West Africa Transport Logistics Analysis Using FastPath

Tema–Ouagadougou Corridor
Final Report

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SUBMITTED TO

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Acronyms and Codes

ASYCUDA	Automated Systems for Customs Data
BADEA	Arab Bank for Economic Development in Africa
BFCC	Burkina Faso Chamber of Commerce
CAF	Cost, Insurance, Freight
CBC	Burkina Shippers' Council
CCIA-BF	Chambre de Commerce, d'Industrie et d'Artisanat de Burkina Faso
CGTR	Confédération Générale des Transporteurs Routiers
CEPS	Customs Excise and Preventing System
ECOWAS	Economic Community of West African Countries
EDI	Electronic Data Interchange
GCNet	Ghana Community Network Services
GCMS	Ghana Customs Management System
GHATAG	Ghana Haulage and Transport Owners Association
GIFF	Ghana Institute of Freight Forwarders
GPHA	Ghana Ports and Harbours Authority
GPRS	General Packet Radio Service
GPRTU	Ghana Public Road Transport Union
GSC	Ghana Shippers' Council
GT	Gross tonnage
ICT	Intermodal Container Terminal
IRR	Internal Rate of Return
ISRT	interstate road transit
IST	interstate road transport
JAPTU	Joint Association of Port Transport Unions
km/h	kilometers per hour
MPS	Meridian Port Services
MOU	memorandum of understanding
ONTTB	Organisation Nationale de Transporteurs Terrestres de Burkino
OTRAF	Organisation des Transporteurs Routiers du Faso
OUAGARINTER	Gare Routière Internationale de Marchandises de Ougadougou
RRTC	Reduced Road Transport Costs
SAD	Single Administrative Document
SOFITEX	Societé Burkinabe des Fibres Textiles
SNTRV	Societé Nationale des Transporteurs Routiers de Voyageurs
SOAAG	Ship Owners and Agents Association of Ghana
TCBoost	Worldwide Support for Trade Capacity Building

UEMOA	Union Economique et Monétaire Ouest-Africaine
UNTR	Union Nationale des Transporteurs Routiers
USAID	United States Agency for International Development
WA	West Africa

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Abstract

At the request of USAID/West Africa, the Worldwide Support for Trade Capacity Building project (TCBoost) collaborated with the West Africa Trade Hub (WA Trade Hub) to develop a comprehensive analysis of the transport corridor between Tema, Ghana, and Ouagadougou, Burkina Faso. The TCBoost team used FastPath, a transport corridor diagnostic tool developed jointly by Nathan Associates Inc. and USAID, to assess the variables of cost, time, and reliability of the port, road network, and border posts along the corridor. Comparing performance to international standards, logistics scores were generated for individual corridor links and nodes as well as for the corridor overall.

Three scenarios were analyzed to ensure that the direction of trade (inbound or outbound) and the type of cargo (containerized or noncontainerized) were both factored into the analysis. Corridor performance was also compared with the performance of comparable developing-country corridors previously analyzed with FastPath. The TCBoost analysis recommends several courses of action to improve corridor performance—these range from relatively low-cost policy actions to major investments to upgrade port infrastructure. In some cases, further collaboration between TCBoost, the WA Trade Hub, USAID/West Africa, and the governments of Ghana and Burkina Faso may be required.

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Executive Summary

The USAID-funded West Africa Trade Hub (WA Trade Hub) Reduced Road Transport Costs (RRTC) initiative is researching and evaluating the logistics environment on a number of West African corridors, beginning with the corridor between Tema (Ghana) and Ouagadougou (Burkina Faso). To analyze the Tema-Ouagadougou corridor, the Trade Hub used a methodology that tabulates costs systematically along chosen value chains, breaking them down into formal and informal, and public-sector and private sector. This helps to highlight the weak links in the chain relative to global norms and facilitates recommending ways to improve efficiency. The results of the RRTC analysis were summarized in the draft report "Transportation Costs and Delays: An Analysis of the Ouagadougou-Tema Corridor."

At the request of USAID/West Africa, the Worldwide Support for Trade Capacity Building (TCBoost) project collaborated with the WA Trade Hub on pioneering an approach to transport corridor analysis that leverages the best elements of the RRTC methodology with those of FastPath, a transport logistics diagnostic tool that Nathan Associates developed with USAID funding. USAID/West Africa also expressed a particular interest in using FastPath to learn more about how the infrastructure, processes and procedures at Tema port increase shipping costs and to provide recommendations for reducing these costs.

The FastPath model assesses the variables of cost, time, and reliability of key infrastructure components along a corridor in a consistent and replicable fashion. Each variable represents an indicator of performance by itself, but the three variables are also used to generate a summary performance measure, or logistics score. In the case of the Tema-Ouagadougou corridor, the TCBoost team assessed Tema port, the road network between Tema and Ouagadougou, and the border crossings at Paga (Ghana) and Dakola (Burkina Faso).

DESCRIPTION OF THE TEMA-OUAGADOUGOU CORRIDOR

At the request of USAID/West Africa, the FastPath analysis emphasized the operational performance of the waterside components of Tema port, including berth and channel operations. The description of Tema port focused on berth throughput, berth occupancy, and ship waiting time. Both throughput and occupancy have increased over the years; the occupancy rates for certain berths reached approximately 80 percent. International experience suggests that occupancy rates this high usually result in substantial ship waiting time. Considered together, these figures for throughput, occupancy, and ship waiting time suggest that port productivity is relatively low. The report also provides a brief analysis of GPHA's concession agreement with Meridian Port Services (MPS) and its potential impact on port service competition. Because this

FastPath analysis focuses on infrastructure rather than institutional issues, we have placed this assessment in an appendix.

The road from Tema to Ouagadougou is about 1,000 km and is generally in fair condition, with some segments in poor to very poor condition. One hundred percent of the transit cargo that is transported by surface in the Tema-Ouagadougou corridor uses the road for transportation along the route. The WA Trade Hub has documented the high incidence of informal payments that shippers must make to travel the road network and has recommended a number of ways that road governance can be improved and trade facilitated.

The border post infrastructure in both Paga and Dakola is simple, with a yard on each side of the border for temporary parking of trucks while paperwork is executed. Depending on the volume of trucks, the parking facilities fill rapidly, and trucks must park temporarily on the road. The crossing facilities include a single-line gate in both Paga and Dakola that remains closed until the paperwork is finalized and trucks are allowed to cross.

Tema port handled approximately 865,000 tons of transit cargo in 2008; on average, 48 percent was Burkinabe (413,000 tons). The majority of the Burkinabe transit traffic volume, 64 percent, was handled at Tema port in containers. Transit cargo, however, can be sent to its final destination in one of two ways: either in its container directly, or stripped for onward shipment by truck. The additional handling for stripping increases the cost and the risk of breakage and loss and potentially compromises the bonded status of transit cargo. The WA Trade Hub and corridor stakeholders suggested that about 70 percent of the inbound containers are stripped at the port before undertaking the transit process. In the outbound direction (Burkina Faso to Ghana), only 30 percent is transported in containers. The remaining 70 percent is transported as noncontainerized cargo and consolidated at the shipping line yard before it is transferred to Tema port. Eighty percent of inbound transit cargo is medium-to-high value; ninety percent of outbound transit cargo is medium value.

ANALYSIS

Given these characteristics of transit cargo, three scenarios were created to analyze corridor performance: (1) inbound containerized; (2) outbound containerized and (3) inbound noncontainerized. The scenarios were created using data provided by the WA Trade Hub, as well as by GPHA and other stakeholders during the TCBoost field visit to Ghana and Burkina Faso. For each scenario, logistics scores were generated for each infrastructure component (port, roads, border post), as well as for the corridor overall. Logistics scores are computed by comparing the performance of a component of the transport/logistics chain to international standards and rating it as good, fair, poor, or very poor. This rating is then converted 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 get the total score for a component.

These scores are then given a time-weighted average to compute the subchain total, with reliability treated as variance with a special calculation of the subchain total. A logistics score between 70 and 80 indicates that time, cost, and reliability in the total 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.

Scenario 1(inbound containerized). Overall corridor performance for Scenario 1 received a logistics score of 53, which is characterized as fair-poor.

Table E-1
Logistics Scores for Inbound Containerized Cargo, Scenario 1

	TEU/Year	Average Price	Average Time	Reliability	Logistic Score	Rating
Total Chain	15,807	$3,630	599 hours	81%	53	Fair-Poor
LOGISTICS SUBCHAINS						
Direct Containers	4,743	$3,554	593 hours	82%	54	Fair-Poor
Stripped Containers	11,064	$3,662	601 hours	81%	53	Fair-Poor
Node	**Logistic Score**	**Rating**	**Link**		**Logistic Score**	**Rating**
Tema Port	55	Fair-Poor	Tema port - Transit Yard Road		43	Poor
Transit Yard	53	Fair-Poor	Transit Yard - Apedwa Road		50	Fair-Poor
Apedwa Direct	–	–	Apedwa – Kumasi Road		60	Fair
Apedwa Stripped	40	Poor				
Kumasi	–	–	Kumasi – Paga Road		67	Fair-Good
Paga	73	Good-Fair	Paga – Dakola Road		50	Fair-Poor
Dakola	67	Fair-Good	Dakola – Ouagarinter Road		60	Fair
Ouagarinter	22	Very Poor				

Port performance. In Scenario 1, Tema port received a score of 55 (fair-poor). This reflects issues regarding berth throughput, occupancy, and dwell times leading to lower port productivity. The total time in the yard of 352 hours exceeds by far the normal value for container storage at a port. If 56 hours of Customs clearance time is added to the storage time, the average dwell time for inbound transit containers is 408 hours (17 days). Similarly, waiting time at the channel (41 hours) and total berthing time (20.5 hours) are relatively high, which reflects the port's congested environment. The fair-poor score may also reflect Tema port's policy of allowing transit containers to remain in the yard for 21 days free of charge. Compared with corridors in Asia and Africa (including Chittagong, Bangladesh—a relatively poor performer), Tema port lags considerably behind in average channel wait time and in average unloading time.

Road performance. Surface transport for inbound traffic has an intermediate rating, with road travel times rated as fair in some sections and fair-good or fair-poor in others. Reliability for road transit time is rated fair in the majority of the segments. Nevertheless, price in the majority of the road segments is rated very poor (e.g., high unit costs per TEU-km). Overall, the roads for this scenario can be considered poor to fair. This is due to several factors, including the lack of backhaul cargo for the return trip, which leaves most trucks to return empty, the older trucks used for this transport, and the poor condition of some road links (e.g., the link between Tema and Apedwa, whose surface conditions are poor and whose congestion is heavy). The average cost per container-km in the Tema-Ouagadougou corridor in this scenario is for the most part higher than comparable corridors in Asia and Africa. The average speed of 40 km/h is relatively low, and average delay times are substantially higher than for other corridors, although this is partially explained by the length of the corridor.

Border post performance. The border post at Paga received a score of 73 (good), while the border post at Dakola received a score of 67 (fair-good). Transit goods entering Burkina Faso, however, are cleared at Ouagarinter, a Customs facility in Ouagadougou. The logistics score for Ouagarinter is 22 (very poor), and an adjusted logistics score for Customs clearance at Dakola-Ouagarinter would be 22 (very poor). The average cost per container to cross the Paga-Dakola border for inbound traffic is significantly higher than for selected comparison corridors. This is again because Customs operations at Burkina Faso are performed partially at the border post and partially at Ouagarinter.

Scenario 2 (outbound containerized). Overall corridor performance received a logistics score of 63, which is characterized as fair.

Table E-2

Logistics Scores for Outbound Containerized Cargo, Scenario 2

	TEU/Year	Average Price	Average Time	Reliability	Logistic Score	Rating
Total Chain	862	$1,729	67 hours	33%	65	Fair-Good
LOGISTICS SUBCHAINS						
Direct Containers	259	$1,689	63 hours	35%	66	Fair-Good
Consolidated Containers	603	$1,745	69 hours	32%	64	Fair-Good
Node	**Logistic Score**	**Rating**	**Link**		**Logistic Score**	**Rating**
Ouagarinter	53	Fair-Poor	Ouagarinter – Dakola Road		73	Good-Fair
Dakola	80	Good	Dakola – Paga Road		63	Fair
Paga	53	Fair-Poor	Paga – Kumasi Road		80	Good
Kumasi	–	–	Kumasi – Apedwa Road		73	Good-Fair
Apedwa Direct	–	–	Apedwa – Tema Port Road		63	Fair
Apedwa Consolidated	40	Poor				
Tema Port	72	Good-Fair				

Port performance. In Scenario 2, Tema port received a score of 72 (good-fair). The port received a better logistics score than the inbound direction because Customs processing time exiting Ghana is short, and transit cargo from Burkina Faso does not have to wait at the channel. Tema port lags considerably behind in average loading time at berth compared with other Asian and African ports; however, total handling costs are about average for exports. If consolidation costs are considered, these costs are higher than average. Unofficial costs are high compared to others; while dwell time is relatively low.

Road performance. Road transport time and delays are similar than in the inbound direction but prices are considerably lower given that the possibility of backhaul is likely to happen. Road transport logistics score for the outbound direction is rated fair-good compared with international standards.

Border post performance. The border post at Paga received a score of 53 (poor to fair), while the border post at Dakola received a score of 80 (good). In Paga, the outbound direction has a lower score than in the inbound direction rates as fair-poor performance. This difference may be attributed to the government of Ghana's policy that trucks entering Ghana from Burkina Faso with transit cargo must be escorted by Customs until the cargo reaches Tema, its final destination. The formation of these convoys increases the time required to clear Customs in the outbound direction. Also, the associated Customs payments must be made at the border at Paga in the outbound direction.

Scenario 3 (inbound noncontainerized). Handling of noncontainerized cargo at the port varies according to the type of cargo and equipment used. Therefore establishing a standard measure for performance and comparing it among different subchains is difficult. Logistics scores are not generated for noncontainerized cargo, but the results for time, cost, and reliability for each subcomponent and the overall subchain can be presented. This is summarized in Table E-3.

Table E-3

Performance of Main Subcomponents of Inbound Noncontainerized Transit Traffic, 2009 (Scenario 3)

Component	Official Costs (US$/Ton)	Unofficial Costs (US$/Ton)	Time (hours)	Reliability* (%)
Av. channel operations	0.42	–	47.6	78.9
Av. unloading at berth	1.08	–	78.7	52.8
Total yard handling	9.12	1.50	352.0	4.1
Customs w/o guarantee fund (0.5% of dutiable cargo value) for inbound	3.39		56.0	8.5
Transit Yard	–	–	6.5	15.4
Road Transport	71.91	1.09	26.5	Varies per Segment
Border Crossing at Paga	–	0.79	1.0	50.0
Border crossing at Dakola w/o guarantee fund (0.25% cargo value) for inbound	2.27	0.56	2.0	72.9
Ouagarinter	15.09	4.52	87.7	234.0

Performance based on 2008 data
** The percent of average transit time that would include 90% of shipments.*

The performance of inbound noncontainerized transit cargo can also be compared to the performance of other corridors in Africa; in this case we compared it to the Maputo Corridor in Southern Africa.

Port performance. Tema port rates much worse in waiting time for a berth and in average unloading time than Maputo port. Total handling costs and average Customs costs for imports, however, are lower in Tema. The average Customs time of 56 hours is somewhat higher than for Maputo. The average dwell time for Tema is high, at 17 days for imports but reliability (variation in transit time) is about average. Of course, average variation for a large dwell time is still unreliable. Unofficial costs in Tema are significant, but not much higher than for Maputo.

Road performance. The average cost per ton-km for noncontainerized freight is lower in the Tema-Ouagadougou corridor than along the Maputo-Mozambique border road, which is much shorter (60 km—the shorter distance raises the price). The same factors affect the price for road transport for noncontainerized freight as for containerized freight. Many of these factors represent opportunities for improvement. The average speed along the Tema–Ouagadougou corridor of 40 km/h is only two-thirds the speed in the Maputo corridor, which is poor performance. Average delay times are substantially higher than for the Maputo Corridor, although this is partially explained by the length of the corridor. Unofficial costs are considerably lower in the Tema-Ouagadougou corridor. The reliability measure is about the same as for the Maputo corridor.

Border post performance. The average cost, transit time, and reliability per ton to cross the Ghana-Burkina Faso border are significantly higher than for the Maputo Corridor because of the clearance operations at Ouagarinter.

INTERPRETATION

Table E-4 summarizes how the performance of the Tema-Ouagadougou transport corridor compares to other transport corridors in the developing world.

Table E-4

Comparison of Corridor Performance - Logistics Scores for Containerized Freight

Logistics Component	Tema-Ouagadougou	Laem Chabang-Vientiane	Dacca-Chittagong (a)	Durban-Nelspruit (a),(b)	Maputo-Nelspruit
INBOUND					
Overall logistics chain	51	64	59	63	62
Port	55	55	49	60	51
Road transport	55	70	58	65	51
Border post 1	73 (Ghana)	67 (Thailand)	n/a	n/a	73 (Mozambique)
Border post 2	20 (Burkina Faso[1])	63 (Laos)	n/a	n/a	73 (South Africa)
OUTBOUND					
Overall logistics chain	62	66	54	68	60
Port	72	65	52	70	57
Road transport	70	70	58	65	51
Border post 1	53 (Ghana)	67 (Thailand)	n/a	n/a	67 (Mozambique)
Border post 2	53 (Burkina Faso)	63 (Laos)	n/a	n/a	63 (South Africa)

(a) Overall logistics score does not include border post node scores

(b) Estimated from partial data in Maputo Corridor analysis

[1] In order to compare the customs operations with other corridors where clearance is undertaken at the border, the border post in Burkina Faso was combined for the operations at Dakola and Ouagarinter.

The Tema-Ouagadougou corridor's overall logistics score is lower than the other corridors in the inbound direction, but performs better in the outbound direction.

On the basis of our analysis of the time, cost, and reliability of the Tema-Ouagadougou corridor performance, the TCBoost team identified several potential interventions that can improve performance and raise logistics scores for the corridor. These interventions are presented in Table E-5. To help corridor stakeholders prioritize corridor interventions, the team used FastPath's cost-benefit analysis tool. The full details of assumptions can be found in Appendix D.

Table E-5

Summary of Improvement Evaluations

Improvement Action	Estimated Investment	Present Value of Benefits	Infrastructure User's Estimated Savings / TEU		Cargo Owners Estimated Savings /TEU		Evaluation of Investment
			In	Out	In	Out	
Increase in berth productivity	Evaluated together $70–80 million	$17.4 million	$140	$140	$166	$140	Highly feasible if total containers handled at Tema port are included
Reduction in waiting time for ships		$1.1 billion	$41	$41	$20	$20	
Reduction in dwell times for freight	$2–3 million	Uncertain	Uncertain	N/A	Uncertain	N/A	Feasible for policy actions only*
Reduction of container stripping	Low cost policy actions	Depends on value of freight	Depends on value of freight	N/A	Depends on value of freight	N/A	Uncertain
Reduction of road transport costs	$6 million	$31.8 million	$80	$43	$40	$21	Highly feasible
Elimination of unofficial costs	$3–4 million	$46.4 million	$206	$68	$206	$68	Highly feasible

* *Could be feasible if benefits to Ghanaian shippers are considered.*

Consolidate the container terminal to reduce waiting times and increase berth productivity. Waiting time is especially harmful to liner shipping because it disrupts the schedule at other ports and generates considerable idling expenses. Typical waiting times in other ports around the world are two to four hours, and port surcharges are applied to ports experiencing congestion. Reducing ship waiting times will require the creation of more berth space for the MPS container operations. The creation of more berth space can be done by combining Berths 3, 4, and 5 (the north side of the finger pier) with the MPS operations at Berths 1 and 2 (the south side of the finger pier). This would provide 1.5 additional berth areas, eliminating the berth waiting time that carriers calling Tema have experienced and providing additional container storage in light of expected growth in both domestic and transshipment container trade.

- Estimated cost: $70–80 million
- Estimated benefit over 20-year period (present value): $1.1 billion

Expedite Customs clearance and implement policies to reduce dwell times for containers. The average dwell time for transit cargo at Tema port is about 17 days—too long when compared to dwell times in other ports in Asia and Africa (6 to 10 days). The total time that cargo is stored at the port is high if compared with the time that is actually required to clear Customs and other agencies involved in the transit cargo clearing process. Although this may be due to slow Customs clearance, the long dwell time may also be attributed to the port's policy of granting a 21-day grace period for transit cargo, free of charge. According to the Trade Hub's report, the government of Ghana has invested in a customized electronic system for processing trade and Customs documents. Amending port policies to encourage moving containers out of the yard (i.e., reducing the number of days that transit containers can remain in the yard at no cost) may result in savings of inventory costs, but there may be no savings to cargo owners associated with the reduction of port dwell time if the dwell time is used as a temporary storage to the benefit of the cargo owner. The total benefits from reduced dwell time cannot be calculated without further analysis of the costs and benefits to shippers, the port itself, and the governments of Ghana and Burkina Faso. Further study is needed.

- Estimated cost: $2–3 million
- Estimated benefit over 20-year period (present value): TBD

Reduce container stripping by promoting the use of containers. The total amount of containerized cargo that is stripped at the port is relatively high. The stripping of containers is encouraged by the large security deposits that cargo owners must pay to shipping lines for containers. Shippers also realize that more cargo can be loaded onto a single truck if the cargo is stripped. This leads to the overloading of trucks, faster deterioration of the road infrastructure, and higher road maintenance costs, which must be covered by the governments of Ghana and Burkina Faso. Container stripping might be reduced if cargo owners and shipping companies could negotiate lower deposit charges on containers or faster repayment of deposits upon the return of containers. This would promote the use of containers and benefit both the shippers and the Ghanaian and Burkinabe governments.

- Estimated cost: low-cost policy options
- Estimated benefit over 20-year period (present value): depends on freight value

Build the capacity of the government of Ghana to lower road transport costs by implementing the Ministry of Transport's five-year action plan. Road transport costs in the corridor are high—35 percent higher than the average for other African and Asian corridors analyzed with FastPath. These costs are due to the use of older vehicles, road congestion, and high fuel and truck maintenance costs in the corridor. Some road maintenance improvements have already been achieved in the past eight years by the Ghanaian government's Road Sector Development project. Road transport costs could be reduced up to 15 percent more if the use of more cost-effective vehicles for container transport were encouraged and if there were fewer overloaded trucks causing deterioration of the road. The Ministry of Transport's five-year action plan calls for reducing overloaded trucks and subsidizing loans for new, more cost-effective vehicles, but the plan has not been implemented. The implementation of the action plan will increase the costs of noncontainerized freight (because shippers will no longer be able to overload trucks), but should have a positive effect on road conditions, which will lower overall costs.

- Estimated cost: $6 million
- Estimated benefit over 20-year period (present value): $31.8 million

Eliminate unofficial costs. The West Africa Trade Hub has been implementing a longstanding program to estimate the unofficial costs on several West African transit corridors. For the Tema-Ouagadougou corridor, the unofficial costs incurred in the inbound direction (Ghana to Burkina Faso) averaged approximately $206 per TEU—or 5.7 percent of the total shipping cost. In the opposite direction (Burkina Faso to Ghana), these costs averaged $68, or approximately 3.9 percent of the total shipping cost. A complete elimination of unofficial cost would be a difficult and lengthy process given the widespread incidence of corruption. Nevertheless, tackling corruption can have a great impact on West African competitiveness, the cost of transport for shippers (and the final costs paid by consumers), and infrastructure governance.

- Estimated cost: $3–4 million
- Estimated benefit over 20-year period (present value): $46.4 million

CONCLUSION

The FastPath and RRTC methodologies for analyzing transport corridor performance are complementary, and further collaboration makes sense. Although FastPath analyzes the overall transport infrastructure and operational inefficiency in the transport logistics chain (a more macro approach), RRTC analyzes the processes and procedures unique to specific products for navigating the logistics chain (a more "micro" approach). The overall logistics scores generated by FastPath analysis can also promote a healthy sense of competition among corridors (as with the World Bank's Doing Business scores), and can provide the WA Trade Hub and USAID/West Africa with a leverage point for promoting and implementing regional and national transport sector reforms. Moving forward, TCBoost suggests the following course of action:

1. Integrate FastPath findings into the WA Trade Hub's draft Tema-Ouagadougou corridor analysis to create one comprehensive document

2. Train the WA Trade Hub Transport team and counterparts (trade and transport sector experts of West African Economic and Monetary Unit) on FastPath and collaborate on analysis of three other West African corridors

3. Invest in enhancements to FastPath to address both containerized and noncontainerized freight, more clearly differentiate between official and unofficial payments, and link one inland destination to several different ports

4. With GPHA and Trade Hub experts, analyze the Tema port master plan feasibility study, and suggest ways to promote investment and public-private partnerships in infrastructure

5. Conduct economic impact analysis of policy changes, such as reducing or eliminating the 21-day grace period for Burkinabe containers at Tema port, and those recommended in the WA Trade Hub's draft report

6. Work with WA Trade Hub experts, the Ghana Ministry of Transport, trucker associations, and traders to implement the ministry's five-year action plan, especially to

encourage the purchase of higher-quality vehicles, reduce truck overloading, and discourage container stripping

7. Support USAID/West Africa and WA Trade Hub anticorruption programs

8. Conduct a legal and regulatory assessment to identify the impact of renegotiating the MPS concession agreement or expropriating the port from MPS (the current configuration is not in the public interest) and assess the prospects for establishing Tema as a regional transshipment hub to encourage competition in Tema.

The TCBoost team is pleased to have had the opportunity to work with the WA Trade Hub and USAID/West Africa on conducting this analysis of the Tema-Ouagadougou transport corridor. Continued collaboration on initiatives such as this promises to equip stakeholders with the tools to improve the performance of their transit corridors and trade competitiveness.

1. Introduction

1.1 BACKGROUND

The USAID-funded West Africa Trade Hub (WA Trade Hub) Reduced Road Transport Costs (RRTC) initiative is researching and evaluating the logistics environment on a number of West African corridors and will recommend ways to improve efficiency. The WA Trade Hub corridor research is starting with the Tema (Ghana)-to-Ouagadougou (Burkina Faso) corridor.

The RRTC methodology was developed by Carana Corporation (the implementer of the WA Trade Hub) for use in Latin America. It examines the costs of exporting, from the point of loading goods at an inland point to the point of departure of the ships carrying the goods to market, and compares them with developing-country norms. The WA Trade Hub also uses this methodology for imports. The methodology consists of tabulating costs along chosen value chains, breaking the costs down into legal and illegal and public and private sector, and establishing the weak links in the chain relative to global norms. The study determines the most serious deviations from the norms and identifies the causes: corruption, logistical mismanagement, inappropriate red tape, poor infrastructure, weak institutions, poor coordination, or other reason.

The draft report "Transportation Costs and Delays: An Analysis of the Ouagadougou-Tema Corridor" on the RRTC analysis detailed the institutional arrangements, procedures, and activities related to transportation along the corridor and presented a comprehensive range of logistics costs for both imports and exports. The report shed light on many procedural bottlenecks but did not address the challenges raised by the state of the infrastructure (ports, roads, border crossings). Nor did the methodology present a readily accessible means of comparing the performance of the Tema-Ouagadougou corridor with other corridors in West Africa, throughout the continent, or throughout the world.

At the request of USAID/West Africa, the Worldwide Support for Trade Capacity Building (TCBoost) project collaborated with the WA Trade Hub to pioneer an approach to transport corridor analysis that leverages the best elements of the RRTC methodology with those of FastPath, another transport logistics diagnostic tool developed in part with USAID funding. USAID/West Africa also expressed a particular interest in using FastPath to learn more about how the infrastructure, processes, and procedures at Tema port increase shipping costs and to provide recommendations for reducing these costs.

This report reflects the collaboration between the WA Trade Hub and TCBoost projects to develop a comprehensive diagnostic for the Tema-Ouagadougou Corridor. The TCBoost team would like to thank the WA Trade Hub for its assistance in developing a joint work plan, in providing existing data and collecting additional data to feed the FastPath model, and in collaborating with the TCBoost team during a field visit in early May 2009.

1.2 OBJECTIVE

The objective of this report is to present an analysis of Tema-Ouagadougou corridor performance using FastPath. The report also hopes to demonstrate how the FastPath methodology can complement the RRTC methodology to deliver to USAID/West Africa an easily replicable and comprehensive Tema-Ouagadougou corridor diagnostic to inform discussions with stakeholders and help determine priorities for technical assistance.

1.3 FASTPATH

FastPath, developed by USAID and Nathan Associates Inc., is a model for assessing performance along a transport corridor in a consistent and easily replicable fashion. The model focuses mainly on infrastructure—also referred to as the transport logistics chain. The main variables measured to assess performance are cost, time, and reliability. Each variable represents an indicator of performance by itself. During the analysis, the three variables are used to generate a summary performance measure, or logistics score. The flexibility of the FastPath software allows the user to break down the infrastructure components of the transport logistics chain into nodes and links and measure the three variables (cost, time, and reliability) for each subcomponent (e.g., port, road, border post).

The model allows analysis by selected 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. Each corridor analysis is called a scenario and given a scenario name. Improvements to FastPath following recommendations received from other donors, including the World Bank, have resulted in the enhanced FastPath Lite, with improved data for border posts and road performance information.

