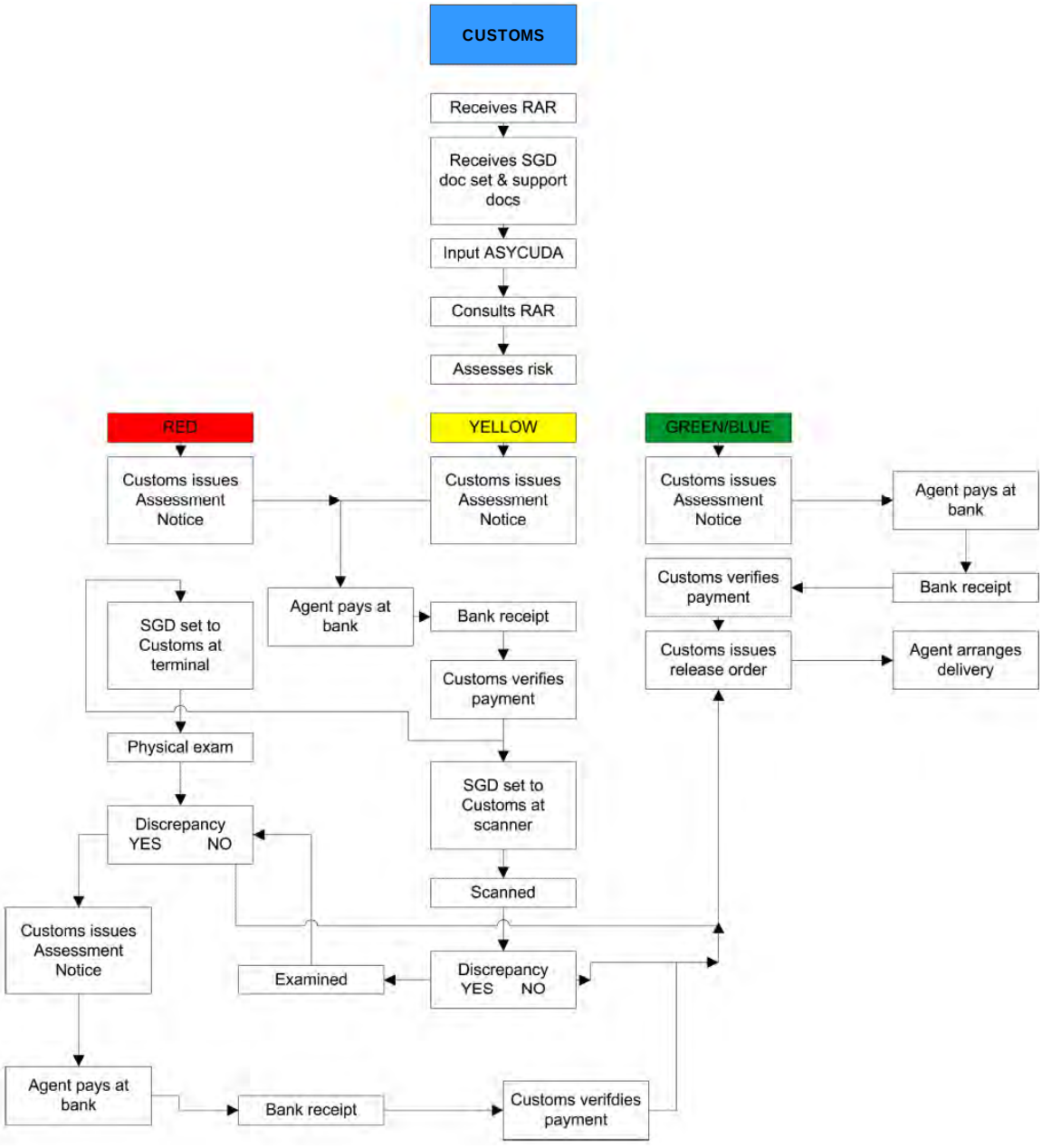
Several programs with the objective of improving Customs clearance are ongoing, and the procedures described in our analysis have since changed. Figure 2-5 shows the steps of the new process.

The new, simplified clearance process started in October 2009. In the traders' zone the declarant prepares the SGD and submits it to Customs electronically. The trader can make payment electronically and request the release of his consignment. When release is requested, a lane for

[8] The clearance process also requires that a preshipment inspection certificate and an intent-to-import form be filed before a shipment leaves the shipping port. These steps in the Customs clearance process, which are cumbersome and costly, are not included in this analysis because they are not part of the process along the Lakaji corridor.

clearing the goods—red, yellow, green, or blue—is assigned automatically. If the consignment was assigned to the green lane, the declarant proceeds to the terminal where the consignment is located and takes delivery. If the assignment is assigned to the yellow lane, the declarant proceeds to Customs for document check, where the officer can decide to release the cargo or refer it to the red line for physical examination or scanning. Blue is fast track, meaning inspection and clearance at the importer's premises.

Figure 2-4
Former Customs Clearance and Delivery Process

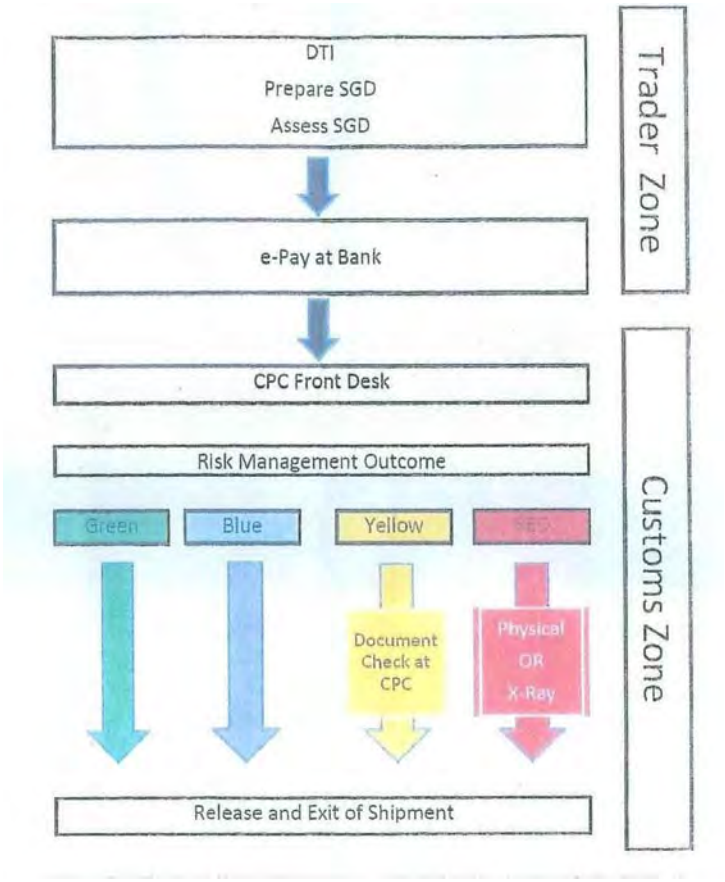


Source: Cotecna Destination Inspection Ltd.

With the new clearance process, the NCS expects less contact between declarants and customs officers. The process eliminates most of the activities that caused delay and therefore will speed

up cargo clearance. One of the major differences between the new and the old clearance procedures is the e-payment system, which allows importers to make payment upon submitting the declaration to Customs but before the goods have been cleared. There will also be a gradual shift from paper documentation to electronic documentation.

Figure 2-5
Simplified Customs Clearance Process



Source: Nigeria Customs Service

INLAND CONTAINER DEPOTS

Many port facilities throughout the world are experiencing encroachment from growth in the cities surrounding the port, partly because of the success of port operations. Lagos Port is not an exception. When limited storage capacity is combined with extensive cargo dwell time, the result is a clogged terminal where congestion escalates both up and down the transport logistics chain.

During a peak of congestion in Lagos Port Complex in 2008, the Ministry of Transport was forced to take extreme action to decongest the port. One action was the unprecedented creation of Customs-bonded storage facilities known in Nigeria as ICDs[9]. Although this served its purpose of

[9] In Nigeria, the term *ICD* has a broader definition than elsewhere. What is referred to in Nigeria—and therefore in this report—as an ICD is simply a Customs-bonded storage facility. The generally accepted definition of ICD is an off-dock marine terminal to or from which containers can be manifested as the port

relieving the congestion from port container terminals, it sets up a costly procedure. As will be discussed later, the transfer from a marine terminal to an ICD can cost as much as US$400 for one 40-ft container or US$300 for one 20-ft container, to which handling cost at the ICD should be added. And the transfer process may take several days if trucks are not available.

More than 20 ICDs were operational near the Lagos Port Complex during the period of analysis of this study, most serving as Customs bonded areas. For this study, we assessed the Lilypond ICD, which is representative of the others.

Lilypond Institutional Arrangements

Lilypond ICD is the largest and most modern in Lagos. It is owned by NPA, which operated it before the privatization program. The terminal is operated by Maersk Container Inland Services, a sister company of APM Terminal, the operator of the marine terminal in Apapa. Container Inland Services encompasses three companies: (1) Lilypond Container Depot Nigeria, the actual terminal operator; (2) Ibafon Container Terminal Ltd., which operates another, smaller ICD near Tincan Island and is involved in trucking containers; and (3) Coman, a stevedoring company in Benin.

Lilypond Terminal Facilities and Equipment

The total area of Lilypond is 12 ha and the static storage capacity is about 7,000 TEU. The main equipment includes 16 reach stackers. Recently, US$9 million was invested in this terminal, including paving of the entire area, new drainage, and new handling equipment.

Lilypond Operational Performance

Lilypond is about 4 km from Apapa and falls within the Apapa Customs district. Vessels calling Tincan with Apapa containers must transfer (“stemm”) the containers to Lilypond. Lilypond ICD is intended to handle overflow from the Apapa marine terminal. The containers of the vessels to be transferred are first block-stowed at the marine terminal then trucked to Lilypond, usually at night when road congestion is less severe than during the day. Because the containers are uncleared, the transfer is done by Customs convoy, with escorts before and after the trucks. With this arrangement, the trip takes three to four hours, and a truck runs an average of only 1.5 trips per night. The present transfer capacity is 120 containers per day (night); therefore, it takes three to four days to transfer a 300- to 400-container shipload. The transfer, cost along with the two additional lifts, amounts to $400 per 40-ft container and $300 per 20-ft container, assuming two containers per truck.

Lilypond’s throughput in 2008 was about 7,000 TEU, all of which were full imports. In addition to full containers, the yard offers limited storage services for empty containers. Transferring empty containers between Lilypond and APMT costs about $75 per trip; the two lifts cost another $15.

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of destination or origin. In Nigeria, some “ICDs” can be manifested as the port of destination or origin, but most cannot and are just bonded storage places.

Congestion and Capacity

Lilypond serves mainly as an overflow for APMT. After the decline in demand and increase in efficiency, APMT has been decongested, so demand for ICD services has dropped. Realizing that the import demand is going to continue to be low for some time, Lilypond management is changing its orientation from imports to exports. At the terminal the study team observed export containers being stuffed with bagged sesame seeds, cotton, and groundnuts directly from trucks (back-to-back).

Assuming average dwell time of 30 days, the dynamic capacity of Lilypond is 65,000 TEU per year, or close to 10 times the throughput during 2008.

ROADS

The Lagos–Kano–Jibiya/Daura corridor is the major route for moving goods to the north of the country, for moving import and export commodities and supplying local markets, and for intrastate movement of cargo. Average annual daily traffic in the corridor ranges from 17,000 vehicles between Lagos and Ibadan in the south to 5,000 vehicles between Abuja and Kano in the north (in both directions). Heavy vehicles account for 10 percent to 14 percent of traffic.

Road Characteristics

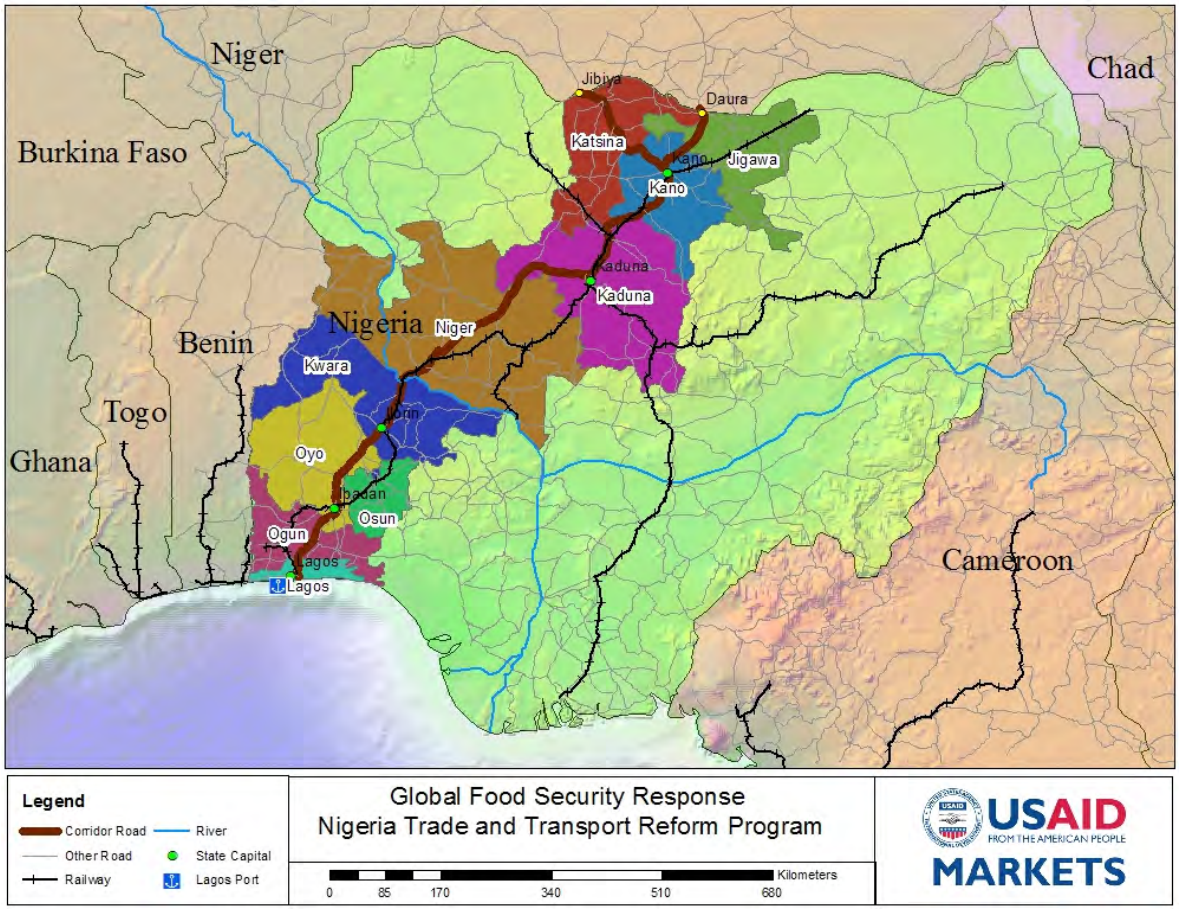
Members of the study team drove along the corridor's roads to take a visual inventory of conditions and develop a comprehensive understanding of road characteristics as the basis for modeling the transport system in the FastPath software. Figure 2-6 presents the road component between Lagos and the two legs linking Kano and Niger, through Jibiya (west going to Maradi) and Daura (east going to Zinder).

For analytical purposes the corridor was divided into the following six segments:

- Lagos Metropolitan Area
- Segment A between Lagos and Ibadan
- Segment B between Ibadan and Kaduna
- Segment C between Kaduna and Kano
- Segment D between Kano and Niger (via Jibiya)
- Segment E between Kano and Niger (via Daura)

The distance between Lagos and Kano is approximately 980 km. From Kano to Niger via Jibiya is 205 km and via Daura 155 km. Corridor length for the eastern leg is 1,185 km and for the western leg 1,135 km. The majority of the road is paved and the surface condition is predominantly poor, especially between Lagos and Kano. The surface condition of both links from Kano to Niger improves significantly and can be considered to be in good condition, with some segments in fair condition. The terrain is generally flat, with some hilly portions that do not create substantial delays for vehicles.

Figure 2-6
Lagos-Kano-Jibiya/Daura Corridor Road Component



Source: Nathan Associates Inc.

Lagos Metropolitan Area

The road network in the Lagos metropolitan area is characterized by poor conditions and heavy and disorganized traffic, with the arteries to the ports constantly blocked. Cargo traffic volume in the metropolitan area can be divided in two categories: trucks that deliver the cargo to a destination within the city limits, and trucks that cross the city for hinterland destinations. In the first group, some trucks are responsible for the transfer of containers between the port and ICD. Some transport companies making container transfers prefer to work at night rather than spend time and money stopped in traffic during the day. Congestion is due mostly to the many trucks parked on the access roads to the ports waiting for business. Some drivers even conduct repairs on the road while waiting. Other non-port-related activities that contribute to congestion are collection of fees from loaded trucks by local government officials outside the port, mechanics repairing broken trucks, poor traffic management on the part of authorities, and public transportation vehicles partially blocking lanes. Additionally, road conditions are so poor that at times there is only one lane available for travel because of potholes, broken vehicles, or flooding. For our analysis, we established the average travel distance in the metropolitan area at 25 km.

Segment A, Lagos and Ibadan

The distance between Lagos and Ibadan is 115 km on a dual carriageway in fair condition, with two lanes and a very narrow emergency lane in each direction. Trucks park inappropriately on both sides of the route near small urban areas, causing congestion and sometimes leaving only one lane operational in each direction. Drainage along this segment seems inadequate, and when rainfall is heavy sections of the road flood. The team observed no major traffic disruption.

Segment B, Ibadan and Kaduna

Conditions deteriorate severely on the 630 km between Ibadan and Kaduna. This segment is a single carriageway, with one lane in each direction, no emergency lane, and most surfacing in very poor condition. In the Ibadan urban area—and all urban areas along the corridor—the road is heavily congested, disabled vehicles constantly block the road, and informal commercial activities abound on the roadside.

Between Ibadan and the town of Oyo is an informal entrance to an alternative road still under construction. Known as the "Dualization Project," the road is supposed to link Ibadan and Ilorin but has not been finished. Still, most private passenger vehicles use it, significantly reducing traffic volume on the main road. The informal access points to the road are made by locals, who collect unofficial tolls and grant access. These points are not maintained and are often wiped out by rain. Most are not suitable for full-size trucks; a truck may enter but there is no guarantee that it will find a suitable exit for returning to the main road. Thus, the observed reduction in traffic volume along Segment B is irregular and the alternate route actually makes transit conditions unreliable and unpredictable.

Traffic volume remains light until the town of Ilorin (120 km from Ibadan). After Ilorin, surface quality worsens and many parts are gravel in poor condition. Pavement, albeit in very poor condition, is found again after the junction that diverts traffic to Abuja or to Kaduna, 290 km after Ibadan. The gravel and paved segments are both heavily congested, and the entire route from Ibadan to Kaduna is vulnerable to flooding from heavy rain and inadequate sewerage overpasses that permit passage of only one vehicle at a time and are easily covered by rising storm waters.

A poorly maintained and badly operated truck fleet also affects road transport in Segment B. The large majority of trucks using the corridor are at least 10 years old and poorly maintained. Because Segment B is a single carriageway, every disabled truck blocks entirely one of only two lanes, usually for two to three days. When the disabled truck is a fuel tanker that has caught fire, both lanes are blocked—for as long as five days, during which time all cargo movement is stalled. During its tour, the team counted 49 disabled trucks between Lagos and Kaduna, an average of one every 15 km.

Segment C, Kaduna and Kano

Segment C, connecting Kaduna and Kano over 210 km, presents a noteworthy improvement in road conditions. It offers a dual carriageway in good condition, with two lanes and an adequate emergency lane. A bypass 58 km from Kaduna allows drivers to avoid entering the urban area of Zaria. The bypass had no major delay or congestion. Road and traffic conditions in and around Kano are poor. The roads are heavily congested and the main routes are visibly deteriorated.

Kano has approximately 12 million inhabitants and is the main point of destination or origin for cargo in the northern part of the country.

Segment D, Kano and Jibiya, and Segment E, Kano and Daura

Past Kano are two routes to Niger. They have similar general characteristics—a single carriageway with one lane in each direction and an emergency lane big enough for disabled vehicles to stop without blocking traffic. Segment D (205 km) connects Kano with Jibiya; Segment E (155 km) connects Kano with Daura. Both segments have a paved surface in good condition. The team observed no congestion and a sparse flow of trucks and cargo to Niger. Most cargo is moved informally in passenger vehicles; overloaded minivans and medium- to heavy-duty trucks are the main users of this portion of the corridor. In interviews, local drivers indicated that trucks move mainly at night on secondary gravel roads to cross the border and avoid customs.

Summary

Table 2-8 summarizes the subjective ratings we used to categorize the characteristics of each link in the road infrastructure on the Lakaji corridor. These ratings allow FastPath to determine a "link factor" to estimate the transport operating cost for each link, by accounting for terrain, road surface condition, and traffic congestion.

Table 2-8
Lagos-Kano-Jibiya Corridor FastPath Road Links Characteristics

Link	Length (km)	Terrain	Surface Conditions	Congestion	Fast Path Factor
Lagos Metropolitan Area	25	Flat	Poor	Heavy	2.2
Lagos–Ibadan	115	Flat-Hilly	Fair	Heavy	2.3
Ibadan–Kaduna	630	Flat-Hilly	Very Poor	Heavy	2.5
Kaduna–Kano	210	Flat-Hilly	Fair	Light	1.2
Kano–Jibiya	205	Flat	Fair	Light	1.1
Kano–Daura	155	Flat	Fair	Light	1.1

Road Institutional and Operational Framework

The Lakaji transport corridor serves a significant proportion of the country's long-distance freight traffic, both domestic and international. A large portion of the traffic is cargo entering or exiting the country via the port of Lagos. This includes transit cargo to and from neighboring countries. Domestic cargo includes agricultural and manufactured goods moving long distance between Lagos and the major economic centers along the corridor. It also includes local traffic between the towns and villages along the corridor.

The Lakaji corridor road passes through nine states: Lagos, Ogun, Oyo, Kwara, Niger, Kaduna, Kano, Katsina, and Jigawa (see Figure 2-5). All road segments are owned and managed by the federal government, but under various arrangements. The Ministry of Works, Housing, and Urban Development is responsible for construction and rehabilitation and has awarded (or plans to

award) concessions on sections with high traffic volume—such as the Lagos-Ibadan expressway—as closed toll roads. The concessionaires will be responsible for

- Upgrading the highways to dual carriageways where appropriate;
- Ensuring the strength and structural integrity of the road and bridges along the route and repairing potholes, cracks, and deformities;
- Managing traffic along the highway to ensure few disruptions;
- Providing service and refreshment areas along the highways, and
- Liaising with authorities to provide highway patrol units to ensure the safety of road users.

The Federal Road Maintenance Agency is responsible for maintenance. In several sections it plans to introduce multiyear output- and performance-based road contracts in which contractors are responsible for maintaining roads to agreed service levels over a long period of time. Other road sections will continue to be maintained under the current system whereby maintenance is decided on an annual basis during the federal budgetary process. This includes the agency's Systematic Road Strengthening and Enhancement Program for periodic maintenance.

The mixed approach offers hope for improving the condition of significant portions of the corridor, but even if successful, it will have a limited impact on overall corridor performance. Sections of road in good condition will be next to sections with conditions ranging from poor to extremely bad. Although local traffic may benefit, long-haul freight will continue to suffer from long transit times and high vehicle operating costs as long as significant sections of the corridor are below acceptable standard.

The Federal Road Safety Commission of Nigeria regulates, enforces, and coordinates road traffic and safety management activities along the corridor. It is responsible for preventing and minimizing road traffic accidents, clearing obstructions on the highways, educating drivers and other members of the public on the proper use of the highways, providing prompt attention and care to victims of road accidents, conducting research into causes of road traffic accidents, determining and enforcing speed limits for all categories of roads and vehicles, and cooperating with bodies, agencies and groups engaged in road safety activities or the prevention of highway accidents.

The enforcement of regulations along the corridor is the responsibility of the Nigeria Police both through its regular bodies and through the highway patrol. At the state level, Vehicle Inspection Offices are also responsible for the enforcement of regulations for vehicles using the corridor.

RAIL

NRC has the sole responsibility for the provision of rail transport in Nigeria. Railway construction began in 1898, and the railway played an important role in connecting the northern part of the country with southern ports, leading to the growth of cities such as Kaduna, Bauchi, and Kano. The network consists of about 3,500 km of 1,067 mm single-track, narrow-gauge track (Western and Eastern Lines). The Lakaji railway corridor is 1,130 km long and includes stations in Apapa Port, Lagos, Abeokuta, Ibadan, Osogbo, Ilorin, Jebba, Mokwa, Minna, Kaduna, Zaria, Kano (closest station to Daura) and Kaura Namoda (west extension toward Jibiya.

At its peak in 1960, NRC hauled 3.0 million tons of freight and 15 million passengers per year and operated long-distance passenger services. Today NRC carries less than 50,000 tons of freight, and its 1 million passengers per year are mainly commuters in the Lagos area. Land transport along the Lakaji corridor is dominated by road; railway operations along the corridor are negligible. The total land-based cargo traffic volume along the Lakaji corridor in 2008 was approximately 3.6 million tons; the NRC transported less than 1 percent of that.

Basic rail connections are available at Apapa and Port Harcourt, but substantial improvement is necessary to bring their efficiency to acceptable standards. A lack of rail access to the port and to the hinterland contributes to the congestion at the port and on the roads.

The NRC has a yearly budget of about NGN 200 million (covering about 85 percent of recurrent expenditures, with operations and rent of land holdings providing the rest). In addition, the Nigerian government directly allocates funds for specific improvements (such as capital or maintenance) at the request of the NRC and after negotiation with and approval by the Ministry of Transport and the National Assembly. The funding mechanisms and institutional arrangement of the NRC prevent it from engaging in the long-term planning that an organization of its nature requires.

The absence of sufficient, uninterrupted, and dedicated funding for maintenance and replacement of equipment and infrastructure, coupled with inefficient resource management and irregular budget allocation, has prevented the NRC from keeping up with long-term investments. As a result, the organization has only a few unreliable locomotives in operation, an insufficient number of wagons, and poorly maintained tracks, as well as deficient signaling and communications.

Regulatory Framework

The Nigerian government, in response to the dismal performance of the railway against the backdrop of its potential, instituted a reform and concession program that calls for the reform, restructuring, and privatization of the railway sector in the following steps:

- Review the NRC Act 1955 as amended in 1990 and draft a new Railway Act
- Establish an independent regulator in the framework of the NTC
- Introduce private sector participation by granting concessions for passenger and freight services
- Divest NRC’s noncore assets.

To these ends, legislation has been drafted proposing a legal framework to implement the government’s reform program. It

- Separates the roles of policymaking, regulation, and operation;
- Provides a platform for the introduction of private sector concessionaires;
- Provides for economic and safety regulation by an interim railway regulator;
- Provides for the promotion and regulation of competition;
- Provides for the establishment of the Nigerian Railway Authority to acquire the corporation’s assets;
- Provides for the compulsory acquisition of land and greenfield development; and

- Provides for the introduction of subsidies for public service obligation.

The final draft has been submitted to the Federal Executive Council for approval.

In the meantime, the Infrastructure Concession Regulatory Commission was established in 2004 to regulate the concessioning of infrastructure in Nigeria. It has the following responsibilities

- Provide general policy guidelines on infrastructure regulation;
- Manage and superintend its policies;
- Make, alter, and revoke rules and regulations for carrying on its functions;
- Ensure efficient performance;
- Take custody of every concession agreement and monitor compliance with the terms and conditions of agreements;
- Ensure efficient execution of any concession agreement or contract entered into by the government;
- Perform other duties directed by the president, as are necessary or expedient to ensure the efficient performance of the functions of the commission.

It is also to serve as the public-private partnership resource center. The commission started operations in 2008 but has yet to guide a concession.

To promote competition, the following concessions were identified by the Infrastructure Concession Regulatory Commission for private sector participation:

- Western Railway—Lagos to Nguru and Kaura Namoda via Zaria
- Eastern Railway—Port Harcourt to Maiduguri, including the Kaduna–Kafanchan link
- Central Railway—A new route from Itakpe to Warri via Ajaokuta.
- Lagos Rail Mass Transit (LRMT)—initially between Agege to Iddo with extensions proposed to Lagos and Victoria Islands and to Lekki/Epe and Ojo/Okokomaiko.

The Central Railway vital for the revitalization of the iron and steel industry was the first concession to be undertaken. The 240 km standard-gauge rail line from Itakpe to Warri was concessioned to Global Infrastructure Nigeria Limited (GINL); GINL's iron ore and other raw steel materials will make up 95 percent of traffic on that line. But although the concession agreement was signed in 2006, the status of the concession is not clear. The federal government in 2008 cancelled the privatization of Delta Steel Plant and the concession of the National Iron Ore Mining Company and Ajaokuta Steel Complex, to which the Central Rail concession was a sequel. GINL has gone for arbitration on the matter. This issue may be affecting the concessioning of other rail sections.

But the government is still interested in promoting the concessioning of the railway and is rehabilitating the western standard-gauge line from Lagos to Kano, The concession of the Eastern and Western Railway Concessions have resumed, and the procurement of the concessionaire is planned to align with the completion of the rehabilitation of the rail lines by end-2010.

Rail Improvements Underway

The Nigerian government made significant rail investments in 2009 and has plans for 2010 to purchase equipment and perform major rehabilitation on the track and other infrastructure.

Rolling Stock

The NRC has placed an order for 25 narrow-gauge locomotives and expects to receive them in 2010. Eight locomotives are expected to be used for passenger service, and the remaining 17 will be used for freight service. The cost per locomotive is US$3–4 million, for a total of US$100 million. The new locomotives are expected to enable the NRC to transport approximately 900,000 tons of cargo per year (assuming reliable, safe, and competitive service and sufficient cargo demand in both directions)—more than 8 percent of freight carried along the Lakaji corridor. But the new locomotives will not be sufficient to provide competitive services and capture a larger share of the market, and the NRC would like to continue purchasing locomotives for a few years to increase service capacity. The NRC also plans to refurbish about 220 wagons per year.

Track

The NRC is conducting an assessment of rehabilitation projects needed to bring track infrastructure to acceptable operating levels. The projects will include communications and dispatch equipment. The assessment is being carried out in four phases:

1. Lagos–Jebba (500 km)—The contract was awarded to a Chinese company for completion in October 2010.
2. Jebba–Kano (630 km)—The NRC expects to issue a tender and award contracts in 2010.
3. Apapa Port—The study is underway to define the rehabilitation projects needed. Invitations for prequalification have been issued. The project is expected to be completed in three months.
4. Eastern Line (Port Harcourt–Maiduguri)—the assessment has not been completed.

