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Lessons of Corridor Performance Measurement

SSATP

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Acronyms and abbreviations

ALCO	Abidjan-Lagos Corridor Organization
AU	African Union
EC	European Commission
ECOWAS	Economic Community of Western African States
GDP	gross domestic product
GVW	gross vehicle weight
ICD	Inland container depot
NCTTCA	Northern Corridor Transport and Transit Coordination Authority
NEPAD	New Partnership for Africa's Development
REC	Regional Economic Community
SSATP	Sub-Saharan Africa Transport Policy Program
TEU	Twenty-Foot Equivalent Unit
TTCA	Transit Transport Coordination Authority Secretariat
UEMOA	*Union économique et monétaire ouest africaine*
UNECA	United Nations Economic Commission for Africa
USAID	United States Agency for International Development
WATH	West Africa Trade Hub (initiative funded by USAID)

Contents

Abstract

This paper aims at presenting the methodological lessons of several corridor performance measurement carried out in Africa. Based on current experience, the authors* conclude that, while road drivers' trip questionnaires may be useful, the core of monitoring activities should mostly rely on existing consolidated data (customs and port data) and limited surveys (freight forwarders, major trucking companies, truckers and transport unions), to benchmark corridor performance.

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1. Introduction

This paper aims at presenting the lessons of corridor performance measurement carried out in the last years in Africa, mostly under initiatives implemented with the financial or technical support of the SSATP.

Developing landlocked countries face many challenges to compete effectively in the world markets. They experience high trade transaction costs, with logistics representing a significant proportion of the GDP, which at times can more than double that of other emerging economies or treble that of developed countries. This problem impacts Sub-Saharan Africa more than any other region, as it includes fifteen landlocked countries.

International transport corridors serve the foreign trade of a single country or of several adjoining countries. They are composed of national segments, also serving domestic traffic. As a result they serve competing demands, and are subject to conflicting objectives for their development, multiple jurisdictions responsible for maintenance and uncoordinated sources of funding for both development and maintenance. Co-operation between States, through corridor-based actions and improved dialogue, can lead to significant transit benefits for landlocked countries.

Given the challenges facing landlocked countries, sensitizing and influencing policy makers on how to improve access requires accurate and specific data on impediments to the smooth flow of traffic. Appropriate data can assist in pinpointing those components of the regional systems that are not working well so that infrastructure, regulatory or institutional reform interventions, or simply operations improvements can be better targeted. It is therefore critical that data on corridor operations be collected systematically.

The performance of a corridor can be evaluated from two main perspectives:

An **infrastructure perspective**, which considers the physical capacity of links and nodes in a corridor as well as their use. This approach is often used when deciding on requirements for additional capacity but provides little insight into the effect of corridor performance on trade.

A **service perspective**, which examines the quality of the services provided for goods moving on the various routes. Performance is measured in terms of average time and cost for transport units moving through this corridor. These may be broken down into time and cost for specific links and nodes (Arnold 2006). In terms of trade facilitation, the second perspective probably gives the most interesting results, as it allows to benchmark several corridors with similar length/characteristics or, for a given corridor, helps reach the optimal transit time that should be expected given the infrastructure and services performance.

The need to set up efficient sustainable monitoring tools has been one of the main lessons drawn from the implementation of regional projects financed by the World Bank and other donors[1]. In order to contribute to this objective, the SSATP developed and tested methodologies for monitoring transport performance along transit corridors, one of the major contributors being the Northern Corridor Transit Transport Coordination Authority Secretariat (NCTTCA) in East Africa.

Based on current experience, we conclude that, while road drivers' trip questionnaires may be useful, the core of monitoring activities should mostly rely on existing consolidated data (customs and port data) and limited surveys (freight forwarders, major trucking companies, truckers and transport unions), especially to benchmark corridor performance[2].

The paper is divided as follows: section 2 draws methodological lessons, section 3 presents the main relevant indicators to benchmark and assesses corridor performance, section 4 presents the results of the pilot initiative along the Northern corridor in East Africa where the principles defined previously were applied, and finally section 5 gives some preliminary conclusions on corridor performance measurement.

[1] Review of Bank lending for African transport corridors (World Bank Report No. 13099, May 1994)

[2] The Transport Coordination Committee for the Regional Economic Communities of the SSATP (REC-TCC) also observed in its 2007 gathering that the sustainability of corridor performance measurement is intricately linked to that of corridor management arrangements, and vice versa. Consequently, several proposals were made to sustain both corridor management groups and corridor performance measurement including:

- User-pay principle, such as a commission on goods at the entry port;
- Contributions by private sector and port operators;
- Contributions/support from governments, through lobbying by RECs; and
- Establishment of a champion for the corridor, e.g. usually a port, or a corporate entity.