The performance data for a scenario are compared with international norms during the input process and are used to create a logistics score for each component of the corridor. Bar charts show the contribution of each mode to the overall 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 a given corridor, the model allows the user to create several alternative scenarios with potential performance improvements. The impact of these improvements is estimated and the tool creates an improved scenario. The tool compares the base case price and time bar charts with the ideal case and with the improved scenarios. Furthermore, 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 internal rate of return (IRR) for the improvement given an estimated cost.

In the next chapter, we describe the Tema-Ouagadougou base case scenarios as defined by the FastPath analysis and the logistics scores for each subcomponent and for the entire corridor.

2. Description

This chapter describes the key components of the Tema-Ouagadougou transport corridor and focuses specifically on the waterside operations of Tema port. This focus is intended to complement the analysis already undertaken by the WA Trade Hub. Data on cargo volume along the corridor are also presented, as are brief descriptions of the scenarios created for the FastPath analysis. Performance statistics are summarized in chart form, paving the way for further elaboration in Chapter 3.

2.1 CORRIDOR DESCRIPTION

The Tema-Ouagadougou transport corridor consists of the port of Tema, the road connecting the port with the border posts at Paga (Ghana) and Dakola (Burkina Faso), and the road linking the Dakola border post to Ouagadougou. During the field visit to Ghana and Burkina Faso, the assessment team examined the rail and inland waterway (Lake Volta) infrastructure along the corridor as well, but these modes were not developed enough to be considered relevant to this analysis.

The WA Trade Hub draft report describes in detail the institutional arrangements, procedures, and activities for movement of goods along the corridor, as well as a comprehensive range of logistics costs for both imports and exports. Consequently, we have limited our description of the corridor to the characteristics of the infrastructure components, emphasizing the operational performance of the waterside components of Tema port, including berth and channel operations. We also present an analysis of the institutional arrangement of the port and constraints on port service competition. This emphasis addresses USAID/West Africa's concerns about high shipping costs on the corridor. Our description of port operations also emphasizes the indicators associated directly with vessel turnaround time: berth throughput, berth occupancy, ship waiting time, berth productivity, and cargo dwell time. This focus complements the WA Trade Hub's analysis, which begins or ends with Customs procedures and covers inland logistics.

2.1.1 Tema Port Infrastructure

A complete operational performance review of a port includes the five main port facilities or services: the berth, the storage yard, intermodal transfer, Customs, and the gate. Tema port does not have an intermodal transfer facility, and the WA Trade Hub draft report addresses the operations at the storage yard and gate, as well as Customs procedures. Our analysis, focusing on the waterside components of the port, covers processes in the anchorage area, the navigation of the access channel, and the transfer of cargo to and from the vessel and to and from the berth.

Berth Throughput and Occupancy

The port of Tema is one of two main seaports in Ghana and it handles about 80 percent of the nation’s import and export cargo. The port has 12 berths whose depths range from 8 meters to 13 meters. Figure 2-1 presents the layout of the waterside port facilities at Tema port , which we divide into the following three sections for the sake of analysis:

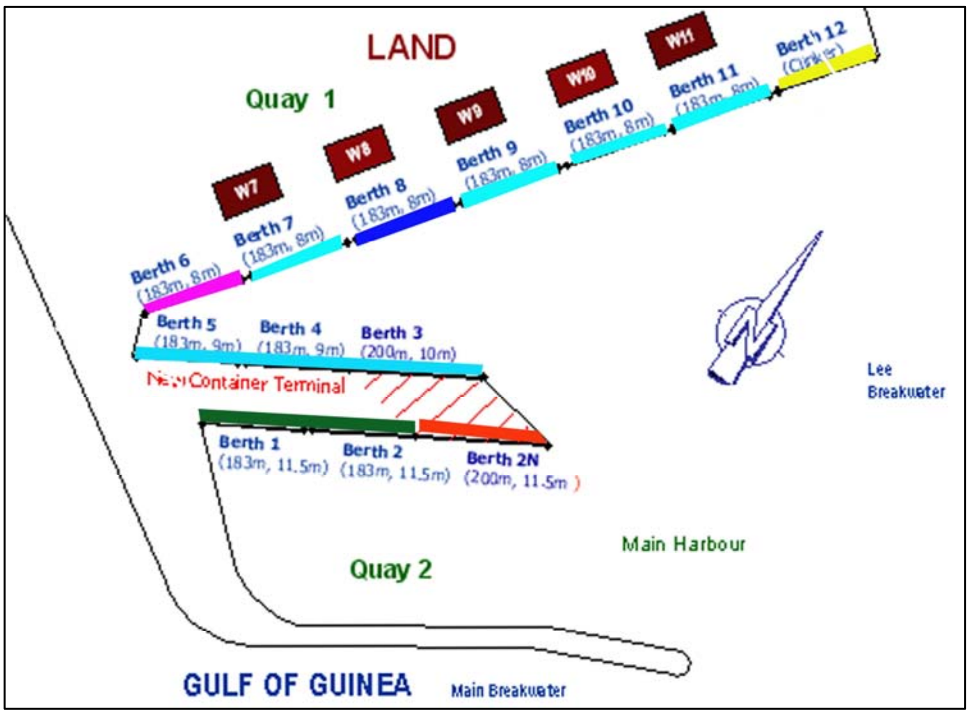
- Berths 1 and 2, also referred to as Quay 2 South, is the port section under concession to Meridian Port Services (MPS), has the deepest berth at Tema (13 meters) and are the only berths equipped with shore-based gantry cranes

- Berths 3, 4, and 5, also referred to as Quay 2 North, are located at the back of Quay 2 South

- Berths 6 through 12, the rest of the port.

Figure 2-1

Tema Port Waterside Facilities Layout



Source: AfriTramp

Berth Throughput

Tema port, like most ports, handles both containerized and noncontainerized cargo. Because containerized cargo tends to be more sensitive to delays, our analysis of berth throughput focuses on containerized cargo.

Table 2-1 breaks down the throughput of each berth and the share of containerized throughput of each berth in 2007 and 2008.

Table 2-1
Throughput by Berth and Share of Containerized Throughput at the Port

Berth	2007		2008	
	TEU	%	TEU	%
1	162,749	32.9	137,159	24.2
2	164,588	33.2	156,738	27.7
1, 2	327,337	66.1	293,897	59.3
3	36,216	7.3	84,134	14.9
4	29,055	5.9	52,941	9.4
5	8,921	1.8	21,845	3.9
3,4,5	74,191	15.0	158,920	28.1
6	2,237	0.5	11,308	2.0
7	17,470	3.5	18,542	3.3
8	26,276	5.3	29,031	5.1
9	24,279	4.9	23,036	4.1
10	17,943	3.6	19,641	3.5
11	5,694	1.1	11,758	2.1
12	-	0.0	-	0.0
6 - 12	93,899	19.0	113,316	20.0
All Berths	495,427	100.0	566,133	100.0

Source: GPHA

The first section of the port, Quay 2 South, handled about 66 percent of throughput in 2007 (137,000 TEU) and 60 percent in 2008 (157,000 TEU). Quay 2 South serves only specialized container ships—no roll-on/roll-off (ro/ro) or other types of cargo. Quay 2 South is part of the new dedicated container terminal operated by MPS and has three ship-to-shore (STS) cranes. Ghana Ports and Harbors Authority (GPHA) representatives indicated that the draft at this quay is 13 meters.

The second section, Quay 2 North, increased its share of throughput from 15 percent to 28 percent, with a total volume of about 160,000 TEU in 2008 for the three berths. Quay 2 North handles container ships, general cargo, ro/ro, and breakbulk (e.g., bagged imports) vessels. The container ships handled in Quay 2 North are also usually smaller than those handled at Quay 2 South because of the shallower draft (10.5 meters compared to 13 meters). The inner berth, Berth 5, is more difficult to reach and can handle only smaller ships and therefore is only rarely used for containers.

The third section of the port includes Berths 6–12, all of which are multipurpose berths. The total volume of containers handled in this area of the port accounted for 113,000 TEU, or 20 percent of the container volume during 2008, the same percentage handled in 2007. Berths 8 and 9 are the most active, together handling about 51,000 TEU. This section of the port is even shallower than Quay 2 North, with drafts ranging from 7 meters to 9 meters, and handles mainly small container ships. Berth 12, which was rehabilitated mainly for handling containers, did not handle any containers in 2007 or 2008. The Port plans to improve Berths 10, 11, and 12, which includes rehabilitating the dock structures, increasing the depth alongside the berths, and installing mobile harbor cranes in the near term and eventually installing STS cranes.

Berth Occupancy

Berth occupancy is usually measured by the proportion of time that a ship is moored at the berth (working or idle) out of the total berth time available, which usually includes calendar time minus major holidays. In some ports, however, where berthed ships tend to stay idle for a long time, the occupancy relates only to the ship's working time. This is the case in Tema port's reporting system, summarized in Table 2-2, which presents historical data on berth occupancy. There is a trend of increasing occupancy over the years, which reflects the growth in throughput. This trend is not uniform among all berths, however; for example, occupancy in Berth 11 is decreasing. Variations in occupancy rates can be explained, perhaps, by a combination of changes in cargo mix, berthing policy, ship handling productivity, and others. Because our focus is on containers and the berths that handle most of them, we conducted a more detailed analysis of Berths 1 and 2, where most containerized cargo is handled.

Table 2-2

Berth Occupancy, 2003–2007 (percent)

Berth	2003	2004	2005	2006	2007
Berth 1	59.1	24.8	70.1	71.1	75.1
Berth 2	51.0	18.4	39.8	67.2	73.0
Berth 3	0.0	0.0	21.5	59.7	60.5
Berth 4	59.8	46.1	56.3	54.8	49.5
Berth 5	58.0	33.5	50.4	34.9	45.7
Berth 6	38.8	59.7	43.8	32.4	38.9
Berth 7	49.0	67.9	67.9	53.6	48.2
Berth 8	54.1	61.4	58.3	47.8	54.3
Berth 9	60.1	64.6	56.9	47.8	51.2
Berth 10	15.5	50.2	59.2	54.5	51.2
Berth 11	66.4	48.1	42.2	16.3	22.3
Berth 12	35.2	29.4	24.0	23.1	30.0

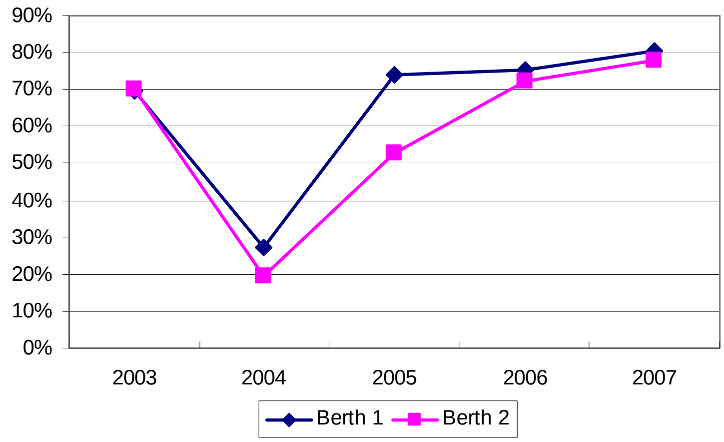
Source: GPHA

Berths 1 and 2 increased occupancy rates greatly between 2003 and 2007, reaching 75 percent and 73 percent occupancy, respectively. The reduction experienced in 2004 and recovery in 2005 are due to the fact that during this period the port acquired three STS cranes.

Figure 2-2 presents occupancy rates for Berths 1 and 2 from a different source, with occupancy including ships' working and idle time—the more common way of measuring occupancy. The occupancy rates according to this calculation reach 80 percent and 79 percent for Berths 1 and 2, respectively, in 2007. This level of occupancy is considered high, suggesting that both berths are full—since berths are unavailable during the berthing and deberthing processes, which may take

30 minutes. This strengthens the argument that Quay 2 South, under concession to MPS, is working at full occupancy. This also indicates that a further increase in throughput by accommodating more ships requiring berth time is bound to result in congestion, ship waiting time, and degradation of the service level. Hence, short of adding berths, the only way to increase throughput at Berths 1 and 2 is by increasing crane productivity.

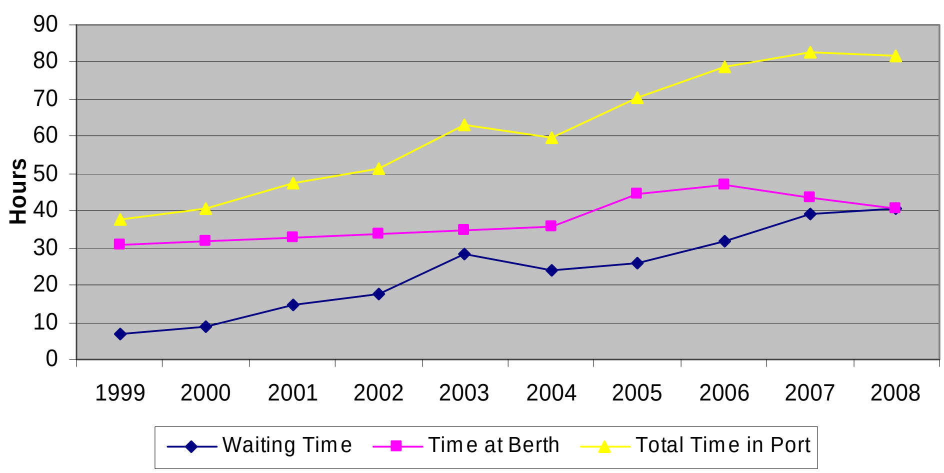
Figure 2-2
Occupancy Rates for Berths 1 and 2, 2003–2007



Ship Waiting Time

International experience suggests that occupancy rates of 80–90 percent usually result in substantial ship waiting time. Figure 2-3 shows the performance of Tema port's waterside operations experienced by cellular container ships for the past 10 years. For the FastPath analysis, we combined the berth waiting time and the channel navigation time and defined it as "channel time." As noted earlier, time at berth is defined as berth occupancy. As the figure shows, the waiting time at the port is increasing steadily each year. Table 2-3 presents the monthly average of ship waiting time that cellular container and general cargo ships experienced in 2008.

Figure 2-3
Cellular Container Ship Turnaround Time



Source: GPHA

Table 2-3
Monthly Average of Ship Time, 2008 (Hours)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
CELLULAR CONTAINER SHIPS													
Ship call	50	45	51	50	52	54	54	51	56	54	46	47	610
Waiting time	19.8	28.7	41.7	28.3	39.0	34.5	21.6	24.2	80.6	27.5	34.8	95.8	39.7
Port navigation time	1.0	1.0	1.1	1.0	1.0	1.2	1.4	1.1	1.2	0.9	1.0	1.0	1.1
Berth time	34.5	42.2	36.4	41.6	42.8	35.5	43.8	38.6	41.2	40.8	45.7	47.2	40.8
Port time	55.3	71.9	79.2	70.9	82.7	71.1	66.8	63.9	123.0	69.2	81.5	144.0	81.5
GENERAL CARGO SHIPS													
Ship call	5	7	5	6	6	7	5	11	7	8	6	10	83
Waiting time	18.6	81.4	25.1	27.7	6.5	46.2	54.2	46.7	49.0	53.5	30.1	79.6	46.4
Port navigation time	3.0	1.0	1.0	1.6	0.8	1.0	1.6	1.3	1.3	1.2	0.8	1.2	1.3
Berth time	122.8	113.6	91.6	209.0	185.2	154.0	257.9	180.9	213.4	163.3	92.1	112.7	157.5
Port time	144.4	196.0	117.7	238.3	192.4	201.2	313.6	228.8	263.8	218.0	123.0	193.5	205.1

Source: GPHA

For container ships, the average waiting time was 40.8 hours, or about 2 days. The average ship berth time (working and idle) was 40.8 hours and total port time 81.5 hours, or 3.4 days. The highest waiting time, recorded in December 2008, was 96.8 hours, about 4 days. For general cargo vessels, average waiting time was 47.6 hours, the ship berth time was 157.5 hours, and total port time was 205.1 hours or 8.5 days.

Berth Productivity

Gross berth productivity in 2008 was low considering the equipment available at the port. Detailed information about productivity at the port was not made available for this study; in late 2007, however, Nathan Associates analyzed berth performance for the GPHA using data obtained from ship-handling reports provided by MPS, the container terminal operator.

Table 2-4 summarizes the data obtained from the ship handling reports, based on calls made by four ships. STS gantry cranes handled the cargo for three of the ships; a combination of one STS and one ship's gear handled the fourth. The MPS reporting system categorizes crane and ship times as gross and net. Crane gross time refers to the time elapsed from when a crane is assigned to work a ship until it finishes the assignment. Crane net time refers to the gross time minus delays.

Table 2-4

Summary of Ship Handling Reports at the MPS Terminal

		Ship A	Ship B	Ship C	Ship D
Ship Handling	Moves	1,115	1,049	514	723
Berth Time	Gross	35.17	52.92	31.42	71.17
	Net	32.17	47.92	26.75	64.20
	Net/Gross	91.5%	90.6%	85.1%	
PRODUCTIVITY					
Berth	Moves—Gross-Hr	31.71	19.82	16.36	10.16
	Moves—Net-Hr	34.66	21.89	19.21	11.26
All Cranes		3	3	2	3
STS Cranes	Moves	1,115	1,049	301	723
Ship's Cranes	Moves	n/a	n/a	213	n/a
STS Cranes	Gross	83.80	90.83	22.42	176.37
	Net	66.73	78.47	20.90	-
	Net/gross	79.6%	86.4%	93.2%	
	Moves—gross-hr	13.31	11.55	22.93	4.10
	Moves—net-hr	16.71	13.37	24.59	
	Avoidable crane delay	1.47	8.03	0	
	% Avoidable delays	1.8%	8.8%	0.0%	
Ship's Cranes	Gross	n/a	n/a	23.53	n/a
	Net	n/a	n/a	22.15	n/a
	Moves—gross-hr	n/a	n/a	9.05	n/a
	Moves—net-hr	n/a	n/a	9.62	n/a
	Avoidable crane delay	n/a	n/a	0.30	n/a
	% avoidable delays	n/a	n/a	1.3%	n/a

n/a—not applicable

The reporting system identifies a long list of possible delays, which for the purpose of analysis are categorized as unavoidable (weather, hatch cover handling) and avoidable (breakdowns, awaiting instruction).

A ship's gross berth time encompasses the entire time that the ship is at the berth, either working or idling. Net berth time refers only to the time during which the vessel is worked (ship's working time). These definitions are in line with those commonly used by most container terminal operators.

The discussion here focuses on Ships A and B in Table 2-4, because of the large number of moves and their being handled by three STSs. Furthermore, the majority of containers in Tema are handled by the berths serving these ships. For both ships, the operations went relatively smoothly, avoidable delays accounting for only 1.8 percent and 8.8 percent of the gross time, respectively. Likewise, ship operation began within an hour of ship berthing time and continued without a break for the entire stay of the ship at berth (no idling before or after work). In these two ships, STS net productivity was 16.7 moves and 13.3 moves per hour, respectively. Accordingly, gross berth productivity, the figure that is of greatest interest to ship owners, was low, at 31.7 and 19.8 moves per hour, respectively. The global standard for berth productivity (using two cranes) is 45to 50 moves per berth.

The specific causes for low productivity cannot be fully understood without a detailed operational and configuration analysis of the terminal. But two factors appear to have an effect on berth productivity. First, in the operational layout, the terminal is configured as a finger pier, which does not provide sufficient space for storing containers for the operation near the berth area. This creates a separation between the berth and the storage yard, forming two container yards, with the primary yard far from the berth. This creates a long crane cycle time, and therefore more time between each lift.

Another and perhaps more relevant reason is that the new terminal organization is still at a learning stage. It is essentially a startup operation, requiring an adjustment period to optimize the operational integration of the various components of the terminal. Recent information provided by MPS suggests that berth productivity during the first half of 2009 increased to 35 moves per hour, showing an improvement of about 10 percent from 2007. This appears to be evidence of a maturing operation, though the more recent data still fall below global standards.

Conventional Berths

Although most large container ships are handled by MPS at Quay 2 South, the vessels handled at the conventional berths (Quay 2 North and Quay 1) account for about one-third of the containerized throughput. All handling at conventional berths is performed by ship’s gear, with the containers staged first alongside the ship in a temporary buffer, from which they are later loaded by reach stackers onto port trucks and drayed to a nearby yard (and vice versa for exports).

A severe lack of space is the primary cause of observed operational inefficiency at the conventional berths. Figure 2-4 shows a typical ship-handling operation amid the congestion on the narrow dock near the ship.

First, a long line of trucks is waiting on the dock with export containers for the ship’s crane; second, a truck is loading bagged sugar from the nearby shed; and third, a pile of containers is on dock, all of which were discharged by the adjacent ship and are waiting to be moved by a reach stacker and trucks to the container yard behind the shed. Another common problem cited by shipping lines is a shortage of equipment, mainly reach stackers and trucks. The resulting productivity is about 5–7 moves per hour, which is not much different from that recorded in Berths 1 and 2 for ship’s gear.

Figure 2-4
Typical Ship-Handling Operations at Multipurpose Terminal

Source: Nathan Associates Inc.

There is also congestion in the container yards serving the conventional berths, the storage areas and, especially, roads inside the conventional section of the port. Many open areas are taken by noncontainerized cargo such as steel coils, dimensional steel, and lumber. Likewise, roads are used for truck parking, including trucks carrying export and import containers, and transit cargo for which Customs clearance is needed.

Cargo Dwell Time

The policy of the GPHA is to provide 21 days of storage free of charge for all transit cargo using Tema port in order to attract transit cargo from landlocked neighboring countries. According to the information received from GPHA and MPS, import transit cargo remains 17 days on average inside the port facilities. The WA Trade Hub draft report analyzes in detail the processes undertaken at the port with detailed information on time, cost, and delays. Although the total cargo dwell time at the port may be a result of a combination of delays in assigning the cargo to truckers in accordance with the official procedures, cargo owners have the option to maximize the free storage time at the port. This free time at the port may be a cheap option for transit cargo owners but, as we will show in Chapter 4 , it is an expensive option when the performance of the infrastructure and the total economic impact of poor performance of infrastructure components are taken into consideration.

Constraints on Port Service Competition

USAID/West Africa also asked TCBoost to provide a brief analysis of GPHA's concession agreement with MPS and its potential impact on port service competition—a relevant issue that had not been raised in the WA Trade Hub's draft report. Because this FastPath analysis focuses on infrastructure rather than institutional issues, we have placed this analysis in Appendix A.

2.1.2 Road Infrastructure

The road from Tema to Ouagadougou is about 1,000 km and is generally in fair condition, with some segments in poor to very poor condition. One hundred percent of the transit cargo transported by surface in the Tema-Ouagadougou corridor uses the road as the main mode of transportation along the route presented in Figure 2-5.

Figure 2-5

Tema–Ouagadougou Transport Corridor Main Connecting Road

Source: Google Map

A four-lane road connects Tema with Accra and continues up to Nsawam. The road is in good condition between Tema and the intersection of Achimota (35 km), just outside Accra. From Achimota is a segment of about 10 km where major road construction is underway. Traffic is heavy because this segment serves Accra’s urban traffic and the temporary road is in precarious condition. The average road speed on this segment is 5 to 8 km/h, but this bottleneck is temporary and the performance of this segment should benefit from the expansion and the elevated sections being constructed.

The four-lane road continues up to Nsawam, there changing to a two-lane road, except where it enters and exits Kumasi. The road is in fair-to-poor condition and the traffic is heavy, particularly in the many urban areas, where the road passes through the center of town. In Suhum, approximately 85 km from Tema, a road bypassing the middle of town is under construction. This section of road is in poor condition for about 5 to 8 km. Approximately 13 km from Suhum, at the junction close to Apedwa, the condition of the road improves dramatically and continues like this up to Kumasi.

From Kumasi to Kintampo the road is in fair condition, and several segments are under construction to widen the road. The terrain after Kintampo is predominantly flat and the road is in fair-to-good condition to the border in Paga. Traffic is light up to Tamale and from Tamale to the Burkinabe border. When the border is crossed, from Dakola to Ouagadougou, the road, though narrow, is in fair condition with light traffic.

The terrain between Accra and Kumasi is mostly flat to hilly. The traffic is relatively heavy with private vehicles and trucks transporting goods between Ghana’s two major cities. During the corridor assessment, the team observed that trucks are constantly overloaded and often suffer breakdowns on the road. In the majority of cases, trucks are repaired on the road.

For the sake of analysis, the road infrastructure on the Tema-Ouagadougou corridor can be summarized as in Table 2-5, using subjective ratings to categorize the characteristics of each link. These subjective ratings allow FastPath to determine a “link factor” to estimate the transport cost for each link, by accounting for terrain, road surface condition, and traffic congestion.

Table 2-5

Tema-Ouagadougou Corridor FastPath *Road Links Characteristics*

Link	Length (km)	Terrain	Surface Conditions	Congestion	Factor
Tema–Apedwa	98	Flat-Hilly	Poor	Heavy	2.4
Apedwa–Kumasi	200	Flat-Hilly	Good	Heavy	2.2
Kumasi–Paga	582	Flat	Fair	Light	1.1
Paga–Dakola	1	Flat	Fair	Light	1.1
Dakola –Ouagadougou	176	Flat	Fair	Light	1.1

2.1.3 Border Post (Paga-Dakola) and Customs (Ouagarinter)

The border post infrastructure in Paga (Ghana) and Dakola (Burkina Faso) is simple, with a yard on each side of the border for temporary truck parking while paperwork is executed. Depending on volume, the parking facilities can fill rapidly, and trucks must park on the road temporarily. The crossing facilities in both Paga and Dakola include a single-line gate that stays closed until a truck is allowed to cross after its paperwork is finalized. The WA Trade Hub’s draft report describes the forwarding procedures at Paga and Dakola, including the hours of operation, the formal and informal procedures and fees involved, and other factors that cause delay, such as language barriers between English- and French-speaking traders or mandatory convoy operations.

Almost all import cargo entering Burkina Faso must be cleared in a Customs facility known as Ouagarinter. A few exceptions are permitted, when temporary storage and clearing are authorized by Customs at bonded facilities at the warehouses of authorized freight forwarders. Figure 2-6 shows an aerial view of the facilities where three major warehouses are identified.

Figure 2-6
Ouagarinter Facilities

Source: Google Maps

2.2 Cargo Characteristics for Tema–Ouagadougou Corridor

Table 2-6 presents the volume of cargo handled by Tema port, with a breakdown by type of commodity. In 2008, Tema port handled nearly 8.7 million tons, with about 4.8 million tons, or 55 percent, in containers. Although the performance of the port is affected by the entire throughput, our analysis focuses on commodities relevant to transit cargo and therefore the parts of the port associated with transit cargo.

Table 2-6

Volume of Cargo Handled by Tema Port by Commodity Description (Tons)

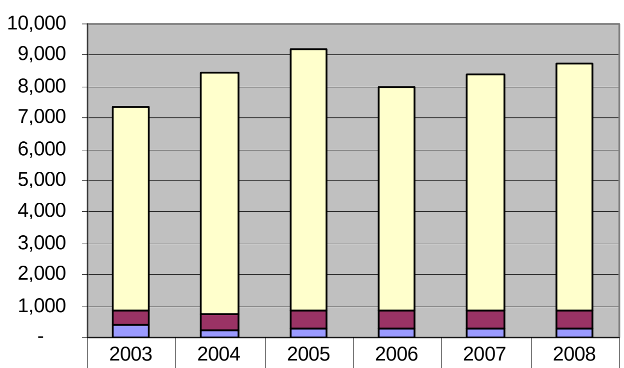
Commodity Description	2003	2004	2005	2006	2007	2008
Agri bulk	52,244	64,261	44,998	32,038	78,955	62,512
Bagged cargo	1,17,1613	774,802	1,109,976	845,193	978,457	80,7120
Containerized	2,477,468	2,856,543	3,386,954	3,774,264	4,226,254	4,759,554
Dry bulk	1,138,782	1,201,982	1,032,062	1,205,488	1,208,095	1,304,211
Lumber	1,524	320	1,192	1,025	1,509	8,202
Conventional	39,234	21,050	32,002	77,744	17,484	45,458
Frozen	-	213,314	246,847	203,436	205,997	310,197
Iron and steel	196,721	203,486	427,610	286,314	316,388	261,085
Liquid bulk	2,179,088	2,954,759	2,785,277	1,417,522	1,173,204	991,132
Machinery and equipment	10,429	14,443	17,253	19,126	23,647	27,573
Unitized cargo	32,433	57,897	46,513	55,040	65,327	62,641
Unpacked vehicles	78,772	59,076	72,779	70,232	83,630	87,364
Total	7,378,308	8,421,933	9,203,463	7,987,422	8,378,947	8,727,049

Source: GPHA

As Figure 2-7 shows, the volume of transit cargo handled by the port, largely imports, has remained relatively constant in the past few years, with a peak of about 888,000 metric tons (MT) in 2006 and a slight decrease in 2007 and 2008. About 85 percent of transit cargo is transported to or from Mali, Burkina Faso, and Niger. A detailed analysis of port cargo volume shows 63 percent of transit cargo is containerized, while 32 percent is breakbulk (23 percent for bagged and 9 percent for iron and steel) cargo.