The rehabilitation projects will replace ballast, steel sleepers, improve rail attachment to the sleepers. The expected safe running speeds after the rehabilitation are 45 km per hour for freight trains and 65 km per hour for passenger trains. Drainage structures will also be repaired. But because the design of the rail is 110 years old and the geomorphic conditions and drainage patterns of the terrain have changed, the drainage structures are potentially inadequate, as recent wash-outs of track sections may indicate. Addressing this problem requires a separate in-depth drainage study.

Signals and Communications

The rehabilitation projects will also consider projects to improve communications and signaling. Repeating stations for the microwave system and their solar power plants will be rehabilitated and protected against vandalism. This will allow direct communication with the trains. The mechanical signals will be replaced by digital color traffic signals that can be controlled remotely.

Port Access

The tracks in Apapa Port will be rehabilitated to reduce dependency on road transport for freight and relieve congestion. There is also a plan to construct a spur to the Lilypond Container Terminal. This project must be considered carefully because the space for expansion at the port is so limited. Normally a railway marshaling yard requires a large area, and the Apapa yard would need to be used to its maximum capacity to make it worthwhile. The concept of ship-to-train operations common in developed countries requires significant investment and a precision difficult to achieve in Nigeria. The benefits expected from implementing this concept in terms of reduction of labor costs are not the same than in developed countries. We recommend a prefeasibility study for intermodal operations to ensure economic viability of this type of operation.

Other Rail Operations Facilities

The federal government plans to set up eight ICDs on a public-private partnership basis. Concessionaires for six ICDs have been selected and contracts were concluded in 2006. The ICDs along the Lakaji corridor are at Ibadan in the southwest and Kano in the north. All ICDs are to be linked by rail, and up to 25 percent of the upcountry container moves from ports will be by rail. Border clearance for inbound and outbound containers will be carried out at ICDs, not the ports. This will reduce delays at ports caused by congestion as well as time spent on border clearance.

3. Cargo Characteristics, Traffic Flow, and Transport Scenarios

This chapter presents an overview of the characteristics of the cargo in the Lakaji corridor market and the dynamics of the flow between origin and destination. It also introduces the scenarios created for the FastPath analysis.

MARKET AND CARGO CHARACTERISTICS

The Lakaji corridor is the most active market in terms of cargo flow in Nigeria. The port of Lagos is the natural gateway for imports to the country and for exports from all the major cities along the corridor as well as other cities in the country. Lagos is also one of the largest industrial cities in Nigeria, processing the majority of food products that are imported into Nigeria. For example, nearly 50 percent of the consumption volume of rice[10] arrives from overseas, most of which uses Lagos as port of entry (although some enters the country illegaly from neighboring countries). Wheat also arrives at the port of Lagos for processing and hinterland distribution. Not only does Lagos serve as the gateway for food-related products but also for other critical agricultural supplies such as fertilizer, equipment, and spare parts.

Kano, to the north, anchors the corridor and serves as a distribution hub for the northern region of most imported goods. It also serves as the collection center of agricultural produce, especially grains, but also export products from the northern region which are then transported to Lagos for overseas shipment. Export products include sesame seeds, hides and skin, sorghum, gum arabic, groundnut cake, tsamiya (to Mali through Niger), and cotton.

Figure 3-1 presents historic containerized and noncontainerized cargo volumes handled by Apapa and Tincan Island Ports, excluding crude oil. In 2008 Lagos Port handled about 1.2 million TEU, of which about 544,000 TEU were imports, 61,000 TEU were laden exports, and the remaining were empty export TEU. About 93 percent of containers were handled by three terminals—APM Terminal, Tincan Island Container Terminal, and Ports and Cargo. For our analysis, we assumed that all containerized cargo was handled in these three terminals.

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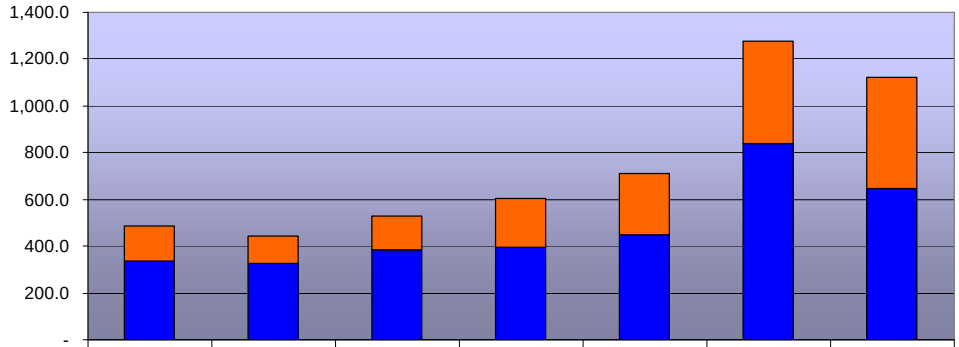
[10] Rice consumption is about 4.6 millions per year; 2.8 million are produced locally and the rest is imported.

Figure 3-1
Port of Lagos Containerized Cargo Volumes (Thousand TEU)

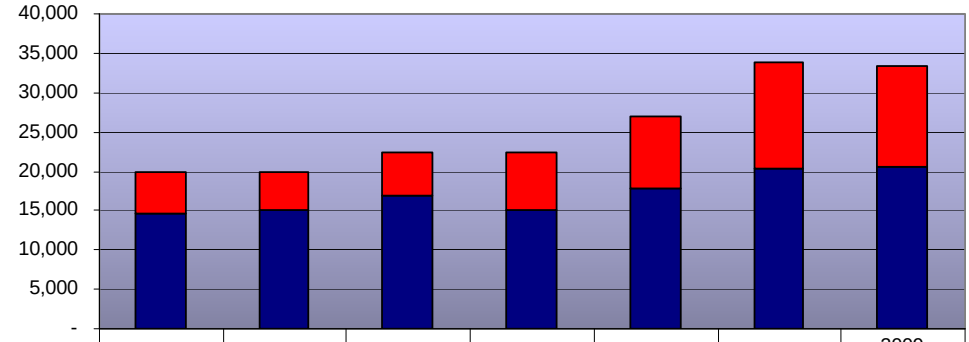


	2003	2004	2005	2006	2007	2008	2009 (Projected)
TCIP	149.5	119.7	144.5	210.0	259.6	435.3	474.5
APAPA	336.4	325.2	382.5	395.1	450.5	840.7	646.8

Source: Corporate and Strategic Planning Division, Nigeria Ports Authority, with adjustments from APMT and Ports & Cargo Terminals

Figure 3-2 present total historic volumes of cargo measured in tons handled by both ports, with about 31 million tons of import cargo and 3 million tons of exports handled during 2008 for a total throughput of almost 34 million tons. These statistics include containerized and noncontainerized cargo, and for the FastPath analysis, the volumes of break bulk and bulk cargo were analyzed separately from containerized cargo volume. Further analysis of NPA statistics indicates that in 2008 the total throughput of noncontainerized cargo was 15.8 million tons. From this total, Apapa handled 8.7 million tons and Tincan Island handled 7.1 million tons.

Figure 3-2
Port of Lagos Cargo Volumes (Thousand Tons)

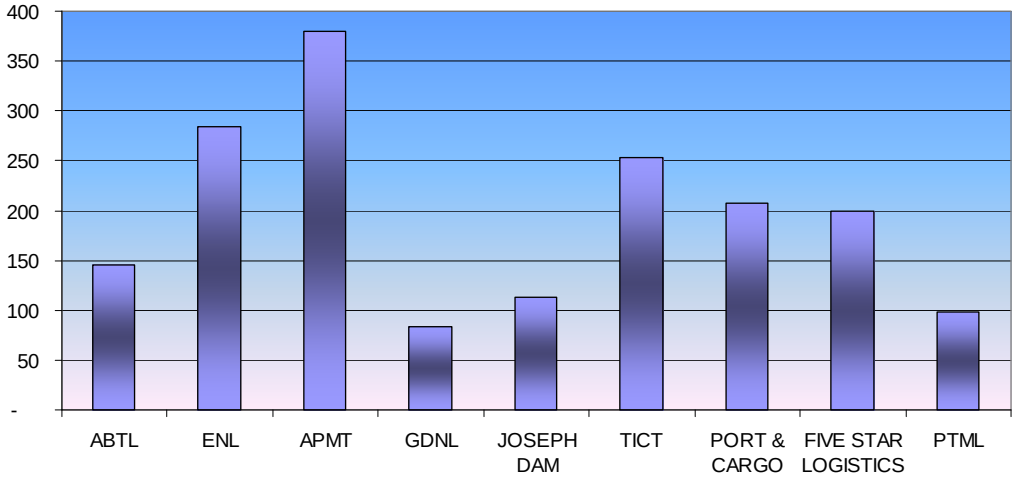


	2003	2004	2005	2006	2007	2008	2009 (Estimated)
TCIP	5,293	4,694	5,461	7,372	9,188	13,413	12,756
APAPA	14,579	15,152	16,931	15,112	17,831	20,309	20,628

Source: Corporate and Strategic Planning Division, Nigeria Ports Authority

Figure 3-3 presents the number of vessels that called Lagos Port Complex. The number of vessels that called APMT, Tincan Island Container Terminal , and Ports and Cargo accounted for a total of 840 vessels. Considering that these three terminals handled about 93 percent of containerized cargo, for our analysis we assume that all containerized cargo was handled by these 840 vessels. The remaining 922 vessels handled all noncontainerized cargo.

Figure 3-3
Vessels Calling the Port of Lagos, 2008 (Units)

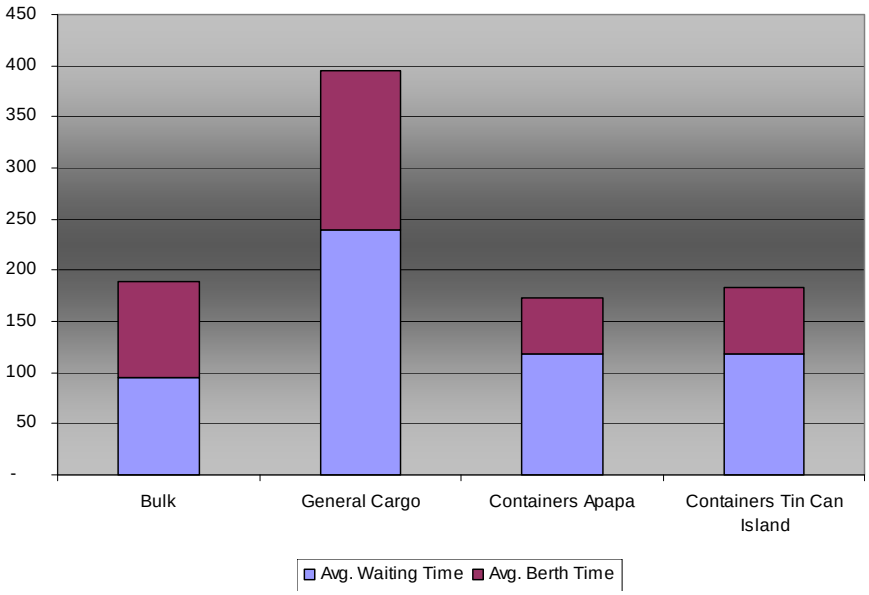


Source: Corporate and Strategic Planning Division, Nigeria Ports Authority

Not only cargo volume gives an indication of how busy or congested port operations are, but also the numbers of vessels, trucks, and wagons, needed to evacuate these volumes out of the port. The number of trucks or wagons needed is in general a function of the number of containers or tons of cargo handled, because trucks and wagons have weight or volume load limitations and are generally used to that limit. The number of vessels, however, varies depending on the characteristics of the vessel, the markets and routes served, volumes destined for other ports served by the same vessel, and other market factors.

Congestion at the berth is normally measured as the time that a vessel has to wait until a berth is available, which is also a function of the number of berths per terminal, the availability of equipment for unloading and loading, the efficiency of that equipment, and of course, the type of cargo served—that is, container, breakbulk, or bulk cargo. Lagos Port is a multipurpose port with several terminals, each specializing in a different type of cargo. Using the same terminals analyzed in Chapter 2 and statistics provided by NPA, we determined the average waiting time of vessels calling Lagos, according to type of cargo (see Figure 3-4). Because congestion sometimes causes container vessels to be diverted from Apapa to Tincan Island and vice versa, we analyzed these two ports separately. The figures were based on the number of berths per terminal, occupancy percentages at each terminal, the number of vessels that called the terminal, and the average waiting time for each terminal. The terminals used for the analysis included ABTL for bulk cargo, ENL for breakbulk (general cargo) and APMT for containers in Apapa, and a combination of Ports and Cargo and Tincan Island Container Terminal for Tincan Island.

Figure 3-4
Average Waiting and Berth Time of Main Terminals at the Port of Lagos, 2008 (Hours)



Source: Corporate and Strategic Planning Division, Nigeria Ports Authority and Terminals Operational Data

FREIGHT SURVEY

Before the privatization efforts and concessioning of ports after 2006, the NPA collected and published comprehensive essential data on port facilities and activities. The latest abstract of port statistics correspond to the 2005 publication. NPA still receives the information from the concessioned terminals but no longer publishes port statistics, which are not publicly available.

Cargo statistics for internal freight flows are not available in Nigeria, and the information on trade with neighboring countries is often also not available. This is the case of trade with Niger, which is significant but not well documented. Nigeria and Niger trade grains and livestock, changing direction depending on season, weather, and market conditions. Kano is at the center of a food product commercialization system in the West African subregion.[11] Similarly, information about internal trade among regions within Nigeria is also scarce. Furthermore, an estimated 20 percent of import cargo that is manifested for Lagos actually has a final destination in the hinterland. But because there is limited use of hinterland Customs commands, over 95 percent of cargo is cleared in Lagos.

Therefore, there is a great gap in data on cargo volume hauled on the Lakaji corridor. This is due to the relative disarray in the regulation of the road transport, the lack of a systematic data collection effort that consolidates disaggregated data and general Origin-Destination surveys. The

[11] Several studies have been conducted on this subject: M. Abdoul, K. Dahou, M. Trémolières, 2004, Maradi-Katsina-Kano: a Development Corridor, WABI/DT/21/04; Noëlle Terpend, 2006, An Assessment of Knowledge about Trade and Markets related to Food Security in West Africa, WFP/ODAN; Food Security and Cross-border Trade in the Kano-Katsina-Maradi Corridor, 2006, Joint mission report, WABI/DT/30/06; and Review of West African Markets and Trade, 2006, FEWS NET/WFP

railway carries minimum amounts of freight given the current problems caused by the lack of maintenance of the equipment and track.

Recognizing the importance of obtaining an accurate estimate of the real freight volume handled along the corridor, the Trade and Transport Reform Team met with stakeholders to identify type, volume, and origin and destination of cargo, direction of movement, type of vehicle used for transportation, frequency and cost of haulage, and other information. The following cities were selected for their importance to the corridor, as described:

- **Lagos—**the major industrial center of Nigeria and the most important port for both import and export cargo volume, except for oil. The majority of imports destined for other regions of the country passes through Lagos.
- **Kano—**distribution hub for the north of most imported goods and collection and distribution center for agricultural products, especially grains for Nigeria and Niger. It is also the collection center for products to be exported through Lagos, such as sesame seeds, hides and skin, sorghum, gum Arabic, groundnut cake, tsamiya (to Mali through Niger), and cotton.
- **Kaduna—**industrial center that is the point of origin and destination of certain cargo and a major point of exit and entrance into the corridor.
- **Mokwa—**major North-South junction that is a rest center for truck drivers (Nearby Minna is home to the National Association of Road Transport Owners [NARTO].)
- **Jibiya—**primary border crossing post connecting Kano in Nigeria with Maradi in Niger and the end point of the corridor.

The following stakeholders were interviewed for the survey:

- USAID/Markets, Kano Office
- Nigerian Shippers Council, Zonal Office, Kano
- Maersk Nigeria Limited, Kano and Lagos offices
- Inland Container (Nigeria) limited, Kano
- Container Inland Services, Lagos
- NARTO officials of the trucking branch in Kano, Kaduna and Minna
- National Union of Road Transport Workers officials in Kano, Kaduna, and Mokwa
- Manufacturers association of Nigeria, Kano and Kaduna offices
- Several freight forwarders in Lagos
- Olam Nigeria, Lagos
- Dawanau Grains Market Association, Kano
- Danbatta Livestock Market Association, Danbatta-Kano
- Dala Foods (Nigeria) Limited, Kan,o as an importer and exporter.

The following commodity flows were observed:

- Grains (sorghum, maize, sesame seed, cowpea, and soybean) from Kano to the Lagos area
- Grains (rice and wheat) from Lagos to Kano
- Grains to and from Jibiya
- Livestock from Kano to Lagos/Environs and Abuja
- Petroleum from Lagos to Kano
- General cargo

- Containers from Lagos to Kano
- Cement from Lagos to Kano
- Fertilizer from Lagos to Kano.

FREIGHT FLOWS AND MODAL SHARE

The results of the interviews were tabulated and the units of TEU, heads of livestock, crops and other commodities were converted into metric tons to express all loads in the same unit. Additional information about container movement along the corridor was provided by the Container Inland Services as well as partial statistics from the Nigerian Ports Authority. The information about volume that was collected from the interviews was also checked and correlated with heavy-vehicle traffic counts in counting stations along the corridor. Details of the assumptions used calculating the total corridor freight volumes are presented in Table 3-1. The total estimated corridor freight volume between Lagos and Kano is about 6.19 million tons per year in both directions (South-North and North-South). Additionally, 978,000 tons were transported by road between Kano and Jibiya destined for Niger.

Table 3-1
Assumptions Used in the Estimation of Total Corridor Freight Volume

Variable	Assumption
Average weight of 20-ft container	30 tons
Average weight of 40-ft container	40 tons
Weight of truck with cattle	300 kg/head and 19–25 heads/truck
Weight of truck with sheep	256–268 kg/head and 39 heads/truck
Weight of pretroleum products truck	45,000 liters/truck = 40 tons/truck
Maximum truck capacity (incl. overload)	50 tons/truck
Percentage of empty backhauls	85%

The NRC transported 47,000 tons along the corridor. This is equivalent to 0.8 percent of freight volume on the corridor. The remaining 6,143,000 tons, or 99.2 percent of the volume, was transported by road.[12]

The survey focused on the major commodities transported along the corridor, as described by the major producers, importers and transporters. This does not capture the entire universe of traffic along the corridor. Using the information in bills of lading collected at the Port of Lagos potentially miscounts the cargo destined for the northern region, considering that a considerable amount of cargo destined for the north is manifested for Lagos and after being cleared by Customs it might be repackaged before being hauled north. For this reason, particularly for the

[12] The NRC's share of volume is expected to increase after investments in this sector are realized and operational changes are put in place—to 715,000 tons per year or about 12 percent of total corridor traffic—but this will happen only if NRC can prove to potential costumers that it can keep to schedule and improve its reputation for being a responsible operator.

intermodal study, we recommend that a follow-up study be carried out to identify total demand on the corridor based on origin-destination surveys in different points along the corridor.

Lagos Port Import Flows

The total volume of imports into the Port of Lagos during 2008 was about 31 million tons (12 million tons of containerized cargo, 13 million of general cargo and 6 million bulk cargo aproximately). The major commodities of containerized cargo includes industrial chemicals, plastic materials, auto parts, agricultural machinery, construction materials among others. Bulk cargo included cement, wheat, fertilizers and liquid cargo. General cargo included rice, fish, other cereals, fertilizers, iron and steel, vehicles, among others.

In 2008 the total value of these imported goods was US$27.24 billion[13] excluding mineral fuels and oil. The most important commodities in terms of value included 63 percent for machinery, equipment, plastics, steel, iron, copper, aluminum and other metal products. Agricultural and food products, including cereal, fish, meat, dairy products, fruit, coffee,cocoa, nuts, spices, and manmade staples accounted for about 10 percent of total value. An interesting product associated with food production and food security is fertilizers, which accounted for 1.5 percent of total value.

According to the information collected in interviews with clearing agents, freight forwarders, truck transport companies, and Customs officials, about 80 percent of cargo arriving in Nigeria via Lagos, or 25 million tons, remains in the Lagos metropolitan area and that import cargo distributed to the hinterland using the Lakaji corridor was about 3.4 million tons. The remaining volumes were destined to other regions of the country via different transport corridors.

The majority of the import cargo transported on the Lakaji corridor had Kaduna or Kano as destination, and only about 2 percent went to the northern end of the corridor close to Jibiya.

Lagos Port Export Flows

Exports in Nigeria represent a small percentage of total port throughput. In 2008 exports accounted for 3.0 million tons, less than 10 percent of the total volume at the port. Of the total volume of export cargo, about 65 percent, or 1.95 million tons, originated in Lagos, and about 500,000 tons arrived from the north via the Lakaji corridor. The remaining 550,000 tons originated in other areas of the country, using different routes to get to Lagos. The majority of cargo using the Lakaji corridor originated in Kano or in areas close to it, with less than 1 percent originating in Jibiya.

Total export value for all of Nigeria in 2008 was US$80.75 billion[14] including oil products. The mineral fuel oils and other oil-associated structures had a value of US$76 billion. Other export products accounted for a total value of US$4.75 billion or 6 percent of the total exports. The top

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[13] Source : ITC calculations based on COMTRADE statistics, 2008

[14] Idem 13

10 products made up 75 percent of this figure and include raw hides, cocoa, plastics, essential oils and perfumes, rubber, books and newspapers, machinery, manmade staple fibers, oil seed, and grain and seeds.

NPA statistics show that containerized exports made up about 55 percent of total volume in tons and 45 percent was exported as general cargo. Bulk export volume was insignificant.

Because the volume of import cargo is so much greater than the volume of exports and because emergency food supplies would arrive as import cargo, our analysis focuses less on export processes and more on imports.

Corridor Volume

Table 3-2 presents the volumes of cargo handled through the corridor for containers, bulk, and general cargo that will be used during the analysis of FastPath scenarios.

Table 3-2

Total Volume of Cargo Handled at Lagos Port and Distributed along Lakaji Corridor

Origin/Destination	Containers		General Cargo (Tons)	Bulk (Tons)	Total
	Tons	TEU			
IMPORT					
Lagos Metropolitan Area	6,968,794	435,550	12,308,675	5,275,146	24,552,615
Kano	231,392	14,462	1,676,358	718,439	2,626,189
Jibiya	4,628	289	32,020	19,452	56,100
Total Lakaji Corridor	7,204,813	450,301	14,017,053	6,013,038	27,234,905
Rest of Nigeria	1,506,179	94,136	1,368,791	580,895	3,455,864
Total Imports Lagos	8,710,992	544,437	15,385,844	6,593,933	30,690,769
EXPORT					
Lagos Metropolitan Area	632,965	39,560	1,337,390	-	1,970,355
Kano	98,448	6,153	182,143	-	280,591
Jibiya	1,969	123	5,531	-	7,500
Total Lakaji Corridor	**733,382**	**45,836**	**1,525,064**	**-**	**2,258,446**
Rest of Nigeria	240,410	15,026	532,459	-	772,869
Total Export	973,792	60,862	2,057,523	-	3,031,315
Total Lagos Port	9,684,784	605,299	17,443,367	-	33,722,084

SOURCES: NPA, port terminal operators, and freight survey conducted for this report

The total combined import and export volume along the Lakaji corridor is about 30 million tons, although our freight survey estimated a total of 6.19 million tons in both directions. Domestic traffic accounts for the difference, which is half of the total volume transported through the corridor.

CORRIDOR GROWTH

In the previous section, freight volume along the Lakaji corridor was estimated. Although the scope of this study does not include estimating cargo growth, this variation can be relevant in identifying the potential economic benefits or losses associated with logistics performance. In general, freight growth can be associated with economic growth. Transport literature commonly associates growth in freight traffic with GDP, and some suggest that cargo traffic growth can reach 1.2 to 1.5 times GDP growth.

Table 3-3 presents historic and projected data for Nigeria's GDP—with a period of soaring growth between 2001 and 2004 and an average annual growth rate of 7 percent during the past five years. The most recent projections from the International Monetary Fund (IMF) have Nigeria's economy growing at an average annual rate of 6 percent from 2009 through 2014.[15]

Table 3-3
Nigeria GDP, Constant Prices (NGN million)

Year	GDP	Change (%)
1997	4,340	2.8
1998	4,458	2.7
1999	4,479	0.5
2000	4,717	5.3
2001	5,102	8.2
2002	6,183	21.2
2003	6,822	10.3
2004	7,544	10.6
2005	7,951	5.4
2006	8,445	6.2
2007	9,034	7.0
2008	9,574	6.0
2009	9,852*	2.9*
2010	10,343*	5.0*
2011	10,883*	5.2*
2012	11,529*	5.9*
2013	12,247*	6.2*
2014	13,022*	6.3*

* Projected
Source: International Monetary Fund, World Economic Outlook Database, October 2009

Freight traffic at Lagos Port Complex (Figures 3-1 and 3-2) indicates that in the past five years, containerized cargo has grown an average of 15 percent per year (excluding empty containers) and noncontainerized cargo has grown an average of 11 percent per year. The relationship between GDP and cargo volume growth in Nigeria is therefore consistent with what the literature suggests—on the high side, with a relationship rate close to 1.7–2.0.

High transport costs and taxes and cumbersome customs processes have discouraged transit cargo on the Lakaji corridor. This cargo is now being moved through neighboring corridors, particularly in Benin. In addition, interviews with stakeholders indicated that a considerable volume of cargo that is destined for Nigeria has also shifted to Benin for illegal entry into the country. This volume is necessarily difficult to estimate, but it might be recovered if performance along the Lakaji corridor improves. Reasons given for the diversion of goods include the ban on many products in Nigeria, higher import tariffs, and long delays and inefficiency at the Port of Lagos.

In our projections of the economic impact of improvements proposed in our recommendations, we used a conservative annual traffic growth of 10

[15] IMF GDP Growth Projections, September 2009.

percent between 2010 and 2020 and a more moderate rate of 5 percent for the following 10 years to 2030, along with the GDP growth projections of the IMF and a conservative relationship between GDP and cargo growth.

TRANSPORT LOGISTICS SCENARIOS

The dynamics and performance of the terminals inside the Lagos Port Complex vary depending on whether the cargo is containerized or noncontainerized and whether it is import or export. To model these variables, we created six scenarios in FastPath to assess corridor performance:

1. Import containers in Apapa
2. Import containers in Tincan Island
3. Export containers (assessing both Apapa and Tincan Island together)
4. Import general cargo
5. Export general cargo
6. Import bulk

Volumes of bulk export cargo are very small and therefore were not analyzed.

Because rail operations are practically nonexistent and unreliable—there were no real or relevant rail commercial operations along the corridor in during 2008—these are not included in any base case (current) logistics scenario. Nevertheless, representatives from the NRC and the Ministry of Transport indicated that railway operations along the Lakaji corridor could start in 2010 or 2011, so rail operations are an area for potential improvement that could result in more efficient transport operation along the corridor.

Unofficial payments are common practice in Nigeria, but learning how much unofficial payments add to transport along the corridor was difficult for two reasons. Some parties interviewed, particularly in large companies, preferred not to discuss the subject, indicating that their company does not promote corrupt practices. And the range of amounts provided by other companies varies considerably, suggesting that these kinds of payments and the time lost in dealing with checkpoints are not uniform and depend on many factors including the type of company, availability of documentation, and time of day. Anecdotal information, however, indicated that payments range from 2 percent to 30 percent or even 50 percent of the official cost of the cargo. Nonetheless, the majority of companies interviewed acknowledge that these charges are already included in the rates charged to clients as part of the cost to do business. As we will present later in the recommendation section, a program to identify and document unofficial cost and time could be implemented to identify the impact of these variables in the economy and along the logistics components of the Lakaji corridor.

Containers

Nigeria imports more than it exports and must re-export excess empty containers. Table 3-4 summarizes the numbers of containers handled by all terminals in Lagos Port Complex in 2008—544,437 TEU of laden import containers but only 60,862 TEU of laden export containers and

670,592 TEU of empty export units. The total handled in both directions at Apapa and Tincan Island terminals was 1,276,043 TEU.[16]

Table 3-4
Container Traffic Statistics at Lagos Port Complex, 2008 (TEU)

Terminal	Import		Export		Total (TEU)
	Laden	Empty	Laden	Empty	
APAPA					
ABTL	257	-	-	-	257
ENL	64	-	-	-	64
APMT	272,217	10	19,913	548,274	840,414
GDNL	-	-	-	-	-
Subtotal	**272,538**	**10**	**19,913**	**548,274**	**840,735**
TINCAN ISLAND					
Josephdam	10	-	1,840	8,317	10,167
Tincan Island Container Terminal	139,372	-	25,331	46,315	211,018
Port & Cargo	92,356	142	8,609	56,227	157,334
Five Star Logistics	18,861	-	2,964	7,258	29,083
PTML	20,727	-	2,205	4,201	27,133
KLT	573	-	-	-	573
Subtotal	**271,899**	**142**	**40,949**	**122,318**	**435,308**

Source: Corporate and Strategic Planning Division, Nigeria Ports Authority, with adjustments from APMT and Ports & CargoTerminals

Containerized cargo is handled primarily by APMT in Apapa Port and by TICT and Ports & Cargo in Tincan Island. Therefore, we focused our analysis of containerized cargo for each port using the performance information for these terminals. The performance analysis, which will be described later, indicates that performance is different in several components of the Apapa and Tincan Island container terminals, particularly in the import direction. Therefore, we considered necessary assessing the corridor in the import direction using both terminals separately. For this purpose, we have created two scenarios using each port as the entry point to the corridor. All activities undertaken outside the terminal gates will be the same for the rest of the corridor. For exports, performance differences are less noticeable, except for operations at the berth. Because the other components perform similarly in Apapa and Tincan Island, for exports we combined the operations in both ports.

[16] According to the NPA, 922,073 TEU were handled through Lagos port, but a detailed review of data provided by terminal operators suggests that volumes were higher. We made appropriate adjustments to reflect this information.

To determine the economic importance of each scenario, we identified the trade composition value for all containerized cargo. This analysis was undertaken using the total number of containers from Table 3-4 and the value of cargo that normally is transported via container. Although the value distribution of import and export goods corresponds to the totality of the goods imported by Nigeria through all its ports, it is reasonable to assume that a similar distribution of goods value was experienced in Lagos port. Using this assumption, Table 3-5 presents the trade composition value for containerized cargo used in the FastPath analysis.

Table 3-5
Trade Composition Value for Containerized Cargo

Value of Trade	Import Traffic %	Export Traffic %
Low, < $10,000/TEU	40	10
Medium, $10, 000–$50,000/TEU	50	65
High, >50,000/TEU	10	25

Most of the cost associated with cargo handling and storage at the terminal depends on the size of the container—20-ft or 40-ft. Therefore to determine the cost per TEU we determined the cost per container in each terminal and calculated and weighted average cost per TEU. The calculations for determining the cost per TEU are presented in Appendix B. The analysis of the containerized scenarios is described below.