Figure 2-7

Total Volume of Cargo Handled at Tema Port, 2003-2008 ('000 Metric Tons)

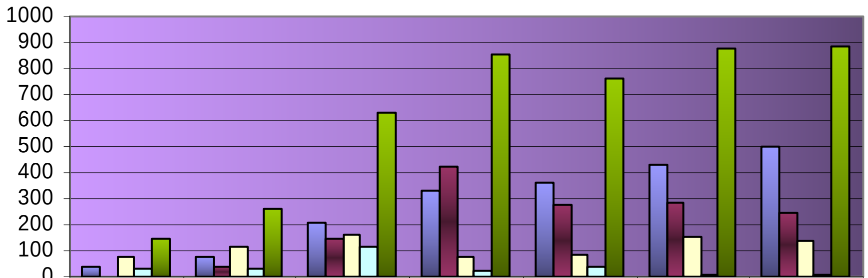


	2003	2004	2005	2006	2007	2008
Domestic Cargo	6,523	7,658	8,328	7,100	7,535	7,863
Transit Containerized	427	519	581	616	557	554
Transit Non Containerized	428	245	294	272	287	311

Source: GPHA

Figure 2-8 shows the historical volume of transit traffic by origin/destination. Burkina Faso, on average, accounts for about half (48 percent) of the volume, which has risen steadily.

Figure 2-8
Transit Traffic Volume by Country, 2000-2006 (‘000 Metric Tons)



	2000	2001	2002	2003	2004	2005	2006
Burkina Faso	42	78	209	330	364	428	498
Mali	0	38	144	423	277	288	243
Niger	76	116	160	78	87	151	141
Others	27	29	115	25	37	9	5
Total	146	261	628	855	764	875	888

Source: WA Trade Hub, GPHA

2.2.1. Transit Traffic Volumes

With the total transit volume at Tema port in 2008 at about 865,000 tons, and 48 percent on average from Burkina Faso, for the purpose of our FastPath analysis, the total volume of transit cargo attributable to Burkina Faso in 2008 was about 413,000 tons. Table 2-7 presents a breakdown of traffic by direction and type of cargo.

Table 2-7
Burkinabe Transit Traffic Volumes for FastPath Model

	Tema Port Transit Total		Burkinabe Transit Traffic	
	Tons	TEU	Tons	TEU
Total	**864,307**		**412,888**	
Noncontainerized cargo	310,628	-	148,390	-
Inbound	310,617	-	148,385	-
Outbound	11	-	5	-
Containerized	553,679	34,893	264,498	16,669
Inbound	530,665	33,089	253,504	15,807
Outbound	23,014	1,804	10,994	862

Source: TCBoost estimates based on total volume handled at Tema port provided by GPHA

The majority of the Burkinabe transit traffic volume, 64 percent, is handled at Tema port in containers. The transit cargo, however, can be sent to its final destination in one of two ways: either directly in its container, or stripped.

2.2.2. Containerized Stripped/Consolidated Cargo

Cargo received in containers is more often stripped at Tema port for onward shipment by truck to Burkina Faso or other landlocked country destinations. In most cases these trucks are filled with at least two or two-and-a-half 20-foot containers. This additional handling in the transfer of goods increases the cost, increases the risk of breakage and loss, and potentially compromises the bonded status of the transit cargo. It also promotes the overloading of trucks to save on the fixed cost per unit transported, resulting in damage to the road infrastructure in the corridor. To discourage the movement of containers to inland destinations, owners charge consignees high deposits and then delay returning the deposits. During interviews and discussions, the WA Trade Hub and corridor stakeholders suggested that about 70 percent of inbound containers are stripped at the port before the transit process is undertaken.

It is assumed that outbound container volumes follow the same distribution pattern as inbound volumes. The majority of containers return empty to Tema because the companies that use them need to return them quickly to avoid paying demurrage and to recover the container deposit. For the FastPath analysis, we assumed that only 30 percent of outbound cargo is transported in containers. The remaining 70 percent is transported as noncontainerized cargo until its arrival at Tema, where the cargo is consolidated into containers at the shipping line yard and then transferred to the port. In the past five years, 99.9 percent of outbound transit cargo has been consolidated and shipped through Tema in containers.

Table 2-8 presents our estimate of containerized cargo transiting the corridor.

Table 2-8
Direct and Stripped Containers Volumes for FastPath Model

	Inbound Containers		Outbound Containers	
	Tons	TEU	Tons	TEU
Direct traffic	68,355	4,743	3,298	259
Stripped	185,148	11,064	-	-
Consolidated	-	-	7,696	603

2.2.3. Trade Composition Distribution

The inbound transit trade activity along the Tema-Ouagadougou corridor substantially exceeds the volumes of exports, and this relationship is forecast to continue in the short and medium terms. In order to determine the economic importance of the goods transported along the corridor, we have organized the trade composition to show high-, medium-, and low-unit-value products.

In the inbound direction, about 45 percent of imports coming into Burkina Faso are high-unit-value products, such as mineral fuel; electrical and electronic equipment; vehicles; boilers; and optical, photo, technical, and medical equipment. Medium-unit-value products such as pharmaceutical products, construction material, plastic and rubber products, textiles, edible fruit and preparations, account for about 35 percent of volume. Low-unit-value products such as cereals, paper and board, milling products, sugar, wheat, and rice account for the remaining 20 percent of import volume.

In the outbound direction, composition varies considerably. Cotton accounts for about 80 percent of exports in terms of value Products such as oil seed, oleagic fruits, grains, sugar, and wood articles suggest that medium-unit-value products account for 90 percent of the export volumes. Other high unit value products such as precious stones, machinery and works of art account for 5 percent of the volume. The remaining 5 percent is low-unit-value products.

Although this distribution corresponds to the totality of the goods imported and exported by Burkina Faso, it is reasonable to assume that the Tema-Ouagadougou corridor has a similar distribution of trade composition. Table 2-9 presents the suggested trade composition for inbound and outbound transit cargo.

Table 2-9
Trade Composition Value for Transit Cargo

Value of Trade	Inbound Traffic %	Outbound Traffic %
Low, < $10,000/TEU	20	5
Medium, $10, 000–$50,000/TEU	35	90
High, >50,000/TEU	45	5

2.2.4 TEU/Container Ratio

FastPath uses a TEU/container ratio estimated for 2008 according to GPHA statistics. The relationship for transit cargo is relatively low, with a higher use of 20-foot containers. Table -.10 presents the TEU/container ratio used in FastPath scenarios.

Table 2-10
TEU/Container Ratio Distribution

Direction	TEU/Container
Transit inbound	1.2
Transit outbound	1.1

2.3. SCENARIOS FOR FASTPATH ANALYSIS

The dynamics and performance of the seaport terminal vary, depending on the direction of transit cargo: inbound (Ghana to Burkina Faso) or outbound (Burkina Faso to Ghana). Performance also varies depending on whether the cargo is containerized or noncontainerized (breakbulk). We created three FastPath scenarios to assess corridor performance:

1. Inbound containerized
2. Outbound containerized
3. Inbound noncontainerized

Although 70 percent of outbound transit cargo is transported from Ouagadougou to Tema without the use of containers, before the cargo enters the port it is consolidated. Because cargo handling at the port is performed only in containers, the analysis at the terminal for the outbound direction requires only one scenario. To account for the time and cost incurred during the stripping and consolidation of containers, the two containerized scenarios (Scenarios 1 and 2) have two different subchains. A detailed description and analysis of each scenario is presented in Chapter 3.

2.4 SUMMARY STATISTICS FOR CORRIDOR PERFORMANCE

Tables 2-11 through 2-13 summarize the cost, time, and reliability of the Tema-Ouagadougou Corridor's transport/logistics chain from a shipper's point of view for the three transit traffic scenarios. These tables also show the norms for good global standards. Costs have been broken down into official and unofficial, in accordance with the information provided by the WA Trade Hub. Because the information on cost is sometimes applicable for a truck, but other times is applied per container or even on a per-ton basis, using the total cargo volume and number of containers handled during 2008, the cost for containerized cargo has been adjusted to determine the unit costs per TEU. Similarly, all costs for noncontainerized cargo have been adjusted to a per-ton basis.

Table 2-11

Performance of Main Subcomponents of Inbound Containerized Transit Traffic, 2009 (Scenario 1)

Component	Cost (US$/TEU)			Time (hours)		Reliability*	
	Official	Unofficial	Norm Range	Total	Norm Range	%	Norm Range
Av. channel operations**	146.60	–	5–15	40.8	1–15	93.1	5–40
Av. unloading at berth***	46.70	–	10–50	20.4	4–8	15.6	5–50
Total yard handling	263.94	35.54	30–145	352.0	10–35	2.1	5–40
Customs w/o guarantee fund premium (0.5% of dutiable cargo value) for Inbound	110.63		15–55	56.0	24–60	8.0	5–90
Stripping process	73.58	34.64	–	8.0	–	50.0	–
Transit yard	–	–	–	6.5	–	15.4	–
Road transport	2,471.75	21.55	50–160	26.5	17–26	Varies by segment	5–100
Border crossing at Paga	–	15.65	5–15	1.0	1–3	50.0	5–100
Border crossing at Dakola w/o guarantee fund premium (0.25% cargo value) for inbound	44.72	10.96	5–15	2.0	1–3	72.9	5–100
Ouagarinter	298.71	87.49	30–100	87.7	2–6	234	5–40

Performance based on 2008 data
** The percent of average transit time that would include 90% of shipments.*
*** Including a port surcharge of $140 for delays to ships in channel*
**** Average unloading time per container is half the average time for ship unloading.*

Table 2-12

Performance of Main Subcomponents of Outbound Containerized Transit Traffic, 2009 (Scenario 2)

Component	Cost (US$/TEU)			Time (hours)		Reliability*	
	Official	Unofficial	Norm Range	Total	Norm Range	%	Norm Range
Ouagarinter	229.28	5.95	30–100	2.5	2–6	160.0	5–40
Border crossing at Dakola	11.52	–	5–15	1.0	1–3	50.0	5–100
Border crossing at Paga	106.20	36.00	5–15	6.7	1–3	68.0	5–100
Road transport	930.15	16.39	50 - 160	26.5	17 - 26	Varies by segment	5–100
Consolidation process	55.96	–	–	6.0	–	25.0	–
Customs at Tema port	–	4.50	15–55	3.5	24–60	39.3	5–90
Total yard handling	151.02	5.40	30–145	1.8	10–35	35.7	5–40
Av. loading at berth**	46.70	–	10–50	20.4	4–8	15.6	5–50
Av. channel operations***	146.60	–	5–15	1.1	1–15	22.7	5–40

Performance based on 2008 data
** The percent of average transit time that would include 90 percent of shipments.*
*** Average unloading time per container is half the average time for ship unloading.*
**** Including a port surcharge of $140 for delays to ships in channel*

Table 2-13

Performance of Main Subcomponents of Inbound Noncontainerized Transit Traffic, 2009 (Scenario 3)

Component	Official Cost (US$/ton)	Unofficial Cost (US$/ton)	Time (hours)	Reliability* (%)
Av. channel operations	0.42	–	47.6	78.9
Av. unloading at berth	1.08	–	78.7	52.8
Total yard handling	9.12	1.50	352.0	4.1
Customs w/o guarantee fund (0.5% of dutiable cargo value) for inbound	3.39		56.0	8.5
Transit yard	–	–	6.5	15.4
Road transport	71.91	1.09	26.5	Varies by segment
Border crossing at Paga	–	0.79	1.0	50.0
Border crossing at Dakola w/o guarantee fund (0.25% cargo value) for inbound	2.27	0.56	2.0	72.9
Ouagarinter	15.09	4.52	87.7	234.0

Performance based on 2008 data
** The percent of average transit time that would include 90 percent of shipments.*

The containerized cargo scenarios (Scenarios 1 and 2) have been assigned logistics scores. This score is computed by comparing the performance of a component of the transport/logistics chain and rating it as good, fair, poor, or very poor, according to international standards. This rating is then converted 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 get the total score for a component.

These scores are then given a time-weighted average to compute the subchain total, with reliability treated as variance with a special calculation of the subchain total. If there is more than one subchain in a chain, the scores of the subchains are averaged to compute the chain total. The logistics scores for Scenarios1 and 2 are presented in Tables 2-14 and 2-15, respectively. A logistics score between 70 and 80 indicates that time, cost, and reliability in the total 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.[2]

The scenario for noncontainerized cargo (Scenario 3) does not feature logistics scores. Handling of noncontainerized cargo at the port varies depending on the type of cargo and the equipment used; therefore establishing a standard measure for performance and comparing it among different subchains is difficult. Consequently, logistics scores are not generated for noncontainerized cargo, but the results for time, cost, and reliability for each subcomponent and the overall subchain can be derived and analyzed.

Table 2-14
Logistics Scores for Inbound Containerized Cargo, Scenario 1

	TEU/Year	Average Price	Average Time	Reliability	Logistic Score	Rating
Total Chain	15,807	$3,630	599 hours	81%	53	Fair-Poor
			LOGISTICS SUBCHAINS			
Direct Containers	4,743	$3,554	593 hours	82%	54	Fair-Poor
Stripped Containers	11,064	$3,662	601 hours	81%	53	Fair-Poor
Node	**Logistic Score**	**Rating**	**Link**		**Logistic Score**	**Rating**
Tema Port	55	Fair-Poor	Tema port - Transit Yard Road		43	Poor
Transit Yard	53	Fair-Poor	Transit Yard - Apedwa Road		50	Fair-Poor
Apedwa Direct	–	–	Apedwa – Kumasi Road		60	Fair
Apedwa Stripped	40	Poor				
Kumasi	–	–	Kumasi – Paga Road		67	Fair-Good
Paga	73	Good-Fair	Paga – Dakola Road		50	Fair-Poor
Dakola	67	Fair-Good	Dakola – Ouagarinter Road		60	Fair
Ouagarinter	22	Very Poor				

2 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.

Table 2-15
Logistics Scores for Outbound Containerized Cargo, Scenario 2

	TEU/Year	Average Price	Average Time	Reliability	Logistic Score	Rating
Total Chain	862	$1,729	67 hours	33%	65	Fair-Good
LOGISTICS SUBCHAINS						
Direct Containers	259	$1,689	63 hours	35%	66	Fair-Good
Consolidated Containers	603	$1,745	69 hours	32%	64	Fair-Good
Node	**Logistic Score**	**Rating**	**Link**		**Logistic Score**	**Rating**
Ouagarinter	53	Fair-Poor	Ouagarinter – Dakola Road		73	Good-Fair
Dakola	80	Good	Dakola – Paga Road		63	Fair
Paga	53	Fair-Poor	Paga – Kumasi Road		80	Good
Kumasi	–	–	Kumasi – Apedwa Road		73	Good-Fair
Apedwa Direct	–	–	Apedwa – Tema Port Road		63	Fair
Apedwa Consolidated	40	Poor				
Tema Port	72	Good-Fair				

In the next chapter, we explain in more detail how FastPath was used to model the scenarios and how the logistics scores for each scenario were generated.

3. Analysis

The analysis of the corridor performance was carried out using FastPath. In this chapter we describe the FastPath model and introduce the results that will be interpreted in Chapter 4. At the end of the chapter we also present the general framework of the concession agreement between MPS and GPHA, its potential effects on competition and pricing, and possible remedies to overcome the concession's competitive constraints.

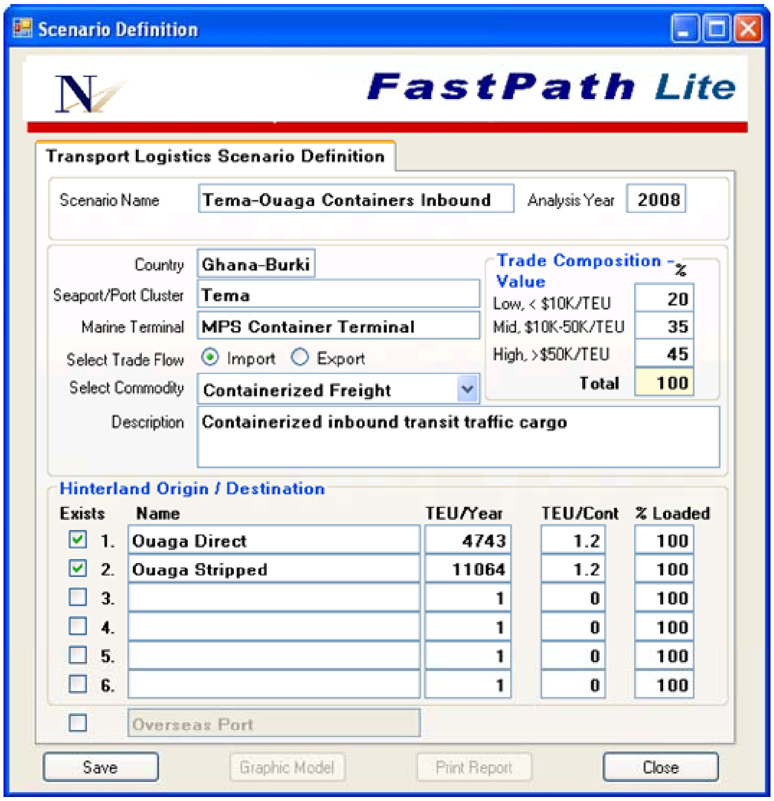
This analysis was conducted, for the most part, with data collected by the WA Trade Hub in the context of the RRTC analysis summarized in February 2009. Consequently, in some cases, we needed to reorganize the data provided by the WA Trade Hub and other sources to adapt them to the variables used by FastPath. This is particularly relevant to data on transit traffic volume, containerized vs. stripped cargo, trade composition distribution, TEU/container ratio, and informal payments. We also needed to set assumptions about the characteristics of certain infrastructure components. We incorporated into the FastPath model several assumptions on data input, ensuring that our analysis considered the most relevant characteristics and particularities encountered along the Tema-Ouagadougou corridor. Appendix B has more information on data input, assumptions, and definitions.

3.1 SCENARIO 1: INBOUND (GHANA TO BURKINA FASO) CONTAINERIZED TRANSIT TRAFFIC

The network for this scenario begins at the MPS terminal as the entry node to the corridor and Ouagadougou as the hinterland destination node. All import transit cargo entering Burkina Faso must be cleared in a Customs facility known as Ouagarinter, with a few exceptions where temporary storage and clearance are authorized at bonded facilities in the warehouses of authorized freight forwarders. Our analysis includes only Ouagarinter. For simplification in FastPath, two hinterland nodes were created to differentiate cargo transported directly in containers from stripped cargo: the time, delays, and cost of stripping the containers are different. All other characteristics remain constant. In both subchains (direct containerized vs. stripped), the Customs process starts at the border where the cargo consignment is entered into the Customs system but the actual clearing process is undertaken in Ouagatinter.

Figure 3-1 shows the major characteristics of the inbound flow of containerized cargo coming into Burkina Faso through the Tema-Ouagadougou corridor. The estimated number of containers handled in this direction during 2008 accounted for about 15,800 TEU. Of this total, about 70 percent of the containers are stripped and the goods transferred to trucks. Depending on the size of the truck, once the container is stripped the trucks are filled with one, two or even two and a half 20-foot containers.

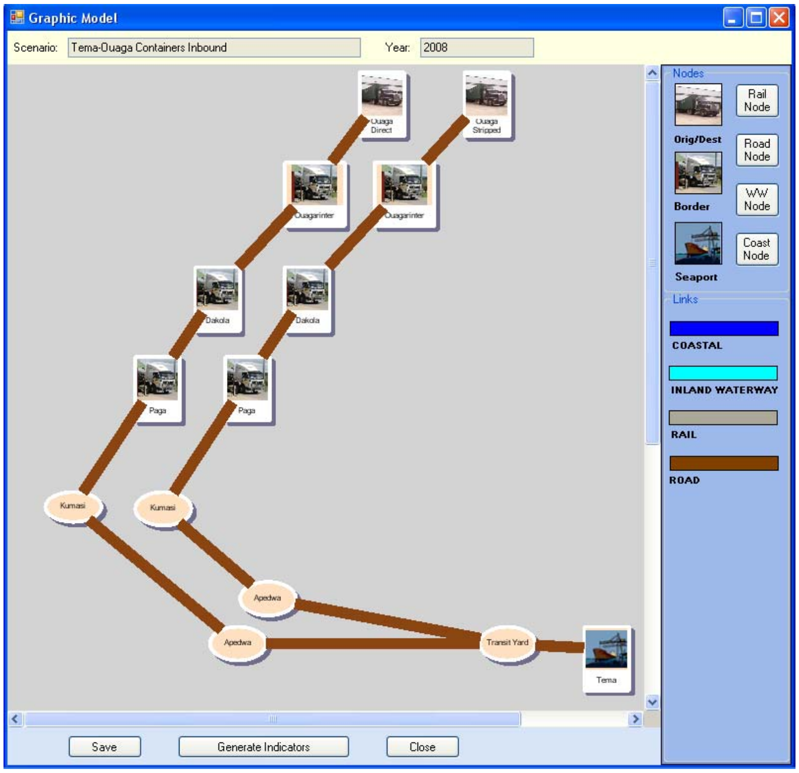
Figure 3-1
Transit Flows Included in the FastPath Inbound Containerized Scenario (Scenario 1)



This stripping process increases the cost, increases the risk of breakage and loss, and potentially compromises the bonded status of transit cargo. It also promotes the overloading of trucks to save on the fixed costs per unit transported, resulting in damage to the road infrastructure. For the purpose of our analysis, we assume that 50 percent of the 20-foot containers are carried by one small truck and the other 50 percent is carried by larger trucks (two 20-foot containers per truck); 40-foot containers are always carried by one big truck.

Figure 3-2 presents a graphic model of the two subchains for fully containerized and stripped cargo. Although the characteristics of the links are the same for both subchains, there are differences in cost and time in the port node, which includes stripping in the stripped subchain.

Figure 3-2
FastPath Schematic Representation of Tema-Ouagadougou Corridor for Subchains of Containerized Inbound Transit Traffic



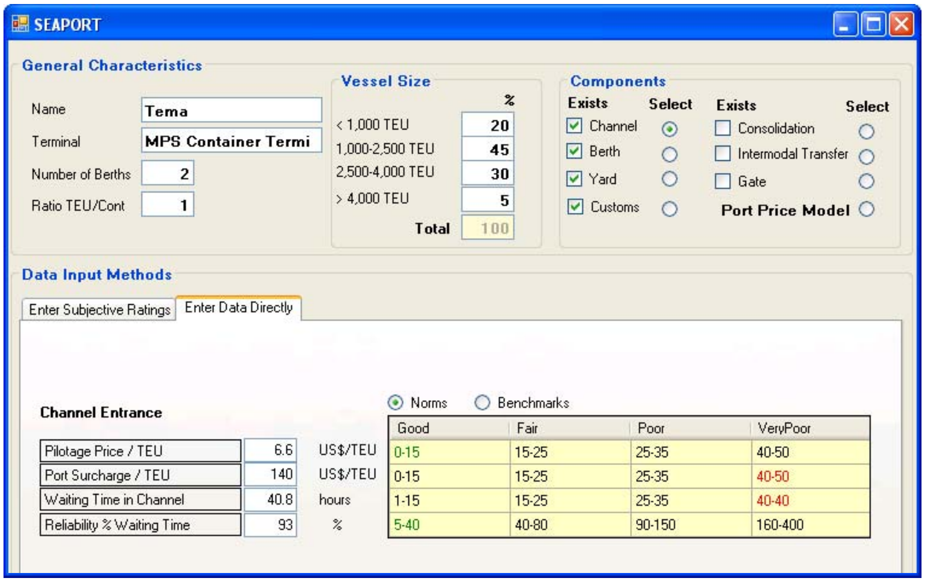
3.1.1 Port Performance

When the graphic model of the corridor has been created, the relevant data for corridor nodes and links (e.g., ports, road segments, border crossings, Customs) is input for each subchain. The data required for seaport nodes include the time, cost, and reliability for the operations at the channel, berth, yard, and Customs. The data for the channel and berth operations were provided by MPS, the terminal operator, and GPHA. The data included the number of vessels that called the port in 2008 and a detailed description of the vessels, including size (LOA and GRT), waiting time spent at anchor, time spent sailing the channel, time at berth, berth assigned, and number of TEU handled per vessel. This information is provided in Appendix B. With this information and the port tariff, cost and time per TEU were derived. (Assumptions informing this calculation are presented in Appendix B.) Information for Customs and yard operations were derived from the detailed information collected by the WA Trade Hub. Figure 3-3 shows the data entry screen for the channel operations.

The data entry screen for channel operations has two main parts: top and bottom. The top required the input of general information associated with the characteristics of the seaport and the bottom allows for the input of specific information for each subcomponent. On the bottom right, the norms from the FastPath database are shown. These norms will later be used to generate the logistics score for the subcomponent. For channel operations, the pilotage, towage, and mooring cost of US$6.60 per TEU falls in the range of the good norm. Similarly, the 40.8-hour vessel waiting time is excessive and according to global standards falls in the range of very poor.

Figure 3-3

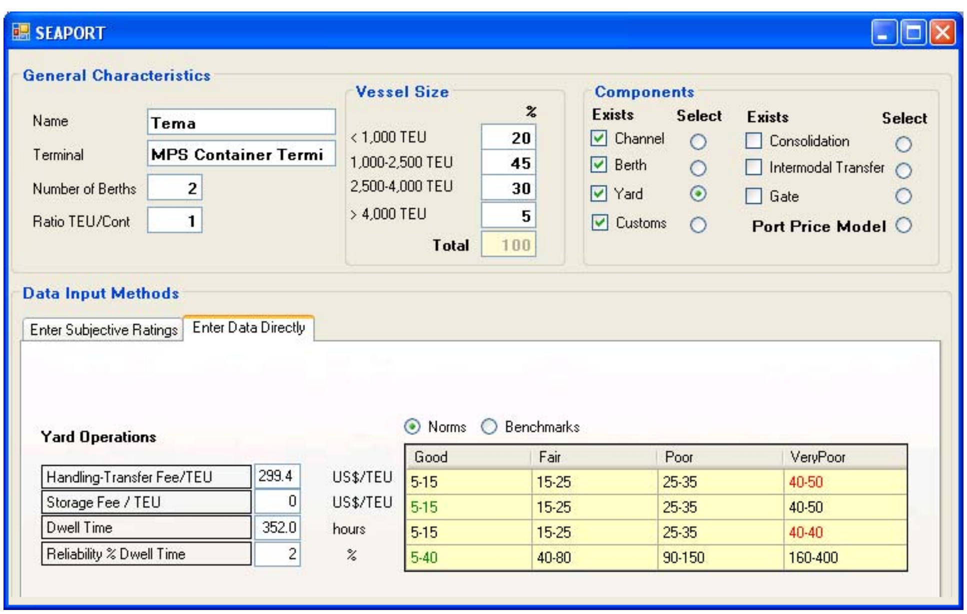
FastPath Data Entry Screen for Channel Operations



Similar screens are used for the other components of the seaport, including berth, yard, and Customs processes. Figure 3-4 presents the data entry screen for the yard operations showing handling and transfer fees, storage fees, dwell time, and the reliability of dwell time. The handling and transfer fees include port handling charges, dock fees for transferring containers from the temporary stacking area at the quayside to the main yard, shipping line charges (release), and forwarder fees. The storage charges are zero because transit cargo remains an average 17 days at the port and the free storage period for transit cargo is 21 days.

Figure 3-4

FastPath Data Entry Screen for Yard Operations



The data for time, cost, and reliability for containerized inbound transit cargo were presented in Table 2-11. The only difference between the direct containerized and stripped subchains is the additional process carried out at the port to strip the containers, incurring an additional cost of $108.22 (combined official and unofficial) and additional time of 8 hours.

3.1.2 Road Performance

After entering the information for the seaport, we entered the data for the other corridor components. As with port performance, this is done for both the direct containerized and stripped subchains. All transit cargo leaving the port has to go to the transit yard before proceeding to its final destination. Trucks spend an average of 6.5 hours in the transit yard, with an average additional delay of two hours observed. This information is incorporated into the model using the transit node, as presented in Figure 3-5.