Import Containers—Scenarios 1 and 2

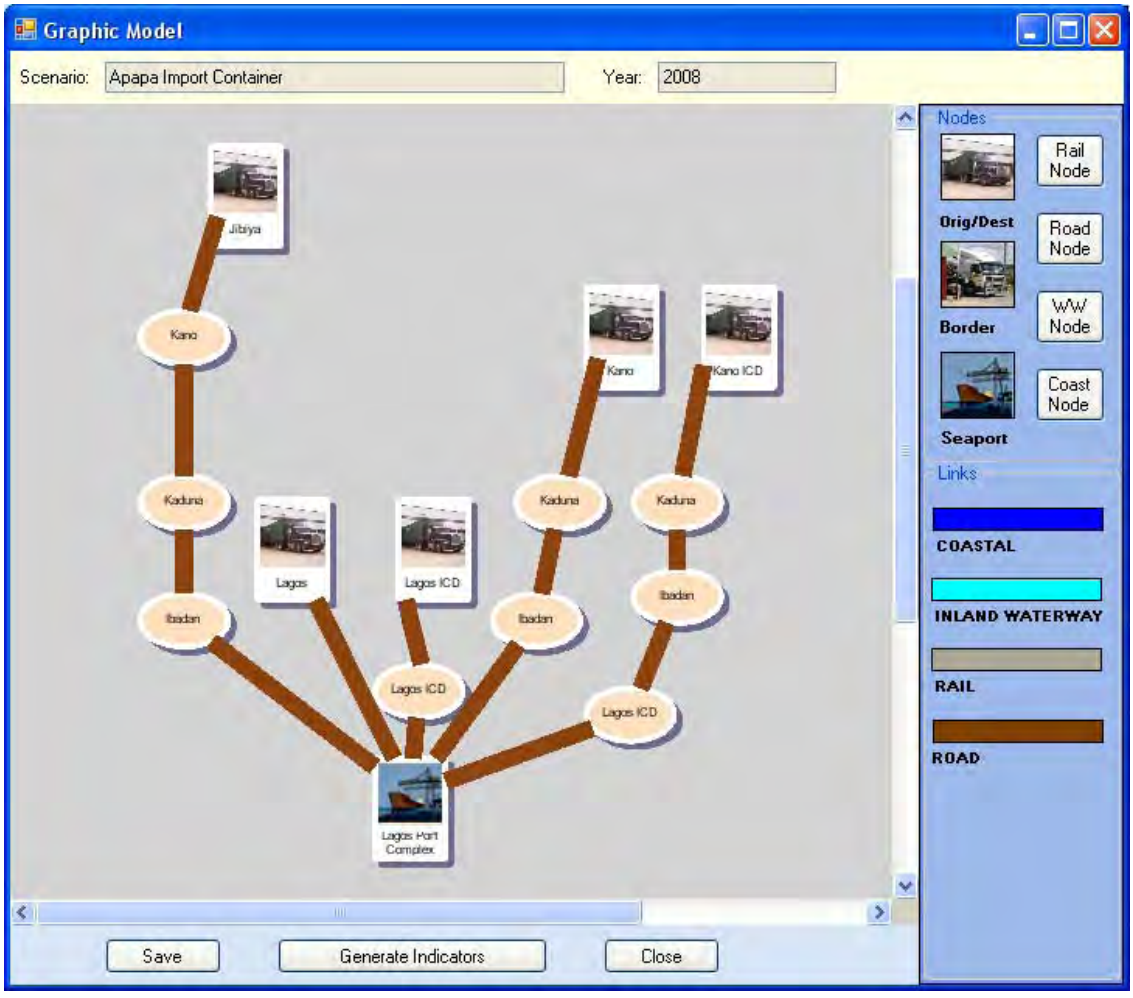
Full containers imported through the port of Lagos accounted for a total of 544,589 TEU. Of this amount, 272,548 TEU were handled through Apapa and the remaining 272,041 TEU through Tincan Island. Shippers and cargo owners have little to say in the decision of which terminal to use because the shipping line makes the decision. Import cargo volume distribution is about equal, suggesting that both ports seem to provide a similar level of service to shipping lines or that both ports were working close to their capacity during 2008.

Each port has a Customs command assigned, and shippers or their clearing agents go through Customs at their respective command. It is not possible to clear cargo in a different command than the one originally assigned. There is no Tincan ICD; therefore ships calling Apapa with Tincan cargo (e.g., Maersk Line) must also call Tincan. Such double calling is costly; it requires more ship's time at port, additional pilotage and tuggage, and more berth hours. When ships call at Tincan with Apapa cargo, the cargo is usually sent by truck to the designated Apapa ICD. Although not as expensive as double calling, this still involves an additional cost for transfer. Having multiple Customs Area Commands in the same port area is untenable. In addition, each command has specific revenue goals that must be reached creating competition among them.

A graphic model of Scenarios 1 and 2 is presented in Figure 3-5. This schematic representation shows the Lagos Port Complex (which contains Apapa and Tincan Island) and five subchains. Three subchains correspond to the process followed when cargo is not transferred to ICDs and goes to three final destinations—Lagos Metropolitan Area, Kano, and Jibiya. Cargo volumes destined for intermediate locations such as Kaduna or Ibadan were included in the closest

destination in the model (Kano or Lagos). In addition, two subchains simulating the process experienced by cargo transferred from the port to an ICD because of additional costs incurred in this process. These two subchains have the additional node identified as Lagos ICD in the figure. Although the characteristics of all the links are the same for all subchains, there are differences in cost and time in this particular ICD node that must be incorporated into the model as separate subchains. For Scenario 1, the information in the port node corresponds to Apapa port. For Scenario 2, the information in the port node refers to Tincan Island.

Figure 3-5
FastPath Schematic Representation of the Lakaji Corridor, Scenarios 1 and 2 for Import Containers



The operational performance at the berth is different in each port because of differences in handling equipment and terminal configuration. The same situation applies for storage, where Apapa shows a dwell time of about 20 days and Tincan Island nearly 30 days. But the operational performance in other components in which the terminal does not have full control—that is, border clearance and to some extent gate operations, which are related to the Customs scanning and inspections process—are similar in both ports. Costs associated with operations in both ports vary, although these tend to be within the ranges of a harmonized tariff structure established by the NPA in the concession agreements. One of the cost components that can be established directly by the terminal operator is storage costs. This is a good measure because it gives terminal

operators a tool for advocating for faster removal of containers from the terminal, avoiding having to use the terminal facilities as a warehouse.

Historically, terminal operators have maintained very low storage charges, and importers have exploited this circumstance, deliberately delaying the clearance of cargo and using the port as a storage facility. Importers even abandon cargo at the port, hoping to get their goods back when Customs auctions them at very low prices. During our analysis, the container terminal in Apapa introduced progressive storage rates that vary depending on the size of the container (20-ft or 40-ft) and type of container (dry or reefer), with intervals of 4 to 12 days, 13 to 20 days, and beyond 21 days. This measure is expected to reduce the time that port users leave their cargo at the terminal.

Apapa Port Import Scenario (Scenario 1)

Figure 3-6 depicts the major characteristics of import containers coming into Nigeria through the Port of Apapa. The estimated number of containers handled in this direction during 2008 was 272,548 TEU.

Figure 3-6
Import Flows in Apapa-Scenario 1, 2008

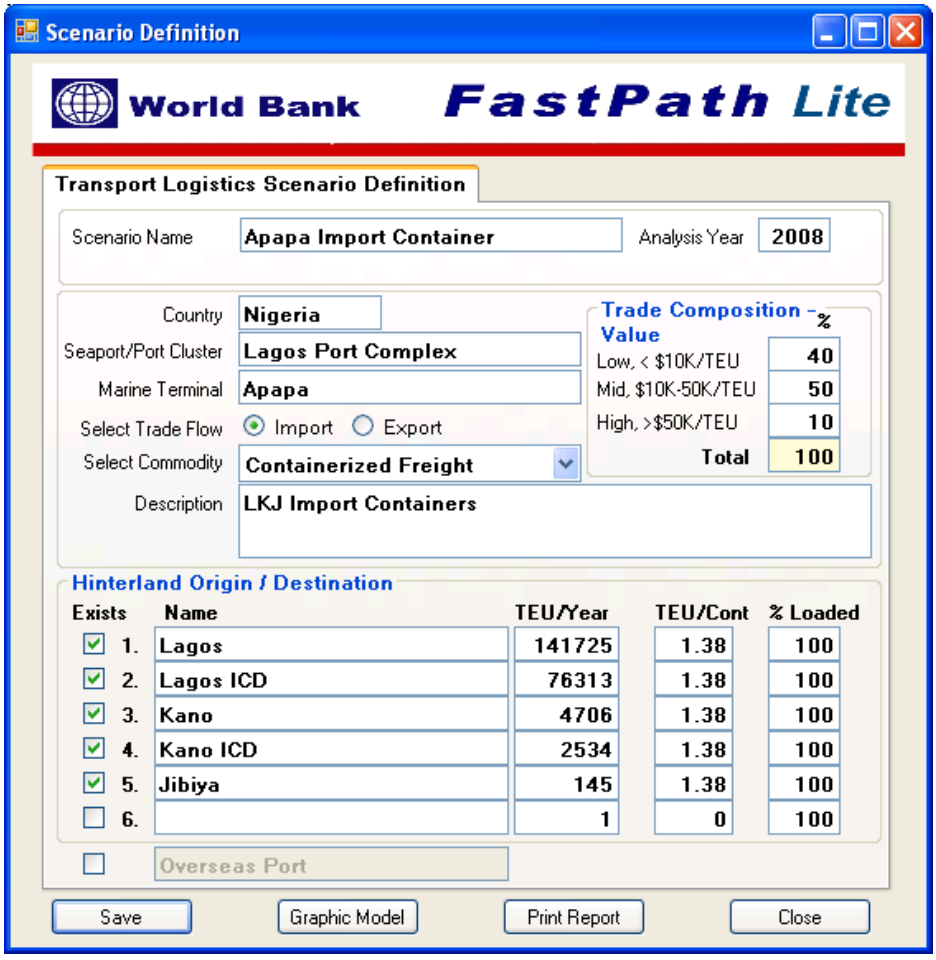


Table 3-6 summarizes performance of each component of the corridor in terms of time, cost, and reliability. From the basket of variables composing activities along the corridor, FastPath analyzes the components that have a major impact on the use of infrastructure but does not assess each and every cost or process. The table also shows the norms for accepted good global standards. An initial assessment of the performance can be conducted comparing actual cost, time, or reliability with these norms.

Table 3-6
Performance of Main Subcomponents of Import Containers, Apapa Port 2008 (Scenario 1)

Component	Cost (US$/TEU)		Time (hours)		Reliability[a]	
	Total Average	Norm Range	Total Average	Norm Range	Total Average	Norm Range
APAPA PORT						
Average channel operations[b]	146.41	2–22	117.6	1–15	51.0	5–40
Average unloading at berth[c]	124.98	10–50	27.5	4–8	26.4	5–50
Total yard handling and storage	575.48	10–30	181.0	5-15	8.5	5–40
Customs CISS for import[d]	280.00	15–55	289.0	8–36	67.3	5–40
Gate	36.81	0-4	5.0	0-4	70.0	5-100
ROAD						
Road transport Lagos metro area	553.55 (22.14/km)	0.05–0.15 per km	4.0 (12km/h)	40-60 (km/h)	50	5–100
Road transport Lagos–Kano	2,321.23 (2.48/km)	0.05–0.15 per km	Varies per segment	40-60 (km/h)	Varies per segment	5–100
Road transport Kano–Jibiya	265.72 (1.29/km)	0.05–0.15 per km	8.6 (45km/h)	40-60 (km/h)	100	5–100

[a] *The percent of average transit time that would include 90% of shipments.*
[b] *Including a port surcharge of N15,000 and N25,000 for 20-ft and 40-ft for delays to ships in channel, eliminated at the end of 2008*
[c] *Average unloading time per container is half the average time for ship berth time.*
[d] *CISS is the Comprehensive Import Supervision Scheme fee, which corresponds to 1 percent of the FOB value of goods. Other fees are charged during clearance, but because these apply only to certain goods or are based on a percentage of the duty, they are difficult to calculate and are not included in the analysis.*

The first part of the table refers to the performance of the main components at Apapa port. Data include the number of vessels that called the port and the detailed description of berth occupancy and vessel turn-around time. With this information and the port tariff, a cost per TEU was derived. Data for channel and berth operations were provided by NPA and for vessel waiting time by APMT. Data for Customs, yard, and gate operations were derived from interviews with freight forwarders, clearing agents, customs officials, and terminal operators. Assumptions informing this calculation are presented in Appendix C.

Channel Operations

Total channel costs per TEU include US$14.09 for port dues plus port surcharge of US$132.35. Port dues at the channel are within the range for good performance compared with international norms. This might be because vessels do not have to pay for waiting time at anchor and they

normally wait for berth availability about 20 miles from the port entry buoy. Waiting time of 117 hours exceeded by far the maximum time acceptable in most international ports. For this reason, shipping lines charged the port congestion surcharge during the majority of 2008, until the end of the year when berth congestion was reduced. The port should do all possible to keep waiting time within acceptable ranges to avoid such surcharges.

Berth Operations

Berth transfer costs of US$124.98 per TEU fall in the poor-performance range—good performance is about US$50 per TEU. Average shipyard time is also high at 27 hours average per vessel. In the first months of 2009, APMT improved berth productivity and expects that average shipyard time will be reduced.

Yard and Customs Operations

Taking into consideration all the activities charged in the yard, the average cost per TEU is US$378, which compares very poorly with international norms. The many levies on this activity —environmental protection, Maritime Organization of West and Central Africa (MOWCA), Nigerian Maritime Administration and Safety Agency (NIMASA)—add a great deal to the charges for the use of port infrastructure and the terminal yard handling fees (NPA cargo dues plus terminal handling charges). The multiagency clearance process involves SON and the National Agency for Food and Drug Administration Control.

Average dwell time of 20 days, which includes 181 hours of storage time and 289 hours of border clearance, is just too high. Terminals are responsible for receiving containers from vessels before containers are transferred to the hinterland; they are not intended for long-term container storage. If shippers use the terminal as a cheap warehouse, storage rates should be increased.

The port administrative and regulatory framework does not penalize organizations that impede operations. The framework should be restructured to create incentives for efficiency and penalize practices that harm the port's operational performance. APMT already has progressive storage rates, but these should be reviewed if congestion at the yard is caused by importers' deliberately delaying clearance or abandoning cargo. A review of the reasons for clearance delay should be incorporated into importers' files, the terminal should enforce the 90-day rule for uncleared cargo, and importers repeatedly at fault should be banned from importing. Often a lack of funds is the reason for clearance delays; the Nigeria Shippers Council should advocate for credit facilities to ensure fund availability to liquidate letters of credit.

Border clearance is lengthy and cumbersome—about 12 days—and usually starts only after the vessel has arrived, because the bill of lading and the ship manifest are required. Early clearance should be promoted and clearing formalities should be completed as early as possible, preferably before vessel arrival. A number of studies analyzing these issues have made recommendations for reducing the clearance time. Several developing countries have had good results in reducing time for clearance while increasing revenue because cargo volumes increase with the facilitation of import formalities.

The risk management system should be changed immediately. According to stakeholders, approximately 70 percent of containers are selected for the red line and most of the rest are selected for yellow. Nearly all are physically examined. The scanning and examination process takes an average of 98 hours (4 days).

The average time for physical examination is about 137 hours (5.7 days). According to customs, examinations are required because shippers provide inaccurate or faulty declarations. The system for penalizing irregularities in customs declarations and incentivizing traders' compliance is inadequate. Examinations themselves create many problems:

- Consume scarce waterfront area at the marine terminal for container positioning and customs offices
- Generate extraneous traffic in the marine terminal (e.g., outside trucks and cars, stevedores, agents, cargo owners and others involved in the examination that should not be part of the process).
- May be interrupted by bad weather because they are conducted in the open. The terminal operator has not provided acceptable cover for examination areas.
- Create opportunities for contact between Customs, other agency, or contract examiners and cargo owners; the interaction creates the opportunity for bribes and rent seeking.

In contrast, scanning—based on a modern x-ray machine—is quick: 35 seconds for a 20-ft container and 55 seconds for 40-foot container. There is no physical contact between the customs officer and the cargo owner, and results are fully documented, with digital images of the content and forms. The results are available for review at the examination machine and at any computer terminal linked to it elsewhere. About 35 percent of scanned containers also undergo physical examination, either because scanning reveals irregularity or the container is considered high risk by other variables. Lagos Port already has scanning systems in place but these are underused.

Other ancillary costs are incurred by shippers during the border clearance process not associated with the use of infrastructure. These include clearing agent fees, freight forwarders, shipping agents fees, and other costs that facilitates the import process. These costs are not included in the analysis because little can be done by regulators to modify or control these market-driven expenses.

Gate Operations

There are two gates in Lagos Port: the first is controlled by NPA and the second is the terminal gate. Queues at the NPA gate create congestion that affects the performance at the terminal gate.

The average 5-hour gate processing time in the import direction is considered fair. Good performance is 0 to 4 hours. Nevertheless, this includes only time to exit the port and does not reflect time spent trying to reach the port. Access roads to the port are in very poor condition and parking is inadequate, so trucks park on access roads to wait, creating congestion. Truckers make informal payments at the gates to gain entry, then enter the ports and claim the few parking spaces available, causing congestion. While the problems outside the port are not responsibility of the terminal operator, action—implementation of a truck control system and truck staging areas—

could improve performance at the gate and reduce congestion and waiting time, and consequently operating costs.

Road Performance

The information about the characteristics, travel times, and costs of road transport along the Lakaji corridor was collected through interviews with freight forwarders, transport companies, and truck and cargo owners. Meetings with officials from the Transportation Planning and Coordination Department at the Ministry of Transport, the Road Sector Development Team at the Ministry of Works and Housing, and the Federal Roads Maintenance Agency provided insight into the regulatory framework and plans to improve road conditions.

During the interviews, detailed records were made of the steps required to collect, consolidate, distribute and transport cargo to/from Lagos and points along the corridor. Issues such as congestion, road conditions, overnight stays, night driving, accidents, and alternative routes were discussed and their impacts estimated in average, maximum, and minimum travel times. Several quotes for different points along the corridor were used to estimate transport costs and their variation between road segments. Issues such as cargo origin and destination, delay and wait time, operating cost (fuel and labor), empty returns, equipment positioning, and commercial strategies were considered in the cost.

There are two significantly different transport markets in the corridor, both dominated by import flows. These are short haul within Lagos and long haul along the corridor. The short-haul transport of cargo between the Port of Lagos and the Lagos metropolitan area (including the ICDs) is characterized by very significant road congestion. The average cost of transport is US$554 per TEU or US$22.14 per TEU/km for 25-km deliveries. This exceeds by far the norm of US$0.05–0.15 per TEU/km. The average speed of 12 km per hour (including waiting time) for 25-km deliveries is low compared to the norm of 40–60 km per hour.

Considering this low average travel time, companies specializing in the transfer of containers to ICDs prefer to operate at night when in a single shift (8 hours) they can make three transfers compared to two during the day. This extra transfer increases the productivity of the operations and could mean the difference between a company’s success or failure.

Customs does not clear cargo at night, and therefore only transfers to bonded warehouses are possible at that time. Extending Customs hours to allow night operations could increase the productivity at the port and reduce operational costs. Night operations would have to be accompanied by other measures such as installation of lighting by terminal operators and also adaptation of operational procedures for extended hours clearance.

For the long-haul road transport market, this study divided the road into four segments: Lagos–Ibadan, Ibadan–Kaduna (including Ibadan–Ilorin segment), Kaduna–Kano, and Kano-Jibiya/Daura. The first segment is dominated by severe road congestion and high traffic volume. The second is characterized by moderate road congestion and very poor road conditions, which cause very low speeds and accidents. Drivers spend at least one night on this long segment because driving it at night is not safe. The third segment is characterized by fair road conditions and light congestion and the fourth segment by fair road conditions and very light traffic.

The Ibadan–Kaduna segment has the lowest average speed—22 km per hour, including waiting time—and the highest cost—US$2.7 per TEU/km. The other segments have higher speeds: 23 km per hour for Lagos–Ibadan and 45 km per hour for Kaduna–Kano and Kano–Jibiya/Daura. These segments perform at the international standard for good. Costs in these segments are US$2.48 per TEU/km for Lagos–Ibadan and US$1.29 per TEU/km for Kaduna–Kano and Kano–Jibiya/Daura. These costs are still high compared with international norms. The total transport costs for Lagos–Kano is US$2,321 per TEU.

Many stakeholders also complained about container demurrage charges. Demurrage charges for Lagos, Kano, and Jibiya/Daura were estimated on the basis of charges of US$25.8 per day for 20-ft containers and US$38.7 per day for 40-ft containers. It was estimated that a roundtrip within Lagos takes an average of 15 days; a roundtrip to Kano, 25 days; and a roundtrip to Jibiya/Daura, 27 days (including storage at the port beyond the negotiated free days, border clearance, transport to Kano, storage at Kano, and return to Lagos). The average demurrage charge for containers transported within Lagos was estimated at US$490, to Kano US$820, and to Jibiya US$880.

Tincan Island Port Import Scenario (Scenario 2)

Figure 3-7 depicts the major characteristics of import containers coming into Nigeria through Tincan Island Port. The number of containers handled in this direction in 2008 was estimated at 272,041 TEU.

Figure 3-7
Import Flows at Tincan Island-Scenario 2, 2008

Table 3-7 summarizes the performance of each component of Tincan Island Port in terms of time, cost, and reliability. The road components are omitted here because the information is given in Table 3-5.

Table 3-7
Performance of Main Subcomponents of Import Containers, Tincan Island Port 2008 (Scenario 2)

Component	Cost (US$/TEU)		Time (hours)		Reliability[a]	
	Total Average	Norm Range	Total Average	Norm Range	%	Norm Range
Average channel operations[b]	157.58	2–22	117.6	1–15	51.0	5–40
Average loading at berth[c]	124.43	10–50	32.5	4–8	56.2	5–50
Total yard handling, storage, and shipping agent	881.03	10–30	393.0	5–15	25.3	5–40
Customs (CISS) and other agencies	280.00	15–55	289.0	8–36	67.3	5–40
Gate	36.60	0–4	5.0	0–4	70.0	5-100

Performance based on 2008 data
[a] *The percent of average transit time that would include 90% of shipments.*
[b] *Including a port surcharge of NGN 15,000 and NGN 25,000 for delays to ships in channel, which was eliminated at end-2008*
[c] *Average loading time per container is half the average time for ship berth time.*

Port Performance

Port performance operations in Tincan Island are very similar to those in Apapa except in dwell time and total storage charges. The additional storage charges are a direct consequence of the longer dwell time. If Customs clearance time is the same in each command, and the behavior of importers is similar in both ports if market conditions and requirements are the same, the longer period is a result of greater inefficiency in Tincan Island. Tincan Island has two separate, smaller terminals while Apapa has a single terminal. Therefore, congestion has a greater effect in Tincan Island. If handling equipment is added to the equation, the productivity of Tincan Island is far less than the productivity of Apapa. Configuration is another disadvantage of Tincan Island terminals, and the physical facilities are old and difficult to expand or modernize. Because expansion is not possible at Tincan Island, the only option for the terminals to handle more cargo is by reducing the dwell time of containers. The dwell time at Tincan Island port has its terminals working at full capacity constantly. Lower dwell times will increase capacity without major infrastructure investments.

All the operational issues and recommendations described in Apapa for border clearance, inspection, and gate operations are valid for Tincan Island container terminals.

Export Containers—Scenario 3

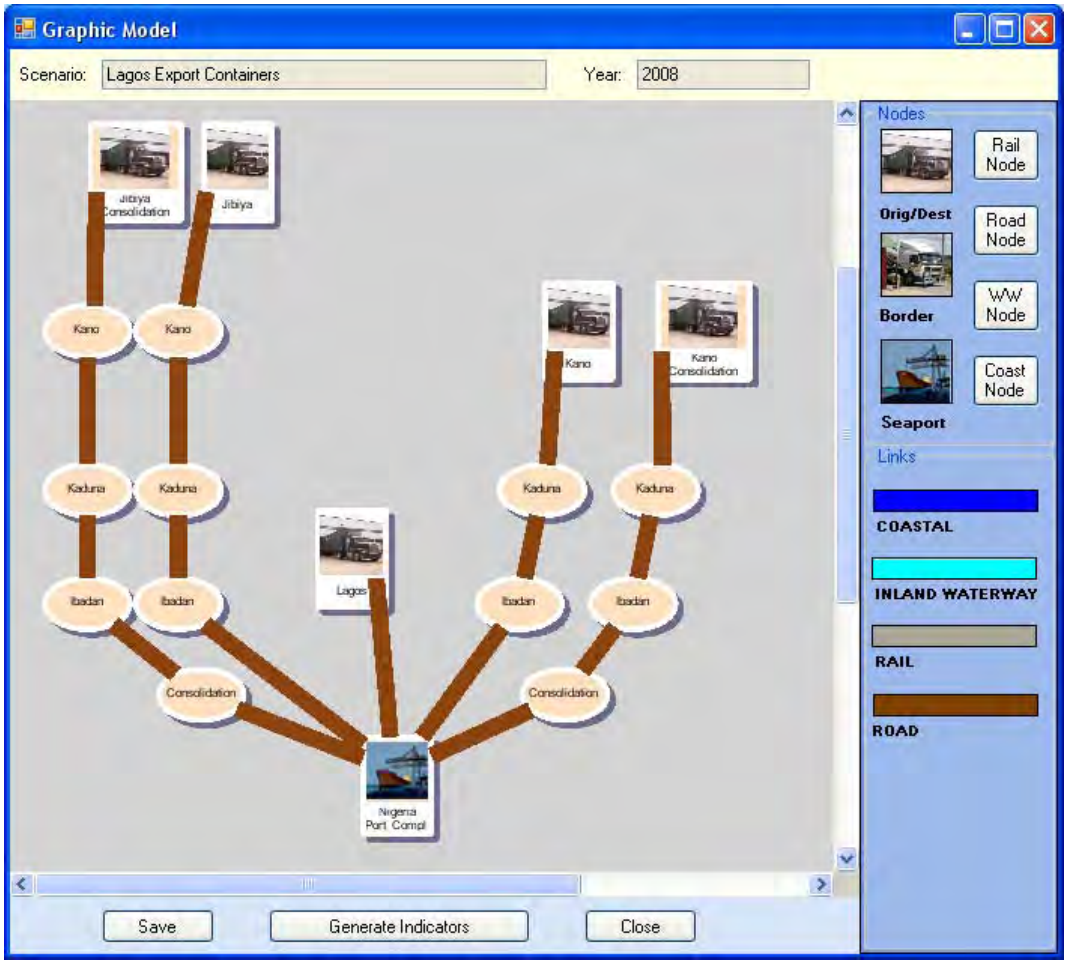
Export container performance variables, particularly cost variables, are lower on the road and in the port than those for import containers. Some cargo arrives directly in containers but approximately 85 percent must be consolidated and containerized in Lagos before it proceeds to the port. We incorporated into the FastPath model a consolidation node to replicate this activity, which generates additional costs and time when cargo must be offloaded from the first truck,

transferred to a warehouse, and loaded into a container. The container then must be loaded into another truck and transferred to the port. This operation is necessary because of the scarcity of containers in regions where export cargo is generated and because volumes must be consolidated to complete a full container load.

For our analysis and given the low volume of export cargo handled in each port, the export scenario incorporates the volumes of both ports into one Port Complex. This is also because in the export direction the performance at both ports is similar except for performance at the berth. Therefore performance in this component is calculated as a weighted average using the volume and the performance at each port.

Figure 3-8 depicts the major characteristics of full export containers through Lagos port, showing three subchains for direct containers from Jibiya, from Kano, and from the Lagos metropolitan area. Two additional subchains show the consolidation node for noncontainerized cargo that is containerized in Lagos.

Figure 3-8
FastPath Schematic Representation of the Lakaji Corridor, Export Containers – Scenario 3



The total number of export containers—full and empty—handled by Apapa port was 568,187 TEU, while Tincan Island handled only 163,267 TEU. Full containers numbered 19,913 TEU in

Apapa and 40,949 TEU in Tincan Island. We do not include in our analysis the operations for empty containers because cargo owners are not responsible for this type of operation. Nevertheless, a review of TEU handling volume alone provides an indication that berth productivity at Apapa port is better than in Tincan Island. Shipping lines do not generate revenue when moving empty containers; on the contrary, they have to assume the cost when moving them. Therefore, they prefer using the terminal with the best berth productivity to load empty containers. Apapa shows a lower volume of full TEU, but the volume handled there is higher when empties are included. This confirms that Apapa has better berth productivity and that shipping lines are using it to handle the containers that do not generate revenue.

Figure 3-9 presents the major characteristics of containerized export cargo and Table 3-8 shows the performance of the subcomponents of the Lakaji corridor.

Figure 3-9
Export Flows at Lagos Port Complex, 2008

Table 3-8
Performance of Main Subcomponents of Export Containers, 2008 (Scenario 3)

Component	Cost (US$/TEU)		Time (hours)		Reliability[a]	
	Total Average	Norm Range	Total Average	Norm Range		Norm Range
ROAD						
Road transport Jibiya–Kano	121.86 (0.59/km)	0.05–0.15 per km	8.6 (45km/h)	40–60 km/h	100	5–100
Road transport Kano –Lagos	1,064.52 (1.08/km)	0.05–0.15 per km	Varies per segment	40–60 km/h	Varies per segment	5–100
Consolidation process	83.19	–	72.0	–	33.3	–
Road transport Lagos metropolitan area	553.55 (22.14/km)	0.05–0.15 per km	4.0 (12km/h)	40–60 km/h	50	5–100
PORT						
Gate	30.81	0-4	12	0–4	75	5–100
Customs and other agencies at Lagos port	210.00	15–55	24	24–60	75	5–90
Total yard handling	316.24	30–145	120.0	10–35	58	5–40
Average loading at berth[b]	95.43	10–50	27.5	4–8	26	5–50
Average channel operations[c]	156.82	5–15	6.0	1–15	58	5–40

Performance based on 2008 data
[a]*The percent of average transit time that would include 90 percent of shipments.*
[b]*Average unloading time per container is half the average time for ship berth time.*
[c]*Including a port surcharge of $134 per TEU for delays upon arrival to ships in channel*

Road Performance

The first part of the table provides information about expenses incurred on the road. The travel times for road transport for containerized export traffic along the Lakaji corridor are similar to those for import container traffic. Nevertheless, road transport costs are lower than in the northbound direction. This may be a result of market adjustments considering that trucks traveling northbound generally return empty while trucks traveling southbound to Lagos generally have a load to carry going back north. The cost of transport from Kano to Lagos is US$1,065 (or US$1.08/km).