Figure 3-5

FastPath Data Entry Screen for Transit Yard Node

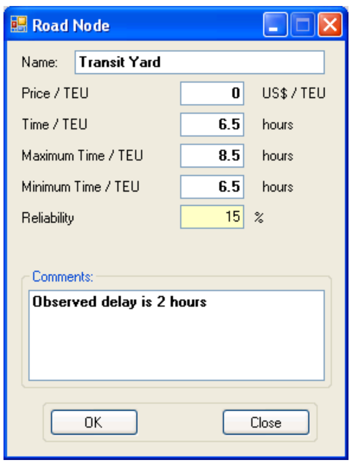
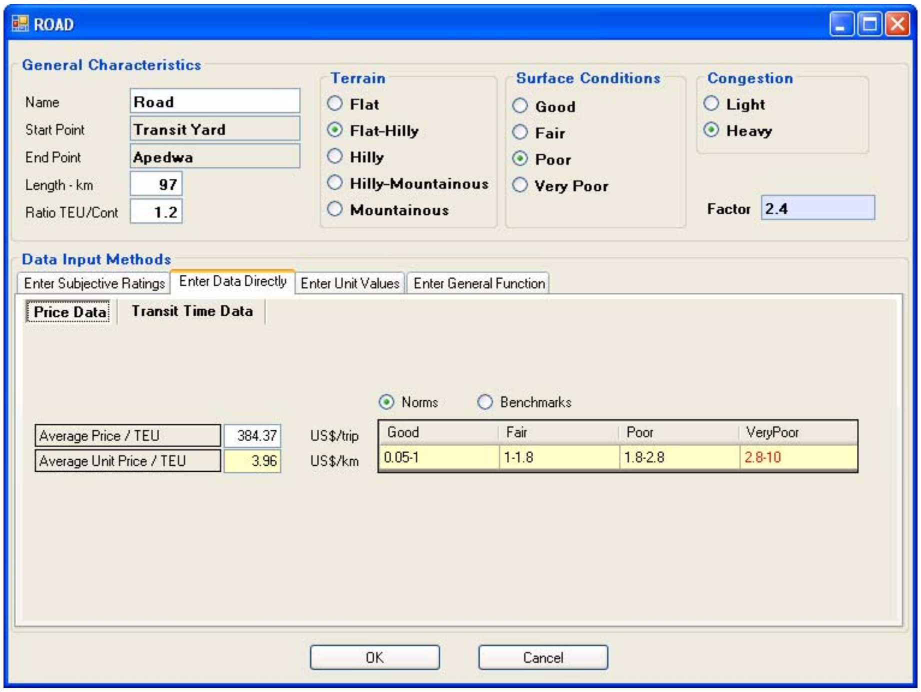


Table 2-5 presented the characteristics of the road segments that informed the road component analysis. FastPath produced data entry screens for each road segment; but we present only one of these screens here, for the segment connecting the transit yard in Tema with Apedwa, in Figure 3-6.

Figure 3-6

FastPath Price Data Entry Screen for the Road Link Connecting Tema with Apedwa



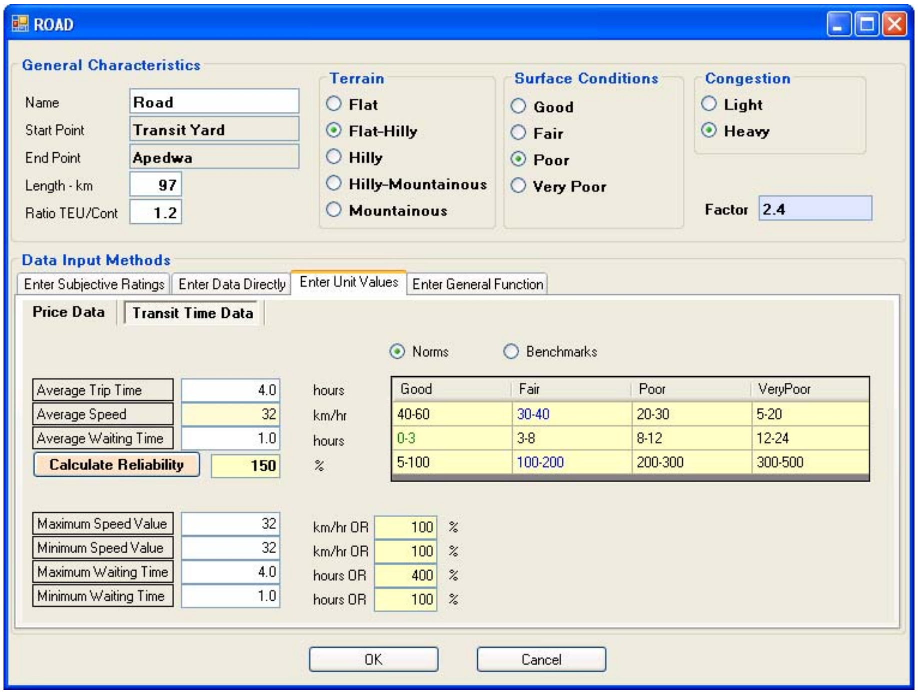
As with the seaport data entry screen, the road segment screen has two parts: the top for general information and the bottom for price data. According to the data obtained from the WA Trade Hub, OTRAF trucking rates inbound from Tema to Ouagadougou are US$2,142 for a 20-foot container and US$3,094 for a 40-foot container. With the information on the number of 20-foot and 40-foot transit containers that passed through Tema port with a final destination of Burkina Faso, we established the weighted transport cost of US$2,493 per TEU from Tema to Ouagadougou. These rates include the informal payments truck drivers incur during the journey. The WA Trade Hub, through the Improved Road Transport Governance program, has been monitoring informal payment along major corridors in West Africa. According to the Trade Hub's statistics for the third quarter of 2008, informal payments and delays per truck along the Tema-Ouagadougou corridor accounted for US$32.77 and about 4 hours, respectively. The amount of informal payments per truck is equivalent to US$21.55 per TEU.

The total road transport cost must be broken down in order to establish the cost per segment. Considering the general characteristics of the segment, including the terrain, surface conditions, and traffic congestion, FastPath establishes a road segment factor. Given the conditions of flat-hilly terrain, poor surface condition, and heavy congestion of the segment linking the Tema transit yard with Apedwa, the road segment factor is 2.4. With the total length of the segment, the road segment factor, and the total road transport cost, we establish an average price per TEU of US$384.37 for this segment. The unit price per TEU is therefore US$3.96, which falls in the very poor range. A similar procedure is used to determine the average price for each subsequent segment.

Figure 3-7 presents the transit time data screen for the Tema-Apedwa road segment. The information entered into the model was based on the average travel time during the field visit to Ghana and Burkina Faso and cross-checked with interviews with cargo owners and truck drivers. For this link, the average trip time is about 4 hours and average waiting time 1 hour. With this information and the length of the segment, we establish an average speed of 32 km/h for the segment.

Figure 3-7

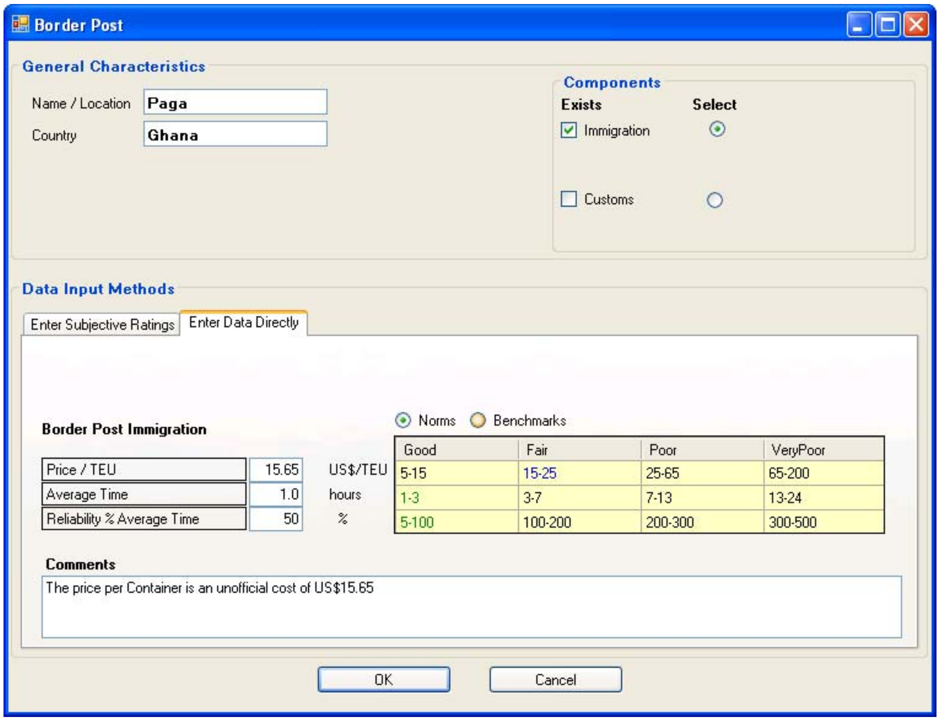
FastPath Transit Time Data Entry Screen for the Road Link Connecting Tema with Apedwa



3.1.3 Border Post and Customs Performance

Besides the Customs operations at Tema port, three other processes are related to Customs operations along the corridor: Customs clearance at the Paga (Ghana) and Dakola (Burkina Faso) border posts and the Customs clearance process at Ouagarinter. The WA Trade Hub draft report details the time, costs, and delays experienced in the different processes undertaken in each border post. This information was the basis for the data entered into FastPath, as depicted in Figure 3-8. The figure shows the information associated with the border operations at Paga for inbound transit cargo. Operations at Paga in the inbound direction are associated mainly with the confirmation that the transit cargo is leaving the country and with immigration procedures for trucks and truckers.

Figure 3-8
FastPath Data Entry Screen for Paga Border Post Inbound Operations



Although no official costs are incurred at Paga in the inbound direction, US$23.80 per truck is paid unofficially. This is equivalent to US$15.65 per TEU. The processes takes on average 1 hour, with delays of about 1 additional hour, indicating that reliability is 50 percent. The performance for price, time, and reliability fall in the ranges of fair, good, and good respectively.

Figure 3-9 shows the operations at Dakola Border Post, where processes are associated mainly with pre-Customs declaration and immigration of trucks and truckers. Pre-Customs declarations are entered into the system at this point but the majority of goods have to be cleared in Ouagarinter. The operations at Dakola include US$44.72 of official costs, which do not include the guarantee fund premium of 0.25 percent of the cargo value, and US$10.96 unofficial costs. The processes take about 2 hours on average, and the reliability is 73 percent, given that the maximum time for the processes could be 4.92 hours. Performance for price is poor, while average time and reliability are good.

Figure 3-9
FastPath Data Entry Screen for Dakola Border Post Inbound Operations

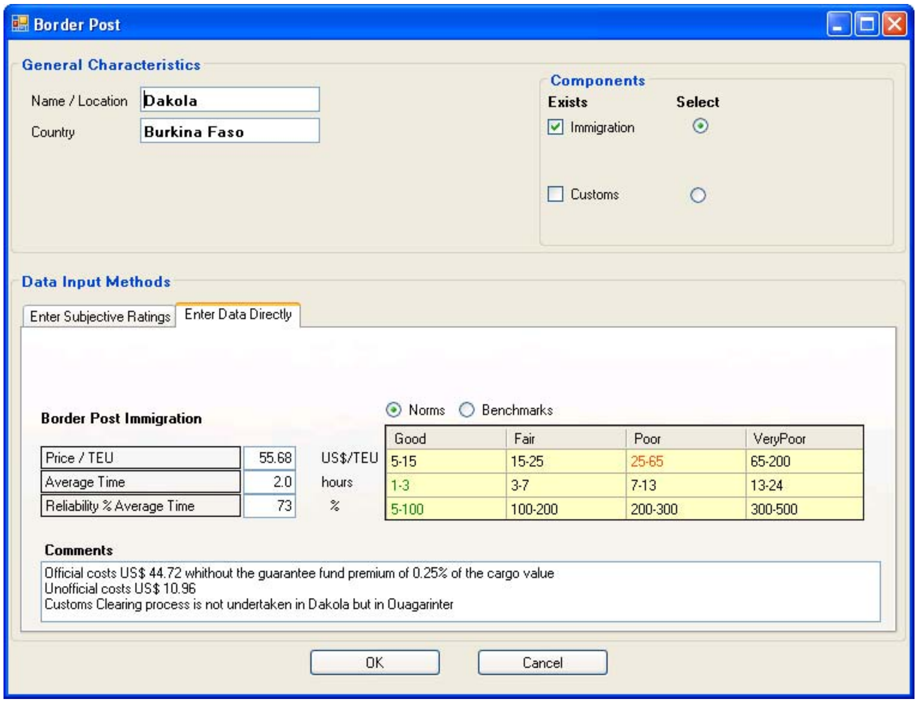


Figure 3-10 shows the Customs data entry screen for Ouagarinter. The WA Trade Hub Draft Report explains in detail the different processes undertaken in Ouagarinter which account for a total of US$386.20 (official and unofficial), 87.7 hours (3.65 days), and reliability of 234 percent which all fall into the very poor performance for Customs.

Once all the information has been input into the model, FastPath generates indicators which are summaries of all data (price, time and reliability) by subchain and for the total chain. For containerized freight FastPath also calculates an overall logistics efficiency score ranging between 20 (poor) and 80 (good). Figure 3-11 presents the FastPath summary output screen for inbound containerized freight.

The overall score is a good indication of performance of the logistics chain but these values represent a total for all containers in the scenario and weighted averages of price, time, reliability, and overall logistics efficiency score over all the subchains. Additional information for each subchain can be displayed to identify those components that perform less efficiently than others. Figure 3-12 presents a break down of the logistics score for the components of the containers direct traffic. A similar screen can also be displayed for the stripped subchain. A further break down of the Tema seaport node displays the performance of the subcomponents that form the terminal. It is at this level where the logistics scores are generated.

Figure 3-10
FastPath Data Entry Screen for Ouagarinter Customs Operations

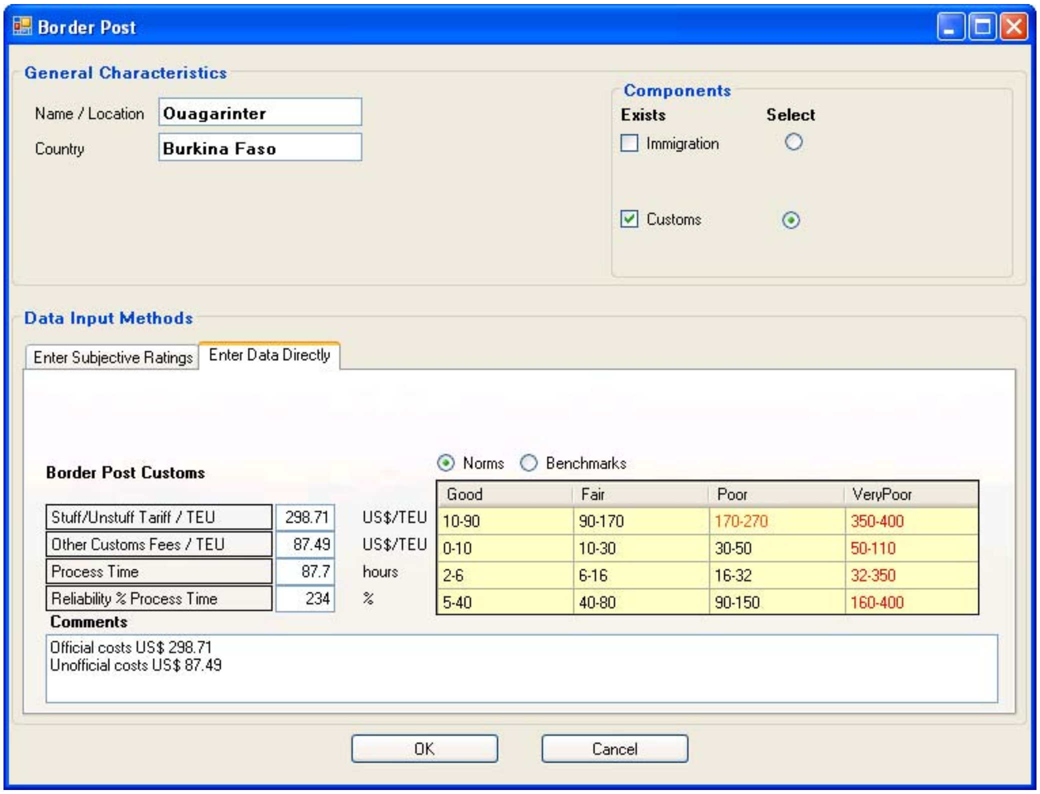


Figure 3-11
FastPath *Summary Output Screen for Tema-Ouagadougou Inbound Containerized Traffic*

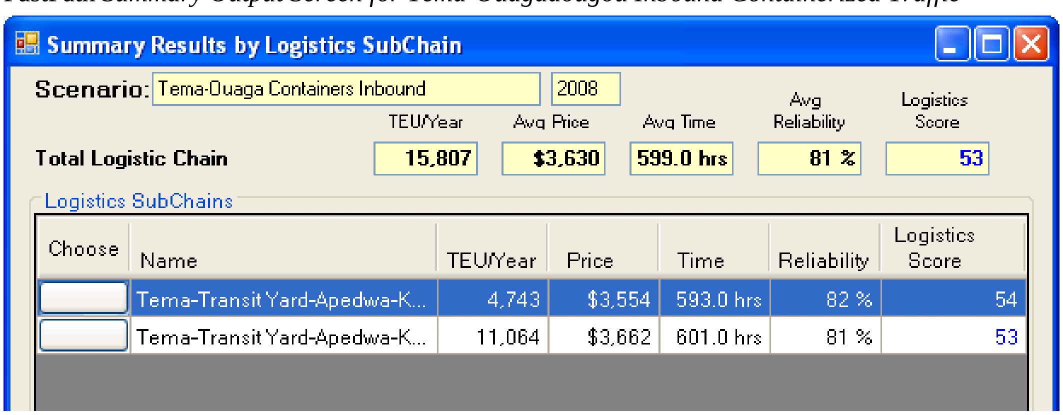


Figure 3-12
FastPath *Summary Output Screen for Direct Containerized Inbound Traffic*

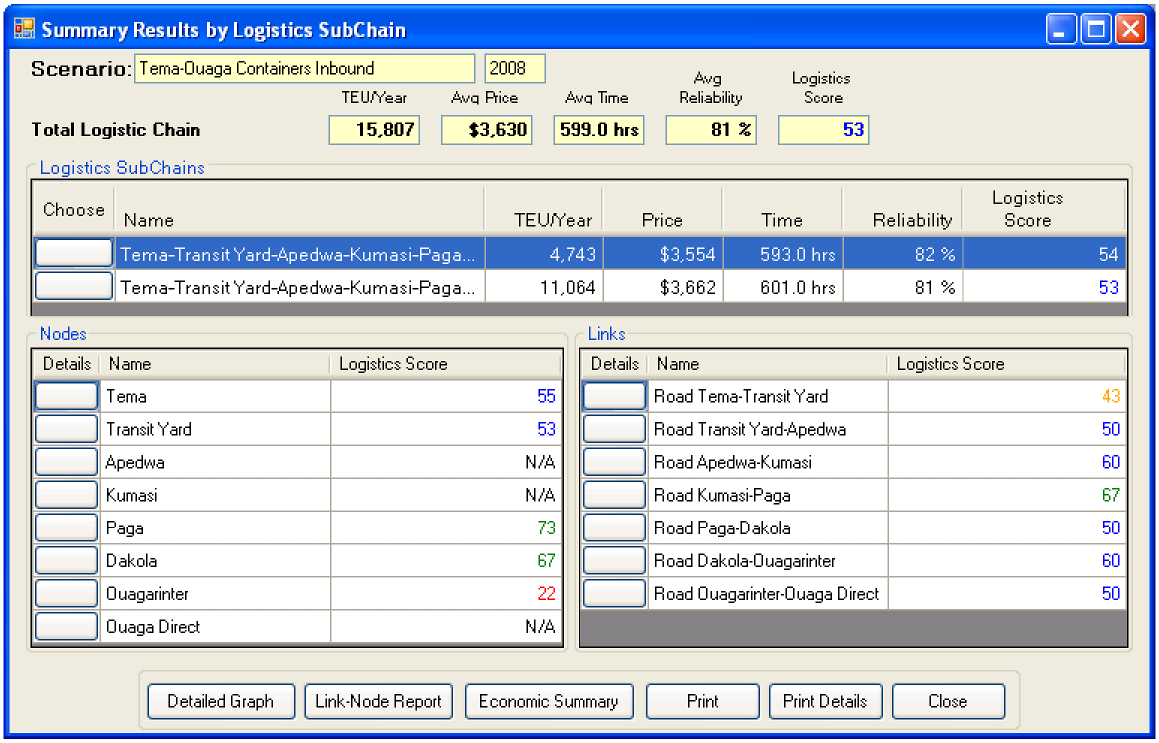
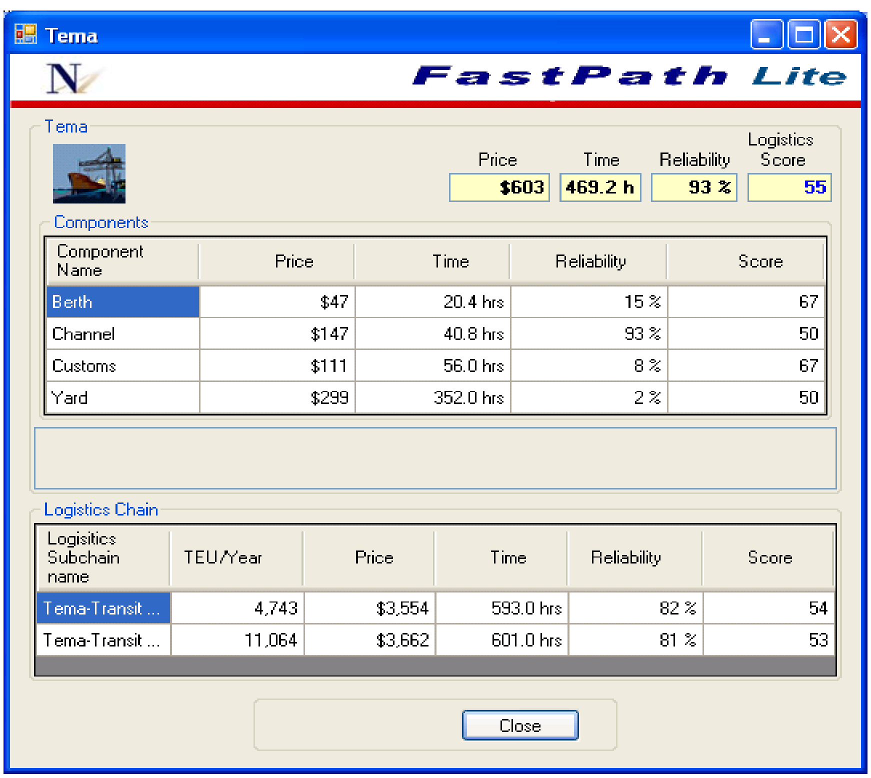


Figure 3-13
FastPath Tema Port Performance for Containerized Inbound Traffic



3.1.4 Analysis of Logistics Scores

As mentioned at the end of Chapter 2, the logistics scores are based on a comparison of the performance of the particular component with the norms. Using the values from the operations at the channel presented in Figure 3-3, Table 3-1 shows how the logistics score is generated. The performance of each component in terms of time, cost, and reliability is assigned a score in accordance with the associated rating—80 for good, 60 for fair, 40 for poor and 20 for very poor. Then the component logistics score is determined as the average score of the three variables (time, cost, and reliability).

Table 3-1
Calculation of Logistics Scores for Berth Operations

Variable	Value/TEU	Norm Range	Rating	Score
Price per TEU	46.7	10–50	Good	80
Average time ship-yard	20.4	16–24	Poor	40
Reliability % Average Time	15	5–50	Good	80
			Component Logistics Score	67

Similar calculations are undertaken for each and all the components of the logistics chain. The overall logistics efficiency score for a logistics subchain is calculated as a weighted average of the individual logistics scores of the elements of that subchain. The weighting factor is the time taken at each step.

A quick review of the logistics scores generated for the containerized inbound scenario show that the performance of most of the road links is fair-good or poor with scores of 50 and 60. Cost is the variable that lowers the road link scores. The performance at Ouagarinter is very poor (22) for all variables. The port also shows low performance at the yard (50) and at the channel (50). We present a more detailed interpretation of these results in Chapter 4.

3.2 SCENARIO 2: OUTBOUND (BURKINA FASO TO GHANA) CONTAINERIZED TRANSIT TRAFFIC

The Tema-Ouagadougou transport corridor has relatively little transit cargo moving in the outbound direction (Burkina Faso to Ghana). Furthermore, in 2008 all outbound transit cargo handled through Tema was exported by container. The total number of export containers was 862 TEU. These included an estimated 259 containers transported directly from Ouagadougou to Tema and cargo transported as breakbulk in trucks and consolidated at the shipping line’s yard in Tema. As mentioned earlier, consolidation requires more time and charges than full containers arriving directly from Ouagadougou. These activities are similar to the stripping of containers presented in Section 2.2.2. The consolidation charges are incorporated into the subchain using consolidation costs and time.

The trucks bringing noncontainerized cargo from Ouagadougou to be consolidated in Tema carry an average volume of two 20-foot container loads. Therefore, the charges that apply to a truck are accounted for in the equivalent charge for two 20-foot containers (2 TEU). As opposed to the inbound direction where in some cases trucks would carry only one 20 foot container, in the outbound direction cargo owners tend to consolidate bigger trucks to save on fixed costs. In determining the total TEU cost for outbound traffic and given that all cargo is handled at the port in containers, it is assumed that MPS is the container terminal where all cargo is discharged and then loaded to ships. Therefore, the charges at the port used in the FastPath model are those associated with the MPS terminal. Figures 3-14 and 3-15 present the characteristics of the outbound flows and the schematic representation of the corridor for containerized outbound cargo, respectively.

Figure 3-14

Characteristics of the Containerized Cargo Included in the FastPath Outbound Transit Scenario

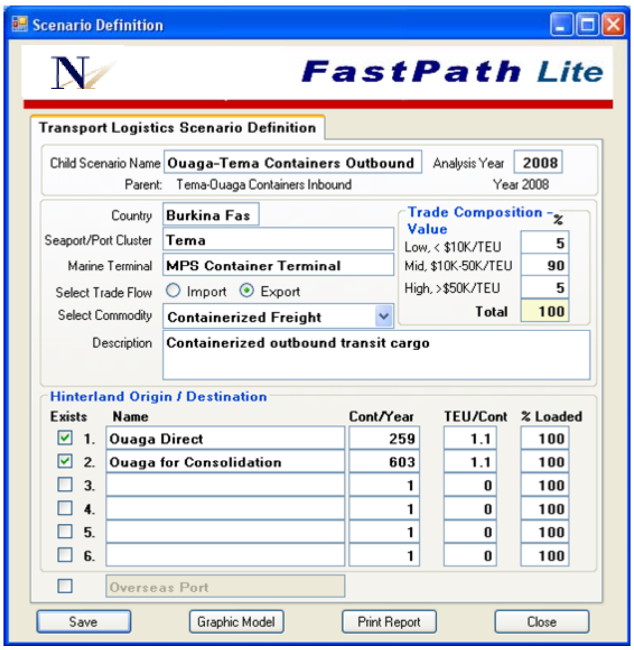
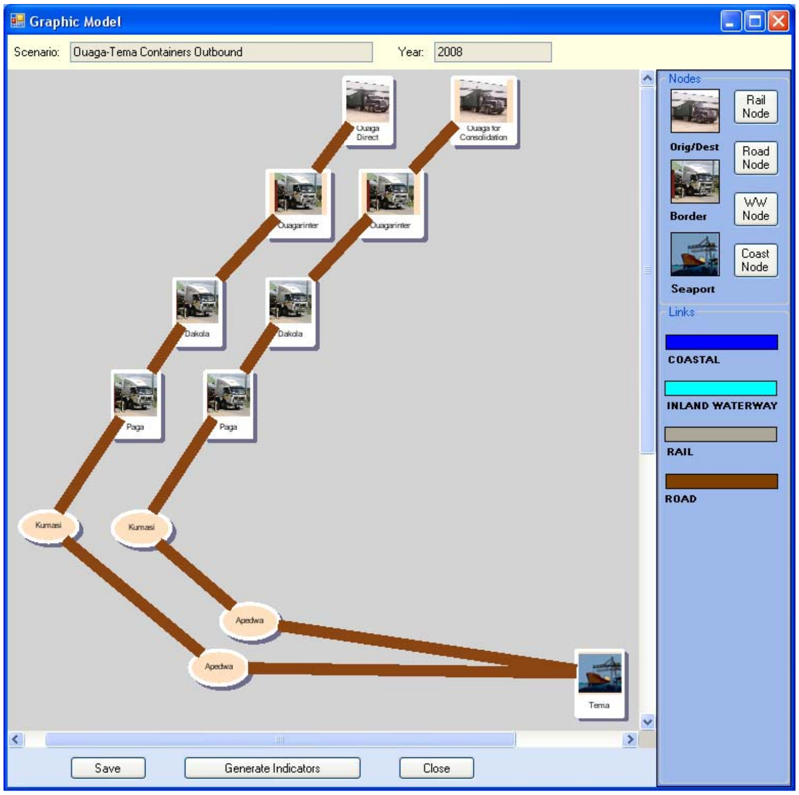


Figure 3-15

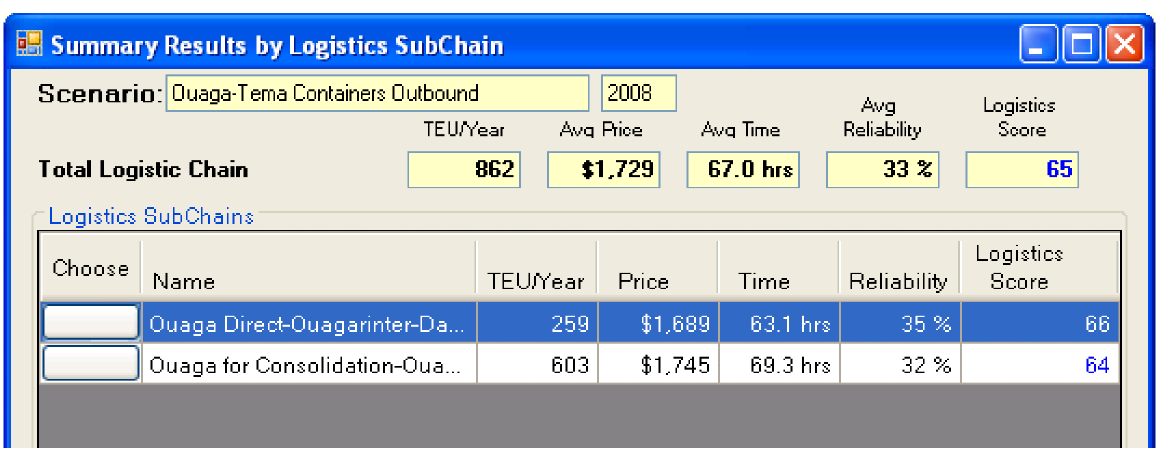
FastPath Schematic Representation for Outbound Containerized Transit Cargo



Logistics scores for this scenario were generated following the same procedure described in section 3.1.1. Figures 3-16, 3-17, and 3-18 present the most relevant results for the outbound containerized scenario.