The majority of cargo arriving from the north must be containerized in Lagos. This is because of a scarcity of containers in the north; consequently about 85 percent of cargo is transported in open trucks. In most cases, exports are consolidated to ensure a full container load. The containerization or consolidation process takes an average of three days, and the majority of export certificates are verified during this time. We have incorporated into the model a consolidation node where these activities take place.

Port Performance

Information for each component of the port was calculated using data on export cargo as presented in Appendix B.

Gate Operations

Gate operations in the export direction are characterized by long queues outside the port gates and no pregate procedures, which causes longer processing time when documentation is not properly presented. Access roads to both Apapa and Tincan Island experience severe congestion, particularly during peak business hours. The average delay of 12 hours to enter the port is considered very poor. This process includes the operation at both the NPA and terminal gates.

Yard and Customs and other Agencies Operations

Yard operations at the terminal include the transfer of the container from truck to yard and storage before being loaded onto the vessel. Normally the container is stacked close to the berth to avoid delays when vessel loading has started. The average storage time of five days is more than what international standard operations require but the average storage charge is considered fair. This takes into consideration that the first three days of storage are free of charge.

In terms of yard handling cost, export cargo incurs levies for environmental protection, MOWCA and NIMASA, which are added to the terminal handling charges and cargo port dues. Export container rates for most charges are less than for import cargo but are still high and considered very poor compared to international standards.

Border clearance times of 24 hours are considered poor when compared to international norms. The Cobalt fee—not a Customs fee but a SON fee for test for conformity to Nigerian standards—of 0.5 percent of FOB value, although it varies depending on the product, is considered expensive—very poor compared to international standards.

Berth Operations

Berth transfer costs of US$95.43 per TEU fall in the range of poor performance. Average time shipyard is high, at 27 hours average per vessel.

Channel Operations

Total channel costs per TEU include US$22.70 for port dues plus a port surcharge of US$134.12. Port dues at the channel are in the fair-performance range compared with international norms. The wait time to sail after loading is finished is low. Formerly, a surcharge was applied for all containers, regardless of their import or export direction, but the surcharge was removed at the end of 2008 and is no longer applied.

Noncontainerized Cargo—Scenarios 4, 5, and 6

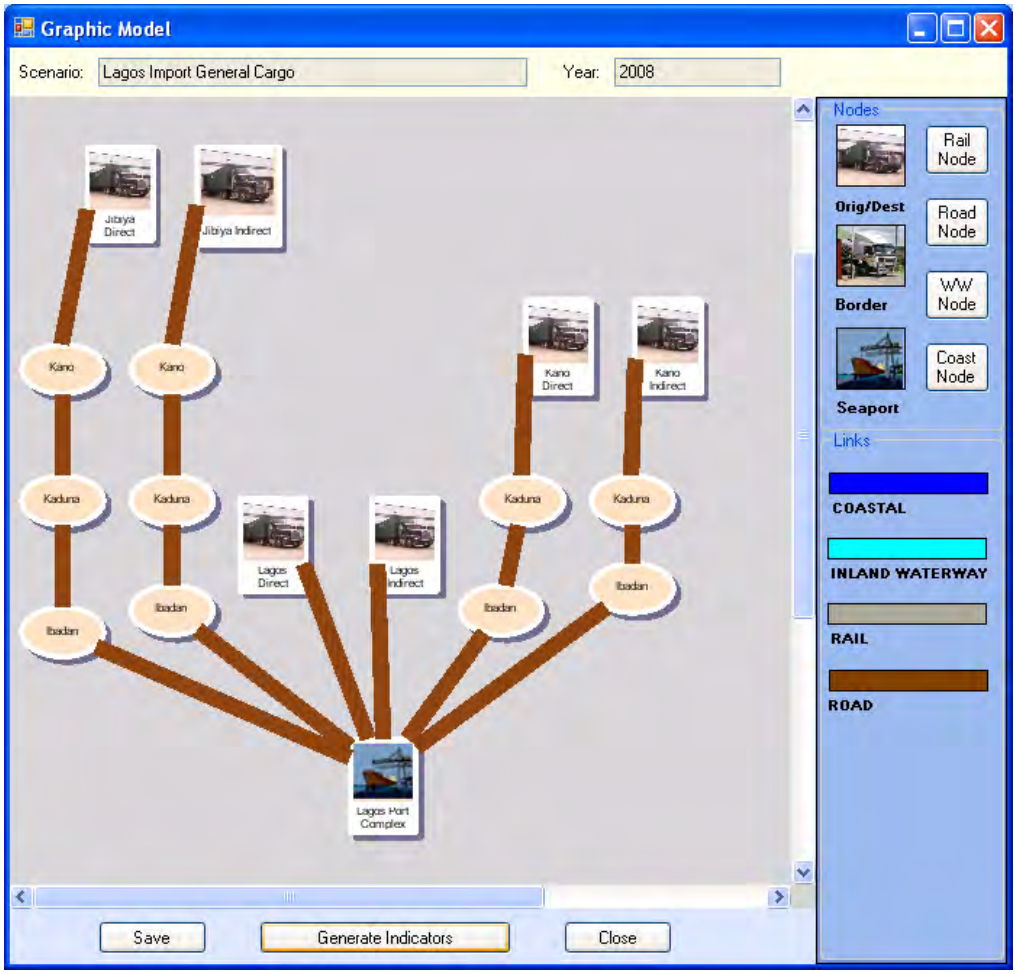
Noncontainerized cargo includes general or breakbulk [17] cargo and bulk cargo. There are many operational differences between containerized and noncontainerized cargo with the most significant the fact that inspection of noncontainerized cargo is easier from a Customs point of

[17]General cargo and breakbulk are used interchangeably in this report. General cargo is heterogeneous in size, shape and handling requirements but is packed in units; e.g., containers, barrels, bales, crates, packages, bundles, and pallets.

view. This facilitates Customs clearing processes and cargo can be discharged directly from vessels into trucks that proceed directly to hinterland distribution. Handling of noncontainerized cargo at the port varies depending on the type of cargo and the equipment used, and therefore establishing a standard measure for performance that allows comparison with other transport logistics chains or with accepted international norms, as can be done for containerized cargo, is difficult.

General cargo accounts for approximately 70 percent of noncontainerized cargo handled at Lagos Port Complex. Figure 3-10 presents the schematic representation of the Lakaji corridor for noncontainerized cargo. The major difference with container flows is the possibility of serving vessels directly.

Figure 3-10
FastPath Schematic Representation of Noncontainerized Import and Export Cargo, Scenarios 4, 5, and 6



ENL, the main terminal handling general cargo, is the most congested terminal in Lagos Port Complex. It does not have shore cranes; ship handling relies exclusively on ship's gear. Some of the ships are of older design and have low-capacity, slow cranes. Using ship's gear is inefficient when working directly to trucks, which is common at ENL. Mobile harbor cranes for ship handling should be implemented at ENL to make cargo handling more efficient. Many general

cargo terminals throughout the world have such cranes. Mobile harbor cranes save berth time and shorten ship's waiting time but involve additional cost, so making mobile harbor crane use mandatory (through all-in pricing) or establishing minimum productivity rates and berth times with punitive docking tariffs for longer times should also be assessed. ENL has two new LHM 250s, but they are missing parts and are not operational. Detailed analysis of the operational performance of general cargo is presented below.

General Import Cargo Scenario (Scenario 4)

The majority of the import cargo arriving at Lagos is noncontainerized, with about 15 million tons of general cargo. General cargo handling processes at the port are very different than those for containers, requiring different equipment, storage—and times and costs. Therefore, a separate scenario has been generated to assess general cargo. Figure 3-11 presents the major characteristics of general import cargo.

Figure 3-11
General Cargo Import Flows at Lagos Port Complex, 2008

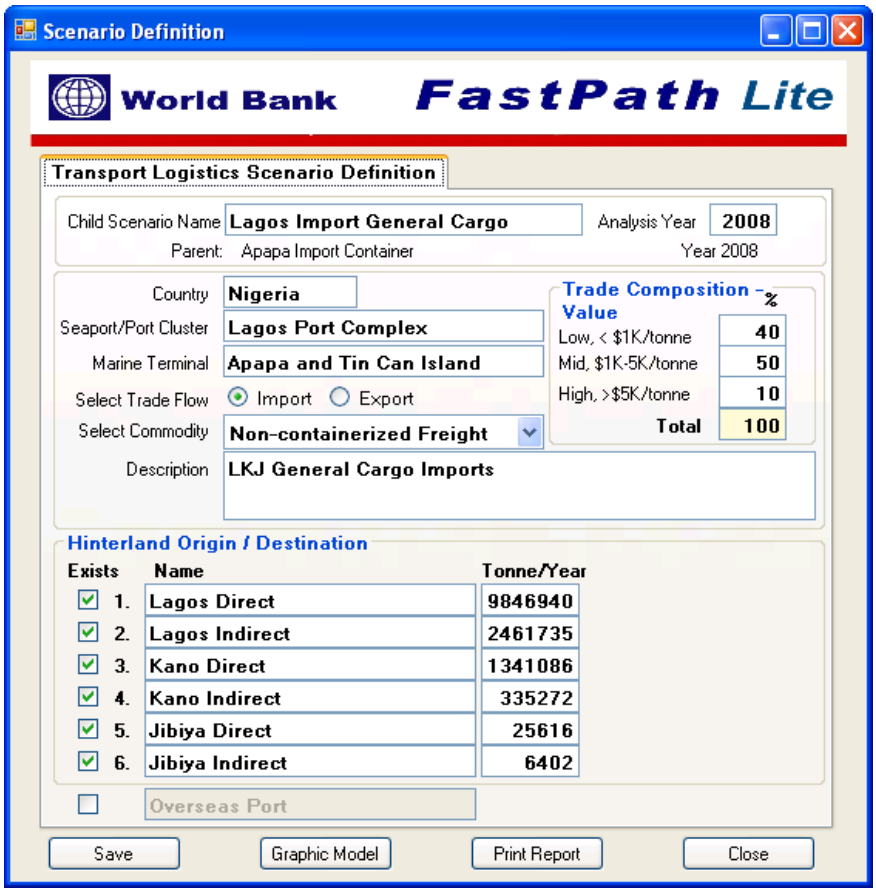


Table 3-9 presents performance measurements for time, cost, and reliability for the different components along the Lakaji corridor for general import cargo. The first six components of the table refer to the operations at the port. The figures in each component were calculated based on the information presented in Appendix C.

Table 3-9
Performance of Main Subcomponents of General Import Cargo, Scenario 4, 2008

Component	Cost (US$/ton)	Time (hours)	Reliability[a] (%)
Average channel operations[b]	13.35	240.0	165
Average unloading at berth	6.22	124.2	37
Customs (CISS)	4.19	3.0	50
Yard operations (cargo dues)	2.70	-	-
Storage (only indirect handling)	2.56	504.0	75
Gate	0.68	5.0	70
Road transport Lagos metropolitan area	18.45	4.0	50
Road transport Lagos–Kano	77.37	96.0	Varies by segment
Road transport Kano–Jibiya	8.86	8.6	100

Performance based on 2008 data
[a]*The percent of average transit time that would include 90 percent of shipments*
[b]*Includes vessel demurrage charges for vessel waiting time of US$1.2 per Ton per day for an average of 10 days*

Port Performance

Operational performance for general cargo is unsatisfactory where handling is still performed by ship's gear, during the day only and mostly by direct transfer to trucks. General cargo terminals are congested because of insufficient berth capacity—which is largely the result of low berth productivity, especially with regard to the handling of bagged rice. This congestion will be eased when some of the rice is handled in bulk. Mechanical systems for handling dry bulk are five times more productive than handling bagged cargo.

Charges at the port for discharge of general cargo are based on either direct handling or transfer into trucks or on indirect transfer in which cargo is temporarily stored at the port. Discussions and interviews with terminal operators and freight forwarders indicated that about 80 percent of cargo is handled directly to trucks. Also, it was estimated that storage time for indirect general cargo is about three weeks.

Channel and Berth Operations

Total channel costs per ton include US$1.35 for port dues plus port surcharge of US$1.2 per day, for vessel demurrage charges associated with the waiting time for berth availability for a total of US$12 per ton during the average 10 days of waiting time. Total charges at berth include US$0.12 per ton for berth rent and US$6.1 per ton for port dues.

Waiting time for general cargo vessels during 2008 was about 240 hours. Causes for such a long waiting period include the fact that handling equipment at the berth is nonoperational and all the operations are performed with vessels' gear. Also, operations at the berth can be made only during daytime in a shift of 12 hours. No night operations are performed for general cargo.

The average unloading time correspond to 80 percent of the berth time, or 124.2 hours. This percentage was estimated considering that import volumes are higher and therefore require a

longer time than export cargo. This differs from the analysis of containerized cargo where empty export containers still have to be loaded into the vessel.

Yard, Customs and Storage Operations

Yard operations account only for about 20 percent of cargo because the rest of the cargo is unloaded directly to trucks which exit the terminal when load is full. Depending on the size of the consignment discharged from the vessel, trucks form small convoys to exit the port. The environmental protection and MOWCA levies are also applied to general cargo. Cargo dues and the levies for import general cargo are US$2.7 per ton.

Customs operations for general cargo generate the same CISS charge of 1 percent of the FOB value of goods. With the information on the value of general cargo goods and the imported volumes imported, following a procedure similar to that for containerized cargo we estimated CISS fees at about US$4.19 per ton. All general cargo is precleared, and Customs inspects goods visually when the vessel arrives at the berth, checking that the description in the declaration matches the goods to be unloaded. Quantities of goods are confirmed at the end of the unloading process.

The volume of cargo that remains in the port facilities generates storage charges. As indicated above, about 20 percent of the volume handled at the port is transferred indirectly and is stored at the port. For our analysis, we estimated that half the volume is stored in sheds and the rest is stored in the open. The average dwell time for general cargo is about three weeks or 21 days. On the basis of these assumptions, the average storage cost of general cargo was US$2.56 per ton.

Gate Operations

Gate operations for trucks leaving the general cargo terminal have similar performance in time and reliability as for container trucks. Cost per ton of import general cargo is US$0.68. All the operational issues and recommendations for gate operations described for containerized cargo are also valid for general cargo.

Road Performance

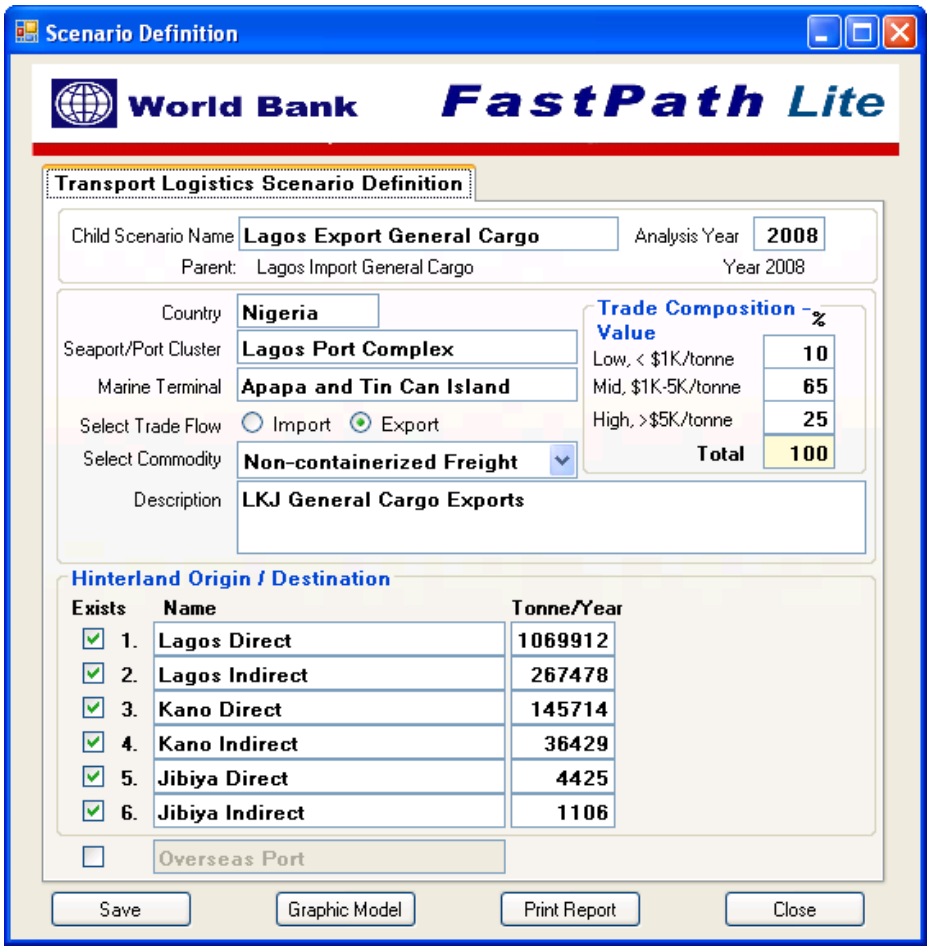
The travel times for road transport of general import cargo along the Lakaji corridor are similar to those described in the road component for import container traffic (Table 3-6). The costs are also similar because in general road transporters charge per truck travel with a maximum weight, independently of whether they are transporting container or loose cargo. The main difference is the type of trailer required (flat platform for containers or container cars for general cargo) but the tractor is the same. For that reason, the transport costs for general import cargo are equivalent to those used in the import container analysis divided by an average weight per truck of 30 tons to estimate the cost per ton. The cost to transport general cargo in the Lagos metropolitan area is about US$18.45 per ton, from Lagos to Kano is US$77.37 per ton (assuming a full truck and empty return) and if the cargo is transported to Jibiya, an additional charge of US$8.86 per ton is incurred over the Lagos–Kano cost.

General Cargo Export Scenario (Scenario 5)

The performance of Lagos port for general export cargo is similar to that for import cargo. Terminals are congested because of insufficient berth capacity and lack of modern equipment for loading. Figure 3-12 presents the major characteristics of general export cargo.

Figure 3-12

General Cargo Export Flows at Lagos Port Complex, 2008



Charges in the export direction vary in accordance with the information presented in Table 3-10.

Table 3-10
Performance of Main Subcomponents of Export General Cargo-Scenario 5, 2008

Component	Cost (US$/ton)	Time (hours)	Reliability[a] %
Road transport Jibiya–Kano	4.06	8.6	100
Road transport Kano–Lagos	35.48	96.0	Varies by segment
Road transport Lagos metropolitan area	18.45	4.0	50
Customs and other agencies at the port	0.63	4.0	50
Gate	0.55	12.0	70
Total yard handling (cargo dues)	1.90	-	-
Storage (only indirect handling)	1.00	64.8	75
Av. loading at berthb	4.12	31.0	37
Av. channel operations	1.35	3.0	58

Performance based on 2008 data
[a] *The percent of average transit time that would include 90 percent of shipments.*
[b] *Average loading time per ton corresponds to 20 percent of the total vessel time at the berth.*

Road Performance

The southbound travel times for export general cargo traffic along the Lakaji corridor are similar to those described for export container traffic. There is, however, variation in the amounts charged for general cargo traveling south in the corridor according to the type of cargo, size of vehicle, and origin and destination of the shipment. For instance, livestock from Kano to Lagos, sent in smaller trucks, costs US$806, while agricultural goods such as cowpeas or sorghum and also larger livestock like cattle cost US$1,065. These costs are lower than the US$2,321 paid for northbound transport of containers. In fact, the average southbound transport costs for general cargo (US$1,065) are 54 percent lower than the northbound for containers. This might be for several reasons: greater willingness to travel a long distance (compared to Lagos-based companies that prefer short-haul services), closer relationship between transporters and producers (higher discounts), and fewer empty return trips, considering that a truck going to Lagos probably can get a load for the return trip.

Port Performance

General cargo terminals in the export direction perform similar than in the import direction, with the characterization of inefficient operations due to the lack of proper handling equipment.

Gate Operations

Gate operations for trucks entering general cargo terminals at the port have similar performance in time and reliability as operations for container trucks. Cost per ton of general export cargo is US$0.55. All the operational issues and recommendations for gate operations described for containerized cargo are also valid for general cargo.

Yard, Customs and Storage Operations

Assuming a similar distribution between indirect and direct handling for export operations at general cargo terminals, yard operations account for about 20 percent of cargo. Nevertheless, cargo dues and levies apply for both indirect and direct handling. Therefore, the environmental protection and MOWCA levies and cargo dues of US$1.9 per ton apply for export general cargo.

Customs operations for export general cargo generate the same charge of 0.5 percent of the FOB value of goods (Cobalt fee). This estimated value is about US$0.63 per ton of imported goods. Customs' and other agencies' inspection of goods is made visually, and all certificates must comply with the regulations for export procedures. The review process takes about four hours normally during loading operations.

Cargo that is indirectly transferred to vessels arrives to the port approximately one to two weeks (13 days) before it is loaded, incurring storage charges of about US$1.0 per ton.

Channel and Berth Operations

Total channel costs per ton include US$1.35 for port dues. Port surcharges for general cargo vessel waiting time do not apply to exports. Total charges at the berth are US$4.12, which includes US$0.12 per ton for berth rent and US$4.0 per ton for port dues. The average loading time corresponds to 20 percent of the berth time, which is the estimated time for loading export cargo. The average time to finalize departure operations and leave port is about 3 hours.

Bulk Import Cargo Scenario (Scenario 6)

Operational performance for bulk cargo in Lagos is satisfactory. After heavy investment in facilities, equipment, and personnel, Lagos has a modern dry bulk operation. The major commodities handled in bulk include cement, wheat, and fertilizer. Operational characteristics to handle bulk cargo vary from the other two types of cargo and depend on weather conditions. Bulk cargo cannot be handled in rainy conditions, and operations must stop and vessel hatches must be closed in the event of rain to avoid damage to the cargo.

There is hardly any export volume of bulk cargo and therefore the FastPath analysis includes the assessment of the import volumes only. Figure 3-13 presents the major characteristics of import bulk cargo. Approximately 90 percent of the volume of bulk cargo is distributed by conveyor systems to clients' facilities near the terminal. The remaining 10 percent, which includes an important volume of fertilizers, is handled indirectly and distributed to the northern region.

Table 3-11 presents the performance measurements for time, cost, and reliability for the different components along the Lakaji corridor for general import cargo.

Figure 3-13

Bulk Import Flows at Lagos Port Complex, 2008

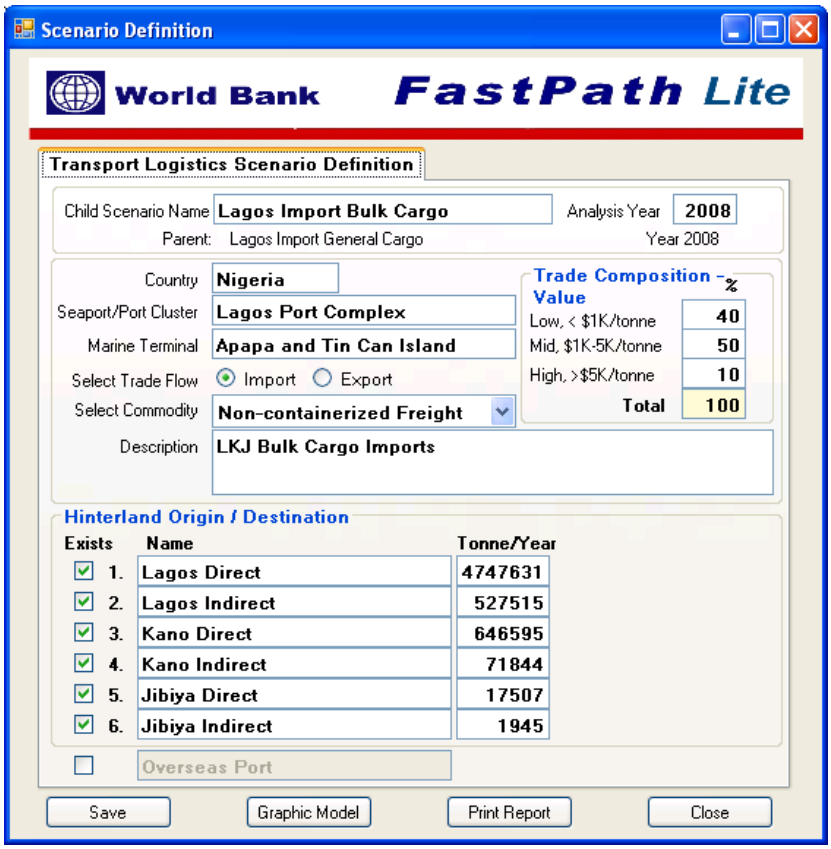


Table 3-11

Performance of Main Subcomponents of Import Bulk Traffic, Scenario 6, 2008

Component	Cost (US$/ton)	Time (hours)	Reliability[a] (%)
Average channel operations	1.35	95	144
Average unloading at berth	2.56	94	23
Customs (CISS) and other agencies at the port	2.57	3.0	50
Yard operations (cargo dues)	2.09	-	-
Storage (only indirect handling)	2.47	504.0	75
Gate	0.39	5	70
Road transport Lagos Metropolitan Area	18.45	4.0	50
Road transport Lagos–Kano	77.37	96.0	Varies by segment
Road transport Kano–Jibiya	8.86	8.6	100

Performance based on 2008 data

[a] *The percent of average transit time that would include 90 percent of shipments.*

Port Performance

Operational performance for bulk cargo is satisfactory. Most delays experienced in bulk terminals in Lagos are associated with bad weather.

Channel and Berth Operations

Total channel costs per ton include US$1.35 for port dues. Total charges at the berth are US$2.56, including US$0.06 per ton for berth rent and US$2.5 per ton for port dues. Waiting time for bulk vessels in 2008 was about 95 hours (3.96 days) with reliability of 144 percent. Operations at the berth accounted for 94 hours on average, which corresponds to the unloading time for import cargo. The reliability of berth time is 23 percent.

Yard, Customs and Storage Operations

The environmental protection and MOWCA levies plus cargo dues for bulk import cargo add up to US$2.09 per ton. About 10 percent of the cargo requires indirect handling.

Customs operations for bulk cargo generate the CISS charge of 1 percent of the FOB value of goods. This estimated value is about US$2.57 per ton of imported goods. All bulk cargo is precleared, with duties paid before the vessel arrives. Customs' and other agencies' inspections of the goods are made visually upon vessel arrival at the berth, checking that the description in the declaration matches the goods to be unloaded. Quantities of goods are confirmed at the end of the unloading process.

The cargo that remains in the port facilities incurs storage charges. As indicated above, about 10 percent of the volume handled at the port is transferred indirectly and is stored at the port. Given the characteristics of bulk cargo, all the volume is stored in sheds. The average dwell time for general cargo is about three weeks or 21 days. On the basis of these assumptions the average storage cost of general cargo is US$5.72 per ton.

Gate Operations

Gate operations for trucks leaving the bulk cargo terminal have similar performance in time and reliability as container and general cargo trucks. The cost per ton of import bulk cargo is US$0.39. All operational issues and recommendations for gate operations described for containerized cargo are also valid for bulk cargo.

Road Performance

The travel times and costs of the road transport for import bulk traffic along the Lakaji corridor are similar to those described for general import cargo (Table 3-9). The cost to transport general cargo in the Lagos metropolitan area is about US$18.45 per ton, from Lagos to Kano is US$77.37 per ton (assuming a full truck and empty return), and if the cargo is transported to Jibiya, an additional charge of US$8.86 per ton is incurred over the cost from Lagos to Kano.

4. Corridor Performance Scores

Transport logistics chains are composed of similar kinds of activities, regardless of where in the world they occur. A key feature of FastPath is its capability to compare performance to international standards and identify areas for potential improvement. In this section we compare the performance of the Lakaji corridor with international standards and with other corridors previously assessed with FastPath.

LOGISTICS SCORES

The containerized cargo scenarios (Scenarios 1, 2, and 3) were compared with the ideal situation, in which the performance of all variables is rated good. Logistics scores are computed by comparing the performance of a component of the transport logistics chain with international standards and rating it as good, fair, poor, or very poor, then converting the rating to a numeric score—80 for good, 60 for fair, 40 for poor, and 20 for very poor. Then the scores for price, time, and reliability are averaged to arrive at the total score for a component. These scores are then weighted to compute the subchain total, with reliability treated with a special calculation. Scores of subchains are averaged to compute the total for the chain. A logistics score of between 70 and 80 indicates that time, cost, and reliability in the supply chain are efficient and competitive according to global standards. Reliability is measured in terms of average transit time, which accounts for 90 percent of the variation in transit times for different shipments. This reliability measure reflects the extent to which transit time can be predicted by shippers.[18]

Because comparison with international standards does not take into consideration context and particularities of regions, we also compared the Lakaji corridor to other corridors that have been the subject of recent FastPath analysis:

- ***Tema–Ouagadougou (2008).*** In collaboration with the West Africa Trade Hub, FastPath was used to assess the performance of the Tema–Ouagadougou corridor. The analysis identified the steps and the associated cost, time, and reliability incurred by transit cargo destined for Burkina Faso, from its arrival at the port of Tema through its journey along the corridor and

[18] For typical transport logistics activities, less than 40 percent is very predictable or "good" reliability, 45–80 percent is considered relatively predictable or fair reliability, 90–150 percent is somewhat unpredictable or poor reliability, and more than 150 percent is considered highly unpredictable or very poor reliability. For shorter activities these thresholds are higher.

through the border, to the clearing facility in Ouagadougou. The road segments are very relevant for benchmarking the Lakaji corridor. Similarly, the Lagos port complex can be compared with a regional port that competes for transit cargo and determines the potential of Lagos to serve Nigeria's neighboring landlocked countries.

- ***Southern Africa (2007).*** In 2007, a FastPath pilot analysis was conducted of the transit corridor between the port of Maputo (Mozambique) and the inland depot of Nelspruit (South Africa), as well as between the port of Durban (South Africa) and Nelspruit. This corridor's rail operations are relevant to the Lakaji corridor if rail operations are resuscitated as planned.
- ***Association of Southeast Asian Nations (ASEAN) region (2006)***
  - ***Vientiane (Laos) to Laem Chabang (Thailand)—***The transit route with the highest volume of freight is the route via the port of Laem Chabang, Thailand. This is a road-and-rail corridor that suffers from a number of impediments at border crossings. Laem Chabang is a popular port for goods transiting Thailand on their way to Laos.
  - ***Danang Port (Vietnam) to Mukdaharn (Thailand) via Sawanakhet (Laos).*** This road corridor crosses three countries; the road has been upgraded but constraints on efficiency remain. This corridor has always been considered to have high transit potential. Danang is a popular port for goods transiting Vietnam on their way to Thailand.
- ***Bangladesh (2007).*** The Dacca–Chittagong Corridor has been selected as a basis of comparison because it is a relatively poor performer in the Asia region.

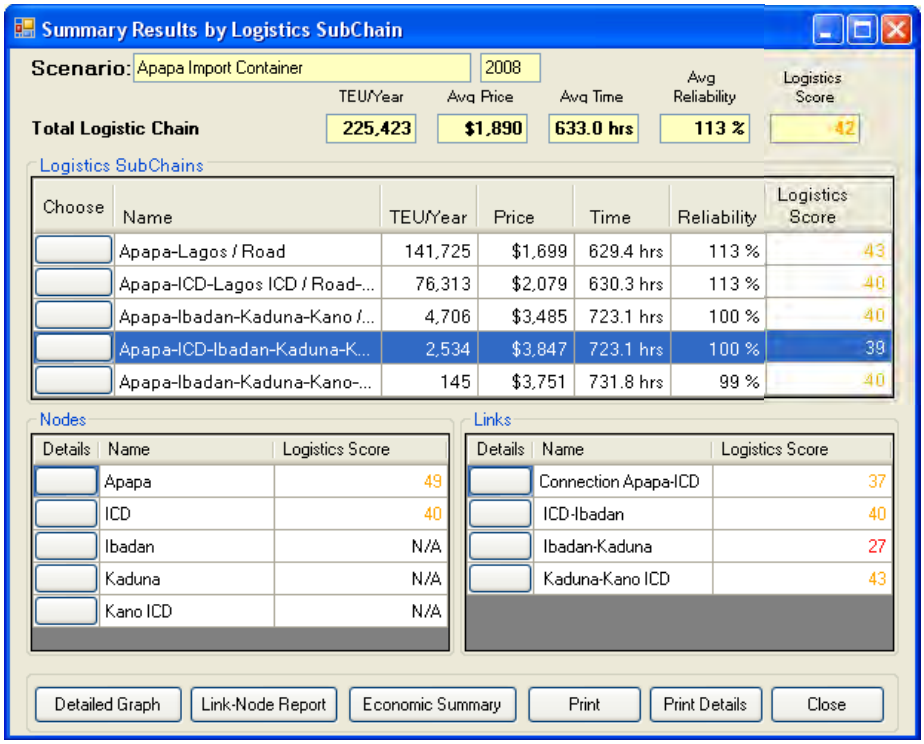
The scenarios for noncontainerized cargo (Scenarios 4, 5, and 6) do not feature logistics scores. Handling of noncontainerized cargo at the port varies according to the type of cargo and the equipment used; therefore establishing a standard measure for performance and comparing it among subchains is difficult. Nevertheless, the road transport component for noncontainerized cargo is similar to that for containers, so although logistics scores are not generated for handling of noncontainerized cargo at port, the logistics scores beyond the yard (port gate and hinterland transport) are the same as those for containers.

With the information derived from the benchmark exercise, we also recommend concrete steps for improving Lakaji corridor performance and conduct a cost-benefit analysis for each recommendation.

SCENARIO 1: APAPA IMPORT CONTAINERS

Figure 4-1 shows the summary output screen with the results for the Apapa import container scenario and associated logistics scores. Each subchain has a destination for cargo—Lagos Urban Area, Lagos Urban Area through ICD, Kano, Kano through ICD, and Jibiya—that is assessed separately and given a score. A weighted overall logistics score is then generated for the whole scenario. The overall score for import containers at Apapa port is 42 (out of 80), a poor performance. This score is obtained through a combination of scores in each subcomponent of each subchain. Figure 4-1 also shows detailed scores for the Apapa–Kano through ICD subchain with a total score of 39 derived from the performance of each node and link of the subchain.

Figure 4-1
FastPath Summary Output Screen for Import Containerized Traffic, Apapa 2008



Road Performance

Surface transport performance for import container traffic varies according to segment (see Figure 4-1), but most are in the poor range. The worst is the longest segment, between Ibadan and Kaduna, with a score of 27, with continuous interruption of traffic speed due to potholes or extreme congestion. Time is rated very poor on this segment (630 km), with average speed lower than 20 km per hour, taking into consideration truck stops for overnight rest, lunch, and other driver needs. The price on this segment and all other segments is very poor (e.g., high unit costs per TEU-km). Several factors are at play in this score, including the lack of cargo for the return trip from Kano and the age of the trucks used. Import prices incorporate all associated expenses for the return trip. Road and truck performance in the Lagos metropolitan area also earned a poor score because of the low speeds associated with the interaction with city traffic and the unreliability of transit times, which vary considerably depending on time of day and congestion. Transport prices for distribution in the Lagos metropolitan area are extremely high—averaging about US$500. The Kaduna–Kano segment performs better—with a score of 43—because it has undergone improvements in speed and reliability, but the price is still very high.

Port Performance

The logistics score for port performance at Apapa port was 49 (out of 80), which is in the poor-fair range for international ports. Figure 4-2 breaks down performance by component. Customs, with a score of 33, is in the range of poor-very poor because of the long clearance time of 289 hours (12 days) and high scanning and inspection costs. Yard operations also earned a poor score, which is a reflection of the 186 hours (8 days) of storage time of containers at the port, in addition

to the 12 days for border clearance, and storage charges for such a long period. Similarly, 117 hours (4.9 days) waiting time at the channel and the associated port congestion surcharge in 2008 are high and rate as poor performance. The two components that better perform in this scenario are berth and gate operations, although these still fall in a poor-fair range.

Figure 4-2
Port Performance for Import Containerized Traffic, Apapa 2008

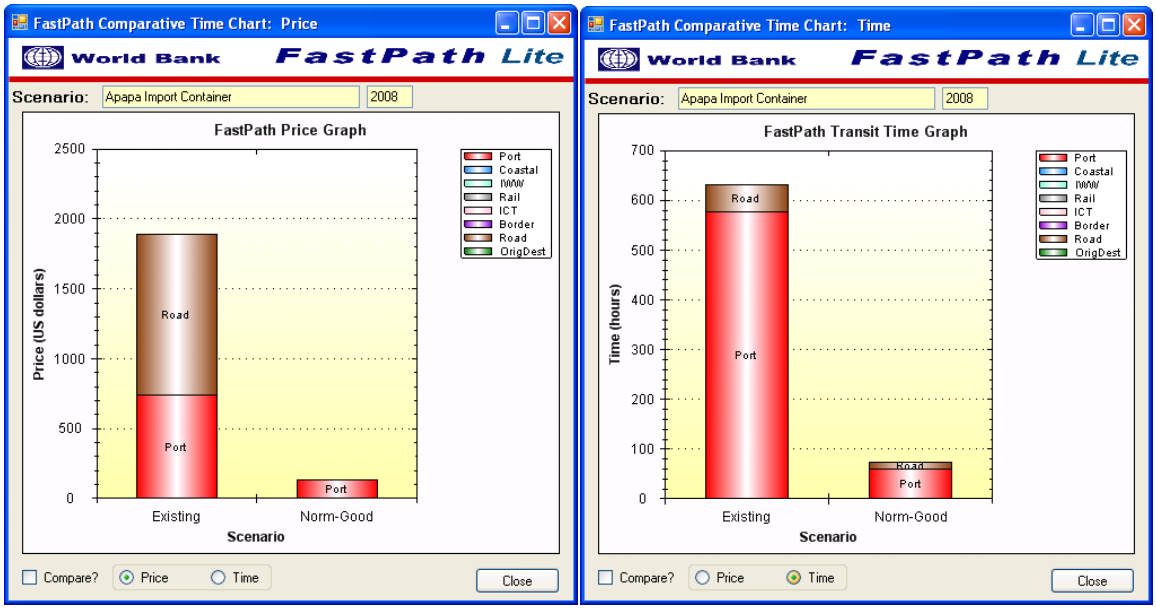
Components

Component Name	Price	Time	Reliability	Score
Berth	$125	27.5 hrs	26 %	47
Channel	$146	117.6 hrs	51 %	43
Customs	$280	289.0 hrs	67 %	33
Gate	$37	5.0 hrs	70 %	53
Yard	$575	186.0 hrs	15 %	40

ICD Performance

About 35 percent of the cargo arriving at Apapa port terminal is transferred to the Lilypond container terminal. Transferring containers to ICDs allows the container terminal to control the dynamic capacity of the port and avoid congestion. The container terminal operator, relying on information about containers stacked at the port and new arrivals, schedules those that will be transferred to the ICD upon arrival. The cargo owner is notified of the transfer during border clearance. Containers to be transferred terminal must be scanned at the terminal because ICDs do not have scanning capabilities. Container scanning and transer are undertaken at night, to avoid city traffic congestion. The transfer cost is about US$364 per TEU, which must be covered by the cargo owner. The possibility of transfer to an ICD creates uncertainty about the final cost of importing. Figure 4-3 shows the performance of the corridor in time and cost in comparison with international standards for good performance.

Figure 4-3
FastPath Price and Time Comparison Graphics for Import Containerized Traffic, Apapa 2008



Comparison with other Import Cargo Corridors

Table 4-1 compares the performance of Apapa port with selected other ports. In 2008, Apapa performed considerably worse in most subcomponents. It lagged considerably behind in average channel wait time, confirming the congested nature of the port during the analysis period. Vessel waiting time is directly related to long unloading and loading operations, which is also high, at an average of 55 hours for total berth time. Total port handling costs, which include the port congestion surcharge, are the highest among all assessed ports, although if the port surcharge is eliminated, port handling costs would be close to those experienced in Durban. Handling costs do not take into consideration any storage charge.

Customs time and average dwell time (storage plus Customs) are also high compared with other ports. Average dwell time of 17 days for transit cargo in Tema, where containers remain at the port free of charge, indicate that transit cargo importers there are maximizing the free storage period before removing the cargo from the port. In Lagos, total dwell time includes full charges after the third day, suggesting that importers are using the port as warehouse.

Table 4-1
Port Performance Containerized Imports in Selected Corridors

	Lagos–Kano	Tema–Ouaga	Danang–Mukdahorn	Chittagong–Dacca	Durban–Nelspruit	Maputo–Nelspruit
	Apapa	Tema Port	Danang	Chittagong	Durban	Maputo
Average channel wait time	118 hr	41 hr	N/A	30 hr	4 hr	8 hr
Average unloading time at berth[a]	27.5 hr	20.5 hr	12 hr	16 hr	8 hr	16 hr
Total port handling costs	US$686.23[c]	US$492[c]	US$107	US$302[c]	US$750	US$350
Customs costs	US$280	US$129	US$462	US$294	–	US$285
Customs time	289 hr	56 hr	24 hr	48 hr	16 hr	24 hr
Average dwell time (including Customs)	20 days	17 days[d]	3 days	12 days	3 days (est.)	3 days
Reliability[b]	113%	93%	125%	45%	100% (est.)	268%
Logistics score	49	55	55	49	60	51

[a] *Average unloading time per container is half the average time for ship berthing time.*
[b] *The percent of average transit time that would include 90% of shipments.*
[c] *Including a port surcharge for delays to ships in channel ($132 for Lagos, $140 for Tema and of $190 for Chittagong).*
[d] *Dwell time for inbound transit cargo*

Average Customs costs for imports are within the range of the ports being compared and very similar to those observed in Maputo and Chittagong. Reliability is poor compared with the reliability of other ports.

The total logistics score of 49 for Apapa is among the lowest of the African ports in Table 4-1 and similar to the score for Chittagong, which is a poor performer in Asia.

Surface transport for import traffic is presented in Table 4-2. The average cost per TEU-km from Lagos to Kano is higher than in Asian corridors but similar to surface transport on other African corridors. If the destination of cargo is in the Lagos metropolitan area, the cost per container-km increases dramatically, to an average of US$22 per TEU-km. Several factors contribute to the high prices in African corridors, including the old age of the trucks used and the lack of sufficient backhauls. Because most African countries are import more than they export, most trucks return empty from hinterland destinations. These factors present opportunities for improvement.

Table 4-2
Comparison of Import Road Transport Performance in Selected Corridors for Containerized Freight

	Lagos–Kano	Tema–Ouagadougou	Laem Chabang–Vientiane	Dacca–Chittagong	Maputo–Nelspruit
Av. cost per TEU-km	US$2.5[a]	US$2.4	US$1.2	US$1.2	US$2.5[b]
Av. Speed	20 kph	40 kph	51 kph	35 kph	60 kph
Av. delay time	30 hr[c]	4 hr	1 hr	1 hr	1 hr
Reliability[d]	100%	110%	29%	83%	105%
Logistics score	39	55	70	58	51

[a] *Long haul-distance (980 km). For short haul in the Lagos metropolitan area cost per TEU-km is about $22.*
[b] *Very short-haul distance (60km). This drops to $2 per TEU-km for longer distances.*
[c] *Includes 3 overnight rest*
[d] *The percent of average transit time that would include 90% of shipments.*

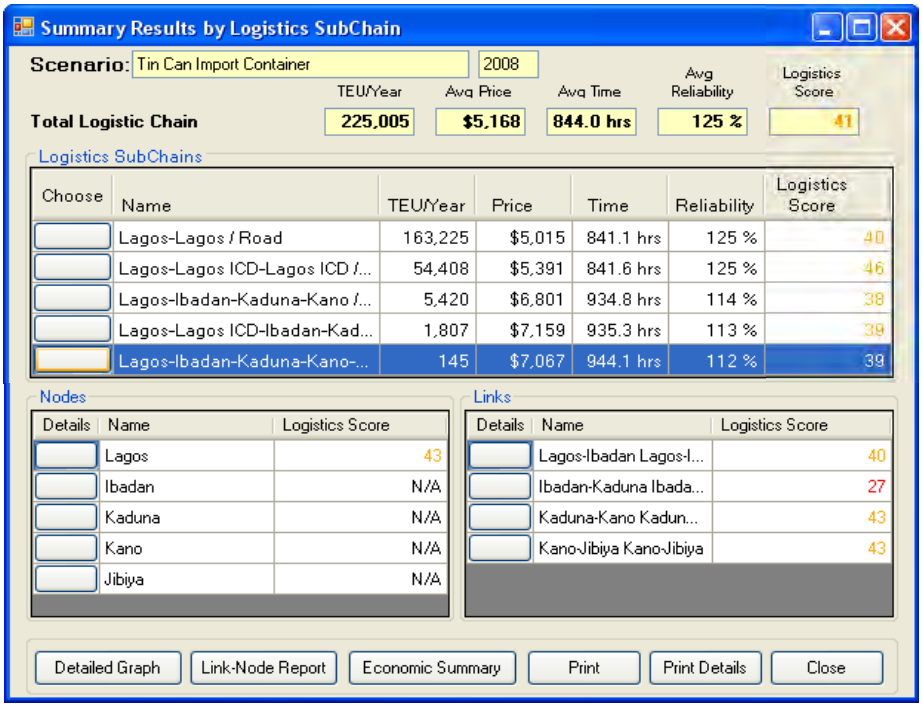
The average speed of 20 km per hr is low and rates the corridor as a poor performer. Although the speed in segments including Lagos–Ibadan and Kaduna–Kano improves to an average of 40 to 50 km per hr, average speed is dominated by the longest segment between Ibadan and Kaduna, which is characterized by very poor road conditions with substantial delays caused by broken-down trucks blocking the way. The reliability measure is average for the three African corridors in this table, indicating extreme unpredictability of transit times.

The overall logistics score for road transport is 39, which is a poor rating, and is lower than all other corridors.

SCENARIO 2: TINCAN ISLAND IMPORT CONTAINERS

The scenario for import containers through Tincan Island has the same performance along the road component as Scenario 1, but the performance at the port is different because berth and yard performance is different. Figure 4-4 shows the summary FastPath output screen for the Tincan Island import container scenario, with an overall logistics score of 41. Scores for the road segments are the same than the scenario with Apapa port. In addition to the road components described in Scenario 1, Figure 4-4 also shows the performance information of the link going from Kano to Jibiya. The score of this segment is the same as for Kaduna–Kano because road conditions, traffic characteristics, and travel cost, time, and reliability are very similar.

Figure 4-4
FastPath Summary Output Screen for Import Containerized Traffic, Tincan Island 2008



Port Performance

The logistics score at Tincan Island was 43, which is in the poor range for international ports. Figure 4-5 shows the breakdown of performance by component, with Customs and yard (storage) still bad performers because of lengthy dwell time. Average berth and channel operations are less efficient than in Apapa, although fewer vessels called Tincan Island in 2008 and fewer TEU were handled through this terminal. Longer time and higher weighted average TEU prices are a reflection of the use of less efficient equipment at the berth.

Figure 4-4
Port Performance for Import Containerized Traffic, Tincan Island 2008

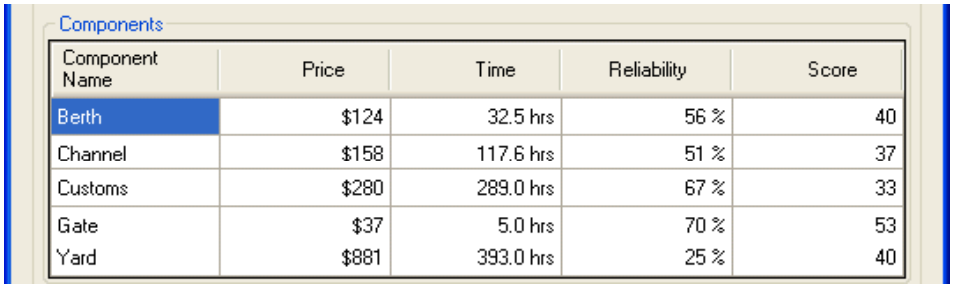
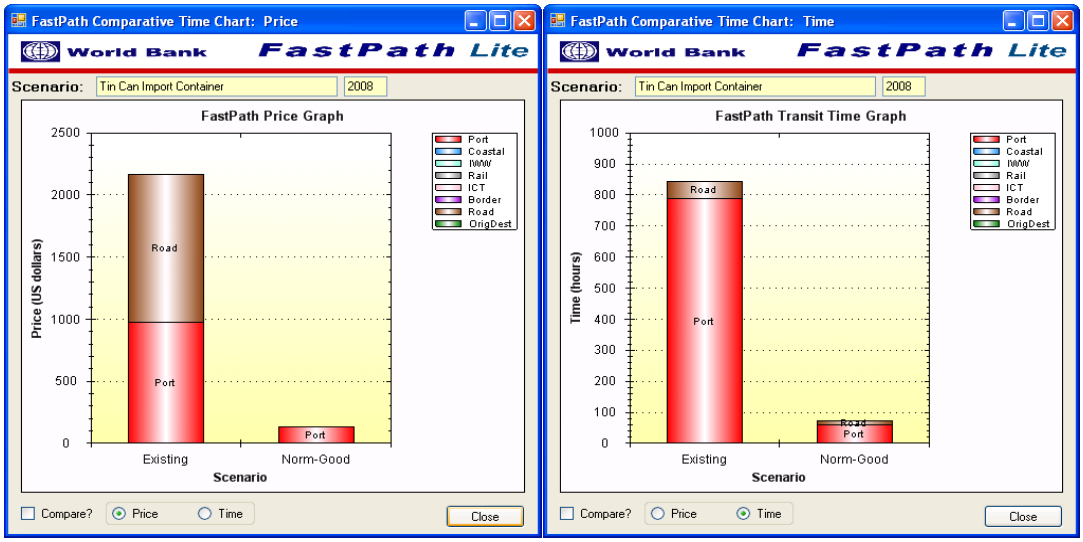


Figure 4-6 shows the performance in time and cost for Tincan Island import containers, comparing the performance with internationally accepted norms for good performance.

Figure 4-6

FastPath Price and Time Comparison Graphics for Import Containerized Traffic, Tincan Island 2008



Comparison with other Import Cargo Corridors

Tincan Island, which performs worse than Apapa, also performs worse than other ports in several components. Table 4-3 compares the performance of Tincan Island Port with those of other ports, including Apapa. The major difference is in the average unloading time at berth, which is 5 hours more than at Apapa because Tincan Island relies on vessel equipment for loading and unloading, which tends to be slower. Another component with a significant difference is average dwell time, which is 29 days. The performance of the road components is the same as for Apapa and therefore is not broken out here.

Table 4-3

Port Performance in Selected Corridors for Containerized Imports

	Lagos–Kano	Lagos–Kano	Tema–Ouaga	Chittagong–Dacca	Durban–Nelspruit	Maputo–Nelspruit
	Tincan	Apapa	Tema Port	Chittagong	Durban	Maputo
Average channel wait time	118 hr	118 hr	41 hr	30 hr	4 hr	8 hr
Average unloading time at berth[a]	32.5 hr	27.5 hr	20.5 hr	16 hr	8 hr	16 hr
Total port handling costs	US$692[c]	US$686.23[c]	US$492[c]	US$302[c]	US$750	US$350
Customs costs	US$280	US$280	US$129	US$294	–	US$285
Customs time	289 hr	289 hr	56 hr	48 hr	16 hr	24 hr
Average dwell time (including Customs)	29 days	20 days	17 days[d]	12 days	3 days (est.)	3 days
Reliability[b]	125%	113%	93%	45%	100% (est.)	268%
Logistics score	43	49	55	49	60	51

[a] *Average unloading time per container is half the average time for ship berthing.*

[b] *The percent of average transit time that would include 90% of shipments.*

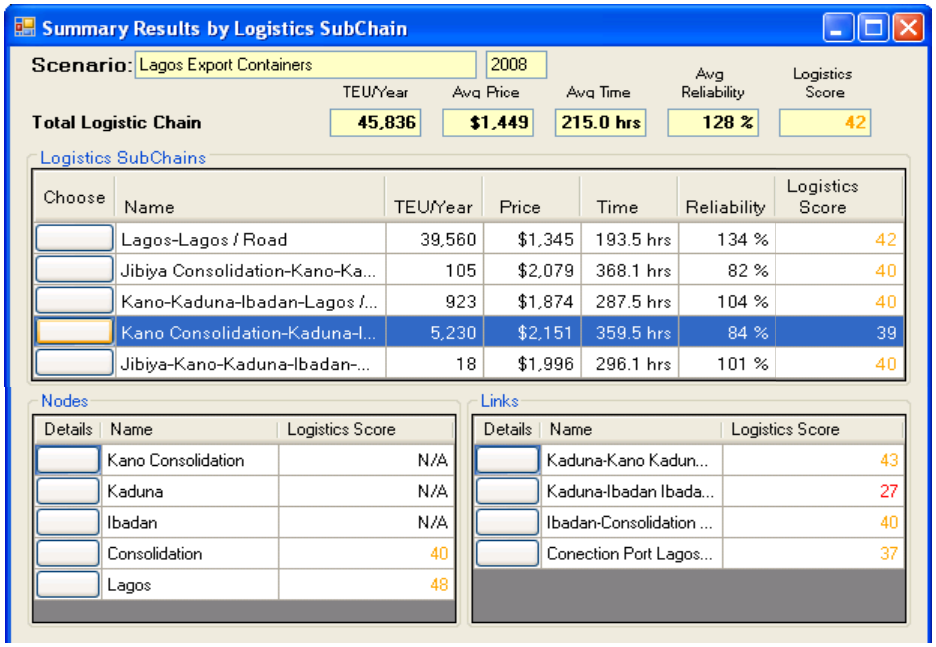
[c] *Including a port surcharge for delays to ships in channel ($132 for Lagos, $140 for Tema and of $190 for Chittagong).*

[d] *Dwell time for inbound transit cargo*

SCENARIO 3: LAGOS PORT COMPLEX EXPORT CONTAINERS

Export volume is considerably lower than import volume. And because most activities have similar scores for time, cost, and reliability in Apapa and Tincan Island ports, corridor performance in the export direction was assessed combining the two terminals as one port. The volumes used for the analysis accounted for the totality of laden containers. Empty containers were considered only when determining berth productivity and associated vessel cost per TEU. The overall logistics score is 42, which is similar to the score for Scenario 1. This is because the logistics scores for the road sector are pretty much the same as for imports, although costs from the hinterland to Lagos are considerably lower. Figure 4-7 shows the FastPath summary output screen for containerized export cargo at Lagos Port Complex.

Figure 4-5
FastPath Summary Output Screen for Export Containerized Traffic, Lagos Port Complex 2008



Road Performance

The average cost per TEU/km from Kano to Lagos is US$1.08, which is lower than the US$2.48 in the opposite direction, but both are MUCH higher than the standard for good performance of US$0.15 per TEU/ km. The scores for transit time and reliability are the same in both directions. Cost, time, and reliability for export cargo originating in Lagos are the same as for imports because congestion is still the determining factor used by transporters when assessing transport market prices in the Lagos metropolitan area.

Port Performance

The logistics score for exports in Lagos port was 48, which is in the poor-fair range for international ports. Figure 4-8 shows the breakdown of performance by component. The score of 47at the berth is poor-fair; the US$95 per TEU, which includes berth rent and terminal handling

charges at the berth, is considered on the high side; and the average of 27 hours to load containers onto the vessel is also too long and earns a score of very poor. Channel operation scored 60, which is fair. The price of US$157 per TEU includes the port congestion surcharge, which made the price fall into the very poor category. The performance at the berth for export containers improves considerably if the port surcharge is eliminated, which happened near the end of 2008.

Figure 4-6

Port Performance for Export Containerized Traffic, Lagos Port 2008

Components

Component Name	Price	Time	Reliability	Score
Berth	$95	27.5 hrs	26 %	47
Channel	$157	6.0 hrs	58 %	60
Customs	$210	24.0 hrs	75 %	47
Gate	$31	12.0 hrs	75 %	47
Yard	$316	120.0 hrs	58 %	40

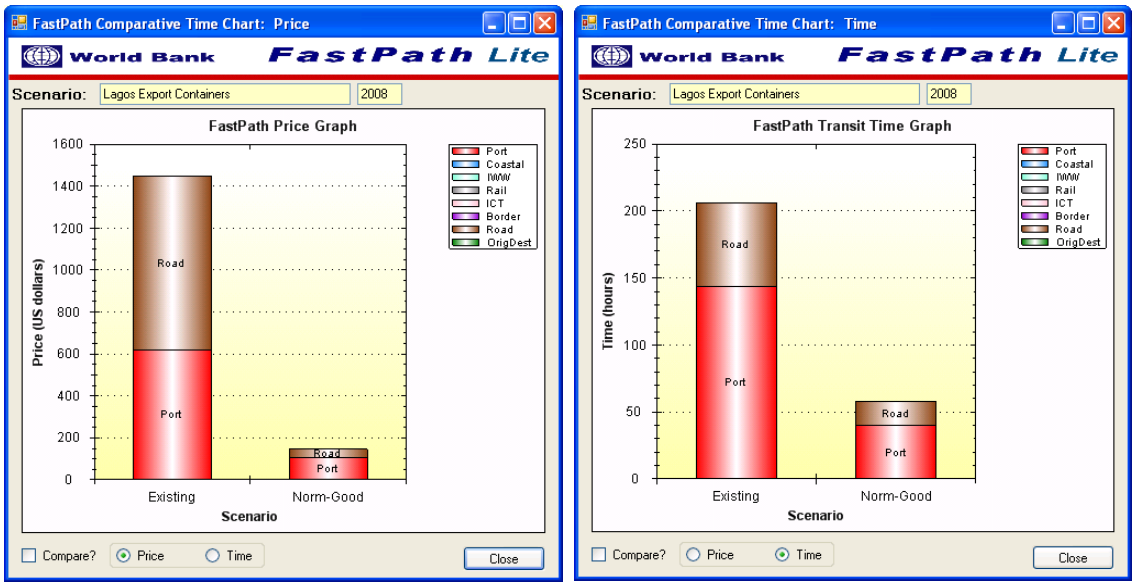
Customs operations performance, with a score of 47, is better than for imports but is still only poor-fair. The cost of US$210 per TEU estimated on 0.5 percent of FOB value of the goods is very high when fees of US$15 to US$ 55 per TEU are considered good. The 24 hours for inspection and release of export containers is also too long. As for imports, the involvement of too many agencies slows the process.

Gate entry operations are cumbersome, and long queues of trucks are always waiting at the entrance of both Apapa and Tincan Island ports. Inside the terminal, yard operations score only 40 for average time and price per TEU.

Figure 4-8 shows the performance in average time and cost for Lagos Port Complex export containers compared with internationally accepted norms for good performance.

Figure 4-7

FastPath Price and Time Comparison Graphics for Export Containerized Traffic, Lagos Port 2008



Comparison with other Export Cargo Corridors

During 2008, road transport time and delays were similar to those in the import direction but prices were considerably lower, given that backhaul to the hinterland are likely. Average price per TEU-km was US$1.08. A similar situation has been observed in Tema-Ouagadougou corridor where the average price per TEU-km in the export direction is US$0.9 compared to US$2.3 in the import direction. Although the prices are lower in the export direction, compared to the norm these are still high and rated as very poor. Therefore, the logistics scores in the export direction are the same than in the import direction. (see Table 4-2 for road performance comparison).

Table 4-4 compares the performance of Lagos port with other selected ports for containerized exports. Loading operations are the same than unloading operations considering that approximately the same number of containers arriving to the port must leave, even if these leave empty. Total port handling costs are lower than in the import direction, but these are still high compared to other competitor ports. This is particularly sensitive to Nigerian exporters because their products will be less competitive in international markets.

Table 4-4
Comparison of Port Performance in Selected Corridors for Containerized Exports

Component	Lagos–Kano	Tema–Ouagadougou	Laem Chabang-Vientiane	Dacca–Chittagong	Durban–Nelspruit	Maputo–Nelspruit
	Lagos Port	Tema Port	Laem Chabang	Chittagong	Durban	Maputo
Average loading time at berth	27.5 hr	20.5 hr	8 hr	16 hr	8 hr	8 hr
Total port handling costs	US$599.3[a]	US$349.7[a]	US$70	US$390[a]	US$750	US$350
Customs costs	US$210	US$4.5	US$180	US$60	–	US$146
Customs time	24 hr	3.5 hr	3 hr[c]	24 hr	4 hr	6 hr
Average dwell	6 days[b]	1.5 days	3.5 days	2.5 days	1.5 days	1.5 days
Reliability[d]	136%	58%	125%	45%	100% (est.)	268%
Logistics score	48	72	65	52	60	51

[a] *Including a port surcharge for delays to ships in channel ($132 for Lagos, $140 for Tema and of $190 for Chittagong)*
[b] *Includes average storage time in importers warehouse outside the port*
[c] *Inland Customs facility*
[d] *The percent of average transit time that would include 90 percent of shipments.*

Customs cost and time for exports are also lower than for imports but are still higher than for other ports. This suggests that further analysis of customs processes and costs for exports should be undertaken to ensure the competitiveness of Nigerian export goods. Average dwell time also is high compared to the time allowed by other ports. This storage time at the port might be reducing dynamic capacity in the ports. The score assigned to Lagos for export containers is 48, which is considered poor to fair.

Table 4-5 summarizes how the Lakaji transport corridor performance in handling containerized imports and exports compares to the performance of other transport corridors. The overall

logistics scores are similar in both directions—poor. The Lakaji corridor scores are lower in all components, but particularly for exports.