Figure 3-16

FastPath Summary Output Screen for Tema-Ouaga Containerized Outbound Traffic


Summary Results by Logistics SubChain

Scenario: Ouaga-Tema Containers Outbound 2008

	TEU/Year	Avg Price	Avg Time	Avg Reliability	Logistics Score
Total Logistic Chain	862	$1,729	67.0 hrs	33 %	65

Logistics SubChains

Choose	Name	TEU/Year	Price	Time	Reliability	Logistics Score
	Ouaga Direct-Ouagarinter-Da...	259	$1,689	63.1 hrs	35 %	66
	Ouaga for Consolidation-Oua...	603	$1,745	69.3 hrs	32 %	64

Figure 3-17
FastPath Summary Output Screen for Direct Outbound Traffic

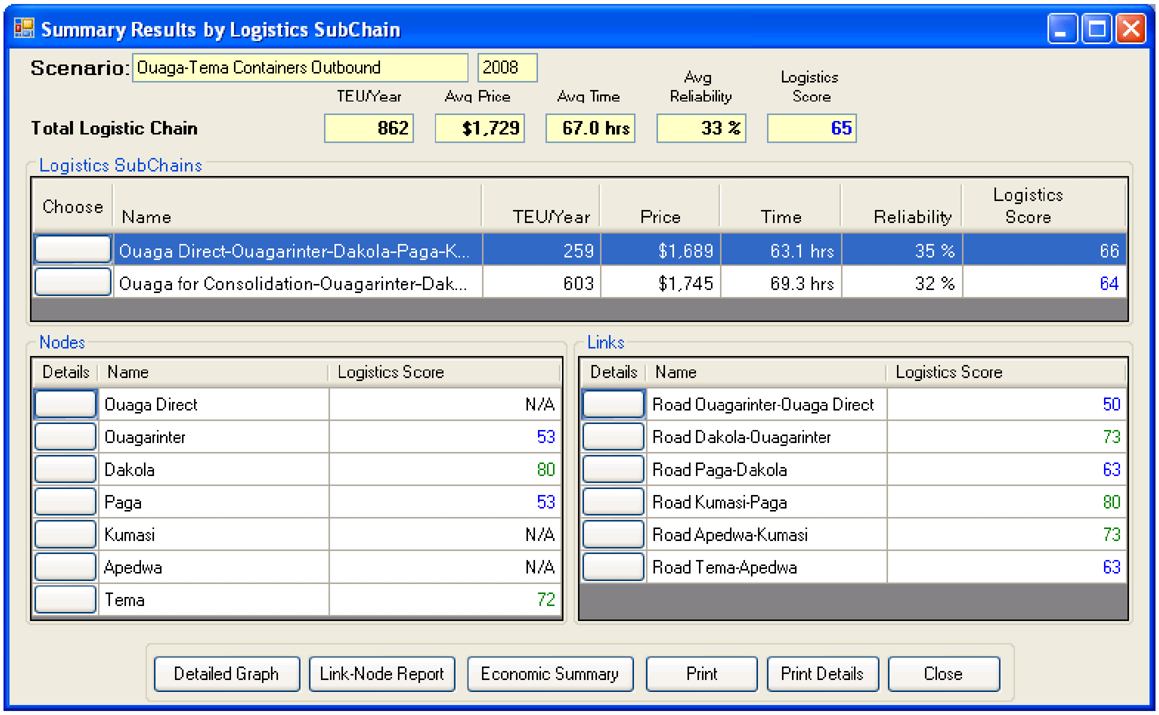
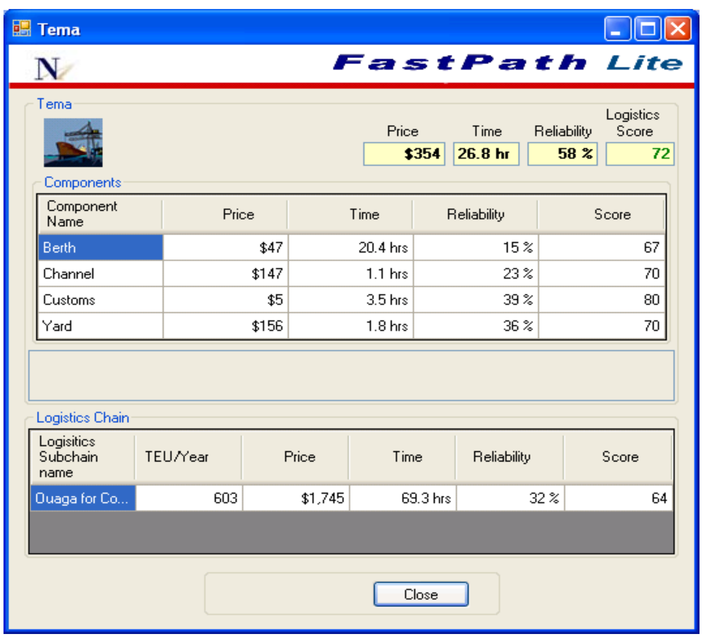


Figure 3-18
FastPath Tema Port Performance for Outbound Traffic



The performance in the containerized outbound scenario suggests that corridor performance outbound is better than inbound. The nodes that have the lowest score include operations of Customs in Ouagarinter (53), due to the cost of transit documents, and at the Paga border post

(53) also due to the costs incurred while entering Ghanaian territory. The improvement in the performance of road links is due to lower transport costs in this direction. The performance at the port is also good considering that there is rarely any storage of export cargo and Customs operations are also short and inexpensive.

3.3 SCENARIO 3: INBOUND (GHANA TO BURKINA FASO) NONCONTAINERIZED TRANSIT TRAFFIC

Although the majority of cargo arriving at Tema for transport to Burkina Faso is containerized, about 36 percent of the cargo is shipped in breakbulk form. This includes bagged cargo, iron and steel, frozen products, and machinery and equipment. Breakbulk handling processes at the port are very different from those for containers, requiring different equipment, storage, and times and costs. Accordingly, a different scenario was generated to assess breakbulk cargo.

Given the differing characteristics for handling noncontainerized cargo, ports tend to have separate terminals to handle it. This is the case for Tema port, where general cargo is handled at the Multipurpose Terminal at Quay 1.

FastPath was conceived to measure logistics performance using containers as the major unit of cargo. Handling of containers is standardized and allows for performance comparisons with global standards and on the basis of these norms, generate logistics scores. Nevertheless, handling of noncontainerized freight, different from bulk, is still relevant in many developing countries, particularly in Africa. For the purpose of analyzing the performance of noncontainerized cargo relevant to many West African countries, FastPath has been modified. The assessment still assesses time, cost, and reliability, but the unit used for the analysis is tons instead of TEU.

Charges at the port for discharge of general cargo are based on either direct handling or transfer to trucks or on indirect transfer where cargo is temporarily stored at the port before it is transferred onto trucks. Our analysis assumes that 80 percent of cargo is handled indirectly. Storage time for general cargo handled indirectly is also very long, with an average of 17 days of total dwell time.

During 2008 the estimated volume of breakbulk transit cargo destined to Burkina Faso from Tema port accounted for almost 150,000 tons. Figure 3-19 presents the principal characteristics of the noncontainerized (breakbulk) inbound flows. Figure 3-20 shows the schematic representation of the corridor for noncontainerized freight.

Figure 3-19

Transit Flows Included in the FastPath Inbound Noncontainerized (Breakbulk) Scenario

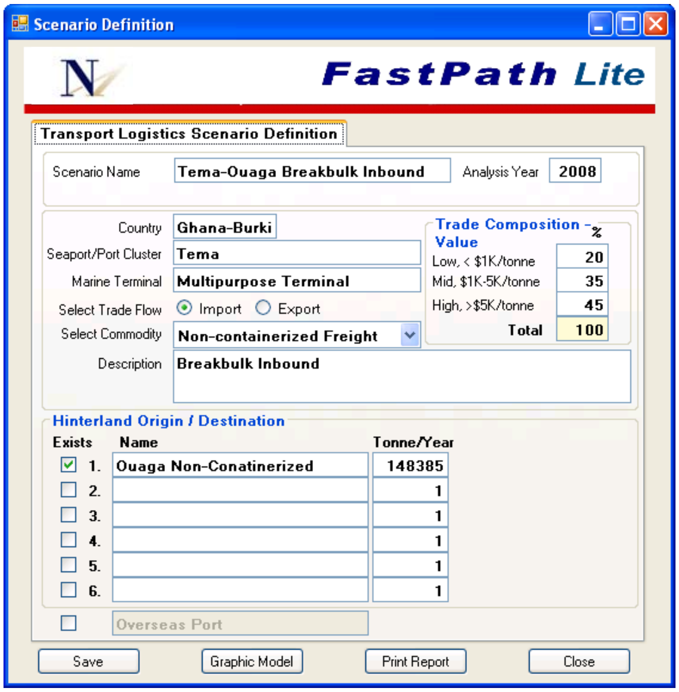
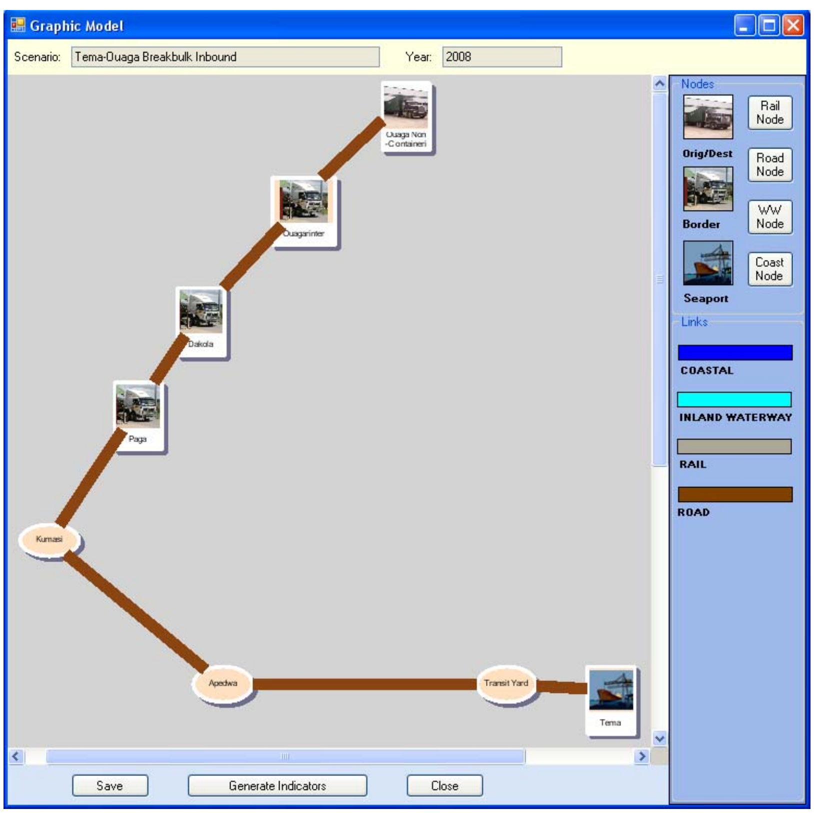


Figure 3-20

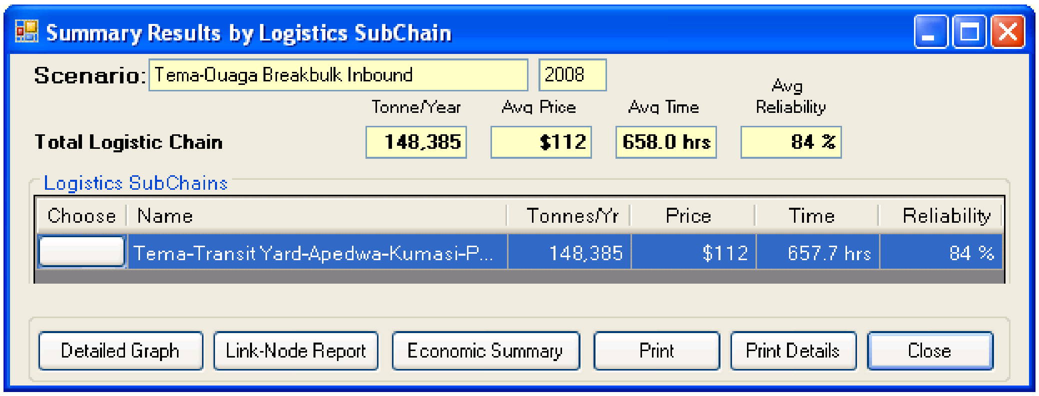
FastPath Schematic Representation for Inbound Noncontainerized (Breakbulk) Transit Cargo



The data for time, cost, and reliability for noncontainerized cargo was incorporated into the model and performance indicators were generated following the same procedures as for containerized cargo. The WA Trade Hub draft report presents the average trucking rates per ton authorized by OTRAF. The historic trend shows increments year by year with values of US$70.21 and US$71.40 for 2006 and 2007, respectively. We therefore assumed that for 2008 the average rate per ton between Tema and Ouagadougou is US$73. The information for road transport time and reliability is the same as for containerized freight. Figure 3-21 presents the overall results for noncontainerized inbound cargo.

Figure 3-21

FastPath Summary Output Screen for Tema-Ouagadougou Inbound Noncontainerized Traffic



3.4 SUMMARY OF FASTPATH RESULTS

Table 3-2 presents a summary of the time, cost, reliability, logistics score, and performance rating for all three scenarios generated for the Tema-Ouagadougou corridor.

To demonstrate the relative economic importance of the corridor within the parameters of each scenario, we used FastPath's economic importance estimation tool to gauge the value of trade flows as a percentage of Burkina Faso's GDP. This also provides a measure of the relative significance of the logistics costs compared to trade value. These estimates were derived by entering the data on transit traffic volumes, trade composition distribution, and TEU/container ratio into the FastPath model.

Table 3-2
Time, Cost, Reliability and Logistics Score for Tema-Ouagadougou Corridor, 2009

Component	Performance Measure					
	TEU/Year*	Avg. Price	Av. Time	Reliability	Logistics Score	Rating
INBOUND CONTAINERIZED TRANSIT TRAFFIC(SCENARIO 1)						
Direct Containers	4,743	$3,554	593 hours	82%	54	Fair-Poor
Stripped Containers	11,064	$3,662	601 hours	81%	53	Fair-Poor
Total Chain	**15,807**	**$3,630**	**599 hours**	**81%**	**53**	**Fair-Poor**
OUTBOUND CONTAINERIZED TRANSIT TRAFFIC (SCENARIO 2)						
Direct Containers	259	$1,689	63 hours	35%	66	Fair-Good
Consolidated Containers	603	$1,745	69 hours	32%	64	Fair-Good
Total Chain	862	$1,729	67 hours	33%	65	Fair-Good
INBOUND NONCONTAINERIZED TRANSIT TRAFFIC*(SCENARIO 3)						
Total Chain	148,385 tons/year	$112 / ton	658 hours	84%	N/A	N/A

Performance based on 2008 data

3.4.1 Scenario 1: Inbound (Ghana to Burkina Faso) Containerized Transit Traffic

The Burkinabe transit traffic containers moved in this transport chain accounted for 15,807 TEU, with an estimated total logistics chain value of $59 million, representing economic activity of 0.7 percent of Burkina Faso GDP. Furthermore, the estimated value of trade flows accounted for $912 million, representing about 11.5 percent of Burkina Faso’s GDP. This scenario accounts for both containerized and stripped transit cargo.

3.4.2 Scenario 2: Outbound (Burkina Faso to Ghana) Containerized Transit Traffic

The economic activity in this direction is small when compared with containerized inbound activity, with an estimated 862 TEU of Burkinabe transit trade and an estimated total logistics chain value of $1.5 million, representing economic activity of 0.02 percent of Burkina Faso’s GDP. In addition, the estimated value of trade flows accounted for $30 million, which is about 0.4 percent of Burkina Faso’s GDP. This scenario accounts for both containerized and consolidated cargo.

3.4.3 Scenario 3: Inbound (Ghana to Burkina Faso) Noncontainerized Transit Traffic

The total volume of noncontainerized cargo mobilized along the Tema-Ouagadougou Corridor in 2008 was close to 150,000 tons. The estimated total value of goods transported in this chain was $16.6 million, and the estimated value of trade flows was $238 million, which represent 0.2 percent and 3.0 percent of Burkina Faso’s GDP respectively.

4. Interpretation

A key feature of a FastPath analysis is the tool's ability to compare corridor performance to international norms and benchmarks. Armed with this information, transport corridor stakeholders can develop action plans for improving corridor performance. Diagnostic bar charts are generated by FastPath with the data entered for each scenario and with the norms from the database. These charts compare the existing situation to one in which the norms are all good. The price bar chart is generated showing the breakdown of price by mode on the left side and compares it with a case with only good performance on the right. A similar bar chart is generated for transit times, including waiting times.

Transport/logistics chains are composed of similar sets of activities, regardless of where in the world they occur. It is important to benchmark transport/logistics performance in West Africa against other transport corridors in Africa and Asia to appreciate the performance of the Tema-Ouagadougou corridor. In this chapter we compare the Tema-Ouagadougou corridor performance to corridors that have been the subject of FastPath analysis in the past 4 years:

- ***Southern Africa (2007).*** In 2007, Nathan Associates conducted a FastPath pilot analysis of the Maputo Corridor in Southern Africa. The analysis included an assessment 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. Comparing performance data between Southern and West Africa has strategic importance for West Africa to understand its competition on the continent.

- ***Association of Southeast Asian Nations (ASEAN) region(2006)***
  - ***Vientiane (Laos) to Laem Chabang (Thailand)—***Like Burkina Faso, Laos is a landlocked country that depends on the port infrastructure of neighboring countries. The transit route with the highest volume of freight movement 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 through Thailand on their way to Laos.
  - ***Danang Port (Vietnam) to Mukdaharn (Thailand) via Sawanakhet (Laos).*** This road corridor crosses three countries. Although the road has been upgraded, constraints on corridor efficiency remain. This corridor has always been considered to have high transit potential. Danang is a popular port for goods transiting through Vietnam on their way to Thailand.

- ***Bangladesh (2007).*** The Dacca-Chittagong Corridor in Bangladesh has been selected as a basis of comparison because it is a relatively poor performer in the Asia region.

Finally, we also recommend concrete steps for improving Tema-Ouagadougou corridor performance, analyzing the costs and benefits for each recommendation.

4.1 TEMA-OUAGADOUGOU CORRIDOR PERFORMANCE AND INTERNATIONAL NORMS

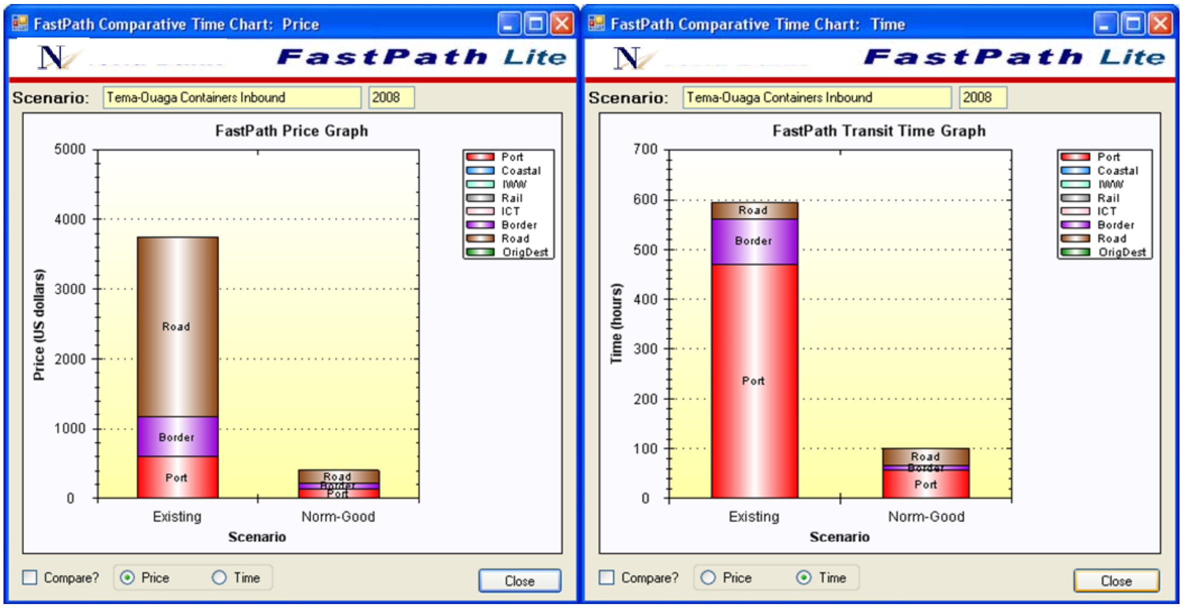
In this section we present the performance of the Tema-Ouagadougou corridor for containerized cargo. Each scenario is compared with the ideal situation (in which all variables perform with a value rated good).

4.1.1 Scenario 1: Inbound (Ghana to Burkina Faso) Containerized Transit Traffic

Figure 4-1 shows the performance in time and cost of the inbound traffic, comparing the performance with internationally accepted norms for good performance. From the price graph (left) we can see the high costs for road transport while in the time graph (right) the total time at the port represents almost 80 percent of the total time incurred along the transport chain.

Figure 4-1

FastPath Price and Time Comparison Graphics for Inbound Containerized Transit Traffic, 2009



Port performance. The port earned a logistics score of 55 (out of 80), which is in the fair-poor range for international ports. A breakdown of performance by component at the port shows Customs with a score of 67, which good-fair. The total cost for Customs[3] does not include the guarantee fund premium of 0.5 percent of the dutiable cargo value because this varies according to the goods being imported. The total time in the yard of 352 hours exceeds by far the normal

[3] The total cost for Customs at Tema port includes Chamber of Commerce fee, transit fee, CBC interstate waybill, Chamber of Commerce fee for unstuffing, payment to OTRAF, Log book sticker and the Guarantee Fund Premium (0.5 percent of dutiable cargo value)

values for container storage at a port. If 56 hours of Customs clearance time is added to the storage time, the average dwell time for inbound transit containers is 408 hours (17 days). Similarly, waiting time at the channel (41 hours) and total berthing time (20.5 hours) are relatively high, which reflects the port's congested environment.

In Table 4-1, we compare the performance of Tema port with other selected ports for containerized imports. Tema port lags considerably behind in average channel wait time and in average unloading time compared with the other ports, including Chittagong--a relatively poor performer in Asia. Customs time, total port costs, and average dwell time (storage plus Customs) are also high when compared with other ports. However, average Customs costs for imports and the reliability are relatively low compared with other ports.

Table 4-1

Port Performance in Selected Corridors for Containerized Imports

	CORRIDOR				
	Tema-Ouagadougou	Danang-Mukdahorn	Dacca-Chittagong	Durban-Nelspruit	Maputo-Nelspruit
Port Component	Tema Port	Danang	Chittagong	Durban	Maputo
Av. channel wait time	41 hrs	N/A	30 hrs	4hrs	8 hrs
Av. unloading time at berth*	20.5 hrs	12 hrs	16 hrs	8 hrs	16 hrs
Total port handling costs	US$492***	US$107	US$302***	US$750	US$350
Stripping costs	US$108	n/a	n/a	n/a	n/a
Stripping time	8 hrs	n/a	n/a	n/a	n/a
Customs costs	US$129	US$462	US$294	–	US$285
Customs time	56 hrs	24 hrs	48 hrs	16 hrs	24 hrs
Average dwell time (including Customs)	17 days****	3 days	12 days	3 days (est.)	3 days
Unofficial costs (%)	7.8%	5% (est.)	15%	5% (est.)	10% (est.)
Reliability**	93%	125%	45%	100% (est.)	268%
Logistics score	55	55	49	60	51

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

Road performance. Surface transport for inbound traffic as presented in Figure 3-12 has an intermediate rating with road travel times rated as fair in some sections and good in others. Reliability for road transit time is rated fair in the majority of the segments. Nevertheless, price in the majority of the road segments is rated very poor (e.g., high unit costs per TEU-km). This is due to several factors, including the fact that there is lack of backhaul cargo for the returning trip and hence most of the trucks return empty, the relatively older trucks used for this transport, and the poor condition of some road links. Inbound prices also incorporate all associated expenses for the return trip.

The average cost per container-km in the Tema-Ouagadougou corridor up to the Ghana border shown in Table 4-2 is higher than all the comparators except for Maputo-Mozambique border road which is a much shorter haul distance (60km) which raises the price. There are several factors which contribute to the high price for Tema-Ouagadougou corridor, including the old age of the trucks used for transit traffic and the lack of sufficient backhauls, among others. These and other factors, however, represent opportunities for improvement.

Table 4-2

Comparison of Inbound Road Transport Performance in Selected Corridors for Containerized Freight

Performance Component	CORRIDOR				
	Tema-Ouagadougou	Laem Chabang-Vientiane	Dacca-Chittagong	Durban-Nelspruit	Maputo-Nelspruit
	Tema- Ghana Border	Laem Chabang-Thai Border	Dacca-Chittagong	Durban-Nelspruit	Maputo-Mozambique Border
Av. cost per TEU-km	US$2.4	US$1.2	US$1.2	US$2.0	US$2.5**
Av. speed	40 kph	51 kph	35 kph	100 kph	60 kph
Av. delay time	4 hrs	1 hr	1 hr	2 hrs	1 hr
Unofficial costs (%)	1%	10% (est.)	15%	5% (est.)	10% (est.)
Reliability*	110%	29%	83%	100% (est.)	105%
Logistics score	55	70	58	65	51

** The percent of average transit time that would include 90% of shipments.*
*** Very short haul distance (60km). This drops to $2 per TEUt-km for longer distances.*

The average speed of 40 km/h is relatively low and compares with Dacca-Chittagong, also a poor performer. Average delay times are substantially higher than for other corridors, although this is partially explained by the length of the corridor. Unofficial costs are relatively low in the corridor. The reliability measure is worse than all the other corridors in this table. The overall logistics score is 55 which is close to a fair-poor rating, and comes in lower than the other corridors.

Border post performance. The inbound operations at the border post are assessed separately for Paga and Dakola. The performance at Paga is relatively good with a score of 73. The performance at Dakola is fair to good with a score of 67 but activities performed there do not include Customs clearance and instead, these only include a review of immigration documents, a preliminary review of clearing documents and the introduction of import data into the Customs system. All import cargo entering Burkina Faso must proceed to Ouagarinter, the Customs facility located in Ouagadougou, to undergo Customs clearing process. Therefore, to properly compare performance of Customs clearing process with other corridors' border posts, it is necessary to make an adjustment of time and cost taking into consideration that the process starts in Dakola and continues in Ouagarinter. The adjustment combines the operations of each node, adding the time, cost, and reliability variables. The combined results and logistics scores are presented in Table 4.3.

Table 4-3

Customs Clearance and Border Post Operations adjusted for Dakola-Ouagarinter, Inbound Direction

Component	Price (US$/TEU)	Price Score	Time (Hours)	Time Score	Reliability %	Reliability score	Logistics Score
Ouagarinter+Dakola	442	20	89.7	20	245	20	20

Performance based on 2008 data

The combined performance is very poor, with a logistics score of 20. The price per TEU is high even though it does not include a second guarantee fund charge equivalent to 0.25 percent of the value of the goods paid when entering Burkina Faso. Because this charge varies depending on the value of the products being imported, it is not included in our price calculations. The average time for Customs clearance combining Dakola and Ouagarinter exceeds 4 days, and the reliability of this time is also very poor with a value of 244 percent.[4]

The average cost per container to cross the Ghana-Burkina Faso border for inbound traffic shown in Table 4-4 is significantly higher than for the selected comparison corridors. This is due to the fact that the Customs operations at Burkina Faso are performed partially at the border post and later continue at Ouagarinter.

Table 4-4

Comparison of Border Post Performance in Selected Corridors for Inbound Containerized Freight

Performance Component	Corridor		
	Tema-Ouagadougou[5]	Laem Chabang-Vientiane	Maputo-Nelspruit
Av. cost per container *	US$457	US$180	US$200
Av. transit time *	90.7 hrs	3 hrs	4 hrs
Unofficial costs (%) *	25%	20% (est.)	10% (est.)
Reliability*	250%	125%	56%
Logistics score border post 1, inbound	73 (Ghana)	67 (Thailand)	73 (Mozambique)
Logistics score border post 2, inbound	20 (Burkina Faso)	63 (Laos)	73 (South Africa)

** Numbers include border posts on each side of border.*

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

[4] Reliability is the percent of average transit time that would include 90 percent of shipments. As noted previously, “good” value performance of reliability would be in the range of 0-40 percent. The variation in time for clearing the goods at Ouagarinter varies between 4-22 days, explaining the poor reliability performance.