Table 4-5
Comparison of Corridor Performance–Logistics Scores for Containerized Cargo

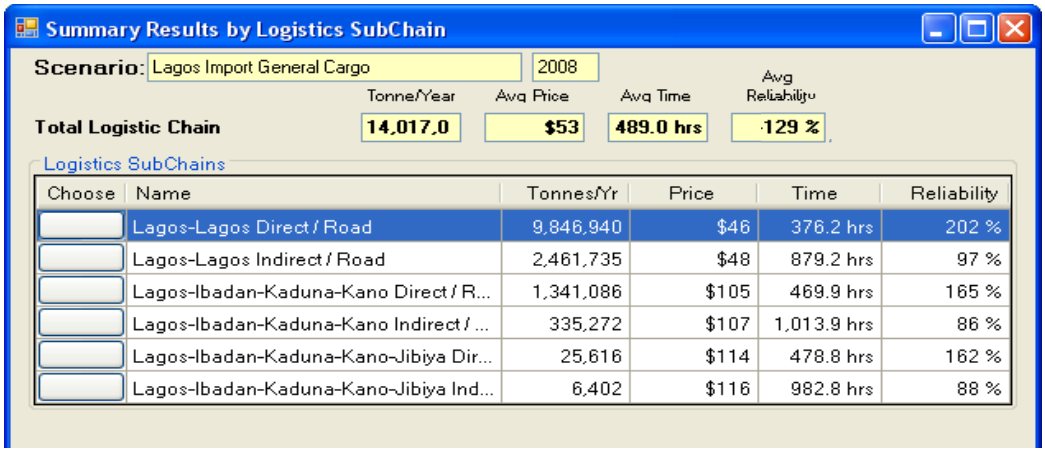
Logistics Component	Lagos-Kano or Jibiya[a]	Tema-Ouaga	Laem Chabang–Vientiane	Dacca–Chittagong[a]	Durban–Nelspruit[a,b]	Maputo–Nelspruit
IMPORT						
Overall logistics chain	42	51	64	59	63	62
Port	49	55	55	49	60	51
Road transport	39	55	70	58	65	51
EXPORT						
Overall logistics chain	42	62	66	54	68	60
Port	48	72	65	52	70	57
Road transport	39	70	70	58	65	51

Overall logistics score does not include border post node scores
Estimated from partial data in Maputo Corridor analysis

SCENARIO 4: LAGOS PORT COMPLEX IMPORT GENERAL CARGO

Figure 4-9 presents performance characteristics of the components that constitute the logistics chain for import general cargo, with the subchains associated with direct and indirect discharge. Differences in price and costs are related to storage at the port in accordance with the information for import general cargo (see Table 3-8).

Figure 4-8
FastPath Summary Output Screen for General Import Cargo, Lagos Port Complex 2008—Scenario 4



Lakaji corridor import general cargo operations cost is on average US$53 per ton and the time is 489 hours on average. This performance is compared to two other corridors where FastPath data

for noncontainerized cargo are available: the Tema-Ouagadougou corridor in Ghana and the Maputo-Nelspruit corridor in Mozambique. This information is presented in Table 4-6.

Table 4-6
Comparison of Port Performance in Selected Corridors for Noncontainerized Imports

	Lagos–Kano or Jibiya	Tema–Ouagadougou	Maputo–Nelspruit
	Lagos Port	Tema Port	Maputo
Average channel wait time	240 hr	48 hr	8 hr
Average unloading time at berth	124 hr	78 hr	24 hr
Total port handling costs/ton	US$22.95	US$10.62	US$29
Customs costs/ton	US$4.19	US$4.89	US$22
Customs time	3 hr	56 hr	48 hr
Average dwell time (indirect handling only)	21 days	17 days	6 days
Reliability*	129	94%	300%

** The percent of average transit time that would include 90 percent of shipments.*

Port Performance

Lagos port waiting time and unloading time is much longer than at the other ports. This is a reflection of the congestion experienced in the main general cargo terminal where there is no specialized equipment to unload cargo. The total port handling cost in Lagos includes the surcharge of US$1.2 per ton per day demurrage fee charged by vessels for waiting time. If this surcharge is reduced, port handling charges at Lagos would be similar to those charged at Ghana. Customs time at Lagos port is very short because all cargo is precleared. The average 21-day storage time applies only to indirect cargo, which applies only for 20 percent of the total volume handled at the terminal.

Road Performance

The average cost per ton-km for import general cargo in the Lakaji corridor shown in Table 4-7is similar to that for Tema-Ouagadougou and lower than for the Maputo corridor. The same factors affect the price for road transport for general cargo as for containerized freight. Many of these factors represent opportunities for improvement.

The average speed of 20 km per hr is considerably lower than any of the other two corridors and the average delay times are substantially higher, although this is explained partially by the length of the corridor. The reliability measure is about the same in all three corridors.

Table 4-7
Comparison of Road Transport Performance in Selected Corridors for Import General Cargo, Lagos 2008

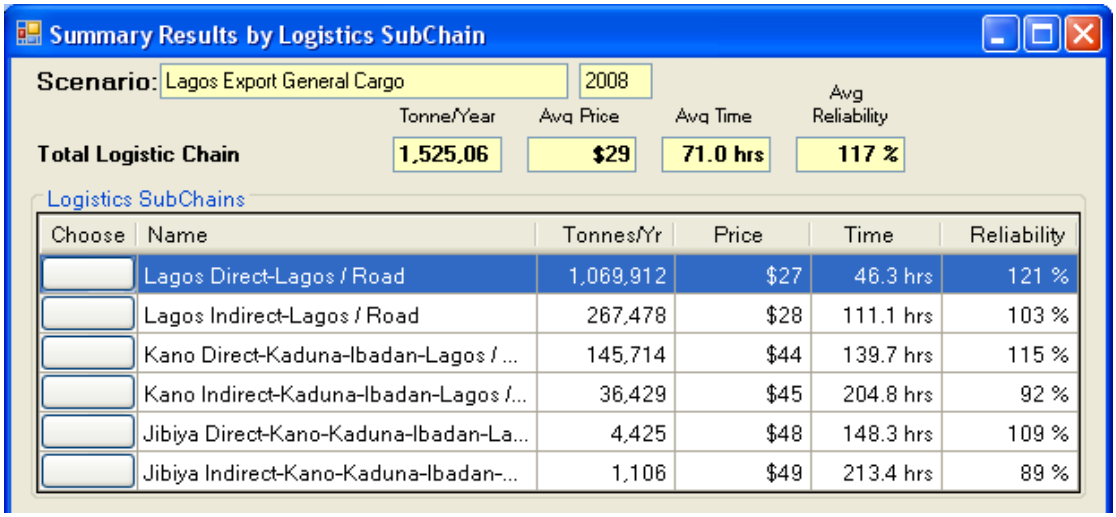
Performance Component	Corridor		
	Lagos-Kano/Jibiya	Tema-Ouagadougou	Maputo-Nelspruit
Av. Cost per Ton-km	US$0.08	US$0.07	US$0.13**
Av. Speed	20 kph	40 km/h	60 km/h
Av. Delay Time	30 hrs***	4 hrs	1 hr
Reliability*	100%	110%	105%

** The percent of average transit time that would include 90 percent of shipments.*
*** Very short haul distance (60km). This drops to $0.10 per cont-km for longer distances.*

SCENARIO 5: LAGOS PORT COMPLEX EXPORT GENERAL CARGO

Figure 4-10 presents performance characteristics of the export general cargo scenario components and the subchains associated with direct and indirect loading. Like for imports, the differences in price and costs are related to storage at the port in accordance with the information for export general cargo. The performance of export general cargo handling is not compared to that of other corridors because analysis on exports was made only for containerized cargo.

Figure 4-9
FastPath Summary Output Screen for Export General Cargo, Lagos Port Complex 2008 – Scenario 5



Port Performance

Port performance in the export direction is characterized again by slow operations at the berth due to the lack of terminal shore equipment. Channel operations do not present major delays in this direction. Very little cargo is handled indirectly to vessels because of limited storage capabilities in general cargo terminals.

Road Performance

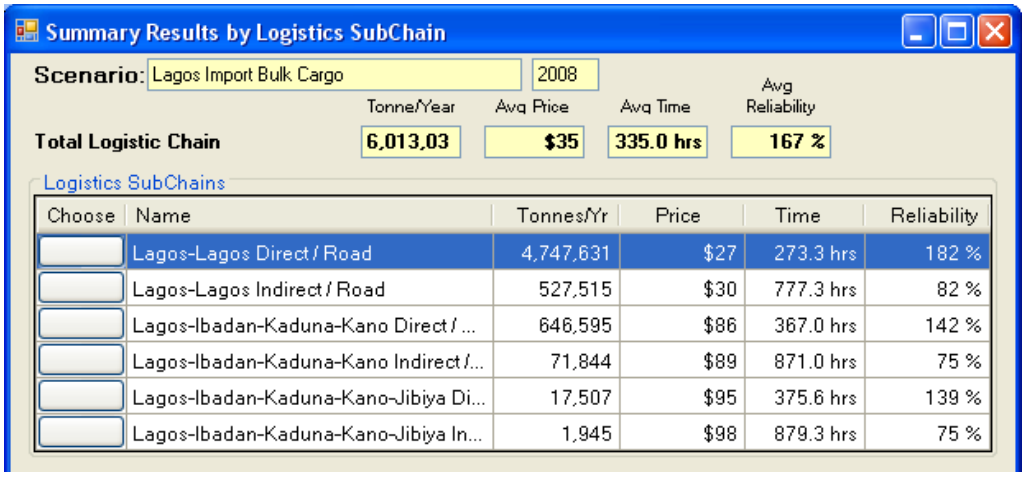
The average cost per ton-km for export general cargo in the Lakaji corridor is US$0.04 per ton-km, which is half of the cost in the import direction. All other road components have the same performance as in the import direction.

SCENARIO 6: LAGOS PORT COMPLEX IMPORT BULK CARGO

Bulk cargo operations in Lagos are performed efficiently thanks to the heavy investment made in bulk handling equipment. Figure 4-11 presents performance characteristics of the import bulk cargo operations and the direct and indirect discharge from vessels. The differences in cost and time are the result of storage at the port. No other bulk cargo operation has been assessed with FastPath and therefore, there is no information with which to benchmark the performance of bulk cargo at Lagos Port Complex.

Figure 4-10

FastPath Summary Output Screen for Import Bulk Cargo, Lagos Port Complex 2008, Scenario 6



5. Recommendations and Conclusions

In this section we list recommendations for improvements based on the FastPath analysis, including actions that will have an immediate impact on corridor performance. We conduct a cost benefit analysis of these potential improvements and identify their potential benefits.

PORT

Operations

All Terminals

- Move truck staging areas outside ports to organize access roads and decongest port access. Trucks would wait in a staging area for their appointment to drop or pick up cargo; trucks without an appointment would not be allowed near the port entrance. Also trucks would not be allowed to enter the port in search of cargo and then remain inside, creating congestion.
- Develop an appointment system for cargo pick-up and delivery based on cargo clearance and agreements between shipping lines, freight forwarders, shippers and transporting companies. Scheduling would take into consideration processing rates at the gate, Customs, and handling equipment to minimize congestion at the gates and inside the terminals.
- Increase availability of Customs and banking services by extending hours of operation in the port.

Container Terminals

- Reduce dwell time.
  - Reduce Customs clearing time by making widespread use of risk assessment results from digital systems.
  - Redefine the fee structure for storage in the port.
  - Create a warehousing strategy.
  - Enforce rules to define and auction abandoned cargo.
- Improve the allocation of ICD transfer charges to reduce the unpredictability of total import costs, such as by charging transfer fees for all import containers instead of only for those that are actually transferred; a lower fee for all containers would cover the cost of the transfer of a

sufficient number of containers to keep the port operating at its optimal level, and all containers would benefit from the decongestion.

General Cargo Terminals

- Increase the hours of operation by installing lighting
- Obtain more equipment to handle bulk cargo and open more warehousing to allow temporary storage inside the port (facilities for storage of general cargo were reduced severely because of excessive use by shippers).

Bulk Cargo Terminals

The operations, equipment, and storage areas at bulk terminals are good. Further analysis should be conducted to explore the possibility of using these terminals to a greater extent; for example handling rice in bulk could improve the logistics performance for this commodity, although other factors must be taken into consideration because bulk handling could compromise the quality of the product.

Institutional and Regulatory Reform

- Establish the independent regulator for the ports, which can be expected to improve the monitoring of the concession agreement (particularly regarding investment by the concessionaire and release of space and other actions by the NPA) and improve port performance.
- Support drafting of regulations and mobilization for the passage of the National Transport Commission Bill.
- Publish port performance indicators to enable monitoring and carry out concession monitoring according to the concession agreement.
- Reduce the multiplicity of government agencies at the port.

CUSTOMS

Some of the recommendations for Customs may have already been considered in the Customs component of the Transport Reform Program that is consulting with the presidential task force seeking to reform Customs and reduce clearance times.

- Require the prearrival submission of declaration and supporting documents and fully automate border clearance.
- Provide training to small importers on Customs procedures, forms, requirements, and online systems.
- Improve application of risk management by the NCS.
- Consider penalizing recurring, inaccurate, and faulty Customs declarations and use risk management to reward compliance.
- Unify Customs commands.

ROADS

Operations

- Institute a road governance program that would evaluate the impact of checkpoints, review laws and regulations that assign the responsibility to federal and local government agencies of overseeing the vehicles and the cargo along the road and identify which agencies do have these responsibilities, perhaps following the model used in the USAID West Africa Trade Hub program since 2005.
- Institute a road monitoring program through truck driver surveys that identify the number of checkpoints encountered, the frequency of bribe requests, accidents, road conditions, and other travel related incidents in direct association with the recommended road governance program.
- Support the implementation of axle load control through technical advisory services to implement weight stations (either as concession or government-controlled organization).
- Promote strict vehicle roadworthiness and safety inspections through the road governance program (to ensure that checkpoints perform their objectives of overseeing vehicle compliance) and with membership certification standards that guarantee a certain minimum of vehicle conditions and driver training.
- Implement a program to finance truck fleet renewal. If the roadworthiness and safety inspections through the road governance program are implemented, the membership certification that warranties better performance would be expected to draw higher rates that permit funding a replacement program by the transporters. Through members' combined greater purchasing power, negotiate better truck replacement costs and government and commercial loans at preferred rates.
- Promote consolidation centers in the hinterland to reduce the empty backhaul flows by matching cargo with empty trucks and increasing the use of now-empty containers in the export direction. Such centers would reduce rates by improving the truck use.

Maintenance and Capital Improvements

- Support implementation of performance-based road maintenance contracts through advocacy and, if necessary technical advisory services.
- Monitor the frequency and performance of the maintenance projects as per government programs and private operators' contracts.
- Monitor the reconstruction and rehabilitation projects implemented along the corridor.

Institutional and Regulatory Reform

- Develop recommendations to rationalize the activities of regulatory agencies on the roads to reduce the number of checkpoints.
- Support drafting of regulations and mobilization of a Road Fund to improve the funding of road maintenance and its long-term scheduling, particularly for capital improvements and rehabilitation.

- Refine legal framework to enable and manage road PPPs (concessions and performance maintenance contracts).

RAILWAY

The timing and applicability of our recommendations on the railway depend on the decisions made soon about the ownership structure of the Nigerian Railway Corporation.

Operations

- Review the intermodal connection to Apapa port and the possible railway extension to Tincan Island port
- Evaluate the changes necessary for bonded shipments to travel to the hinterland, especially Kano, by rail.
- Before concessions redefine NRC commercialization strategies and promote strategic partnerships with trucking companies for door-to-door service at competitive prices; promote partnerships with clients in which wagon purchases by customers are exchanged for lower rates.
- Increase locomotive and wagon availability through improved maintenance, eliminating use of wagons as storage, improved fee structures, and possible provision of equipment for offloading at a shipper's premises
- Improve train dispatch and yard operations though better container and cargo tracking technology, signaling, and additional shunting locomotives.

Maintenance

The most important recommendation regarding maintenance is to allocate sufficient funds to perform regular maintenance of locomotive and rolling stock, track, sleepers and drainage, equipment (communications and signals). This important issue is not currently a major component of the budget.

Capital Expenditures

- Identify options to increase railway capacity such as additional sidings, improved communications and signaling equipment, and improved equipment for control rooms.
- Rehabilitate railway warehouses and provide loading equipment to maximize wagon use.

Institutional and Regulatory Reform

- Support the drafting of the enabling legislation to implement the railway concession if concessioning is the option selected.
- Support the drafting of the concession agreement that assigns an appropriate distribution of risk between the concessionaire and the government and establishes a minimum performance level and investment for the concessionaire.

- Establish the National Railway Authority to monitor the performance of the concession or the NRC (depending on the ultimate decision in this regard).
- Redefine the railway's mission to one of a service oriented agency if it remains a government-run organization.
- Provide training on commercialization and operations best practices for the NRC if it remains as a government-run organization and the National Railway Authority personnel.

ANALYSIS OF POTENTIAL IMPROVEMENTS

The initial list of recommendations was narrowed to six that have the greatest potential performance impact. Improvements were discussed among stakeholders and assessed in greater detail to determine their feasibility and establish their potential benefits.

Potential Improvements

The potential improvements considered for the corridor include physical, institutional, and policy improvements. The FastPath analysis suggests remedies for long dwell times for containerized cargo, which in turn creates congestion at terminal berth, channel, and gates. Congestion is also observed in general cargo terminals, suggesting that loading and unloading operations are slow. In addition, the majority of the hinterland distribution of cargo is undertaken exclusively by trucks because rail operations have been abandoned. The reactivation of intermodal operations with rail should be explored to alleviate road congestion and reduce transport cost to the hinterland. To improve performance at the port and reduce traffic congestion in the city, truck control systems should be implemented to organize the arrival and departure of trucks to and from the port and limit the vehicles authorized in the vicinity of the port at a given time.

During the three workshops held for this study, stakeholders expressed concern about the lack of a forum to discuss concerns and recommend solutions to infrastructure problems and poor freight transport performance. The creation of an entity to promote public and private dialogue is recommended to take the lead in promoting and implementing activities improving transport efficiency along the corridor.

Cost-Benefit Analysis and FastPath

FastPath allows the comparison of the costs of different scenarios. The user creates an improvement scenario with reduced costs to the shippers and uses the cost-benefit analysis function to create a spreadsheet with cost data from the two scenarios, which calculates the cost savings in the base year. The user may set growth rates for the cost savings and input investment costs for improvements. The spreadsheet calculates the net present value to shippers of the improvement for the life of the project.

This basic calculation with the cost savings can be supplemented with other benefits and costs where they occur. For example, if freight time savings are expected to generate inventory cost savings, these can be added. In this way all costs and benefits are accounted for. The estimates of benefits and costs given below are order-of-magnitude estimates; these estimates should be refined following a more detailed evaluation of the feasibility of the improvements identified.

Improvement Analysis

Establish a Corridor Management Entity

The transport corridor connecting Lagos to Kano and the Niger border (Jibiya/Daura) has been identified as a critical link for moving crops key to food security. There is a need to bind public and private sector stakeholders to a common vision on operational, infrastructural, and regulatory initiatives and reforms that must be taken to improve the performance of the corridor. In other parts of the region and the world, the forum that brings together public sector infrastructure providers and regulators with private sector shippers and infrastructure and service providers is a corridor management group. In Nigeria because there is no corridor management framework, the private sector has had limited opportunity to advocate for policy and regulatory reforms to improve corridor performance in a formal forum that encourages open communication and effective implementation of recommendations. The formation of a corridor management group in Nigeria is therefore recommended. This activity was identified during the inception of the Trade and Transport Reform Program and confirmed during consultation with stakeholders. Actions for this improvement are running in parallel with the Transport Component of the GFSR Program.

Possible Actions for Establishing the Corridor Management Group

The establishment of a corridor management group requires high-level political endorsement and the participation, buy-in, and cooperation of public and private sector stakeholders. A review of corridor management best practices should be prepared and discussed among stakeholder to determine the best management option for the Nigeria context. Seminars and workshops should be conducted to discuss and choose the appropriate governance approach and design the corridor management framework. Actions that the corridor management group could undertake include

- Stakeholder collaboration
  - Advocacy for regulatory reform
  - Programs for self-regulation
  - Information exchange
  - Performance monitoring
  - Integration of logistics services
  - Introduction of new technology
- Advocacy
  - Maintenance and road funds
  - Design and location of transport amenities, roadside services
  - Harmonization of regulations
  - Reduction of roadblocks
  - Overloading
  - Road safety

Potential Benefits of Establishing the Corridor Management Group

The principal role of a corridor management group would be to advocate for initiatives to improve corridor performance. The organization would serve as a forum for public-private dialogue on setting priorities and carrying out initiatives. It would also assess the benefits of various initiatives and the contributions of individual government agencies and associations

representing the transport sector in pursuing these initiatives. Beyond this, the organization would act as a public advocate for these initiatives and would monitor progress in implementing them. The most relevant benefits from the establishment of a corridor management group include:

- Develop and encourage business clustering along development corridor.
- Focus attention on specific transport logistics problems that cause the corridor to underperform.
- Encourage public-private dialogue and cooperation to define solutions to performance issues.
- Facilitate flow of operational information and monitor progress in implementing solutions.
- Assist government in refining transport policy and provide a channel of communication between industry and government.
- Reduce delivery cost (reduced transit time, lower cost of vehicle maintenance, increased reliability of shipments, fewer road accidents, informal fees and harassment).
- Implement regulations and permits (harmonization of laws and increased information on laws to road users and the general public).
- Issue certification for members that meet operating standards that ensure adequate and timely services.

Investment Costs for Establishing the Corridor Management Group

The corridor management group would need a board of directors, working groups, and a secretariat. The board would hold meetings on a biannual basis but more frequently in the first year of operation. The secretariat would initially have an executive secretary and three full-time staff to provide administrative assistance, organizational and information technology support and transport economic assessments.

The major costs will be the operating budget for the secretariat and the costs for meetings and communications. The cost for the secretariat, including staff and office facilities, is estimated at $250,000 per year. The cost for meetings and communications is expected to be $100,000 per year. Costs for outside experts for the working groups would be small in the first year but could reach $200,000 in subsequent years as the focus shifts to longer-term and more complex initiatives. We estimate about $500,000 will have to be financed the first and second years of operations. Part of the costs would be defrayed through contributions in kind for office space. When results start to be achieved, the organization will be in a better position to charge users for services and its operating budget will depend on member contributions. We estimate the total investment cost for establishing the corridor management group at $500,000 to $1 million.

Evaluation of Actions to Establish the Corridor Management Group

The policy actions that the corridor management group will promote will facilitate the implementation of other potential improvements. It is uncertain to determine the actual value of the activities that the group will promote and therefore the evaluation of actions is not made at this point.

Develop a Truck Staging Area and Truck Control System

Improved operational performance can expand capacity and alleviate or even eliminate congestion. Trucking services, the sole mode of transport to and from the port, operate under an inefficient system that generates long waits and poor performance at terminal gates, significant air pollution, and congestion at the terminals and throughout neighboring areas. While the privatization efforts undertaken by the government at both Apapa and Tincan Island ports have started to show improvements in its marine terminals, these efforts have not been accompanied by programs to improve trucking services. Trucks clog the city, port operations are vulnerable outside terminal gates, and importers and exporters are constantly frustrated by poor service and lack of control over who is picking up, transporting, handling, and delivering their cargo.

Actions for Developing Truck Staging Area and Truck Control System

To improve gate services and reduce congestion at the gates and in neighboring areas of the Lagos Port Complex, a truck control system consisting of a regulatory framework, an improved physical infrastructure, and an information system to manage the movement of commercial trucks entering the terminals should be implemented. The information system could also serve as a platform for coordinating activities among freight agents, trucking companies, and truck drivers in a deregulated environment.

The proposed system would have an entry point and truck staging areas outside the Lagos Port Complex where trucks would wait until the terminal gate authorizes their arrival for delivery or pick-up. At the truck staging area, dispatchers would enter a permit request, the truck control system would validate that the truck seeking to perform the operation is qualified to do so, including checking licensing and driver information, fitness of the equipment for the operation, and readiness of cargo and documentation, through electronic interfaces to the relevant systems. Trucks would be allowed in the neighboring areas of the terminals only with system authorization, thus reducing the volume of trucks in the area. Gate inspections could be reduced because the documentation review is undertaken at the staging area and discrepancies solved before trucks arrive at the gates.

Potential Benefits of Developing Truck Staging Area and Truck Control System

The benefits expected from the implementation of truck staging areas include a better integrated and more competitive sector. A reduction in travel time to and from the ports and increased reliability are also expected. Increased return on investment for transport companies and more trips per truck are also expected. More profitable companies could renovate their fleets more easily as well. The information technology required to track and plan the trips will make it easier to create cargo consolidation companies to allow individual truckers the opportunity to transport consolidated cargo from small shippers at a more competitive costs. Finally, the removal of a significant number of trucks will reduce accidents and breakdowns from long trips in a congested environment.

For the purposes of the FastPath analysis it was assumed that the implementation of the truck staging areas and truck control system will reduce travel time by three hours (two hours of waiting time to access the gate and one hour of congestion time to get to the port). Transport cost

and operation savings (time, fuel, tires) were estimated using figures from a World Bank study that reported savings of US$3.75 per hour or US$11.25 per container.[19]

Investment Costs for Developing Truck Staging Area and Truck Control System

The elements required to implement these types of systems include an IT platform that can track and coordinate the movement of trucks. Similar projects elsewhere have required initial investment of US$63.5 million. This includes the cost of the IT platform (US$3.5 million) and the identification and construction of two truck staging areas with an approximate capacity of 800 trucks each, plus support services such as bathrooms, restaurants, and repair services for approximately US$60 million. The annual operational and overhead staff costs for the staging areas are US$1.37 million, and computer upgrades, maintenance, and training of staff need an additional US$700,000 per year. Annual infrastructure maintenance is estimated to be 5 percent of the investment cost, and major maintenance every 10 years is estimated to be 15 percent.

Cost-benefit Analysis of Developing Truck Staging Area and Truck Control System

An estimated 1.6 million trucks per year are needed to move the volume of imports and exports handled by Apapa and Tincan Island ports. The cost-benefit analysis indicates that the initial investment of US$63.5 million and annual operating costs of US$5.2 million would yield a net present value of benefits of US$122 million over 20 years. The benefits included in this calculation have been constrained by port capacity, which is expected to reach full capacity within five years if no improvement is made. Both containerized and noncontainerized cargo in both import and export directions would benefit. With the improved scenario the logistics scores for containerized cargo vary depending on the import or export scenario analyzed. Table C1A in Appendix C presents the information for the cost-benefit analysis for the development of the truck staging area and truck control system.

Promote the Use of Intermodal Transport Systems

Rail currently does not provide services in the Lakaji corridor. It is expected that upon rehabilitation of the rail infrastructure along the corridor, a rail-based transport system between the marine terminals in Lagos and the consumption and production points in Kano can be promoted. At this stage international freight, especially the inland movement of imports of marine containers, would be the anchor for this corridor. But containers alone will not generate sufficient traffic to justify the improvements, so we also suggest including domestic freight, both general and bulk cargo, in the study. The aim of this study is to define the most viable configurations, in terms of physical, operational, and institutional factors.

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[19] The World Bank study reported a reduction of US$1–3 per ton per day saved (US$3 per ton *30 ton per container = US$90 per container per day). Therefore US$90 divided by 24 hr per container equals US$3.75 per hour or US$11.25 per container entering or leaving the port.

Possible Actions for Promoting the Use of Intermodal Transport Systems

The proposed corridor can potentially serve both international and domestic freight. These two types of freight also affect the definition of the transport system. This definition relates to the two major system components:

- Type of trains to be employed, for containers and noncontainerized cargo
- Type and location of intermodal rail terminals within or outside marine terminals.

The location of the intermodal terminals also affects the decision of what would be included in them: the length and capacity of working and storage tracks, size of marshalling yards for containers, and the availability of open and covered storage. Another related issue is whether the trains and terminals will include bonding capacities. The type and location of intermodal terminals relates both to Lagos and hinterland points.

The definition of the institutional aspects involves decisions related to the investment and operation of tracks' equipment, and especially terminals. The role that the government plays in the operation, maintenance, and upgrade of equipment and infrastructure in the Nigerian railways needs to be redefined in line with the current role that railways play in the transportation sector of countries around the world and specific long-term transport sector plans in Nigeria.

The introduction of the private sector into railway operations is a growing trend in other parts of the world. African countries have preferred to grant concessions, and experience indicates that the probable success of a concession depends on the extent to which a country has robust laws governing planning, procurement, and management of PPPs; and the existence of dedicated institutional capacity to support PPP implementation (through a PPP Unit for example). A strong and independent concession regulator with a clear mandate (protecting the government's interests while allowing innovation from the private sector) is required to enforce the concession contract rules and make private rail operators accountable and meet the minimum performance requirements stipulated in the concession agreements. The regulator would also evaluate and approve tariff increases necessary to cover cost increases.

Potential Benefits of Promoting the Use of Intermodal Transport Systems

It is expected that once there is a commercially oriented rail service, it will implement associations with trucking companies that will offer a combined reduced transport rate (compared to an all truck service) with very efficient intermodal transfers. It is also expected to observe time savings through the use of the rail service because it's not subject to the congestion restrictions seen in the roads and is able to conduct night operations. Additional savings will include the reduction in inventory costs due to more reliable delivery times.

For the purposes of the FastPath analysis it was assumed that the increased promotion of the Intermodal Transport System will increase the rail mode share and reduce the travel time (versus an all road service facing the existing travel difficulties). It is important to recognize, given the significant investments required in railway track infrastructure due to years of neglect, the government is maintaining a significant role in the short term, committed to a planned 5 year rehabilitation program for the track. A shipper would take several factors into consideration in

making a choice for the transport mode. Some of the factors for the choice of transport between road and rail include:

- Reliability of transit time
- Tariff
- Additional costs at origin and destination for rail mode
- Ready availability of wagon/truck
- Security of cargo
- Availability of information for cargo in transit
- Attitude of service provider and its staff
- Compensation procedure for loss and damage

The above benefits would materialize only if the railway is rehabilitated and operated as an efficient commercial business focusing on competitive pricing, service quality and customer needs. Further, railway should be enabled to compete with road transport on a fair basis by imposing appropriate road user charges on road vehicles and strict enforcement of axle load to prevent overloading. These actions need to be taken in the same time frame as the award of concessions and railway rehabilitation.

Investment Costs for Promoting the Use of Intermodal Transport Systems

It is assumed, for the purposes of this analysis, that the rehabilitation projects that the Nigeria Railway Corporation is already implementing will be completed and travel between Lagos and Kano on the railway will be possible. The government of Nigeria has made an initial purchase of 25 locomotives and equipment that should arrive in the second half of 2010 and is rehabilitating wagons to provide rail services along the Lakaji corridor. It is also assumed that the annual operation expenses will be covered by current rail transport rates. The investment proposed in our analysis will allow the rail services to transport 715,000 additional tons of cargo per year.

The scenario analyzed requires the purchase of 12 new narrow-gauge locomotives similar to the ones already purchased. These locomotives will provide service of about 60 wagons per day from Lagos to Kano. The cost of purchasing the locomotives is US$48 million (US$4 million each). Additionally, there is a need to rehabilitate approximately 360 wagons to operate the trains at a total cost of US$36 million.

Evaluation of Actions Promoting the Use of Intermodal Transport Systems

Rail services to transport 715,000 tons from Lagos to Kano will eliminate approximately 20,000 truck trips. Because there is no rail access to the port, additional short-haul services are required from the port to the train terminal in Lagos, and from the train terminal in Kano to its final destination. Nevertheless, the long-haul savings from the train compensate the additional cost of these short-haul services.

The result of the cost-benefit analysis of the actions to promote the use of intermodal systems indicates a net present value of benefits of US$2.5 million. This reflects only the impact of the switch of cargo from trucks to trains. Other benefits not accounted for include the reduced travel time for road users given reduced traffic resulting from 20,000 fewer truck trips per year. This improvement would benefit both containerized and noncontainerized cargo in both import and

export directions. With the improved scenario the logistics scores for containerized cargo increase depending on the segment and the direction analyzed.

Table C2A and C2B in Appendix C present the cost-benefit analysis for the development of the rail-intermodal transport system.

Reducing Total Dwell Time

Average dwell time for import cargo at Apapa port is about 20 days and at Tincan port 29 days. Storage charges are not levied in the first three days but are levied from the fourth day on until the container is removed from the terminal. The average dwell time is excessive compared with the dwell time in other corridors and creates congestion problems at the ports. The causes for this excessive dwell time include complex Customs procedures, lack of capacity by some freight forwarders and shippers to follow the clearance process, and low yard storage charges compared to charges for bonded warehouses in the Lagos metropolitan area, incentivizing the use of the port as storage by cargo owners.

Possible Actions for Reducing Dwell Time

Potential actions to reduce dwell times could include simplification of border clearance procedures to speed up the process and encouraging shippers to move containers out of the port sooner through higher storage fees and transfer of cargo to the ICDs after a specific period of time. Speeding up border clearance could be accomplished through better risk management, reducing the number of agencies involved, maximizing use of the new Customs inspection facilities, extending Customs hours of operation, and online payments of fees. This could reduce Customs requirements significantly, which has been achieved in similar situations. All these actions could reduce average dwell time to about 10 days total.

Potential Benefits of Reducing Dwell Time

The total time that cargo is stored at the port is high compared with the time that is actually required to clear Customs and other agencies involved in the transit cargo clearance process. The dwell time experienced in other corridors managing transit cargo averages close to 10 or even 6 days. The reduction in time will result in savings in storage fees. In addition, demurrage charges incurred by shippers will also be reduced. Reducing clearance time will allow shippers to get their cargo quicker and reduce their storage charges. The revenue that port terminals lose in storage charges will be compensated for in increased capacity and cargo served. This scenario is feasible in Nigeria, where cargo projections are still increasing at a fast pace. An additional benefit from reducing dwell time is an increase in the capacity of the terminals and the resulting reduced need for further investment.

Investment Costs for Reducing Dwell Time

Providing incentives to move containers out of the yard is a policy action that does not involve major investments (ICDs are also in place). Speeding up Customs requires reengineering of the processes, improving information systems, and training and equipment by shippers. Allowing online payments and requiring fewer agencies to sign off on cargo offloading requires moderate investment to cover reorganization and reengineering of processes. Extending hours of operation

requires additional labor and operating costs. We estimate investments of about $25 million, including training. This investment would have to be undertaken on a nationwide basis and the corridor would benefit from it.

Evaluation of Actions to Reducing Dwell Time

It is expected that the actions to reduce the dwell time will result in a 50 percent reduction in storage time and a 35 percent reduction in clearance time. Taking into consideration the progressive storage charges at the port, reduction in storage time will be greater in Tincan Island. The reduction of 10 days in dwell time will result in savings of $394 per TEU in Tincan Island and $135 per TEU in Apapa. There will be savings of $143,967,000 during the first year of implementation. The cost-benefit analysis of actions to reduce the use of infrastructure due to dwell time reductions indicate a net present value of benefits of US$1.48 billion. These benefits are derived from using all cargo handled at both ports and not only cargo moved through the corridor.

Figure 5-1 presents the comparison graphics for the current and improved scenarios for cost and time of reduced dwell time only for Apapa port. With the improved scenario, logistics score at Apapa terminal would increase from 49 to 53 and at Tincan Island from 43 to 47.

Figure 5-1

FastPath Price and Time Comparison Graphics for Current and Improved Scenarios, Apapa

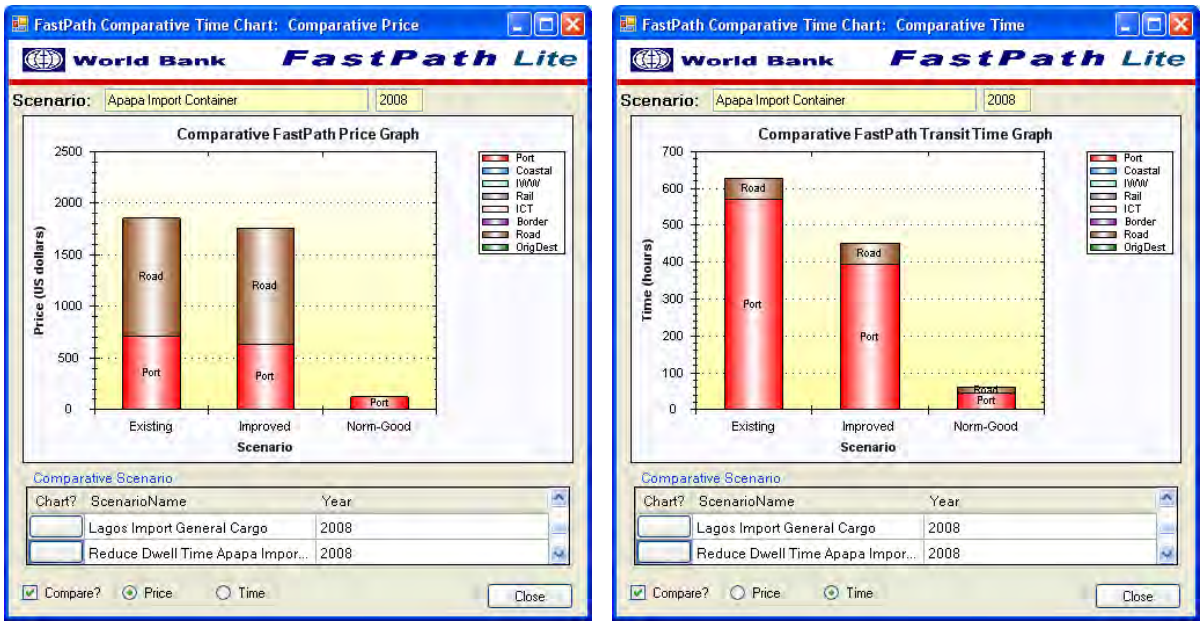

Table C3A and C3B in Appendix C present the information of the cost-benefit analysis for the reduction of dwell time using weighted average figures for both ports.

Additional savings would be obtained by shippers considering that reduction in dwell time will also result in a direct reduction of container demurrage time charged by shipping lines. With an average cost of $30 per day, the reduction of 10 days of dwell time could also signify additional $300 per TEU of demurrage charges. This saving is not generated from the use of infrastructure

and depending on the arrangements between the shippers and shipping lines, these may be discounted. Therefore we did not include these savings in our analysis, but this could be a direct savings to several shippers.

Improve the Operational Performance of General Cargo Terminal

The analysis of breakbulk cargo was undertaken using ENL Terminal, where vessels calling the port experienced average waiting time of 10 days and where average service time at the berth was 6.5 days. Furthermore, the majority of general cargo handled at the terminal is imported, suggesting that unloading operations make up the majority of the time vessels spend at berth. Considering that the terminal has seven berths, this allows the terminal to have higher occupancy rates without experiencing congestion. The berth occupancy rate at the terminal based on data provided by NPA is about 72 percent. This rate is acceptable for a seven-berth facility. Nevertheless, the average waiting time of 10 days is high, suggesting that the terminal is suffering from congestion.

Several factors contribute to the congestion at the terminal. There is no specialized equipment to serve the vessels, and as a result, all operations at the berth are done with ship's gear. The productivity of ship's gear is less than that of specialized equipment. In addition, unloading operations are done directly from vessel to truck, creating irregularities in the vessel-truck interface. Trucks are arranged by the ship agent, not by the terminal operators. Having several parties involved in the operations creates interruptions, but also any delay in truck arrival has a direct impact on performance at the berth.

Improvement in operational performance would result in shorter cycles to serve the vessels at berth and consequently the waiting time to get a berth assigned would be shorter. This will also result in a reduction in the charges incurred by the ship at the port.

Possible Actions for Improving the Operational Performance of General Cargo Terminal

The terminal has two nonoperational mobile harbor cranes. The first step should be putting to work the equipment transferred to the terminal operator by NPA during the concession program, which will require a smaller investment than acquiring new equipment. An additional crane would provide the terminal with three mobile harbor cranes, which will be adequate to serve four to five berths with specialized equipment. Given the characteristics of the specialized equipment, mobile harbor cranes perform better with heavy breakbulk cargo. Nevertheless, not all commodities have this characteristic and therefore not all berths need to be served with mobile harbor cranes.

The use of specialized cranes would have to be complemented by operational procedures to avoid disruption and down time at the berth. The direct operations from vessel to truck would have to be modified to an indirect discharge with partial storage of goods at the storage facilities for later loading by truck. This additional step will result in additional cost for the discharge operations but the process would benefit from greater efficiency as a whole, resulting in a reduction of the total cost of operations. In addition, considering that indirect operations do not require truck dispatch

during the night, with proper lighting, ships could be served at night as well, resulting in greater productivity per day.

It will be important that the temporary storage does not exceed the free storage time of three days to avoid storage charges. This seems reasonable considering that truck loading would be faster compared with the operations undertaken at the berth.

Potential Benefits for Improving the Operational Performance of General Cargo Terminal

It is expected that using specialized equipment and changing operational procedures will double, productivity at the berth and therefore the service time at the berth will be reduced by half in most of the ships. This reduction will result in greater berth availability and consequently a reduction in ship waiting time upon arrival.

According to the statistics provided by NPA, average berth time for general cargo vessels was 155 hours, or 6.4 days, and average waiting time was 240 hours, or 10 days. With seven berths, a 50 percent reduction in berth time could reduce the original waiting time by about two-thirds.

This improvement would particularly benefit the discharge and handling of rice, one of the major products handled at ENL and one associated with food security. Berth productivity for bagged rice is 1,500–2,800 tons a day during a 12-hour shift, resulting in an average discharge operation of 10 days for a shipment of 20,000 tons of rice. With the improved scenario—working hours increased to 18 hours a day—productivity increases to 5,000 tons or even 6,000 tons per day. The reduction in ship service time would fall to 4 days instead of 10 and the vessel waiting time would also fall to an average of 4 days.

Investment Costs for Improving the Operational Performance of General Cargo Terminal

The terminal operator would have to make investments to refurbish the two mobile harbor cranes that ENL received from NPA during the concession process and will also have to purchase one additional mobile harbor crane. This would cost about US$8 million. Additional adjustments to storage area and lighting to allow extended hours of operation at the berth would also be necessary. ENL is undergoing a rehabilitation program to expand the storage areas for general cargo. Some additional works may be necessary to provide satisfactory buffer area for temporary storage of general cargo, particularly rice, for indirect discharge operations. We estimate these additional works at about US$8 million.

Evaluation of Actions for Improving the Operational Performance of General Cargo Terminal

Several variables are affected by the change of operations, but the improvement of operations will result in an overall reduction of charges at the port. First, there will be an increase from NGN 89 to NGN 168 per ton of general cargo handled, considering the change from direct to indirect handling. This is equivalent to US$0.50 per ton of general cargo handled.

Nevertheless, there will also be reduction in other charges. Berth charges will fall from US$0.17 to US$0.07 for a net savings of US$0.10 per ton when the stay of the ship at the berth falls from 10 to 4 days. Also there will be a reduction in ship waiting time from 10 days to 4 days. For rice, the reduction in ship waiting time will represent savings of U$S1.2 per ton per day on demurrage charges applied by ship owners when vessels have to wait for berth availability. If waiting time is reduced 6 days, this will represent savings of US$7.2 per ton.

The use of specialized equipment and extending working hours to 18 hours day will result in additional charges at the terminal considering that terminal operators' operational expenses would increase. It is estimated that this increment could be in the range of US$3.00 per ton handled. Estimated net savings from this improvement would therefore be US$3.8 per ton handled.

Saving for other commodities would not be as substantial as for rice because vessel demurrage charges would not be similar. Nevertheless we estimate saving at about US$0.5 per ton.

Assuming that rice volumes handled at Lagos port are approximately 2 million tons per year, there will be savings on an annual basis of $7,600,000. The result of the cost-benefit analysis of the actions to improve general cargo handling using specific savings and volumes associated with rice imports indicates a net present value of benefits of US$50 million. These estimates assume increment of rice imports at 5 percent per year until 2015 when the terminal may reach capacity. Afterwards, the volume of rice handled at ENL will remain constant.

Table C4A and C4B in Appendix C present the information of the cost-benefit analysis for improving the Operational Performance of General Cargo Terminal.

Improve Road Transport Services—Road Governance Program

A significant number of checkpoints are operated along the Lagos-Kano-Jibiya Corridor by people claiming to represent a variety of agencies at the federal, state, and local levels of government—the police, immigration, road authority, revenue authority, safety, health, and agriculture agencies, among others. The public that faces these checkpoints does not have enough information to determine if they are legitimate and therefore pays fines for genuine and fictitious infractions, falling prey to corruption, paying bribes to avoid fines.

The checkpoints have multiple consequences, including additional cost and time for cargo shipments, insecurity because the checkpoints can also be used to highjack vehicles, and reduced trust in government institutions. From the road operations point of view, the checkpoints reduce the effectiveness of legal and warranted checkpoints and weighbridges in performing their regulatory missions of ensuring that vehicles meet operational and weight requirements and that cargo complies with regulations.

Possible Actions for Improving Road Transport Services

The corridor management group that has been recommended is conducting a review of the laws and regulations that apply to all the sections of the corridor to determine which agencies have genuine oversight of operations in the corridor. The review will also identify duplications and limits to the oversight to regularize checkpoints and limit their number. The recommendations from this review may lead to regulatory action by the federal government.

Potential Benefits for Improving Road Transport Services

The reduction in the number of checkpoints will increase the regulatory effectiveness of real checkpoints by making it easier to monitor and curb the corruption associated with them. As a result, the safety of operations along the corridor will increase significantly when the agency responsible for inspecting the roadworthiness of the trucks can stop tankers from spilling gasoline as they travel along the road and stop trucks whose brakes do not operate properly from endangering other road users. The road surface will not deteriorate as fast when weighbridges can issue fines to overloaded trucks and offload cargo to the regulated level.

Another safety-related improvement is the reduction in highjacking by people posing as government officials that will result from fewer and better-regulated checkpoints.

For shippers and transporters the reduction in the number of checkpoints will result in time and operating savings as well as increased reliability from fewer stops and higher speeds. The improved effectiveness of the checkpoints will also help preserve the road surface and reduce accidents and breakdowns, all resulting in higher speeds and reliability.

Investment Costs for Improving Road Transport Services

The West Africa Trade Hub has undertaken the Improved Road Transport Governance (IRTG) program since 2005 in several transport corridors in West Africa. The organizational set-up includes regional and national entities and personnel from the Trade Hub. Reports are produced quarterly and follow-up advocacy work is undertaken to disseminate the results. A similar program could be implemented in Nigeria for the Lakaji corridor and led by the corridor management group. Funds of about $150,000 per year would be needed to organize surveys. A pilot program could be run for two years and if it is successful, could be integrated into the operational budget of the corridor management group. Total investment required is therefore $300,000.

Evaluation of Actions to Improving Road Transport Services

The results from the program will be used as input for the advocacy activities of the corridor management group to identify options to improve performance along the Lakaji corridor. The information from surveys will identify the impact on cost and time of checkpoints along the corridor. Determining the actual monetary value of these actions is not possible and therefore the value was not included in our estimations.

CONCLUSION

Summary of Benefits from Implementing Recommendations

The recommended actions have varying potential. Table 5-1 summarizes the benefits and costs and relative feasibility of each investment. Truck staging areas and the intermodal transport system are by far the largest investments. The reduction of dwell time at the port requires lower investment costs if border processing reforms are the key processes to be addressed and the benefits are immense. The two other improvements, establishment of the corridor management group and the improved road transport service, are feasible considering that the implementation

and promotion of policy actions will lead to feasible actions. All these potential improvements appear desirable but need further investigation to verify their potential. The establishment of the corridor management group is underway, and the Trade and Transport Reform Program is conducting feasibility studies for the truck staging areas and for the intermodal transport systems will be undertaken. Also, the Customs component of the Trade and Transport Reform Program is attempting to simplify the border clearance process, which would lead to a reduction of dwell time. Improvements have an effect on logistics scores, showing that step by step, improvements will move Nigeria to a more competitive transport environment.

The corridor management group would be responsible for following up on the expected results from the different actions and it is recommended that every two or three years a new FastPath performance diagnostic analysis is carried out to compare past with new performance and assess if improvements are generating the expected results.

Table 5-1
Summary of Improvement Evaluations

Improvement Action	Estimated Investment ($)	Net Present Value of Benefits ($)	Cargo Owners' Estimated Savings		Evaluation of Investment
			Import	Export	
Establish a corridor management entity	0.5–1.0 million	No monetary value estimated	-	-	Feasible for policy actions
Develop a truck staging area and truck control system	63.5 million	122 million	$11.25 /TEU $0.38 ton	$11.25/TEU $0.38 ton	Highly feasible
Promote the use of intermodal transport systems	84 million	2.5 million	$14/ton	$14/ton	Feasible
Reduce total dwell time	25 million	1.48 billion	$264/TEU average	-	Highly feasible
Promote the use of handling equipment at ENL terminal	18 million	50 million for rice imports	$3.8/ton for rice imports	-	Feasible
Improve road transport service	0.3 million	No monetary value estimated	-	-	Feasible for policy actions

Food Security

A central objective of this analysis was to reduce trade, transport, and supply chain bottlenecks for food security–related commodities and inputs for Nigeria and the wider region. But given the nature of transport corridors, which facilitate the transport of a broad array of goods from many industrial sectors through diverse transport arrangements, addressing these concerns separately from those that affect the general performance of the corridor is impossible. It is therefore necessary to approach this work from a holistic perspective.

Many of the improvement actions recommended yield significant positive benefits across sectors—including agriculture and agribusiness—and in the movement of agricultural products and inputs that are key to improving food security. The strengthening of the operations of the

ENL Terminal and the development of a truck staging area in the Lagos Port Complex are two strong cases in point.

ENL, the main terminal for handling general cargo and for much breakbulk activity, particularly bagged rice, is also the most congested terminal in the Lagos Port Complex. A good part of the congestion is attributable to a lack of modern handling equipment, such as shore cranes for offloading cargo. Shippers can easily incur 10 days or more of demurrage at a $20,000 daily rate for a loaded vessel—meaning that this sole inefficiency could increase the product costs of a 20,000 MT consignment of rice by approximately 3–5 percent. Our recommendation to invest in mobile harbor cranes for ship handling would address this problem and create a benefit of $3.8 per ton, which would ultimately find its way to consumers in the form of more competitively priced food products.

Developing a truck staging area in the Lagos Port Complex, which handles both containerized and breakbulk cargo, which is normally associated with agricultural products, would help reduce the cost of agricultural imports further by decongesting the port and reducing the time it takes to move product from the port to final consolidation or distribution points. Furthermore, minimizing transit time in the supply chain for agricultural products is also of vital concern from a food safety and product quality perspective, given perishability and other related considerations. Moreover, the new staging area would also strengthen Nigerian export operations, which as referenced above is critical for enhancing the competitiveness of this sector to spur economic development and provide the food access that local populations require.

Appendix A: Data Definitions

There are several variables that are used to measure the performance of a logistics system, where each variable can be understood in a different manner by several stakeholders involved in the system. To avoid confusion among participants in the interpretation of results, below we present the definition of the major variables used by FastPath during the performance analysis.

Base case. Scenario describing an existing situation

Benchmarks. Performance measures representing best practice or typical developed country operations

Drayage. Truck delivery of a container to or from an intermodal container terminal

Dwell time. Total time spent by a container in a facility such as a port.

Hinterland node. An origin or destination of container traffic inland from a seaport

Improved scenario. Scenario representing a package of improvements

Intermodal container terminal. A terminal where containers can switch between two modes, usually rail and road. An ICT can have several components (e.g., storage, Customs, drayage).

Link. An element of a logistics chain that has a physical length (e.g., road link, rail link)

Logistics chain. A series of transportation and operational links and nodes through which a container travels from seaport to its inland destination

Logistics score. Performance measure between 20 and 80 representing logistics efficiency

Node. An element of a logistics chain that exists in one location (e.g., seaport, intermodal container terminal)

Norms. Performance measures representing typical values in developing countries ordered in terms of good, fair, poor, and very poor

Price. A logistics performance indicator, usually total price per container paid by the shipper for transiting a link or a node in a logistics chain

Reliability. A performance indicator, defined here as the percent of average time accounting for 90 percent of actual times incurred

Scenario. A detailed description of a logistics chain with traffic data and performance measures

Seaport/terminal. Combination of a seaport and a container terminal that can have several components (e.g., channel, berth, intermodal transfer, Customs)

Subchain. Part of a logistics chain connecting a seaport to a hinterland origin or destination

Transit time. A logistics performance indicator representing the time to pass through a link or a node in a logistics chain, excluding waiting time

Unit value. The value of a performance indicator such price or speed for one unit (e.g., container-kilometer or km per h)

Waiting time. A performance indicator representing time for a container not spent in process

Appendix B: FastPath Model Data Input, Assumptions, and Definitions

In this section we describe the major data input and assumptions incorporated into the FastPath model ensuring that it considers the most relevant characteristics and the particularities encountered along the components of the Lakaji corridor. The FastPath analysis is undertaken from the point of view of shippers. In some cases, the totality of cargo volumes are relevant for our analysis, e.g., the analysis of berth time where the time for the whole operation requires handling both empty and full containers, or the analysis of gate operations where both empty and full containers require time to enter and exit the port. In other cases, we will only assess full containers, e.g., in the analysis of import containers storage charges or export operations charges where cargo owners are only responsible for expenses associated with full containers. Export operations or storage of empty containers are responsibility of shipping lines and therefore will not be assessed as part of our analysis.

Also, there are several charges that are applied based on the type of cargo, i.e. 20-ft container, 40-ft container, cost per truck, cost per ton, cost per vessel, cost per bill of lading. In order to determine the cost per TEU or per ton, it is necessary to undertake some calculations based on the total volumes handled during the analysis period of 2008.

PORT

Taking into consideration that there are two ports in the Lagos Port Complex, Apapa and Tincan Island, Table B-1 presents the distribution of container handled by each port which has been used to determine the weighted average cost per TEU in each port. The average cost per TEU will be used for the performance assessment with the FastPath model.

Table B-1
Container Traffic Statistics at Lagos Port Complex, 2008 (TEU)

Port	Import				Export				Total (TEU)
	Laden		Empty		Laden		Empty		
	20-ft	40-ft	20-ft	40-ft	20-ft	40-ft	20-ft	40-ft	
Apapa	122,233	75,133	4	3	4,305	7,804	118,540	214,867	840,735
Tincan Island	128,997	71,451	68	37	21,322	9,813	63,691	29,314	435,308
Total	251,270	146,584	72	40	25,627	17,617	182,231	244,181	1,276,043

Source: Corporate and Strategic Planning Division, Nigeria Ports Authority, with adjustments from APMT and Ports & Cargo Terminals

Port Charges

Port dues are paid to NPA and are calculated based on the gross registered tonnage (GRT) of the vessel and whether the vessel has made a call in the port or country on the current voyage or not. There are three scenarios:

- First call in Nigeria: 1.28*GRT + US$1,176
- Second call in Nigeria but first in Lagos: 0.938*GRT + US$1,176
- Second call in Nigeria shifting between berths (Apapa to Tincan Island and vice versa): 0.07*GRT + US$1,176

For the purpose of our analysis, it can be assumed that the majority of vessels call Lagos port as its first port in Nigerian territory. Also, the majority of the vessels call only Apapa or Tincan Island and not both. With the information of vessels GRT, the number of vessels per port and the volumes of container Table B-2 presents the information of the estimated port dues per TEU and per metric ton for containerized and noncontainerized cargo respectively.

Table B-2
Estimated Port Dues per GRT of the Ship (2008)

Port	Vessels	GRT ('000 tons)	Total Dues	Units	Unit Charges (US$)
Apapa container	380	8,884	11,818,198	840,735 TEU	14.06/TEU
Apapa noncontainerized	512	8,694	11,730,871	8,694,343 Tons	1.35/Ton
Tincan Island containers	460	9,414	11,709,351	435,308 TEU	26.90/TEU
Tincan Island noncontainerized	410	7,089	9,555,541	7,088,579 Tons	1.35/Ton

Source: Estimations by Markets, based on information provided by NPA

The practice at Lagos port is that vessels do not have to pay for waiting time at anchor. The majority of the vessels do not even wait at anchor and after registering their arrival they maintain a safe distance of about 20 nautical miles from the anchor due to security reasons and only approach the anchor when the berthing is confirmed, in order to arrive at the pilot station at the right time.

The use of pilots is compulsory at Lagos port and charges are included in the port dues. Pilotage charges per vessel are US$125. Similarly, tug assistance is included as part of the port dues,

although some vessels require mooring and unmooring services from a private company. In average, these services require two mooring boats per movement, mooring and unmooring, at about NGN 4,000 per boat. Following a similar procedure s the one followed to calculate the port dues, pilotage and towage services have been calculated for containers and noncontainerized cargo. Table B-3 presents these costs.

Table B-3
Pilotage and Towage cost estimation (2008)

Port	Pilotage (US$)	Towage(US$)
Apapa Containers	0.11/TEU	0.05/TEU
Apapa Non Containerized	0.01/Ton	0.01/Ton
Tincan Island Containers	0.26/TEU	0.12/TEU
Tincan Island Non Containers	0.01/Ton	0.01/Ton

Source: Estimations by Markets, based on information provided by NPA and Shipping Lines

In any event, port dues, pilotage and towage are expenses incurred by the shipping line and therefore are not paid directly by the shipper or cargo owner. These are expenses that are included as part of the payments that the shipper does to the shipping agent. Therefore, in our FastPath analysis, we will include these charges in the model but at the same time will deduct them from the average shipping line charges. Shipping line charges are paid by the client during the border clearance process and will be described later in that section.

Port Congestion Surcharge

The port congestion surcharge for Lagos during 2008 was NGN 15,000 for a 20-ft container NGN 25,000 for a 40-ft container. Towards the end of the year 2008, this charge was discontinued because the congestion levels were considerably reduced. If congestion is experienced again, this surcharge is likely to be charged again. This surcharge will directly affect the cost of goods transported by containers and therefore it is necessary to avoid the return of congestion to container terminals. Port surcharge per TEU according to the distribution volumes of Table B-1 are US$132.35 and US$130.68 for Apapa and Tincan Island ports respectively.

The above surcharges applied to containerized vessels but in certain circumstances noncontainerized vessels also apply demurrage charges due to the fact that the vessel cannot proceed to a berth upon arrival. For example, vessels bringing rice to Lagos are charging in average demurrage of US$24,000 per day when they have to wait for a berth to be assigned. Considering that these vessels are bringing in average 20,000 tons of rice, the demurrage charges are equivalent to US$1.2 per ton.

Waiting Time and Reliability

The average waiting time at anchorage varies considerably for both containerized and noncontainerized cargo and within noncontainerized cargo, among bulk and general cargo. Following the operational assessment undertaken in Chapter 2, vessel waiting time was calculated and presented in Figure 3-3. The average waiting time for container vessels during 2008 was 117 hours (4.9 days). The maximum waiting time experienced was 144 hours (6 days) and the

minimum was 24 hours. With these values and the formula to calculate the reliability as defined by FastPath, the reliability of waiting time for containerized vessels is 51 percent.

General cargo vessels experienced an average waiting time of 240 hours (10 days) with 960 and 168 hours (40 and 7 days) for maximum and minimum values, respectively. The reliability for berth waiting time is 165 percent.

Bulk cargo vessels experienced an average waiting time of 95 hours (3.96 days), the maximum waiting time was 275 hours (11.5 days) and the minimum was 1 hour. The associated reliability is 144 percent. Table B-4 presents the summary of vessel waiting times and associated reliability

Table B-4
Waiting Time at Lagos Port (2008)

Vessel	Average Time (Hours)	Min. Time (Hours)	Max. Time (Hours)	Reliability (%)
Containers	117	24	144	51
General Cargo	240	168	960	165
Bulk	95	1	275	144

Source: NPA, Terminal Operators and Calculations by Markets

OPERATIONS IN THE BERTH

Berth Time and Stevedoring

Berth time has been estimated based on information provided by NPA. The average berth operation time was also presented in Figure 3-3. It is assumed that half of the operational time is required for unloading operations and the other half for loading. Berth time reliability has been calculated using the maximum and minimum time for berth operations for each type of cargo. A summary is presented in Table B-5.

Table B-5
Total Berth Time-Import and Export at Lagos Port (2008)

Vessel	Average Time (Hours)	Min. Time (Hours)	Max. Time (Hours)	Reliability (%)
Containers Apapa	55	38	67	26
Containers Tincan Island	65	15	88	56
General Cargo	155	69	183	37
Bulk	94	72	115	23

Source: NPA, Terminal Operators and Calculations by Markets

Two major charges at the berth include berthing (berth rent), normally charged by the length overall of the vessel and the number of days moored at the berth, and stevedoring of containers or cargo unloading/loading from/to the vessel, which is normally charged by the size of the container (20-ft and 40-ft) or by the weight of the total volume of bulk or general cargo. Normally

these charges are paid by the shipping line, who recovers them as part of the freight rate charged to the shipper. With the information provided by NPA, we are able to estimate the total berth rent in both Apapa and Tincan Island ports. The average length overall of vessels calling Lagos is about 200 m and 170 m for containers vessels and noncontainerized vessels respectively. Table B-6 presents the estimations of berth rent.

Table B-6
Unit Charges for Berth Rent (2008)

Vessels	Quantity	Average Length Overall (m)	Average Call (Hours)	Total Dues	Units	Unit Charges (US$)
Containers Apapa	380	200	55	348,054	840,735 TEU	0.41/TEU
Containers Tincan Island	460	200	65	499,756	435,308 TEU	1.15/TEU
General cargo	694	170	155	1,526,848	12,612,647 tons	0.12/ton
Bulk	228	170	94	304,691	4,798,310 tons	0.06/ton

Source: Estimations by Markets, based on information provided by NPA and Shipping Lines

The other cost incurred at the berth includes stevedoring charges for unloading and loading cargo from/to the vessel. Table B-7 presents all the charges incurred at the berth for both directions.