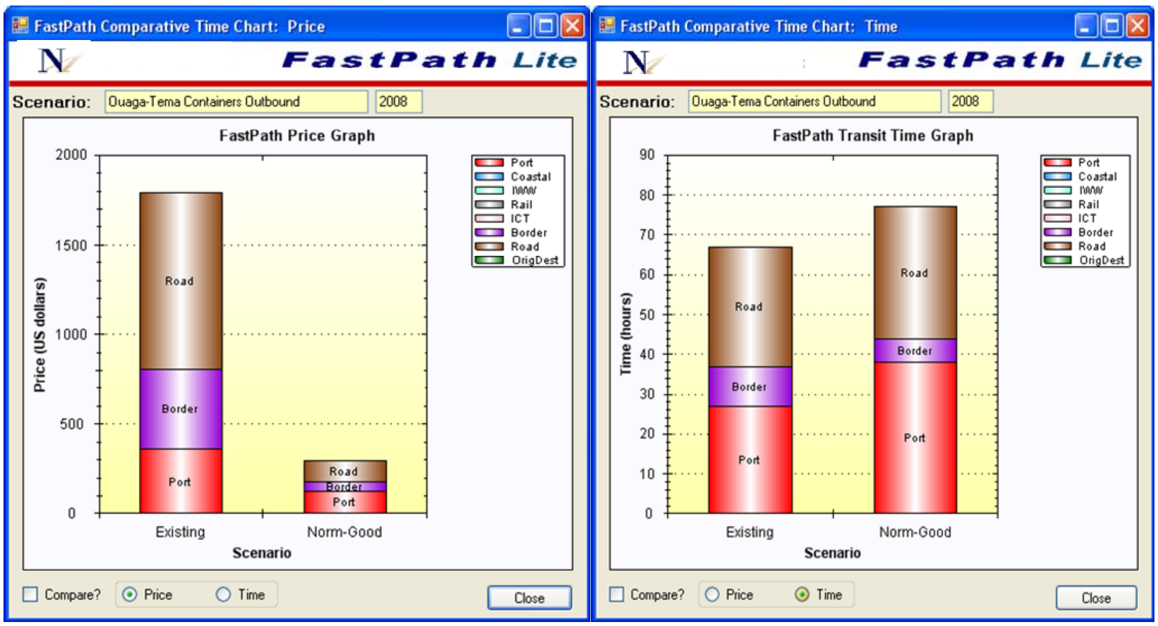
[5] To compare the Customs operations with other corridors where clearance is undertaken at the border, the border post in Burkina Faso was combined for the operations at Dakola and Ouagarinter.

4.1.2 Scenario 2: Outbound Containerized Transit Traffic (Burkina Faso to Ghana)

Figure 4-2 shows the performance in time and cost of the outbound transit traffic comparing the performance with global accepted norms for good performance. The price chart still shows a high price for road transport. The little time spent at the ports is a reflection that cargo is authorized to get into the port with short notice so that there is very little storage of outbound cargo at the port.

Figure 4-2

FastPath *Price and Time Comparison Graphics for Containerized Outbound Transit Traffic, 2009*



Performance based on 2008 data

Port performance. The port has a better logistics score than the inbound direction with a total score of 72 (out of 80), which is in the good-fair range for international ports. The higher score is due to the fact that Customs processing time is short, and there is no waiting time at the channel.

In Table 4-5, we compare the performance of Tema port with other ports for containerized exports. Tema port lags considerably behind in average loading time at berth compared with the other ports. Total handling costs are about average for exports. If consolidation costs are added in, these costs are higher than average. Stripping time is also significant at 8 hours. Unofficial costs are high compared to others; while dwell time is relatively low.

Note that dwell time for domestic cargo is distinguished from dwell time for transit cargo. Transit cargo in Ghana, which require additional staging for compliance with truck/cargo allocation agreements, experience a dwell time of 17 days for inbound transit containers.

Table 4-5

Comparison of Port Performance in Selected Corridors for Containerized Exports

Port Component	Corridor				
	Tema-Ouagadougou	Laem Chabang-Vientiane	Dacca-Chittagong	Durban-Nelspruit	Maputo-Nelspruit
	Tema Port	Laem Chabang	Chittagong	Durban	Maputo
Av. loading time at berth	20.5 hrs	8 hrs	16 hrs	8 hrs	8 hrs
Total port handling costs	US$349.7*	US$70	US$390*	US$750	US$350
Consolidation costs	US$55.96	n/a	n/a	n/a	n/a
Consolidation time	6 hrs	n/a	n/a	n/a	n/a
Customs costs	US$4.5	US$180	US$60	–	US$146
Customs time	3.5 hrs	3 hrs**	24 hrs	4 hrs	6 hrs
Average dwell time (including Customs but not consolidation)	1.5 days	3.5 days	2.5 days	1.5 days	1.5 days
Unofficial costs (%)	2.9%	10% (est.)	15%	5%(est)	10% (est.)
Reliability***	58%	125%	45%	100% (est.)	268%
Logistics score	72	65	52	60	51

** Including a port surcharge for delays to ships in channel ($140 for Tema and of $190 for Chittagong).*
*** Inland Customs facility*
**** The percent of average transit time that would include 90 percent of shipments.*

Road performance. Road transport time and delays are similar to those in the inbound direction but prices are considerably lower given that backhaul is likely. Road transport logistics score for the outbound direction is rated fair compared with international standards.

Border post performance. The border crossing activities in Burkina Faso again include a combination of the activities undertaken at Ouagarinter with those performed at Dakola. Table 4-6 presents the adjusted scores for the Customs clearing process in Burkina Faso and Table 4-7 shows the indicators to cross the Ghana-Burkina Faso border in the outbound direction. In Paga, the outbound direction has a lower score than in the inbound direction with a fair-poor performance (53). This is due to the Government of Ghana's policy that trucks entering Ghana from Burkina Faso with transit cargo must be escorted by Customs until it reaches the final destination in Tema. The formation of these convoys increases the amount of time required to clear Customs in the outbound direction. Also, the associated Customs payments must be made at the border at Paga in the outbound direction.

Table 4-6

Customs Clearance and Border Post Operations Adjusted for Ouagarinter-Dakola, Outbound Direction

Component	Price (US$/TEU)	Price Score	Time (Hours)	Time Score	Reliability %	Reliability score	Logistics Score
Ouagarinter+Dakola	247	20	3.5	80	173	60	53

Performance based on 2008 data

Table 4-7

Comparison of Border Post Performance in Selected Corridors for Outbound Containerized Freight

Performance Component	Corridor		
	Tema–Ouagadougou[6]	Laem Chabang–Vientiane	Maputo–Nelspruit
Av. cost per container *	US$389	US$180	US$200
Av. transit time *	10.3 hrs	3 hrs	8 hrs
Unofficial costs (%) *	11%	20% (est.)	10% (est.)
Reliability**	186%	125%	77%
Logistics Score Border Post 1—Outbound	53 (Burkina Faso)	63 (Laos)	63 (South Africa)
Logistics Score Border Post 2—Outbound	53 (Ghana)	67 (Thailand)	67 (Mozambique)

** Numbers include border posts on each side of border.*
*** The percent of average transit time that would include 90 percent of shipments.*

Table 4-8 summarizes how the performance of containerized freight of the Tema-Ouagadougou transport corridor compares to other transport corridors in both directions (inbound and outbound)

Table 4-8

Comparison of Corridor Performance - Logistics Scores for Containerized Freight

Logistics Component	Tema-Ouagadougou	Laem Chabang-Vientiane	Dacca-Chittagong (a)	Durban-Nelspruit (a),(b)	Maputo-Nelspruit
Inbound					
Overall logistics chain	51	64	59	63	62
Port	55	55	49	60	51
Road transport	55	70	58	65	51
Border post 1	73 (Ghana)	67 (Thailand)	n/a	n/a	73 (Mozambique)
Border post 2	20 (Burkina Faso[7])	63 (Laos)	n/a	n/a	73 (South Africa)
Outbound					
Overall logistics chain	62	66	54	68	60
Port	72	65	52	70	57
Road transport	70	70	58	65	51
Border post 1	53 (Ghana)	67 (Thailand)	n/a	n/a	67 (Mozambique)
Border post 2	53 (Burkina Faso)	63 (Laos)	n/a	n/a	63 (South Africa)

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

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[6] In order to compare the Customs operations with other corridors where clearance is undertaken at the border, the border post in Burkina Faso was combined for the operations at Dakola and Ouagarinter.

[7] Idem foot note 6

The Tema-Ouagadougou corridor's overall logistics score is lower than the other corridors in the inbound direction, but performs better in the outbound direction.

4.1.3 Scenario 3: Inbound (Ghana to Burkina Faso) Noncontainerized Transit Traffic

Table 4-9 presents the performance characteristics of the components that constitute the logistics chain for noncontainerized transit cargo. General or breakbulk cargo arrives at Tema port and is handled at the Multipurpose Terminal.

Table 4-9

Performance of Main Subcomponents of Noncontainerized Transit Traffic, 2009

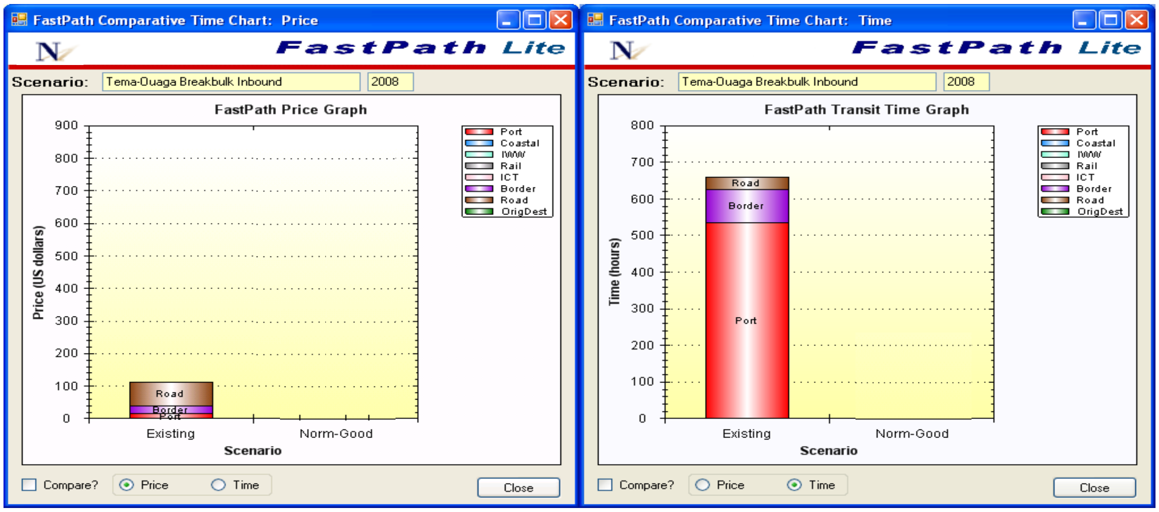
Component	Official Costs US$/Ton	Unofficial Costs US$/Ton	Time (hours)	Reliability (%)
Av. channel operations	0.42	–	47.6	78.9
Av. unloading at berth	1.08	–	78.7	52.8
Total yard handling	9.12	1.50	352.0	4.1
Customs w/o guarantee fund (0.5% of dutiable cargo value) for inbound	3.39		56.0	8.5
Transit Yard	–	–	6.5	15.4
Road Transport	71.91	1.09	26.50	Varies per Segment
Border Crossing at Paga	–	0.79	1.0	50.0
Border crossing at Dakola w/o guarantee fund (0.25% cargo value) for inbound	2.27	0.56	2.0	72.9
Ouagarinter	15.09	4.52	87.7	234.0

Performance based on 2008 data

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

Because handling of noncontainerized cargo at the port varies according to the type of cargo and the equipment used, establishing a standard measure for performance comparing it among different subchains are difficult. Logistics scores are not generated for noncontainerized cargo. The road transport price and time along the corridor are the same as for containerized stripped cargo. Figure 4-2 shows the performance in price and time for noncontainerized traffic. The graphics show values per ton.

Figure 4-3
FastPath *Price and Time Comparison Graphics for Inbound Noncontainerized Transit Traffic, 2009*



The performance of the Tema-Ouagadougou corridor for noncontainerized cargo is compared to only one other corridor where FastPath data for noncontainerized cargo are available: the Maputo-Nelspruit corridor in Mozambique. Only inbound freight flows are considered, as explained in Chapter 3.

Port performance. Table 4-10 compares Tema port to the Port of Maputo for noncontainerized imports. Tema port rates much worse in waiting time for a berth and in average unloading time than Maputo port. Total handling costs and average Customs costs for imports, however, are lower in Tema.

The average Customs time of 56 hours is somewhat higher than Maputo. The average dwell time for Tema is very high at 17 days for imports. However, the reliability (variation in transit time) is about average. Of course average variation percent for a large dwell time is still relatively unreliable. Unofficial costs are significant, but not much higher than Maputo.

Table 4-10

Comparison of Port Performance in Selected Corridors for Noncontainerized Imports

Port Component	Corridor	
	Tema-Ouagadougou	Maputo-Nelspruit
	Tema Port	Maputo
Av. Channel Wait Time	48 hrs	8 hrs
Av. Unloading Time at Berth	78 hrs	24 hrs
Total Port Handling Costs/Ton	US$10.62	US$29
Customs Costs/Ton	US$4.89	US$22
Customs Time	56 hrs	48 hrs
Average Dwell Time (including Customs)	17 days	6 days
Unofficial costs (%)	12%	10% (est.)
Reliability*	94%	300%

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

Road performance. The average cost per ton-km for noncontainerized freight in the Tema-Ouagadougou corridor shown in Table 4-11 is lower than for the Maputo-Mozambique border road which is a much shorter haul distance (60km) which raises the price. The same factors affect the price for road transport for noncontainerized freight as for containerized freight. Many of these factors represent opportunities for improvement.

The average speed of 40 km/h is only two-thirds the speed in the Maputo corridor, which is poor performance. Average delay times are substantially higher than for the Maputo Corridor, although this is explained partially by the length of the corridor. Unofficial costs are considerably lower in the Tema-Ouagadougou corridor. The reliability measure is about the same as for the Maputo corridor.

Table 4-11

Comparison of Road Transport Performance in Selected Corridors for Noncontainerized Freight

Performance Component	Corridor	
	Tema-Ouagadougou	Maputo-Nelspruit
	Tema-Ghana Border	Maputo-Mozambique Border
Av. Cost per Ton-km	US$0.07	US$0.13**
Av. Speed	40 km/h	60 km/h
Av. Delay Time	4 hrs	1 hr
Unofficial costs (%)	1.5%	10% (est.)
Reliability*	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.*

Border post performance. The average cost, transit time, and reliability per ton to cross the Ghana-Burkina Faso border shown in Table 4-12 are significantly higher than for the Maputo corridor because of the clearance operations at Ouagarinter, which are added to the border post operations.

Table 4-12
Comparison of Border Post Performance in Selected Corridors for Noncontainerized Freight

Performance Component**	Corridor	
	Tema-Ouagadougou	Maputo-Nelspruit
Av. Cost per Ton	US$23.22	US$10
Av. Transit Time	90.7 hrs	4 hrs
Unofficial costs (%)	25%	10% (est.)
Reliability*	250%	56%

** The percent of average transit time that would include 90 percent of shipments.*
*** Numbers include border posts on each side of border.*

4.1.4 Conclusions about Performance

On the one hand, the performance of the Tema-Ouagadougou corridor lags significantly behind other developing country corridors used for comparison here with respect to

- Ship waiting times in the port;
- Average unloading and loading times in the port;
- Dwell time for transit cargo in the port;
- Share of inbound containers stripped in port and consequent low containerization rate;
- The cost of road transport;
- The performance of the border post in Burkina Faso; and
- The average speed of road transport

On the other hand, the Tema-Ouagadougou corridor compares favorably with other corridors in:

- The total cargo handling costs in the port;
- Customs costs at the port; and
- Border post costs and transit time in Ghana in the inbound direction.

For other aspects of performance, such as reliability, the Tema-Ouagadougou corridor is about average compared with other corridors. The percent of unofficial payments is better than the worst countries but can be improved.

4.2 ANALYSIS OF POTENTIAL IMPROVEMENTS

Using FastPath, we have identified six potential improvements to improve the performance of the Tema-Ouagadougou corridor. These improvements exclude those already recommended by the WA Trade Hub in order to focus on the new possibilities coming from the FastPath analysis and to avoid duplication. This analysis does not include the benefits associated with Ghanaian cargo for the improvements suggested here, as the focus of the analysis is on the transit trade, and not domestic (Ghanaian) cargo. The benefits accrued to Ghanaian cargo, however, may be necessary to justify the larger investments identified below. This chapter presents each suggested improvement in detail, including a cost-benefit analysis to help stakeholders prioritize investment.

4.2.1 Potential Improvements

Potential improvements considered for the corridor include physical, institutional and policy improvements related to transit traffic.

The FastPath analysis suggests remedies needed to address vessel waiting and berthing time, stripping of containers, road transport costs, and unofficial costs along the corridor. The six actions evaluated above are summarized in Table 4-13 and further elaborated upon below.

Table 4-13
Summary of Improvement Evaluations

Improvement Action	Estimated Investment	Present Value of Benefits	Infrastructure User's Estimated Savings / TEU		Cargo Owners Estimated Savings /TEU		Evaluation of Investment
			In	Out	In	Out	
Increase in berth productivity	Evaluated together $70–80 million	$17.4 million	$140	$140	$166	$140	Highly feasible if total containers handled at Tema port are included
Reduction in waiting time for ships		$1.1 billion	$41	$41	$20	$20	
Reduction in dwell times for freight	$2–3 million	Uncertain	Uncertain	N/A	Uncertain	N/A	Feasible for policy actions only*
Reduction of container stripping	Low cost policy actions	Depends on value of freight	Depends on value of freight	N/A	Depends on value of freight	N/A	Uncertain
Reduction of road transport costs	$6 million	$31.8 million	$80	$43	$40	$21	Highly feasible
Elimination of unofficial costs	$3–4 million	$46.4 million	$206	$68	$206	$68	Highly feasible

** Could be feasible if benefits to Ghanaian shippers are considered.*

The term infrastructure users in Table 4-13 refers to transport service providers, i.e. shipping lines, port operators, freight forwarders and trucking companies. The estimated savings for the infrastructure users and cargo owners are derived from the FastPath analysis approach presented later in this chapter. In some cases, the benefits to cargo owners are clear. For example, in regards to the reduction of ship's waiting time, there is a port congestion surcharge imposed by carriers of about $140 TEU when berth congestion is experienced at the port. Cargo owners also benefit from reductions in inventory costs that add about $26 per TEU. Therefore, the improved scenario will benefit cargo owners at about $166 and $140 per TEU in the inbound and outbound directions, respectively.

However, in other cases, such as berth productivity improvements and reduction of ship's waiting time, the shipping lines are the direct beneficiaries. Benefits to cargo owners will be experienced with reduction of inventory costs and indirectly when freight rates are reduced. This depends on the extent to which carriers are willing to share the benefits of improved efficiency, e.g., retaining 50 percent for their own account and the other 50 percent for their customers in terms of lower freight rates. Our estimates (reflected in Exhibit 2 above) include a total of $41 per TEU in savings from increased berth productivity and therefore cargo owners can be expected to save about $20 per TEU.

Similar estimations are made for the reduction of road transport costs, and the elimination of unofficial costs. All estimated reductions per TEU are presented in the report in Appendix D.

4.2.2 Cost-Benefit Analysis and FastPath

FastPath allows the user to compare the costs of two scenarios in a spreadsheet. The user creates an improvement scenario with reduced costs to the shippers and then uses the FastPath cost-benefit analysis function to create a spreadsheet with cost data from the two scenarios, which then calculates the cost savings in the base year. Assumptions in the spreadsheet allow the user to set growth rates for these cost savings and also to input investment costs for making the improvement. The spreadsheet then calculates the net present value to the 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 to the spreadsheet after it is saved to another location for project analysis. In this way all costs and benefits are accounted for. For the purpose of our analysis, we assume an average inventory value per container of $57,500 and interest rate of 12 percent for assessing freight time savings. 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 below.

4.2.3 Improvement Analysis

The WA Trade Hub report lists several improvements that could be implemented and identifies the potential associated impact in monetary values. In our analysis we present improvements that are connected particularly to the use of infrastructure components that can complement the improvements suggested by the WA Trade Hub. Six potential improvements are analyzed below. Supporting summaries of the cost-benefit analysis components are provided in Appendix D. As earlier noted, the discussion presented in this chapter presents order-of-magnitude benefits only; more detailed analysis would be needed to provide more accurate estimates.

Increasing Berth Productivity

Tema's port performance is far below international standards, and the average loading time for both containers and noncontainerized cargo is more than twice as high as the average of ports in the other corridors analyzed using FastPath—although Tema's productivity is reportedly similar to that of other West African ports.

Possible Actions for Increasing Berth Productivity

The need for a more detailed analysis notwithstanding, MPS is expected to continue to improve until berth performance approaches global standard productivity rates. This can be accomplished while more suitable berth space is created through terminal consolidation as described in the Reduction in Waiting Time for Ships section (next page).

Potential Benefits of Increasing Berth Productivity

Increasing berth productivity will result in lower gross berthing time and consequently lower charges per TEU associated with berthing time. On average, current berthing time is 40.76 hours and the associated charge for berthing time is $2.60 per TEU. With a reduction of berthing time to half of the current figure, which appears to be attainable if compared with the performance of other ports studied using FastPath as presented earlier in this Chapter, the average berthing time will result in an average savings of $0.90 per TEU considering the length overall (LOA) distribution of the vessels calling the port and the applicable tariff.

Vessel idle time will also be reduced and the associated cost of vessel idling could also result in lower operational costs charged by shipping lines. Average vessel operational costs are in the range of $2,000 per hour assuming a 2,000 TEU capacity vessel. A reduction of 20 hours berthing time and 1,000 TEU handled per call will result in a savings to shipping lines equivalent to about $40 per TEU.

The total benefit of this improvement for transit cargo would amount to about $648,000 per year for imports and $35,000 per year for exports. This gives a present value of benefits of $17.4 million over a 20-year period, with a 14 percent growth rate of benefits (same as the growth rate of container traffic) and a 10 percent discount rate. (See Tables D1a, D1b, D2a and D2b in Appendix D for details). There would be additional (substantially greater) benefits to Ghanaian (domestic) cargo if incorporated into the analysis.

Investment Costs for Increasing Berth Productivity

Although MPS is still on a learning curve, tangible improvement could be expected without major capital investments. Other investments might be required and are included as part of the container consolidation option ($70-80 million) described in the Reduction in Waiting Time for Ships section (next page).

Evaluation of Actions to Increasing Berth Productivity

The improved berth productivity was evaluated in conjunction with container terminal consolidation to reduce ship waiting times. This is because the changes to the terminal described below would also facilitate greater berth productivity through the changes in the operational practices associated with combining two berth areas. These two sets of improvements, that is, improved berth productivity and reduced vessel waiting time, generate a net present value of benefits of $1.1 billion compared to $70 million–$80 million net present value of investments. Of course, further detailed analysis of the impediments to acceptable productivity levels is required; GPHA is currently conducting a master plan feasibility study that, among other things, addresses the need and strategies for operational improvements.

Reduction in Waiting Time for Ships

Average 2008 waiting times for container ships are far longer than those in specialized container terminals elsewhere in the world, although they are considered normal for West African ports. For example, during interviews conducted for this study, a major shipping line representative said that waiting times in Apapa, Lagos typically range from four to six days and in other regional ports even more. Ship waiting time is directly related to berth occupancy, which is high as discussed in the previous section. Typical waiting times in ports around the world are two to four hours, and often ships can berth upon arrival and start working immediately. Such short waiting times are achieved by terminal management applying a strict system of preplanned berthing windows, along with an efficient system of information exchange with shipping lines.

Minimizing port time is critical to ship owners and therefore a critical measure of the level of service provided by a port to its customers. A ship's port time has two main components—berth waiting and berth times. Among these two, waiting time is especially harmful to liner shipping because of its unpredictability. A long waiting time disrupts the arrival schedule at other ports and throws the entire service off balance. Sometimes, to avoid delays, ships may bypass a congested port altogether, resulting in huge expenses for additional shipping and port handling. Finally, long waiting time triggers heavy congestion surcharges. The southbound West African congestion surcharge is €100 (US$140) per TEU for Tema, which is higher than the tariff rate for ship handling. This charge is transferred directly to the cargo owner. A reduction in waiting time will ensure that this charge is not applied.

The possible actions, benefits, investment costs, and evaluation of this improvement are described below. Waiting time is especially harmful to liner shipping because it disrupts the schedule at other ports but also generates considerable idling expenses. Typical waiting times in other ports around the world are 2–4 hours, and port surcharges are applied to ports experiencing congestion.

Possible Actions to Reduce Waiting Times for Ships

Reducing ship waiting times will require the creation of more berth space for the MPS container operations. More berth space can be created by combining Berths 3, 4, and 5 (the north side of the finger pier) with the MPS operations at Berths 1 and 2 (the south side of the finger pier). This would provide 1.5 additional berth areas, eliminating the berth waiting time that carriers calling Tema have experienced and providing additional container storage in view of expected growth in both domestic and transshipment container trades. Of course, the consolidation encompasses investment costs to render the additional berthing area suitable for container ship and container handling, estimated roughly in the $70-80 million range. As noted earlier, GPHA is preparing a master plan that may address consolidation as a remedy for berth waiting.

Potential Benefits of Reducing Waiting Times for Ships

One direct benefit of reducing waiting times is ensuring that the port congestion fee is not applied, resulting in a reduction of $140 per TEU for inbound and outbound directions respectively. Additional benefits can be estimated for inventory cost, resulting in savings to the cargo owner of about $25.20 per TEU[8] in the inbound direction. The benefits for transit traffic only add up to $2.6 million per year for imports and $120,680 for exports. They represent a value of $29.8 million over a 20-year period with a 5 percent growth rate (growth rate of total cargo) and a 10 percent discount rate (see Tables D3a, D3b, D4a and D4b in Appendix D). Since all container traffic into the port is affected, it is appropriate to take all the container traffic (transit, domestic, and transshipment) in the port into account. For this scenario the benefits increase to $79 million per year, with a net present value of over $1 billion for a 20-year period (see Table D5a and D5b in Appendix D).

Investment Costs for Reducing Waiting Times for Ships

The costs are included in the costs for container consolidation ($70–80 million) described above.

Evaluation of Actions to Reduce Waiting Times for Ships

The improved reduced waiting time for ships was evaluated in conjunction with container terminal consolidation. These two sets of improvements give a present value of benefits, when applied to transit traffic of $47.2 million over 20 years. However, if the benefits to all containers are taken into account, these amount to over $1 billion compared to $75 million of investments. So this preliminary evaluation shows a highly feasible project (further necessary detailed analysis notwithstanding).

Reduction in Port Dwell Times for Containers

Average dwell time for transit cargo at Tema port is about 17 days. Storage charges are not incurred during the agreed 21-day grace period for transit cargo. Nevertheless, the average dwell time is excessive if compared with other corridors as presented in Section 4. The possible actions, benefits, investment costs and evaluation of this improvement are described below.

Possible Actions to Reduce Port Dwell Times for Freight

Potential actions to reduce dwell times could be to speed up the Customs procedures and to encourage shippers (e.g. higher storage fees) to move containers out of the port sooner. Speeding up Customs could be accomplished by computerizing the process and creating a one-stop shop for imports, with facilities for document submission and exchange and paying fees in the same place. This could reduce Customs requirements to 24 hours, which has been achieved in similar situations. All these actions could reduce dwell times to 10 days total.

Potential Benefits of Reducing Port Dwell Times for Freight

The total time that cargo is stored at the port is high if compared with the time that is actually required to clear Customs and other agencies involved in the transit cargo clearing process. The dwell time experienced in other corridors managing transit cargo show averages close to 10 or even 6 days. The reduction in time will result in savings of inventory costs as presented previously in this chapter. However, there may be no savings to cargo owners associated with the

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[8] Inventory charges are calculated for 15,870 inbound containers carrying goods valued at $912 million assuming a reduced time of 1.6 days at a 12 percent interest rate.

reduction of port dwell time if the dwell time is being used as a temporary storage to the benefit of the cargo owner. The total benefits from reduced dwell time cannot be calculated without further analysis of benefits to shippers.

Investment Costs for Reducing Port Dwell Times for Freight

Providing incentives to move containers out of the yard is a policy action that does not involve investment. Speeding up Customs requires some reengineering of the processes and improved information systems and modifications in the current facilities. This should be a $2-3 million project, including training.

Evaluation of Actions to Reduce Port Dwell Times for Freight

Because of the uncertainty in benefits for reducing dwell time, an evaluation is not made here. Further analysis would have to be done to evaluate the benefits of this potential improvement.