Table B-7
Berth Terminal Handling Charges (2008)

	Import (US$)				Export (US$)			
Charges	20-ft	40-ft	General	Bulk	20-ft	40-ft	General	Bulk
Full berth	97.00	147.00	6.1/ton	4.0/ton	76.00	108.00	4.0/ton	2.5/ton
Empty berth	22.00	44.00	-	-	22.00	44.00	-	-

Source: NPA, Terminal Operators, NIMASA and Calculations by Markets

The weighted average charges at the berth for full imports using the volume distribution of Table B-1 are US$124.57 and US$123.28 per TEU in Apapa and Tincan Island respectively. The same charge but for full export containers is US$94.53 per TEU.

Operations in the Yard and Gate

Yard and gate operations will incorporate the activities of yard handling, storage, border clearance and gate processing. These activities will be subdivided between containerized and noncontainerized cargo considering that border clearance and storage are managed differently for each type of cargo.

Cargo Dues and Yard Handling Charges

All cargo using the port raises harbour dues chargeable by NPA and payable by shippers. In addition, there are several charges applied in Nigeria associated with the use of the port infrastructure an environmental protection levy, MOWKA levy, charges and the NIMASA

theoretical freight rate levy. NIMASA has “determined" a freight rate applicable to the tradelanes from which the cargo originates. The levy for imports corresponds to about 3 percent of the port of loading freight rate and 2 percent of the port of destination freight rate for exports. Table B-8 presents the NIMASA value levy associated with the port of loading and type of container.

Table B-8
NIMASA Levy Charges (2008)

Port Of Loading or Destination	Import (US$)		Export (US$)	
	20-ft	40-ft	20-ft	40-ft
North America and Canada	105	165	70	110
South America and Mexico	81	135	54	90
Europe and Middle East	75	120	50	80
Far East, India and Australia	108	180	72	120
African Ports	54	90	36	60

Source: NIMASA

According to NPA statistics, approximately 15 percent of imports are originated in USA and Canada, 11 percent from South America and Mexico, 27 percent from Europe and the Middle East, 34 percent from the Far East, India and Australia, and 13 percent from African countries. The NIMASA average weighted charges for imports account for US$89 and US$120 for 20-ft and 40-ft containers respectively. Similarly, export destinations are 3 percent to USA and Canada, 14 percent to South America and Mexico, 20 percent to Europe and the Middle East, 23 percent to the Far East, India and Australia, and 40 percent to other African countries. The NIMASA average weighted charges for exports accounts for US$51 and US$84 for 20-ft and 40-ft containers respectively.

Terminal operators also charge the shippers yard handling charges which account for the different operations performed by the terminal at the yard. Terminal handling charges are N31,500 (US$203.23) and N48,300 (US$311.61) for 20-ft and 40-ft containers respectively. Nevertheless, these charges include both berth and yard handling operations. The berth charges were already included in the berth operations (see Table C-6 with US$97 for 20-ft and US$147 for 40-ft) which indicates that yard handling charges are US$106.23 for 20-ft containers and US$164.61 for 40-ft containers.

Table B-9 presents cargo dues, other levies and yard handling charges for containers, bulk and general cargo.

Table B-9
Cargo Dues, Levies and Yard Handling Charges

Charge	Import (US$)				Export (US$)			
	20-ft	40-ft	General	Bulk	20-ft	40-ft	General	Bulk
Harbour Dues	80.00	160.00	2.50/Ton	1.89/Ton	47.00	93.00	1.7/Ton	1.66/Ton
Environmental Protection	3.63	7.68	0.10/Ton	0.10/Ton	3.63	7.68	0.10/Ton	0.10/Ton
NIMASA Levy	89.00	120.00			51.00	84.00		
MOWCA Levy	3.00	4.00	0.10/Ton	0.10/Ton	3.00	4.00	0.10/Ton	0.10/Ton
Terminal handling charges Full – Yard	106.23	164.61	-	-	106.23	164.61	-	-
Total Full	**281.86**	**456.29**	**2.7/Ton**	**2.09/Ton**	**210.86**	**353.29**	**1.9/Ton**	**1.86/Ton**

Source: NPA, Terminal Operators, NIMASA and Calculations by Markets

With cargo volumes distribution from Table B-1 and the charges from Table B-9, total import handling charges per TEU at Apapa are US$378.0 and US$373.5 at Tincan Island. For exports, the average cost per TEU is US$293.32. Yard handling charges for general cargo and bulk cargo will be accrued only for indirect handling cargo. These charges are paid together with storage charges which will be discussed in the next paragraph. Cargo dues per ton for general cargo and bulk cargo are US$2.7 and US$2.09 for imports and US$1.9 ad US$1.86 for exports.

Storage

The majority of general cargo, about 80 percent, is handled directly to trucks. Storage facilities for general cargo include some transit sheds and open storage facilities. Therefore, not much cargo is stored at the port. Steel is one of the few products that are actually stored at the port. There is a free storage period for general cargo up to three days after which cargo will generate storage charges during the next 10 days of about US$0.07 and US$0.13 per day per ton for open area and shed/warehouse storage. The following 10 days will generate storage charges of US$0.13 and US$0.26 per day per ton, and any day exceeding these 20 days of storage will generate US$0.16 and US$0.32 for open area and shed/warehouse respectively. Considering the volumes of general cargo handled indirectly (3.1 million tons) and the average storage period of about three weeks, the total estimated storage charges during 2008 were US$7.9 million or about US$2.56 per ton of general cargo handled indirectly through Lagos Port.

Bulk cargo is also handled directly to conveyor belts for direct distribution to client's facilities located in the proximity of the port, such in the case of wheat, cement and sugar, or indirectly to temporary warehouses and in some cases for additional processes for easier distribution, including product bagging, particularly fertilizers. There is a free storage period for bulk cargo up to three days after which cargo will generate storage charges. During the first 10 days, charges per ton per day are US$0.07 and US$0.26 for open area and shed/warehouse s. The following 10 days will generate storage charges of US$0.13 and US$0.39 per day per ton, and any day exceeding 20 days of storage will generate US$0.19 and US$0.52 for open area and shed/warehouse respectively. Estimated volume of bulk cargo handled indirectly and therefore

stored at the port accounted for approximately 10 percent of the total volume, particularly fertilizers. All this cargo was stored under sheds for an average period of time of three weeks. The associated storage charges for bulk cargo during 2008 included US$3.8 million or about US$5.72 per ton of bulk cargo handled through Lagos. All bulk and general cargo is pre-cleared and upon arrival Customs just verifies that goods correspond with those in the import declaration documentation. CISS border clearance charges are the same (1 percent of FOB value). Based on the volumes of general and bulk cargo and its FOB value, the estimated Customs charge is US$3.7 per ton.

All containerized cargo is discharged indirectly and temporary stored at the port. Several importers deliberately delay the start of the border clearance process in order to take advantage of the system to their own benefit. This situation is sometimes a reflection of the cheap storage rates at the port, but also could be that the importer does not have sufficient funds to make all the associated payments of the border clearance process. Delays in the removal of containers out of the port created congestion and forced the creation of ICD to partially remove containers into bonded area while border clearance was undertaken. In average, the dwell time experience in Lagos port during 2008, was 20 days in Apapa and 29 days in Tincan Island. The maximum dwell time for the same period in each port was about 30 days and 36 days respectively. These average and maximum times is a result of a combination of the individual dwell time experienced by each container. The associated average storage cost is the combination of the cost of each individual container in accordance with the storage time and the progressive storage charges.

As per discussion with terminal operators, all three container terminals have similar storage charges. Tables B-10 and B-11 present the analysis of storage charges for Apapa and for Tincan Island ports respectively. In both cases we are using the progressive storage charges from APMT which vary in accordance with to the combination of storage days and container size. The analysis also takes into consideration that some containers are transferred to ICDs and that the storage charge at the ICD is fix. Container transfer to the ICD is not included here and will be explained later. The average dwell time in days in column 2, indicates the average number of days that a group of containers of 20-ft and 40-ft (column 3) were stored at the port or at the ICD within a storage period. Table C-9 presents the weighted average unit price per period with the distribution of containers handled in Apapa port (122,233 20-ft and 75,133 40-ft) containers respectively. A similar analysis has been undertaken for Tincan Island and presented in Table C-10 using volumes of 128,997 20-ft containers and 71,451 40-ft containers.

Table B-10

Containerized Storage Analysis for Apapa Port(2008)

Storage Period	Average Dwell Time (days)	Containers (%)	20 FT (NGN)	40 FT (NGN)	Average Unit Price per Period (NGN/TEU)
0-3 days	0	-	Free	Free	-
4-12 days	12	15	750	1,500	10,472
13-20 days	20	30	1,500	3,000	29,088
21+ days	28	20	4,000	8,000	78,731
ICD	20	35	600	1,200	13,031

Source: NPA, Terminal Operators and Calculations by Markets

Table B-11
Containerized Storage Analysis for Tincan Island Port(2008)

Storage Period	Average Dwell Time (days)	Containers (%)	20 FT (NGN)	40 FT (NGN)	Average Unit Price per Period (NGN/TEU)
0-3 days	0	-	Free	Free	-
4-12 days	12	15	750	1,500	10,298
13-20 days	20	30	1,500	3,000	28,604
21+ days	35	20	4,000	8,000	120,138
ICD	20	35	600	1,200	12,815

Source: NPA, Terminal Operators and Calculations by Markets

With the above information, the average dwell time in Apapa port is 20 days with an average weighted price per TEU of NGN 30,604 (US$197.45). The average storage time in Tincan Island is 29 days with an average weighted price per TEU of NGN 78,662 (US$507.50). The analysis shows that with the progressive storage rates, the additional 7 days of containers exceeding the 21 days of storage are considerably higher, about NGN 6,865 per day. With this measure, terminal operators are expecting that importers will remove cargo out of the port faster.

Dwell time is defined as the total time that a container remains at the port. Therefore it is measured from the moment that the container is transferred to the storing yard until the moment it has been released and crosses the exit gate. For the purpose of our FastPath analysis, we will subdivide dwell time in three subcomponents: i) border clearance, ii) storage, and iii) gate processing.

In the export direction, the majority of containers are accepted into the port in average six days before the scheduled departure of the vessel in which the goods will be exported. The eport storage charges are the same than in the import direction with 3 days free of charge and a progressive escalation charges. The minimum time in which goods remain in the port are 48 hours and the maximum is about nine days.

Border Clearance Process

Currently, the border clearance documentation process for import containerized cargo could take up to 186 hours (7.75 days) from receipt of the documents from the importer up to the moment that Customs assigns a risk level for lane inspection. This is due to the fact that the process has a number of steps that requires coordination of many actors and in some cases associated payments that must be made before proceeding to the following step. Table B-12 presents a summary of the major steps, costs associated and the average time required to complete each step. It also includes the minimum and maximum time which allows us to calculate the reliability of the process. The payments to the bank are not included given that these are the letters of credit which varies from customer to customer in accordance with the value of the goods.

Table B-12
Customs Operation Process

Process	Cost (NGN)		Hours			Reliability (%)
	20-ft	40-ft	Average Time	Min. Time	Max. Time	
Shipper/consignee provides all shipping documents			8	2	24	137
Freight forwarder or clearing agent documentation review process	80,000	120,000	24	12	36	50
Bank request risk assessment report from scanning company. Once received payment associated report and Form M processing			72	48	120	50
Inspection company undertakes risk assessment report			2	1	24	575
Risk assessment report is submitted to clearing agent			24	12	48	75
Clearing agent completes online single good declaration			24	12	48	75
Customs reviews single good declaration into ASYCUDA ++			24	24	48	50
Client makes payment to shipping agent to release cargo for inspection	25,000	35,000	8	6	48	262
Front line risk validation for clearance lane			8	12	24	75
Payment of duty and proof-of-payment slip			5	1	24	230
Subtotal Customs Operation			**191**	**128**	**420**	

Source: NPA, Terminal Operators, NIMASA and Calculations from Markets

When the clearance lane has been assigned, the importer must pay the import duties directly to the FGN at a designated bank. Included in these duties is the Comprehensive Import Supervision Scheme (CISS) fee which corresponds to 1 percent of the FOB value. Based on the value of goods imported to Nigeria during 2008, the average CISS fee was estimated at US$280 per TEU. This value is underestimated given that other fees are applied as part of the duty of border clearance but given that apply only to certain goods or are calculated based on a percentage of the duty, it is difficult to calculate and we are not including it in the analysis.

Freight forwarder/clearing agent charges are N80,000 (US$516) and N120,000 (US$774) for 20-ft and 40-ft container. The weighted cost per TEU is therefore N102,000 (US$658). Shipping agent charges are N25,000 (US$161) and N35,000 (US$225) for 20-ft and 40-ft container. The weighted cost per TEU is therefore N30,500 (US$182). While this is a cost incurred and paid directly by the shipper, this is not a cost associated with the use of the infrastructure. Instead this are “facilitation” services or ancillary charges and therefore we will not include them into our infrastructure performance analysis.

Once the duty payment has been undertaken, the scanning and/or inspection process is undertaken. ASYCUDA assigns imports containers into four groups:

- Red — Physical examination required.

- Yellow — Only scan required
- Green—Only document check required.
- Blue—No examination at marine terminal or ICD because cargo is cleared at the consignee's premise.

Table B-13 presents the average, minimum and maximum time required for each channel. Based on the combination of containers using each channel and the volumes presented in Table B-1, the total time customs process requires an average of 294 hours (12 days), with a minimum require time, for 90 percent of the occurrences of 172 hours (7 days), and a maximum processing time of 583 hours or 24 days.

Table B-13
Destination Inspection and Scanning Process

Scanning Channel	Containers (%)	Average Time (Hours)	Min. Time (Hours)	Max. Time (Hours)	Reliability (%)
Green/blue channel	5	2	1	2	25.
Yellow channel	25	8	2	6	25
Red channel	70	137	60	197	50
Total weighted average Scanning/ Inspection		98	43	139	

Source: Interviews with FF, CA and Cotecna

The total time customs process requires an average of 294 hours (12 days), with a minimum require time, for 90 percent of the occurrences of 172 hours (7 days), and a maximum processing time of 583 hours or 24 days.

Border clearance process for export containers requires several activities as well but most of these are undertaken by the exporter before the goods actually proceed to the port. All exports are subject to inspection and multiple agencies must be present when containers are sealed, including NCS, the National Agency for Food and Drug Administration Control, Standard Organization of Nigeria (SON), Plant Quarantine Service Division of the Federal Ministry of Agriculture, among others. Previous to the inspection the exporter must complete the Export Proceeds Form, obtain the Nigerian Export Promotion Council registration certificate and pay 0.5 percent FOB value of the goods for verification of Nigerian standards. This fee goes to the private company Cobalt. In total, once all documentation is ready, customs process actually takes in average one day while the consolidation process could take in average 3 days.

Container Transfer to ICDs

Based on discussion with port terminal operators and with ICD operators it was estimated that Apapa port transfer about 35 percent of the containers to ICDs, while Tincan Island terminal transfer about 25 percent. Terminal operators are the ones who make the decision as to which containers are transfer and which remain within their port facilities. The cost of transferring the containers is about N45,000 (US$290) and N65,000 (US$419) for a 20-ft container and a 40-ft container. The weighted average cost per TEU is therefore N56,000 (US$ 361.47) in Apapa and N55,500 (US$358.14). The average dwell time at the ICD is pretty similar to that in the port and

therefore, we have assumed that containers transferred to ICD will have the same storage time than the containers remaining at the port. The storage charges were already calculated and were presented in Table B-10 and B-11 for Apapa and Tincan Island ICDs.

Gate Processing

Once Customs releases the containers the average gate processing takes in average 5 hours, with a minimum of 3 hours and a maximum of 10 hours. Import delivery charges are N5,015 for a 20-ft container and N6,228 for a 40-ft container. The import delivery weighted average cost per TEU using the volumes of Table B-1 is therefore N5,706 for Apapa (US$36.80) and N5,674 for Tincan Island (US$36.60). Export delivery order are N3,687 and N5,567 for 20-ft and 40-ft containers The average export delivery order per TEU is N4,775 (US$30.81)

For general cargo, gate processing charges per ton are N89 and N168 for direct and indirect import operations. Average gate processing is N105 (US$0.68) per ton. For export operations, the charges per ton are N73 for direct operations and N138 for indirect. Average charge is N86 (US$0.55) per ton.

For bulk cargo, gate processing charges per ton are N49 and N168 for direct and indirect operations. Average charge is N61 (US$0.39) per ton

Storage Time

Storage time is the difference between dwell time, border clearance process and gate delivery. Therefore, storage time for containerized cargo in Apapa port is in average 181 hours (8 dyas), with a minimum of 96 hours (4 days) and a maximum of 127 hours (5 days). Similarly, in Tincan Island port the average storage time is 393 hours (16 days), with a minimum of 96 hours (4 days) and a maximum of 295 hours (12 days)

ROAD LINKS AND NODES

Based on information collected during the visual observations of the corridor, for the purpose of *FastPath* we have divided the corridor into 6 road links or segments and as described in Section 2 of this report. The subdivision of the road links was determined based on the physical characteristics of the road, including the terrain condition, road surface as well as the level of congestion experienced along the link. These characteristics have an impact on the operational cost of the vehicles.

The characteristics of each link are presented in Table B-14. These characteristics are internally used by *FastPath* to determine the operational expenses associated with the trucks transiting through these links. The operational expenses are determined using the parameters of design of the HDM-4 road maintenance model.

Table B-14
Lagos-Kano-Jibiya Corridor FastPath Road Links Characteristics

Link	Length (km)	Terrain	Surface Conditions	Congestion	FastPath Factor
Lagos Metropolitan Area	25	Flat	Poor	Heavy	2.2
Lagos – Ibadan	115	Flat-Hilly	Fair	Heavy	2.3
Ibadan – Kaduna	630	Flat-Hilly	Very Poor	Heavy	2.5
Kaduna – Kano	210	Flat-Hilly	Fair	Light	1.2
Kano – Jibiya	205	Flat	Fair	Light	1.1
Kano – Daura	155	Flat	Fair	Light	1.1

The road links connect Lagos port terminal with three major destinations of cargo including Lagos Metropoplitan Area, Kano and Jibiya. Considering that about 35 percent of container volumes is transferred to ICD within the Lagos Metropolitan Area, this segment has been subdivided in two to account for the transfer of cargo to the ICDs and then to its final destination within Lagos or to the hinterland. The ICD have been incorporated into model as a node where all associated cost for container transfer and handling are added here. In addition to the ICD node, there are intermediate nodes incorporated into the model that allow the change of characteristics between adjacent segments. The nodes include the cities of Ibadan and Kaduna

There are no regulations for dry cargo transport costs in Nigeria. Therefore, transport rates vary depending on seasonality, origin and destination, relationship with service providers, among other factors. Base on an analysis of different transport providers the transport cost within Lagos are approximately N80,000 for a 20-ft container and N90,000 for a 40-ft. Transport costs to Kano are in the ranges of N345,000 and N460,000 for a 20-ft and a 40ft container respectively. The average cost per TEU for Lagos and Kano distribution are therefore N85,800 (US$550) and N410,000 (US$2,645) respectively.

Estimation of the transit times for each segment are presented in Table B-15.

Table B-15
Transit times along the Lakaji Corridor

Road Segment	Average Trip Time (Hours	Max. Wait Time (Hours)	Average Wait Time (Hours)	Max. Wait Time (Hours)
Lagos Metropolitan Area	4.0	4.0	2.0	2.0
Lagos Port – Ibadan	8.0	18.0	2.0	1.0
Ibadan – Kaduna	79.3	68.0	50.0	40.0
Kaduna – Kano	8.7	10.0	4.0	1.0
Kano – Jibiya	8.6	10.0	4.0	2.0

Source: Interviews with freight forwarders and trucking companies

Demurrage

Shipping lines are the owners of container containers which normally are assigned to a certain ship serving specific routes and rotations. Therefore, shipping lines have a limited number of containers serving specific markets and require their clients to return the containers within a reasonable time for further use. For Nigeria, shipping lines provide 7 days free of charge upon arrival of the container to the Port. If these days are exceeded, demurrage charges are accrued and this are added to the shipping line agent bill. Normally, shipping lines charge in advance a deposit for the use of the container which is reimbursed upon return of the container to the line. In Nigeria the container deposit charge is N75,000 and N150,000 for 20-ft and 40-ft container respectively. Demurrage cost per day are N4,000 for a 20-ft and N6,000 for and 40-ft. The weighted average cost using the volumes distribution of Table B-1 is N5,100 (US$32) per TEU per day. Taking into consideration that only at the port the dwell time is between 20 to 30 days, cargo owners are already incurring in demurrage costs before the cargo is cleared. Based in our analysis of cargo flows, we estimate a total of 15 days demurrage costs for containers to be delivered within Lagos Metropolitan Area and about 25 days for containers destined to Kano or other hinterland destination. The estimations assume that cargo owner is responsible for the container until the moment that it is returned to the shipping line agent in Lagos. Container demurrage charges are not associated with the use of the infrastructure and therefore will not be incorporated as part of the FastPath infrastructure performance analysis. Nevertheless, if we take into consideration the reduction of dwell time at the port, there will be direct savings to the shipper associated to demurrage charges. In our analysis of potential saving to shippers in improved scenarios that consider savings in time, the impact of demurrage charges are not included given that these may vary depending of the commercial relationship between shippers and shipping lines. Therefore these savings are not incorporated as part of the value of potential savings. Nevertheless, this is an area where shippers could benefit from improvements associated with time reductions.

Appendix C. Cost-Benefit Analysis Data

Table C1A. Cost Benefit Analysis for Truck Staging Areas

Base Scenario Name:	Lagos Port Complex - Total Cargo	**Year:**	2008
Improved Scenario Name:	Truck Staging Areas	**Year:**	2013

Assumptions:	
Investment Year:	2011
Opening year:	2013
Savings per ton (bulk & gral cargo)	$0.38
Savings per Container	$11.25
Growth Rate of Savings (%/yr)	
2010-2020	10%
2020-2030	5%
Year of Maximum Savings:	2018
Discount Rate (%)	10%
Trucks per Year	1,611,303
Total Shipper Savings	$20,280,484

Data Input by user on this sheet
Data Imported from database
Data calculated by spreadsheet

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2011	$64,870,000		-$64,870,000
2013		$20,280,484	$15,035,484
2014		$22,308,532	$17,063,532
2015		$24,539,385	$19,294,385
2016		$26,993,324	$21,748,324
2017		$29,692,656	$24,447,656
2018		$32,661,922	$27,416,922
2019		$32,661,922	$27,416,922
2020		$32,661,922	$27,416,922
2021		$32,661,922	$27,416,922
2022	$11,595,000	$32,661,922	$21,066,922
2023		$32,661,922	$27,416,922
2024		$32,661,922	$27,416,922
2025		$32,661,922	$27,416,922
2026		$32,661,922	$27,416,922
2027		$32,661,922	$27,416,922
2028		$32,661,922	$27,416,922
2029		$32,661,922	$27,416,922
2030		$32,661,922	$27,416,922
2031		$32,661,922	$27,416,922
2032		$32,661,922	$27,416,922
Net Present Value:		$246,438,989	$122,242,861

Table C2A. Comparative Performance for Intermodal Transport Systems

Base Scenario Name:	Lagos-Kano Road Transport			**Year:**	2008
Improved Scenario Name:	Train to Kano			**Year:**	2013
Performance Indicator	Base	Improved	Difference		
1. Unit Transport Price to Shipper	$53	$39	$14		
2. Av. Transit Time for Trip	97.7	61.7	36	hours	
3. Reliability (% of mean time)	129	129	0	%	
4. Total Tons Per Year	715,000	715,000	0		
5. Total Logistics Cost	$38,136,690	$27,939,447	$10,197,243		
6. Investment Costs for Improvements (US$)	N/A	$84,000,000	N/A		
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$86,814,876		
8. Net Present Value (US$) (discounted savings - costs)			$2,558,978		

Data input by user

Data imported from database

Numbers calculated in spreadsheet

Get Data

Table C2B. Cost Benefit Analysis for Intermodal Transport Systems

Base Scenario Name:	Lagos-Kano Road Transport	**Year:**	2008
Improved Scenario Name:	Train to Kano	**Year:**	2013

Assumptions:	
Investment Year:	2010
Opening year:	2013
Base Case Total Shipper Price	$40,281,690
Improved Total Shipper Price	$30,084,447
Total Shipper Savings	$10,197,243
Growth Rate of Savings (%/yr)	
2010-2020	10%
2020-2030	5%
Year of Maximum Savings:	2011
Discount Rate (%)	10%

Data Input by user on this sheet
Data Imported from database
Data calculated by spreadsheet

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2010	$84,000,000		-$84,000,000
2013		$10,197,243	$10,197,243
2014		$10,197,243	$10,197,243
2015		$10,197,243	$10,197,243
2016		$10,197,243	$10,197,243
2017		$10,197,243	$10,197,243
2018		$10,197,243	$10,197,243
2019		$10,197,243	$10,197,243
2020		$10,197,243	$10,197,243
2021		$10,197,243	$10,197,243
2022		$10,197,243	$10,197,243
2023		$10,197,243	$10,197,243
2024		$10,197,243	$10,197,243
2025		$10,197,243	$10,197,243
2026		$10,197,243	$10,197,243
2027		$10,197,243	$10,197,243
2028		$10,197,243	$10,197,243
2029		$10,197,243	$10,197,243
2030		$10,197,243	$10,197,243
2031		$10,197,243	$10,197,243
2032		$10,197,243	$10,197,243
Net Present Value:		$86,814,876	$2,558,978

Table C3A. Comparative Performance for Reducing Dwell Time

Base Scenario Name:	Import Containers		**Year:**	2008
Improved Scenario Name:	Reduced Dwell Time Apapa & Tin Can Island		**Year:**	2011

Performance Indicator	Base	Improved	Difference	
1.Unit Transport Price to Shipper (Apapa)	$197	$63	$135	
Unit Transport Price to Shipper (Tin Can)	$508	$113	$394	
2. Av. Dwell Time (Apapa)	480	240	240	hours
Av. Dwell Time (Tin Can)	696	456	240	
3. Total Containers Per Year	272,548	272,548	0	
Total Containers Per Year	272,041	272,041	0	
5. Total Logistics Cost (Apapa)	$53,814,603	$17,042,426	$36,772,176	
Total Logistics Cost (Tin Can)	$138,060,808	$30,865,772	$107,195,036	
Total Logistics Cost (Laos Port Complex)	$191,875,410	$47,908,198	$143,967,212	
6. Investment Costs for Improvements (US$)	N/A	$25,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$1,649,874,654	
8. Net Present Value (US$) (discounted savings - costs)			$1,477,158,776	

Data input by user
Data imported from database
Numbers calculated in spreadsheet

Get Data

Table C3B. Cost Benefit Analysis for Reducing Dwell Time

Base Scenario Name:	Import Containers	**Year:**	2008
Improved Scenario Name:	Reduced Dwell Time Apapa & Tin Can Isla	**Year:**	2011

Assumptions:

Investment Year:	2010
Opening year:	2011
Base Case Total Shipper Price	$191,875,410
Improved Total Shipper Price	$47,908,198
Total Shipper Savings	$143,967,212
Growth Rate of Savings (%/yr)	
2010-2020	10%
2020-2030	5%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2010	$25,000,000		-$25,000,000
2011		$143,967,212	$143,967,212
2012		$158,363,933	$158,363,933
2013		$174,200,326	$174,200,326
2014		$191,620,359	$191,620,359
2015		$210,782,395	$210,782,395
2016		$210,782,395	$210,782,395
2017		$210,782,395	$210,782,395
2018		$210,782,395	$210,782,395
2019		$210,782,395	$210,782,395
2020		$210,782,395	$210,782,395
2021		$210,782,395	$210,782,395
2022		$210,782,395	$210,782,395
2023		$210,782,395	$210,782,395
2024		$210,782,395	$210,782,395
2025		$210,782,395	$210,782,395
2026		$210,782,395	$210,782,395
2027		$210,782,395	$210,782,395
2028		$210,782,395	$210,782,395
2029		$210,782,395	$210,782,395
2030		$210,782,395	$210,782,395
Net Present Value:		$1,649,874,654	$1,477,158,776

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Data Imported from database
Data calculated by spreadsheet

Table C4A. Comparative Performance for Improving General Cargo Handling for Rice

Base Scenario Name:	Apapa Import General Cargo - ENL				**Year:**	2008
Improved Scenario Name:	Improvements to General Cargo Handling - Rice				**Year:**	2012
Performance Indicator		Base	Improved	Difference		
1. Unit Transport Price to Shipper		$53	$49	$3.8		
2. Av. Transit Time for Trip		489	267.5	221.5	hours	
3. Reliability (% of mean time)		129	129	0	%	
4. Total Tons Per Year		2,000,000	2,000,000	0		
5. Total Logistics Cost		$106,000,000	$98,400,000	$7,600,000		
6. Investment Costs for Improvements (US$)		N/A	$18,000,000	N/A		
7. Discounted Cost Savings for Shippers (US$)		N/A	N/A	$72,822,107		
8. Net Present Value (US$) (discounted savings - costs)				$49,838,279		
	Data input by user					
	Data imported from database			Get Data		
	Numbers calculated in spreadsheet					

Table C4B. Cost Benefit Analysis for Improving General Cargo Handling for Rice

Base Scenario Name:	Apapa Import General Cargo - ENL				**Year:**	2008
Improved Scenario Name:	Improvements to General Cargo Handling - Rice				**Year:**	2012

Assumptions:	
Investment Year:	2011
Opening year:	2012
Base Case Total Shipper Price	$106,000,000
Improved Total Shipper Price	$98,400,000
Total Shipper Savings	$7,600,000
Growth Rate of Savings (%/yr)	
2010-2020	5%
2020-2030	
Year of Maximum Savings:	2015
Discount Rate (%)	10%

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Data Imported from database
Data calculated by spreadsheet

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2011	$18,000,000		-$18,000,000
2012		$7,600,000	$7,600,000
2013		$7,980,000	$7,980,000
2014		$8,379,000	$8,379,000
2015		$8,797,950	$8,797,950
2016		$8,797,950	$8,797,950
2017		$8,797,950	$8,797,950
2018		$8,797,950	$8,797,950
2019		$8,797,950	$8,797,950
2020		$8,797,950	$8,797,950
2021		$8,797,950	$8,797,950
2022		$8,797,950	$8,797,950
2023		$8,797,950	$8,797,950
2024		$8,797,950	$8,797,950
2025		$8,797,950	$8,797,950
2026		$8,797,950	$8,797,950
2027		$8,797,950	$8,797,950
2028		$8,797,950	$8,797,950
2029		$8,797,950	$8,797,950
2030		$8,797,950	$8,797,950
2031		$8,797,950	$8,797,950
Net Present Value:		$72,822,107	$49,838,279