Reduction in Amount of Container Stripping

The total amount of containerized cargo that undergoes the stripping process is relatively high. There are several factors inducing the stripping activity which includes the expensive deposit that cargo owners must pay to shipping lines to ensure that the container will be returned to their possession, but also the practice of loading into a single truck more cargo than what it is possible to transport if a container was used. This practice encourages overloading and unfortunately the mechanisms to control overloading are not enforced. This results in faster deterioration of the road infrastructure and therefore higher maintenance cost which must then be covered by the governments of Ghana and Burkina Faso. The government of Ghana has an Action Plan for reducing overloaded trucks which could reduce the incentives for stripping but it has not yet been implemented. The possible actions, benefits, investment costs and evaluation of this improvement are described below.

Possible Actions to Reduce Container Stripping

One possible action would be to promote the use of containers by supporting negotiations between cargo owners and shipping companies for lower deposit charges on containers or faster repayment of deposits when containers are returned. Implementation of the Government plan to reduce the amount of overloaded trucks will increase the costs of noncontainerized freight but should have a positive effect on road condition which will lower costs.

Potential Benefits of Reducing Container Stripping

There are two types of benefits: those for shippers and those for the government. Shippers could avoid incurring stripping charges which are estimated at $108 per TEU including official and unofficial charges. The promotion of the usage of containers will indirectly reduce the total maintenance cost that both Ghana and Burkina Faso have to devote to maintenance of the road infrastructure along the corridor. There would also be some benefit in reducing damage and losses to goods which result from handling outside the container. This depends on the value of the goods being carried.

While shippers would avoid shipping costs, they would have to incur costs for using the container. There is also a cost for interest on the deposit that is required. The interest cost is estimated at $75 per container. They would also have to pay higher road transport costs per ton, as container trucks carry fewer tons than other trucks. This is estimated as 15 percent of the transport cost, totaling $360 per TEU.

Investment Costs for Reducing Container Stripping

There are few costs for this action as it is primarily a set of policy initiatives.

Evaluation of Actions to Reduce Container Stripping

The benefits for reducing stripping are found in the trade-off between stripping cost savings plus savings in damage or losses of goods compared to transport cost savings plus savings in interest on the container deposit. For high value goods this is a net benefit.

When the government enforces the weight limits for trucks, the economics will change (see analysis below).

Lowering Road Transport Costs

Road transport costs in the corridor are relatively high, amounting to 35 percent more than the average for other corridors analyzed in FastPath. These costs are due to the use of older vehicles, road congestion and high fuel and truck maintenance costs in this corridor. Some road maintenance improvements have already been achieved under a Ghanaian Government Road Sector Development Project over the last eight years. However, there is still scope for greater reduction in road transport costs. The possible actions, benefits, investment costs and evaluation of this improvement are described below.

Possible Actions to Lower Road Transport Costs

Potential actions to reduce road transport costs include the funding of a program to support purchases of newer vehicles and supporting the program to limit the overloading of trucks. Since the high road transport costs are related to the less than good road condition, the limitation of overloading of trucks could also be a potential action. This is planned to be carried out as part of the Ministry of Transport’s 5-year Action Plan.

Potential Benefits of Lowering Road Transport Costs

There could be up to 15 percent reduction in road transport costs because of more cost-effective vehicles for container transport and better road condition with fewer overloaded trucks. The resulting costs would still be higher than the average for other corridors analyzed by FastPath, but this would still be a substantial improvement. These savings would be counteracted to some extent by higher costs for shippers who were formerly using overloaded trucks. This is taken into account in the calculation of net benefits as a 15 percent increase, so for stripped containers the cost to the shippers is the same in this scenario as in the base case. It is estimated that the governments of Ghana and Burkina Faso would save an average of $10,000 per km per year in maintenance costs for a total of $1 million per year (the benefits to other road users would be substantial, but are not estimated here). The total benefits per year would be $1.2 million for containerized imports, $0.04 million for containerized exports and $1.3 million for breakbulk. The total present value of benefits over 20 years would be $31.8 million. (See Tables D6a, D6b, D7a, D7b, D8a and D8b in Appendix D for details).

Investment Costs for Lowering Road Transport Costs

The costs of a program to subsidize loans on trucks for a five year period could be US$1 mil for set up and training and $30,000 per truck with an estimated total of $4 million. The support to the government for overloaded truck program is estimated at $2 million for equipment, training and operational expenses, excluding government salaries for two years. This gives a total of $6 million for investment.

Evaluation of Actions to Lower Road Transport Costs

The total estimated benefits of $31.8 million would more than justify the $6 million investment costs and there are uncounted benefits for other road traffic.

Elimination of Unofficial Costs

The total unofficial cost identified in the inbound direction was estimated at $206 per TEU on average. Similarly, the unofficial cost identified in the outbound direction averaged $68. For inbound breakbulk, the unofficial cost averaged $8.46 per ton. Table 4-14 presents a breakdown of the unofficial costs in each component of the corridor.

A total reduction of unofficial cost could be a difficult and a lengthy process considering its traditional and widespread use. The total impact of unofficial costs is relatively low, accounting for only about 6 percent for inbound containers, 4 percent for outbound containers, and 8 percent for inbound breakbulk. Nevertheless, it is an important percentage when the price quoted by exporters in international markets has to compete with other products that do not have this unofficial tax. Similarly, final consumers have to pay extra for the products that are transported using the corridor.

Table 4-14
Unofficial Costs Observed

	Inbound/TEU	Outbound/TEU	Inbound/Ton
Port and Customs	35.54	9.90	1.5
Stripping	34.64	–	–
Road Transport	21.55	16.39	1.09
Border Crossing at Paga	15.65	36	0.79
Border Crossing at Dakola	10.96	–	0.56
Ouagarinter	87.49	5.95	4.52
TOTAL	205.83	68.24	8.46

Source: WA Trade Hub and manipulation of values to estimate cost per TEU and per Ton

Possible Actions for Eliminating Unofficial Costs

Generally, this would have to be a combination of information systems, enforcement actions and a policy for eliminating corruption. Information systems combined with reengineering of Customs operations have been shown to reduce the opportunity for unofficial payment demands.

Potential Benefits of Eliminating Unofficial Costs

The potential benefit of reducing unofficial costs is about $206 per TEU for import cargo and $68 for export cargo. Considering the volume of containers traded during 2008, the total amount of savings generated per year by reducing unofficial costs in containerized flows would be about $3.3 million and $1.25 million for breakbulk cargo. These add up to a present value of $46.4 million over 20 years.

Investment Costs for Eliminating Unofficial Costs

The costs of a combined program to introduce information systems to reengineer Customs operations and to mount enforcement activities of this type might be $3-4 million over 2 years.

Evaluation of Actions to Eliminate Unofficial Costs

The benefits of this type of program for the shippers far outweigh its costs even in one year. This type of program gives a high return to the economy. See Tables D-9a, D-9b, D-10a, D-10b, D-11a and D-11b in Appendix D.

4.2.4 Conclusions

These six suggested improvement actions have varying potential and size of investment. These are shown in Table 4-13, which summarizes the benefits and costs of each investment and its relative feasibility.

The first two improvements (increase in Berth Productivity and Reduction in Waiting Time for Ships) were evaluated together as the result consolidating the berth areas of the container terminal. This is by far the largest investment but it is potentially highly feasible when considering all the container traffic through Tema. Two other improvements (reduced road transport costs and elimination of unofficial costs) are also highly feasible, but need more careful evaluation of the action items. The third improvement (reduction in dwell time) requires a more precise definition of the available actions because of the complexity of the situation, but probably only policy actions will be feasible at relatively low investment levels. The reduction of container stripping will generate an uncertain amount of benefits as there are offsetting benefits and costs to the shippers. All these potential improvements appear desirable, but need further investigation to verify their potential.

5. Conclusion

The FastPath and RRTC methodologies for analyzing transport corridor performance are complementary and further collaboration makes sense. While FastPath analyzes the overall transport infrastructure and operational inefficiencies in the transport logistics chain (a more macro approach), RRTC can analyze in greater detail the necessary processes and procedures unique to specific products for navigating the logistics chain (a more micro approach). The overall logistics scores generated by FastPath analysis can also promote a healthy sense of competition among corridors, and (as with the World Bank's Doing Business scores) can provide the WA Trade Hub and USAID/West Africa with a leverage point to promote and implement regional and national transport sector reforms. Moving forward, the TCBoost suggests the following course of action:

1. Integrate FastPath findings into the WA Trade Hub's draft Tema-Ouagadougou corridor analysis to create one comprehensive document
2. Train the WA Trade Hub Transport team and counterparts (trade and transport sector experts of West African Economic and Monetary Unit) on FastPath and collaborate on analysis of three other West African corridors
    a. Ouagadougou/Bamako-Abidjan by road and Ouagadougou-Abidjan by rail, documented in a single report;
    b. Bamako-Lomé and Bamako-Tema, with reports on Bamako to Tema and Lomé and Ouagadougou to Tema and Lomé; and
    c. Bamako-Dakar by road and rail with a report on Bamako-Abidjan by road

   The FastPath analyses for the corridors would include a summary of cost, time, and reliability for each corridor component. The logistics scores derived for each corridor can serve as a basis of quick comparison among corridors to promote a healthy sense of competition in the region. The analysis would also provide a comprehensive set of data for discussion of trade facilitation and corridor improvement options.

3. Invest in enhancements to FastPath to address both containerized and noncontainerized freight, more clearly differentiate between official and unofficial payments, and link one inland destination to several different ports. A full description of these enhancements is provided in Appendix E.
4. With GPHA and Trade Hub experts, analyze the Tema port master plan feasibility study, and suggest ways to promote investment and public-private partnerships in infrastructure

5. Conduct economic impact analysis of policy changes, such as reducing or eliminating the 21-day grace period for Burkinabe containers at Tema port, and those recommended in the WA Trade Hub's draft report
6. Work with WA Trade Hub experts, the Ghana Ministry of Transport, trucker associations, and traders to implement the ministry's five-year action plan, especially to encourage the purchase of higher-quality vehicles, reduce truck overloading, and discourage container stripping
7. Support USAID/West Africa and WA Trade Hub anticorruption programs
8. Conduct a legal and regulatory assessment to identify the impact of renegotiating the MPS concession agreement or expropriating the port from MPS (the current configuration is not in the public interest) and assess the prospects for establishing Tema as a regional transshipment hub to encourage competition in Tema.

The TCBoost team is pleased to have had the opportunity to work with the WA Trade Hub and USAID/West Africa on conducting this analysis of the Tema-Ouagadougou transport corridor. Continued collaboration on initiatives such as this promises to make real, positive change possible for the people in the countries served.

Appendix A: Constraints on Port Service Competition in Tema Port

As part of its overall government reform efforts, Ghana passed the Landlord Port Bill in 2003 that effectively transformed the Ghana's Ports and Harbours Authority (GPHA) from an operating port (in which cargo and vessel handling services are provided by GPHA) to a landlord port (in which the private sector provides cargo and vessel handling services generally via licensing, leases, management contracts, and concession agreements). The transformation to the landlord model reflects international best practice and is considered the most effective institutional arrangement for port services. In fact, more than 90 percent of the world's largest container terminals are operated within this port administration framework. The port bill authorizes GPHA to engage the services of the private sector via the noted legal mechanisms.

Under its authority to issue concessions, GPHA executed a concession agreement with Meridian Port Services Limited (MPS) in August 2004. The structure of the concession generally eliminates the possibility of anything more than nominal competition for the 20-year life of the concession. This technical memorandum first describes the general framework of the concession agreement, its potential effects on competition and pricing, and possible remedies to overcome the concession's competitive constraints.

TERMS OF THE CONCESSION AGREEMENT FOR CONTAINER HANDLING IN TEMA

As noted, a concession agreement was executed with MPS. MPS is a special-purpose company set up to operate the GPHA's only container terminal in Tema. MPS is 30 percent owned by GPHA and 70 percent owned in equal shares by AP Moller (parent of Maersk Line, largest vessel operator serving the port) and Bouygues (parent of CGM and Delmas, collectively the third-largest vessel operator serving the port). The concession has a life of 20 years from signing, with the contract expiring in 2024. The concession was not awarded on a public bid basis, but instead awarded on the basis of negotiated terms.

The agreement grants MPS the exclusive right to work (stevedore) any vessel entering the port (Operational Area) that is carrying more than 50 containers. The Operational Area includes the entire port except the fishing and canoe basins to the east end. As a practical matter, MPS exercises its right only for vessels it wants to stevedore and generally chooses not to work multipurpose, ro/ro, or small ships. MPS therefore principally works dedicated container vessels, geared and non-geared, and this pattern is expected to prevail into the future. Since such vessels account for the preponderance of containers at the port, and their penetration is expected to increase, MPS will be the stevedore for the vast majority of containers at Tema for the foreseeable future.

For these concession rights, MPS paid an upfront fee of $5 million, and was subsequently required to pay fixed and variable payments to the GPHA for the life of the concession. The fixed payment constitutes an annual rental payment of $5 and $2 per square meter, respectively, for Areas A and B of the concessioned space. Areas A and B include the primary berth area (Berths 1 and 2 of Quay Two) and backup storage areas. MPS also has the option to use the berths on Quay Two North (Berths 3, 4, and 5), subject to availability.

The amount of the rental payment is subject to review at the 10th and 15th year of the concession agreement, but neither rate can be adjusted more than 15 percent (upward or downward) at the 10th and 15th year. The variable payment, referred to as a royalty payment, requires the higher of $5 million per year, or a combination of 25 percent of the stevedoring charges for loading and discharge of imported containers, 10 percent of the stevedoring charges for loading and discharge of transshipment containers, and 10 percent of the shore handling charges. MPS is also required to cover the debt service cost payment on a $15 million loan secured by GPHA for container terminal equipment and to adhere to a payment schedule for a direct investment made by GPHA in the amount of $4.8 million, also for the container handling equipment.

MPS is also permitted under special circumstances (which are not defined in the agreement) to adjust the stevedoring rates and charges set in the agreement; adjustments cannot be more than 50 percent of the agreement's rates. MPS can, however, raise its rates to match the rates charged by other stevedoring companies in the port (presumably those handling containers on vessels carrying less than 50 containers).

The concession agreement also sets forth operational performance targets, requiring 18 moves per crane hour (based on the calculation of gross crane productivity) and gate turn times (between 60 and 90 minutes). Failure to achieve either of the targets results in a penalty of $100/day.

The causes for concession agreement termination before its expiration date are limited to a force mejeure, event of default, and consequence of government action. Event of default refers generally to the dissolution of either party, the placement of the company under another party's responsibility, failure to carry out the business or disposing a material part of the business, or failure to meet payment obligations. Government action refers to expropriation or nationalization of the concession area or some other action that makes it impossible to carry out the obligations of the agreement.

IMPLICATIONS FOR COMPETITION

Regardless of the performance of the operator, it is highly unlikely that the pricing of services are similar to what would otherwise be market based in a competitive environment. The concession process and agreement is flawed in various respects[9]:

1. The concession agreement was awarded strictly on a negotiated basis; no public bid was issued and it is therefore likely that Ghana did not receive the lowest possible price for container handling services in the negotiated terms.

2. Exclusive (monopoly) rights are accorded to a company owned by two dominant carriers (in addition to GPHA). This arrangement has the potential to squeeze rival carriers out of the market. Carriers that operate terminals have access to proprietary data provided by other carriers, allowing them to attract them away from carriers calling at the terminals. Furthermore, terminal operators affiliated with carriers are known to offer discounts to their own vessels (up to 30 percent). This allows their carriers to offer freight rates lower than rival carriers.

3. The port authority is an equity partner in the concession; this places it in a conflict of interest relative to decisions regarding pricing and port services provided by the GPHA to carriers not calling the container terminal. In the pricing instance, it is difficult to imagine a scenario where GPHA would support lower prices if it means lower variable payments to GPHA and increased risk related to debt service obligations. In the case of services, favoritism for pilotage and tug assist could be rendered towards vessels calling the terminal in which the port authority has an equity interest.

4. Other cargo (e.g. breakbulk) and the containers not handled by the concessionaire are handled by 8-9 licensed stevedoring companies, one of which is managed by GPHA. GPHA allocates cargo to be handled by each of the stevedoring companies, GPHA allocates 25 percent to its own handling, while the remaining 75 percent is distributed in equal allocations among the remaining stevedoring companies. These stevedores offer no serious competitive threat to the concessionaire; they own no equipment and only handle containers on vessels carrying 50 or fewer containers.

5. The charges depicted in the concession agreement are the same as those in GPHA's published tariff. This means that the licensed stevedores, which offer lower productivity, are permitted to charge the same rates offered by the concessionaire, which offers the efficiency and productivity of an integrated container operation. This means that charges applied by the licensed stevedores are likely substantially higher than they should be; the margins for multipurpose vessels (typically those carrying less than 50 containers) are substantially lower than cellular vessels. This can induce a shift of containers away from the stevedores to the concessionaire, diminishing even the nominal competition that exists now for the container trades.

6. As earlier noted, the concessionaire is permitted to charge 50 percent more than the rates in the agreement's tariff schedule due to special circumstances. The circumstances under

[9] Note that most of what is described here relates to potential behavior and is not intended to suggest that GPHA is engaging in anticompetitive behavior.

which this may happen are not defined in the agreement. World experience has shown a propensity by operators to generally cite changing market conditions as the rationale for pressing for higher prices.

According to the port law, GPHA itself may seek approval from the Minister for changes in rates; this appears to not apply to the concessionaire, but instead governs the rates charged directly by GPHA and the stevedoring companies. Given the concessionaire has the right to charge as much as what stevedoring companies charge, GPHA as an equity partner could seek higher rates for the stevedoring companies in order to increase the rates by the concessionaire (who in turn is obliged to pay a percentage of rates collected to GPHA).

7. Given the exclusive or monopoly arrangement that MPS has, the only option for ending the monopoly is to establish a terminal outside the existing harbor. However, based on ongoing master planning efforts in Tema, the cost of such a terminal would be in the $450 million range. Current and projected domestic volumes do not justify this extent of investment; any new terminal would thus rely extensively on transshipment volumes generated from rival carriers and on the establishment of the terminal as a regional transshipment hub serving generally the West Africa region.

POTENTIAL REMEDIES

There is no possibility under the existing arrangement to induce competition. MPS has exclusive rights for container handling, except for vessels carrying fewer than 50 containers. Even if the licensed stevedores could organize and finance construction of a mechanized terminal, the prohibition against handling cellular vessels still means they cannot attract containers away from the concession operator. Further, the scale of the investment required for a terminal outside the existing harbor renders the likelihood of building a new terminal very low unless there is a high probability for attracting substantial transshipment volumes.

Two potential remedies could be considered:

1) Encourage MPS to renegotiate the terms of the agreement. While MPS currently has no incentive to do so, its operation is still constrained by its direct control of only the two berths on the south side of Quay 2. Tema has experienced port congestion at Quay 2, brought along in part by the lack of a sufficient number of mechanized berths. It is thus in MPS' interest to increase berth capacity. Therefore, it may be possible to encourage MPS to give up exclusivity in exchange for rights to equip and operate the north side of Quay 2. This would then introduce the possibility for improving other berth areas (through a concession) in the port to accommodate mechanized handling, thus opening the possibility for serious competition.

2) Expropriate the property from MPS on the grounds that the operation as currently configured is not in the public interest.

A more intensive legal and regulatory assessment should be done to adequately identify the prospects for these two potential remedies. Additionally, given the interest in establishing a transshipment hub in the region (Nigeria, Cape Verde, Cameroon, and Ivory Coast are all considering the potential for establishing regional transshipment centers), an assessment of the prospects for establishing Tema as a regional transshipment hub should be done in an effort to induce competition in Tema.

Appendix B: 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/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/h)

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

Appendix C: 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 Tema-Ouagadougou corridor. We have made adjustments to the model to overcome the limitations of the current version but also have reorganized the data to reflect the requirement of the variables used by FastPath.

C.1 INFORMAL PAYMENTS

The current version of FastPath does not have separate categories for formal and informal payments. Informal payments can be incorporated but these are included as part of the total cost of each corridor subcomponent (road, Customs, port, etc.). Informal costs and delays experienced in checkpoints and barriers along the road component could be added together and incorporated into the analysis using a road node for this purpose at the end of the road component. Nevertheless, these informal payments are indirectly included in the transport rates quoted by transport companies. To be consistent with the analysis and report prepared by the WA Trade Hub, our analysis does not break out informal payments already included in the rates for road transport. Informal payments at the Port ,which includes custom agents and port officials, are incorporated in the gate component of the model. The other informal payments encountered along the corridor are incorporated into the respective node where these are incurred.

C.2 PORT

C.2.1 Charges in the Channel

Pilotage charges apply to all vessels except national or foreign government ships not employed in profitable ventures, pleasure crafts of less than 10,000 gross tonnage (GT) and ships in distress. The rates are collected per movement (arrival and departure) and charged in accordance with the GT of the ship. Towage charges also apply in accordance with the GT of the ship and the usage of 2 tugs is compulsory for all vessels over 1,000 GT.

Table C-1 presents the distribution of ships that called the port organized by ship's GT and the charges for pilotage and towages services. Considering that the port mobilized 8.7 million tons, and that the total cost of services at the channel is about US$1.7 million, the average cost of pilotage and towage services is about US$0.20 per ton. Furthermore, given that Quay 2 South (Berth 1 and 2) mobilized 293,897 TEU in 2008 and that the pilotage and towage charges for vessels moored in these berths accounted for US$1.1 million, the average cost of pilotage and towage is approximately US$3.60 per TEU.

Table C-1

Estimated Charges at the Channel per GT of the Ship

Size of Ship (GT)	Number of Ships	Pilotage US$ (per move)	Towage US$ (per Tug)	Total Charges
2,000	-	54	112	-
4,000	-	86	214	-
6,000	2	161	375	2,140
12,000	71	300	514	115,474
20,000	233	482	642	523,551
30,000	281	589	749	751,675
40,000	101	696	856	313,403
> 40,000	5	803	963	17,655
Total	**693**			**1,723,898**

Source: Estimations by TCBoost based on information provided by GPHA

In addition to the pilotage and towage services, vessels incur anchorage charges while they wait for an available berth. As described earlier, the waiting time at the port averaged 39.7 and 46.4 hours for cellular container ships and general cargo ships, respectively. The anchorage charges account for US$0.07 per GT and per 24 hours or part thereof. The average weighted anchorage charge estimated per ship in accordance with the GT of ships that called the port is US$1,375 per 24 hours. Considering that the average waiting time for container and general cargo ships is charged in fractions of 24 hours, the total anchorage charge for either container or general cargo ships is about US$2,750. Considering that 610 container ships called the port in 2008, handling 566,133 TEU in total, the average anchorage charge is close to US$3 per TEU. Similarly, the average anchorage charge per ton of noncontainerized cargo is about US$0.22.

Adding all the charges related to the channel, the average cost is about US$6.60 per TEU and US$0.42 per ton, respectively.

A similar analysis has been undertaken for noncontainerized cargo using information for general cargo vessels. Charges have been determined on a per Ton basis.

C.2.2 Port Congestion Surcharge

As discussed in Chapter 2, the southbound West African congestion surcharge is EUR 100 per TEU for Tema which is equivalent to approximately US$140. This charge has been temporarily discontinued, but is likely to be charged again as waiting times will continue to be longer than necessary. Port congestion surcharge only applies for containerized freight.

C.2.3 Channel Reliability

The average waiting time at anchorage varies considerably for both container and general cargo vessels. As presented in Table 2-4, the average waiting time at the channel was 40.78 hours for container ships. The maximum waiting time experienced was 96.8 hours and the minimum was 20.84 hours. General cargo vessels show an average waiting time of 47.64 hours with 82.36 and 7.23 hours for maximum and minimum values, respectively. The reliability of the occurrences is therefore calculated to be 93 percent for container vessels and 79 percent for general cargo vessels.

The reliability for all other components of the model has been calculated following the same methodology.

C.2.4 Berthing and Stevedoring

There are two major charges at the berth which include berthing (harbor rent), normally charged by the length overall (LOA) of the ship, and stevedoring of containers from and to the vessel, which are normally charged by the size of the container or by the weight of the total volume of cargo.

Table C-2 presents the distribution of ships that called the port by ship LOA. The data is organized by type of vessel including containerships and multipurpose ships. The total amount of container ships accounted for 610 units with an average berth time of 40.8 hours. Given that the total volume of containers handled in Quay 2 was 452,817 TEU, the average berth time cost per TEU is about US$2.60. Similarly, a total of 83 multipurpose ships called at the port in 2008 with an average time of 157.5 hours. Their berth time cost averaged US$1.1 per ton.

Table C-2

Estimated Charges at the Berth per LOA of the Ship

Ship LOA	No. Ships Quay 2 (Average 40.8 hours)	No. Ships Quay 1 (Average 157.5 hours)	Berthage US$ (24 hours or part)	Berthage US$ (Additional 12 hours or part)	Estimated Charges in Quay 2	Estimated Charges in Quay 2	Total Estimated Charges
50	0	-	53.50	26.75	-	-	-
75	0	-	107.00	53.50	-	-	-
100	1	-	160.50	80.25	321	-	321
125	15	9	240.75	120.38	7,223	15,168	22,390
150	45	8	321.00	160.50	28,890	17,976	46,866
200	379	64	642.00	321.00	486,636	287,616	774,252
250	161	2	909.50	454.75	292,859	12,733	305,592
> 250	9	-	1,284.00	642.00	23,112	-	23,112
Total	**610**	**83**			**839,041**	**333,493**	**1,172,533**

Source: Estimations by TCBoost based on information provided by GPHA

The total cost at the berth includes stevedoring charges for unloading and loading cargo from/to the vessel. Transit containers have special treatment compared with import and export domestic cargo. The charge for loading/unloading transit containers is US$45 for 20-foot and US$85 for 40-foot. Given that FastPath measures the performance per TEU, the average weighted cost for transit containers during 2008 was US$44.10. Similarly, breakbulk cargo also experienced a discounted rate compared with import and export cargo. The total cost per ton varies in accordance with the volume handled per lift. For the purpose of our analysis, we assumed an average lift exceeding 5 tons but not exceeding 10 tons. The cost per ton is US$9.63.

With the above information the average berth cost for our analysis is calculated to be US$46.70 per TEU and US$10.70 per Ton.

C.2.5 Yard Handling, Custom Clearance and Gate Processing Charges

These charges were presented and discussed in detail in the WA Trade Hub report. We have incorporated them into our analysis adjusting the costs to a TEU basis for FastPath purposes, using weighted averages in accordance with direction of traffic flow and type of cargo. There are several charges that are applied on a truck basis or per ton basis. For these charges the following assumptions are made.

1. ***Per truck charges.*** When a 20-foot container is assigned, in most cases (though not all) the trucker prefers to wait for a second 20-foot container to reduce the transport cost per unit. In our analysis it is assumed that 50 percent of the time, trucks will carry two 20-foot containers instead of only one.

2. ***Per ton charges.*** Goods transported along the Tema-Ouagadougou corridor include rice, sugar, wheat, seeds, textiles, construction materials, and cooking oil, among others. These vary in shape and weight. Considering that in 2008 a total of 265,000 tons were handled using 16,670 TEU, the average weight per container is about 16 tons/TEU. This figure seems rather low if we consider that many truckers constantly overload the trucks. Nevertheless, Ghanaian authorities are implementing an important campaign to avoid truck overload and are starting to enforce axle load limitation. For the purpose of this analysis, we will assume that 20-foot containers could carry an average of 15 tons and 40-foot containers an average of 30 tons for a weighted average of 20 tons per TEU. These figures are congruent with the maximum allowable weight included in the OTRAF trucking tariffs.

3. ***Per container:*** Some expenses are charged per container basis without taking into consideration the size of the box. In this case, the cost per TEU can be estimated based on the size of the box.

C.2.6 MPS Terminal Stacking Area Transfer Charge

Because of the odd shape of the MPS container terminal, with two container yards and the main yard far from the berth, all containers that are handled at this terminal incur an additional charge for transferring them from the temporary stacking area at the quayside to the main yard. MPS handles about 80 percent of all containers. Therefore, an average weighted charge due to this transfer is US$10.68 per TEU.

C.2.7 Outbound Cargo Directly Loaded for Export

To be consistent with the WA Trade Hub analysis, it is assumed that all outbound cargo arriving in Tema is immediately stuffed into containers at the shipping line terminal without incurring any warehousing costs. In many cases, Burkinabe cargo owners sell their product to clients that consolidate bigger volumes before exporting the product. Our analysis does not include this sub-process or any of the associated cost or delays.

C.3 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 5 road links and 6 main nodes. 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.

Based on the analysis of the road infrastructure presented in Chapter 2, there are five major road links identified for analysis. The characteristics of each link are presented in Table C-3. 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. The length of the road link connecting the two border posts, Paga and Dakola, is actually less than 1 km but because of limitations of the model this distance was set to the minimum value of 1 km.

Table C-3
Tema-Ouagadougou Corridor FastPath Road Links Characteristics

Link	Length (km)	Terrain	Surface Conditions	Congestion
Tema–Apedwa	98	Flat-Hilly	Poor	Heavy
Apedwa–Kumasi	200	Flat-Hilly	Good	Heavy
Kumasi–Paga	582	Flat	Fair	Light
Paga–Dakola	1	Flat	Fair	Light
Dakola–Ouagadougou	176	Flat	Fair	Light

The road links connect four major nodes where a number of processes take place which prevents the cargo from moving. In addition, there are two virtual nodes used to separate the physical characteristics of the road condition of the links associated to the node. The nodes include:

- ***Tema Port.*** The port has been divided into two main terminals, the MPS Container Terminal where the majority of the containerized cargo is handled, and the Multipurpose Terminal where the break bulk and general cargo is handled. Each terminal is also subdivided in accordance with the activities undertaken in each subcomponent, with particular attention to the variables measured by FastPath, i.e. time, cost, and reliability.

The subcomponents used in the Tema-Ouagadougou corridor include the Access Channel, the Berth, the Storage Yard and Customs. In addition to these four sub-components, we have also used the Consolidation and Gate subcomponents to account for the total dwell time of transit cargo.

While the activities of container stripping are undertaken at the port before the transit cargo actually embarks on the road transport process, the cost associated with this activity is not incorporated into any of the subcomponents at the port. Instead we include these costs in a road node. This is due to the fact that not all cargo arriving in Tema in containers is stripped.

- *Transit Yard Node.* All transit freight arriving to Tema Port must proceed to this yard before proceeding to the final hinterland destination. This node is used only in the inbound direction.

- ***Apedwa Road Node.*** This node is used to separate two links with different physical characteristics. Also in the transport subchain that is analyzing the stripped and consolidated containers, we are incorporating in this node the cost and time associated with this activity.

- ***Kumasi Road Node.*** Similar to the Apedwa node, this node is mainly used to separate the two links with different physical and congestion characteristics.

- ***Paga Border Post.*** In this node we incorporate all the border crossing activities undertaken on the Ghana side of the corridor.

- ***Dakola Border Post.*** This node is the border port located on the Burkinabe side of the corridor.

- ***Ouagarinter.*** This is the main hinterland destination node. All import transit cargo entering Burkina Faso must be cleared in Ouagarinter, with a few exceptions where temporary storage and clearing is authorized by Customs at the bonded facilities located at the warehouses of authorized freight forwarders. Our analysis will only include Ouagarinter and for functionality purposes of FastPath, two different hinterland nodes have been created to differentiate the cargo transported directly in containers from stripped cargo.

- An additional node at the end of the transport subchain, Ouagadougou, was created for modeling purposes. This additional node allows us to evaluate the node Ouagarinter as a Customs operation node.

All the charges incurred along the links and nodes of the corridor are derived from the detailed analysis undertaken by the WA Trade Hub. Similar to the yard handling and Customs process, many of the charges experienced along the corridor are based on a per truck, consignment or container size basis. For the purpose of our analysis, we transformed these costs into a TEU basis for containerized volumes.

Appendix D. Cost-Benefit Analysis Data Tables

Table D1a. Evaluation of Berth Productivity for Inbound Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Tema-Ouaga Containers		**Year:**	2008
Improved Scenario Name:	Increased Berth Prod for Tema-Ouaga Containers		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$3,630	$3,589	$41	
2. Av. Transit Time for Trip	599	589	10	hours
3. Reliability (% of mean time)	81	81	0	%
4. Total Containers Per Year	15,807	15,807	0	
5. Total Logistics Cost	$57,379,410	$56,731,323	$648,087	
6. Investment Costs for Improvements (US$)	N/A	$55,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$16,896,975	
8. Net Present Value (US$) (discounted savings - costs)			($34,639,113)	

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

Table D1b. Evaluation of Berth Productivity for Inbound Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Tema-Ouaga Containers	**Year:**	2008
Improved Scenario Name:	Increased Berth Prod for Tema-Ouaga Cont	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$57,379,410
Improved Total Shipper Price	$56,731,323
Total Shipper Savings	$648,087
Growth Rate of Savings (%/yr)	14%
Year of Maximum Savings:	2030
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2009	$55,000,000		-$55,000,000
2010		$648,087	$648,087
2011		$738,819	$738,819
2012		$842,254	$842,254
2013		$960,170	$960,170
2014		$1,094,594	$1,094,594
2015		$1,247,837	$1,247,837
2016		$1,422,534	$1,422,534
2017		$1,621,689	$1,621,689
2018		$1,848,725	$1,848,725
2019		$2,107,547	$2,107,547
2020		$2,402,604	$2,402,604
2021		$2,738,969	$2,738,969
2022		$3,122,425	$3,122,425
2023		$3,559,565	$3,559,565
2024		$4,057,904	$4,057,904
2025		$4,626,011	$4,626,011
2026		$5,273,653	$5,273,653
2027		$6,011,964	$6,011,964
2028		$6,853,639	$6,853,639
2029		$7,813,148	$7,813,148
Net Present Value:		$16,896,975	($34,639,113)

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

Table D2a. Evaluation of Berth Productivity for Outbound Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Ouaga-Tema Containers		**Year:**	2008
Improved Scenario Name:	Increased Berth Prod for Ouaga-Tema Containers		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$1,736	$1,695	$41	
2. Av. Transit Time for Trip	68	58	10	hours
3. Reliability (% of mean time)	33	33	0	%
4. Total Containers Per Year	862	862	0	
5. Total Logistics Cost	$1,496,432	$1,461,090	$35,342	
6. Investment Costs for Improvements (US$)	N/A	$75,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$494,143	
8. Net Present Value (US$) (discounted savings - costs)			($67,732,597)	

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

Table D2b. Evaluation of Berth Productivity for Outbound Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Ouaga-Tema Containers	**Year:**	2008
Improved Scenario Name:	Increased Berth Prod for Ouaga-Tema Cont	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$1,496,432
Improved Total Shipper Price	$1,461,090
Total Shipper Savings	$35,342
Growth Rate of Savings (%/yr)	14%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2009	$75,000,000		-$75,000,000
2010		$35,342	$35,342
2011		$40,290	$40,290
2012		$45,931	$45,931
2013		$52,361	$52,361
2014		$59,692	$59,692
2015		$68,049	$68,049
2016		$68,049	$68,049
2017		$68,049	$68,049
2018		$68,049	$68,049
2019		$68,049	$68,049
2020		$68,049	$68,049
2021		$68,049	$68,049
2022		$68,049	$68,049
2023		$68,049	$68,049
2024		$68,049	$68,049
2025		$68,049	$68,049
2026		$68,049	$68,049
2027		$68,049	$68,049
2028		$68,049	$68,049
2029		$68,049	$68,049
Net Present Value:		$494,143	($67,732,597)

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

Table D3a. Evaluation of Reduced Ship Waiting Time for Inbound Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Tema-Ouaga Containers		**Year:**	2008
Improved Scenario Name:	Reduced Wait Times for Tema-Ouaga Containers		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$3,630	$3,464	$166	
2. Av. Transit Time for Trip	599	579	20	hours
3. Reliability (% of mean time)	81	81	0	%
4. Total Containers Per Year	15,807	15,807	0	
5. Total Logistics Cost	$57,379,410	$54,755,448	$2,623,962	
6. Investment Costs for Improvements (US$)	N/A	$75,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$28,631,146	
8. Net Present Value (US$) (discounted savings - costs)			($42,153,504)	

Table D3b. Evaluation of Reduced Ship Waiting Time for Inbound Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Tema-Ouaga Containers	**Year:**	2008
Improved Scenario Name:	Reduced Wait Times for Tema-Ouaga Conta	**Year:**	2008

Assumptions:

Investment Year:	2006
Opening year:	2007
Base Case Total Shipper Price	$57,379,410
Improved Total Shipper Price	$54,755,448
Total Shipper Savings	$2,623,962
Growth Rate of Savings (%/yr)	5%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2006	$75,000,000		-$75,000,000
2007		$2,623,962	$2,623,962
2008		$2,755,160	$2,755,160
2009		$2,892,918	$2,892,918
2010		$3,037,564	$3,037,564
2011		$3,189,442	$3,189,442
2012		$3,348,914	$3,348,914
2013		$3,516,360	$3,516,360
2014		$3,692,178	$3,692,178
2015		$3,876,787	$3,876,787
2016		$3,876,787	$3,876,787
2017		$3,876,787	$3,876,787
2018		$3,876,787	$3,876,787
2019		$3,876,787	$3,876,787
2020		$3,876,787	$3,876,787
2021		$3,876,787	$3,876,787
2022		$3,876,787	$3,876,787
2023		$3,876,787	$3,876,787
2024		$3,876,787	$3,876,787
2025		$3,876,787	$3,876,787
2026		$3,876,787	$3,876,787
Net Present Value:		$28,631,146	($42,153,504)

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

Table D4a. Evaluation of Reduced Ship Waiting Time for Outbound Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Ouaga-Tema Containers		**Year:**	2008
Improved Scenario Name:	Reduced Wait Time for Ouaga-Tema Containers		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$1,736	$1,596	$140	
2. Av. Transit Time for Trip	68	68	0	hours
3. Reliability (% of mean time)	33	33	0	%
4. Total Containers Per Year	862	862	0	
5. Total Logistics Cost	$1,496,432	$1,375,752	$120,680	
6. Investment Costs for Improvements (US$)	N/A	$75,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$1,228,306	
8. Net Present Value (US$) (discounted savings - costs)			($67,065,176)	

Table D4b. Evaluation of Reduced Ship Waiting Time for Outbound Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Ouaga-Tema Containers	**Year:**	2008
Improved Scenario Name:	Reduced Wait Time for Ouaga-Tema Conta	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$1,496,432
Improved Total Shipper Price	$1,375,752
Total Shipper Savings	$120,680
Growth Rate of Savings (%/yr)	5%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2009	$75,000,000		-$75,000,000
2010		$120,680	$120,680
2011		$126,714	$126,714
2012		$133,050	$133,050
2013		$139,703	$139,703
2014		$146,688	$146,688
2015		$154,022	$154,022
2016		$154,022	$154,022
2017		$154,022	$154,022
2018		$154,022	$154,022
2019		$154,022	$154,022
2020		$154,022	$154,022
2021		$154,022	$154,022
2022		$154,022	$154,022
2023		$154,022	$154,022
2024		$154,022	$154,022
2025		$154,022	$154,022
2026		$154,022	$154,022
2027		$154,022	$154,022
2028		$154,022	$154,022
2029		$154,022	$154,022
Net Present Value:		$1,228,306	($67,065,176)

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

Table D5a. Evaluation of Reduced Ship Waiting Time for Tema Port Total Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Tema Total Containers		**Year:**	2008
Improved Scenario Name:	Reduced Wait Times for Tema Total Containers		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Price Savings to Shipper	$166	$0	$166	
2. Av. WaitTime for Port	41	8	33	hours
3. Reliability (% of mean time)	81	81	0	%
4. Total Containers Per Year	476,000	476,000	0	
5. Total Logistics Cost	$79,016,000	$0	$79,016,000	
6. Investment Costs for Improvements (US$)	N/A	$75,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$1,104,768,358	
8. Net Present Value (US$) (discounted savings - costs)			$936,153,053	

Table D5b. Evaluation of Reduced Ship Waiting Time for Tema Port Total Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Tema Total Containers	**Year:**	2008
Improved Scenario Name:	Reduced Wait Times for Tema Total Contair	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$79,016,000
Improved Total Shipper Price	$0
Total Shipper Savings	$79,016,000
Growth Rate of Savings (%/yr)	14%
Year of Maximum Savings:	2015
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
2009	$75,000,000		-$75,000,000
2010		$79,016,000	$79,016,000
2011		$90,078,240	$90,078,240
2012		$102,689,194	$102,689,194
2013		$117,065,681	$117,065,681
2014		$133,454,876	$133,454,876
2015		$152,138,559	$152,138,559
2016		$152,138,559	$152,138,559
2017		$152,138,559	$152,138,559
2018		$152,138,559	$152,138,559
2019		$152,138,559	$152,138,559
2020		$152,138,559	$152,138,559
2021		$152,138,559	$152,138,559
2022		$152,138,559	$152,138,559
2023		$152,138,559	$152,138,559
2024		$152,138,559	$152,138,559
2025		$152,138,559	$152,138,559
2026		$152,138,559	$152,138,559
2027		$152,138,559	$152,138,559
2028		$152,138,559	$152,138,559
2029		$152,138,559	$152,138,559
Net Present Value:		$1,104,768,358	$936,153,053

Table D6a. Evaluation of Improved Road Transport for Inbound Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Tema-Ouaga Containers		**Year:**	2008
Improved Scenario Name:	Improved Road Transport for Tema-Ouaga Containers		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$3,630	$3,550	$80	
2. Av. Transit Time for Trip	599	599	0	hours
3. Reliability (% of mean time)	81	81	0	%
4. Total Containers Per Year	15,807	15,807	0	
5. Total Logistics Cost	$57,379,410	$56,114,850	$1,264,560	
6. Investment Costs for Improvements (US$)	N/A	$6,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$17,680,542	
8. Net Present Value (US$) (discounted savings - costs)			$10,618,674	

Table D6b. Evaluation of Improved Road Transport for Inbound Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Tema-Ouaga Containers	**Year:**	2008
Improved Scenario Name:	Improved Road Transport for Tema-Ouaga (	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$57,379,410
Improved Total Shipper Price	$56,114,850
Total Shipper Savings	$1,264,560
Growth Rate of Savings (%/yr)	14%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2009	$6,000,000		-$6,000,000
2010		$1,264,560	$1,264,560
2011		$1,441,598	$1,441,598
2012		$1,643,422	$1,643,422
2013		$1,873,501	$1,873,501
2014		$2,135,791	$2,135,791
2015		$2,434,802	$2,434,802
2016		$2,434,802	$2,434,802
2017		$2,434,802	$2,434,802
2018		$2,434,802	$2,434,802
2019		$2,434,802	$2,434,802
2020		$2,434,802	$2,434,802
2021		$2,434,802	$2,434,802
2022		$2,434,802	$2,434,802
2023		$2,434,802	$2,434,802
2024		$2,434,802	$2,434,802
2025		$2,434,802	$2,434,802
2026		$2,434,802	$2,434,802
2027		$2,434,802	$2,434,802
2028		$2,434,802	$2,434,802
2029		$2,434,802	$2,434,802
Net Present Value:		$17,680,542	$10,618,674

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

Table D7a. Evaluation of Improved Road Transport for Outbound Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name: Ouaga-Tema Containers — **Year:** 2008

Improved Scenario Name: Improved Road Transport for Ouaga-Tema Containers — **Year:** 2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$1,733	$1,690	$43	
2. Av. Transit Time for Trip	68	68	0	hours
3. Reliability (% of mean time)	33	33	0	%
4. Total Containers Per Year	862	862	0	
5. Total Logistics Cost	$1,493,846	$1,456,780	$37,066	
6. Investment Costs for Improvements (US$)	N/A	$6,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$518,239	
8. Net Present Value (US$) (discounted savings - costs)			($4,983,419)	

Table D7b. Evaluation of Improved Road Transport for Outbound Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Ouaga-Tema Containers	**Year:**	2008
Improved Scenario Name:	Improved Road Transport for Ouaga-Tema (	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$1,493,846
Improved Total Shipper Price	$1,456,780
Total Shipper Savings	$37,066
Growth Rate of Savings (%/yr)	14%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2009	$6,000,000		-$6,000,000
2010		$37,066	$37,066
2011		$42,255	$42,255
2012		$48,171	$48,171
2013		$54,915	$54,915
2014		$62,603	$62,603
2015		$71,367	$71,367
2016		$71,367	$71,367
2017		$71,367	$71,367
2018		$71,367	$71,367
2019		$71,367	$71,367
2020		$71,367	$71,367
2021		$71,367	$71,367
2022		$71,367	$71,367
2023		$71,367	$71,367
2024		$71,367	$71,367
2025		$71,367	$71,367
2026		$71,367	$71,367
2027		$71,367	$71,367
2028		$71,367	$71,367
2029		$71,367	$71,367
Net Present Value:		$518,239	($4,983,419)

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

Table D8a. Evaluation of Improved Road Transport for Breakbulk
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Tema-Ouaga Breakbulk		**Year:**	2008
Improved Scenario Name:	Improved Road Transport for Tema-Ouaga Breakbulk		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$112	$103	$9	
2. Av. Transit Time for Trip	658	658	0	hours
3. Reliability (% of mean time)	84	84	0	%
4. Total Containers Per Year	148,365	148,365	0	
5. Total Logistics Cost	$16,616,880	$15,281,595	$1,335,285	
6. Investment Costs for Improvements (US$)	N/A	$6,000,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$13,590,773	
8. Net Present Value (US$) (discounted savings - costs)			$6,900,703	

Table D8b. Evaluation of Improved Road Transport for Breakbulk
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Tema-Ouaga Breakbulk	**Year:**	2008
Improved Scenario Name:	Improved Road Transport for Tema-Ouaga I	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$16,616,880
Improved Total Shipper Price	$15,281,595
Total Shipper Savings	$1,335,285
Growth Rate of Savings (%/yr)	5%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2009	$6,000,000		-$6,000,000
2010		$1,335,285	$1,335,285
2011		$1,402,049	$1,402,049
2012		$1,472,151	$1,472,151
2013		$1,545,759	$1,545,759
2014		$1,623,047	$1,623,047
2015		$1,704,199	$1,704,199
2016		$1,704,199	$1,704,199
2017		$1,704,199	$1,704,199
2018		$1,704,199	$1,704,199
2019		$1,704,199	$1,704,199
2020		$1,704,199	$1,704,199
2021		$1,704,199	$1,704,199
2022		$1,704,199	$1,704,199
2023		$1,704,199	$1,704,199
2024		$1,704,199	$1,704,199
2025		$1,704,199	$1,704,199
2026		$1,704,199	$1,704,199
2027		$1,704,199	$1,704,199
2028		$1,704,199	$1,704,199
2029		$1,704,199	$1,704,199
Net Present Value:		$13,590,773	$6,900,703

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

Table D9a. Evaluation of Elimination of Unofficial Costs for Inbound Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Tema-Ouaga Containers		**Year:**	2008
Improved Scenario Name:	Without Unofficial Costs for Tema-Ouaga Containers		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$3,630	$3,424	$206	
2. Av. Transit Time for Trip	599	599	0	hours
3. Reliability (% of mean time)	81	81	0	%
4. Total Containers Per Year	15,807	15,807	0	
5. Total Logistics Cost	$57,379,410	$54,125,855	$3,253,555	
6. Investment Costs for Improvements (US$)	N/A	$3,500,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$33,115,287	
8. Net Present Value (US$) (discounted savings - costs)			$26,922,989	

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

Table D9b. Evaluation of Elimination of Unofficial Costs for Inbound Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Tema-Ouaga Containers	**Year:**	2008
Improved Scenario Name:	Without Unofficial Costs for Tema-Ouaga Co	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$57,379,410
Improved Total Shipper Price	$54,125,855
Total Shipper Savings	$3,253,555
Growth Rate of Savings (%/yr)	5%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2009	$3,500,000		-$3,500,000
2010		$3,253,555	$3,253,555
2011		$3,416,233	$3,416,233
2012		$3,587,045	$3,587,045
2013		$3,766,397	$3,766,397
2014		$3,954,717	$3,954,717
2015		$4,152,453	$4,152,453
2016		$4,152,453	$4,152,453
2017		$4,152,453	$4,152,453
2018		$4,152,453	$4,152,453
2019		$4,152,453	$4,152,453
2020		$4,152,453	$4,152,453
2021		$4,152,453	$4,152,453
2022		$4,152,453	$4,152,453
2023		$4,152,453	$4,152,453
2024		$4,152,453	$4,152,453
2025		$4,152,453	$4,152,453
2026		$4,152,453	$4,152,453
2027		$4,152,453	$4,152,453
2028		$4,152,453	$4,152,453
2029		$4,152,453	$4,152,453
Net Present Value:		$33,115,287	$26,922,989

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

Table D10a. Evaluation of Elimination of Unofficial Costs for Outbound Containers
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Ouaga-Tema Containers		**Year:**	2008
Improved Scenario Name:	Without Unofficial Costs for Ouaga-Tema Containers		**Year:**	2008

Performance Indicator	Base	Improved	Difference	
1. Unit Transport Price to Shipper	$1,736	$1,668	$68	
2. Av. Transit Time for Trip	68	68	0	hours
3. Reliability (% of mean time)	33	33	0	%
4. Total Containers Per Year	862	862	0	
5. Total Logistics Cost	$1,496,432	$1,437,816	$58,616	
6. Investment Costs for Improvements (US$)	N/A	$3,500,000	N/A	
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$596,602	
8. Net Present Value (US$) (discounted savings - costs)			($2,639,453)	

Table D10b. Evaluation of Elimination of Unofficial Costs for Outbound Containers
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Ouaga-Tema Containers	**Year:**	2008
Improved Scenario Name:	Without Unofficial Costs for Ouaga-Tema Co	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$1,496,432
Improved Total Shipper Price	$1,437,816
Total Shipper Savings	$58,616
Growth Rate of Savings (%/yr)	5%
Year of Maximum Savings:	2015
Discount Rate (%)	10%

Annual Costs and Savings

Year	Investment	Savings	Net Savings
2009	$3,500,000		-$3,500,000
2010		$58,616	$58,616
2011		$61,547	$61,547
2012		$64,624	$64,624
2013		$67,855	$67,855
2014		$71,248	$71,248
2015		$74,810	$74,810
2016		$74,810	$74,810
2017		$74,810	$74,810
2018		$74,810	$74,810
2019		$74,810	$74,810
2020		$74,810	$74,810
2021		$74,810	$74,810
2022		$74,810	$74,810
2023		$74,810	$74,810
2024		$74,810	$74,810
2025		$74,810	$74,810
2026		$74,810	$74,810
2027		$74,810	$74,810
2028		$74,810	$74,810
2029		$74,810	$74,810
Net Present Value:		$596,602	($2,639,453)

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

Table D11a. Evaluation of Elimination of Unofficial Costs for Breakbulk
FastPath
Summary Comparative Investment Evaluation Form

Base Scenario Name:	Tema-Ouaga Breakbulk			**Year:**	2008
Improved Scenario Name:	Without Unofficial Costs for Tema-Ouaga Breakbulk			**Year:**	2008
Performance Indicator	Base	Improved	Difference		
1. Unit Transport Price to Shipper	$112	$103	$8		
2. Av. Transit Time for Trip	658	658	0	hours	
3. Reliability (% of mean time)	84	84	0	%	
4. Total Tonnes Per Year	148,385	148,385	0		
5. Total Logistics Cost	$16,579,056	$15,323,719	$1,255,337		
6. Investment Costs for Improvements (US$)	N/A	$3,500,000	N/A		
7. Discounted Cost Savings for Shippers (US$)	N/A	N/A	$12,777,044		
8. Net Present Value (US$) (discounted savings - costs)			$8,433,676		

Table D11b. Evaluation of Elimination of Unofficial Costs for Breakbulk
FastPath
Cost-Benefit Analysis Sheet

Base Scenario Name:	Tema-Ouaga Breakbulk	**Year:**	2008
Improved Scenario Name:	Without Unofficial Costs for Tema-Ouaga Br	**Year:**	2008

Assumptions:

Investment Year:	2009
Opening year:	2010
Base Case Total Shipper Price	$16,579,056
Improved Total Shipper Price	$15,323,719
Total Shipper Savings	$1,255,337
Growth Rate of Savings (%/yr)	5%
Year of Maximum Savings:	2015
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
2009	$3,500,000		-$3,500,000
2010		$1,255,337	$1,255,337
2011		$1,318,104	$1,318,104
2012		$1,384,009	$1,384,009
2013		$1,453,209	$1,453,209
2014		$1,525,869	$1,525,869
2015		$1,602,162	$1,602,162
2016		$1,602,162	$1,602,162
2017		$1,602,162	$1,602,162
2018		$1,602,162	$1,602,162
2019		$1,602,162	$1,602,162
2020		$1,602,162	$1,602,162
2021		$1,602,162	$1,602,162
2022		$1,602,162	$1,602,162
2023		$1,602,162	$1,602,162
2024		$1,602,162	$1,602,162
2025		$1,602,162	$1,602,162
2026		$1,602,162	$1,602,162
2027		$1,602,162	$1,602,162
2028		$1,602,162	$1,602,162
2029		$1,602,162	$1,602,162
Net Present Value:		$12,777,044	$8,433,676

Appendix E. Potential Enhancements to FastPath for Corridor Analysis

While showing the adaptability of FastPath to diverse conditions unique to links and nodes as well as to cargo types and specific commodities, the user faced having to manually manipulate data to accommodate the need to address specific cargo types. During FastPath's development, the application's functionality requirements centered on the performance of the transport logistics system; because containers capture a fuller range of logistics services than other commodity types (e.g., bulk and breakbulk), FastPath developers designed the application to model a container transiting through the variety of links and nodes in the transport logistics chain. Participants in FastPath's design workshop, representing some of the world's leading authorities in ports, transport, and logistics, indicated that the available software applications focused on analysis from the supply chain manager's point of view—the application thus addressed controllable cost areas that the supply chain manager could address, but there was a lack of such a tool for addressing non-controllable costs—costs influenced by factors outside the purview of supply chain managers, such as infrastructure and institutional and regulatory frameworks and procedures.

With more recent attention to food security and product competitiveness, there is an increasing interest in factors affecting efficient movement of specific commodities, each having its own peculiar logistics challenges. Countries and donor organizations, transport logistics planners, and shippers and producers would thus benefit from greater insight on commodity-specific constraints facilitated by certain changes to FastPath features and capabilities.

FastPath was developed to assess the performance of infrastructure components used to facilitate international freight transport. It uses maritime containers as a unit of cost and performance; in this way, the vast majority of services provided by infrastructure operators along the logistics chain are captured for handling this cargo type. Additionally, benchmark measures for time and cost can be presented in comparative units (e.g. containers). It was not created as a tool to assess product-specific value chains. Therefore, given the context in which the WA Trade Hub would like FastPath to complement their analysis, in its current version FastPath has four limitations: (1) the corridors from one landlocked country to alternative ports cannot be shown in the same scenario and therefore must be analyzed as separate scenarios[10] in the software application; (2) it is designed to deal primarily with containers and not other freight handling types; (3) it groups all containerized traffic as one average container type with an average number of TEU per container, rather than showing separate container sizes, and (4) it does not have different categories of cost for formal and informal payments.[11]

Based on the desired results, the TCBoost-WA Trade Hub team determined that it would be most expedient to explore ways to adapt the existing FastPath tool to

1. ***Deal not only with containers, but also noncontainerized cargo and address the change from one mode to another en route.*** As discussed earlier, the FastPath tool uses the container as the main unit of measure, while RRTC accommodates breakbulk or non-containerized traffic. In this report, we conducted the assessment transforming non-containerized cargo into truckloads. Alternatively, and with more complex future corridors in mind, TCBoost can support programming changes for FastPath (e.g. using a parameter switch to turn the use of different units of measurement “on” and “off”) that can be incorporated fairly quickly.
2. ***Show separate official and unofficial payment categories on cost comparison.*** The current version of FastPath can incorporate unofficial costs in each subcomponent, but the results screens and graphics do not show them separately. This separation has to be prepared manually. In order to differentiate each cost incorporating the values in the graphics, some programming and adjustments are required. The programming, which can be done in the very short term, would include a separate identification of unofficial payments from other costs with changes to the database to add fields for official/unofficial data and the creation of different reporting structures to show these costs in comparison to the total.
3. ***Be compatible with later versions of Microsoft Excel.*** FastPath’s current version operates using Microsoft Excel 2003 for the cost-benefit analysis module. Adapting the tool to Microsoft Excel 2007 does not represent a major modification but should be done.
4. ***Include scenarios with one inland destination linked to several ports.*** The current plan for future corridor analysis includes comparing routes to different ports from one origin (e.g. Ouagadougou to Lomé, Tema and Abidjan). With some programming to create a separate module of FastPath, this variation would allow the comparison of multiple scenarios in the form of a spreadsheet which incorporates a Visual Basic program to retrieve different scenario data and place it in the spreadsheet. The user could enter the names of the scenarios and the program would generate a spreadsheet output and comparison graphics.

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[10] Separate scenarios can be compared in a graphic bar chart displaying two at a time for price and time. However, the graphic display is designed for comparing a base case and an improved case for a given corridor, and it has limitations for comparisons of different corridors.

[11] There are places to put in notations on the cost definitions and to state what is included in costs and time delays in the *FastPath* input screens for locations where informal payments are made.

5. ***Indicate the exchange rate used for different currencies along a corridor.*** This will allow the user to present results and make comparisons indicating the exchange rate used during the analysis. This feature will be helpful, considering the frequent variation of currencies which can occur from the time that the data is collected and when the results are presented. The associated programming for this option is not considerable and can be developed as an add-on spreadsheet function.

6. ***Expand capability of Graphic Input screen to show more than one port.*** The Graphic Input screen allows the insertion of only one port. In so doing, only corridors served by the port placed on the Input screen can be studied. Yet we observe today that policy in some regions is promoting the development of competition between corridors. Inducing such competition generates a greater number of options for the shipper, thus encouraging lower costs and better efficiency and reliability. Enabling the FastPath user to insert more than one port allows the user to more easily consider the competitive dynamics of potential rival corridors and gauge the effects of structural and non-structural interventions on corridor competition. This capability, however, requires substantial modification to the software and cannot be implemented in a rapid timeframe.