2. Methodological Lessons for Corridor Performance Initiatives

2.1 Current approaches to corridor performance initiatives

Corridor monitoring activities can take two forms: (i) corridor-wide monitoring and (ii) detailed monitoring at specific locations, or choke-points, within a corridor. Corridor-wide monitoring involves data collection and surveys covering the length of a corridor, while bottlenecks' monitoring, on the other hand, comprises data at specific locations that constrain transit movement. Corridor-wide monitoring in Africa has been carried out on the Northern Corridor in East Africa or along corridors in West and Central Africa, while detailed micro-level monitoring has been implemented at the Beit Bridge and Chirundu border posts on the North-South Corridor in Southern Africa. It is also a common practice at port level adopted by Port or Customs authorities to monitor either their own performance or that of the other public and private stakeholders involved in the goods clearance process.

Three main methodologies have been used to date, with different costs and focuses:

1. Corridor-wide monitoring based on drivers' trip diaries or questionnaires filled by truck drivers,
2. Bottleneck monitoring based on independent surveys; the focus is usually on border-crossing time,
3. Corridor-wide monitoring based on interviews of freight forwarders and a partnership with port authorities and/or customs.

In the first case, selected truck drivers fill trip sheets in which they are expected to report all the stops (official and non-official) and may also document official payments and bribes.

In the second case, external surveyors report transport time and costs[3]. This methodology is usually used for border-crossing time: several people are posted before and after border-

[3] For this methodology, the use of students is common as field specific expertise is not required.

crossing and report, for instance, time to cross the border or the number of trucks transiting.

In the third case, interviews of freight forwarders, heads of trucking companies, representatives of port authorities or customs are carried out in order to collect traffic, transport time/cost, and clearance time data.

The main difference lies in the fact that the first two approaches mainly consist in ***producing*** data while the third approach mainly consists in ***gathering*** existing data. For the first option, the institution in charge of benchmarking corridor performance usually liaises with local institutions, which supervise trip survey exercises[4]. For the second option, surveyors are recruited on a temporary basis. In the third case, the institution gathers data already collected by customs, port and private sector operators.

Contrary to a common belief, data accuracy with road drivers' trip diaries is far more problematic than with surveys conducted with freight forwarders and trucking companies.

Results of interviews of freight forwarders or head of trucking companies depend on data needs: to get an idea of average corridor transport costs and time, informal and unstructured interviews can be very successful. It only requires that a working relationship already exists between private sector operators and transport specialists from donors' organizations or corridor institutions. For more detailed data such as port clearance, border-crossing time or vehicle operating costs, more formal and structured interviews or data supply protocols need to be carried out due to the use of formal paper or computer-based data sources (customs declarations, truck company records…).

2.2 Sustainability of the appropriate methodology: a critical factor

There is a need to assess both the resources (funding and human/data) available and the results expected before designing a corridor performance measurement exercise[5]. More specifically:

[4] Contrary to what is often said, there is a greater problem of accuracy with road drivers' trip diaries than with operators' surveys. Indeed, truck drivers are often given significant amounts of money to pay for en route controls and have an incentive to report delays and costs excessively in order to earn larger bonuses—one of the lessons from the first phase of corridor performance measurement in West Africa.

[5] It is worth noting that trade facilitation major issues differ between corridors. One of the main challenges with corridor monitoring will however usually how to obtain data on road transport time predictability in an effective and sustainable way.

- What is the focus of the work? Is it to measure or demonstrate the lack of competitiveness of the corridor or to design possible recommendations for the main corridor bottlenecks?

- What is the amount of available resources for the exercise?

- Is it conceived as a one shot exercise or to be undertaken regularly?

- What is the quality of customs and port data on the corridor to be studied?

- Based on the answers to these questions, corridor performance measurement will be designed either based on gathering of existing information or large surveys.

Cost-wise, data production is obviously much more expensive than data gathering from existing sources. This is why, for a functional corridor performance measurement mechanism[6], systematic and more automated collection of road transport data is necessary, mainly through surveys of trucking companies and freight forwarders who would compute data for their own use.

Drivers' trip diaries are usually the most costly exercise. The WATH (West Africa Trade Hub)[7], which builds on an initiative launched by UEMOA and the SSATP in 2002, cost more than $200,000 to collect data on bribes and delays related to roadblocks in four corridors, while surveys of border-crossing time cost $1 million for the ALCO[8] Initiative on four border-posts over eighteen months (including dissemination)[9].

On the contrary, freight forwarders or trucking companies' interviews are much less expensive. However, to get and maintain data collected as part of the NCTTCA exercise described below, requires an estimated recurrent cost equals to 2-3 men-months per year.

[6] Existing computerized data sources, already maintained by ports and customs authorities, can perfectly complement primary data collection gathered through road drivers' trip diaries, which should be the first target of any such initiative, are the most likely to provide sustainability.

[7] For results of the WATH initiative, see Annex 2.

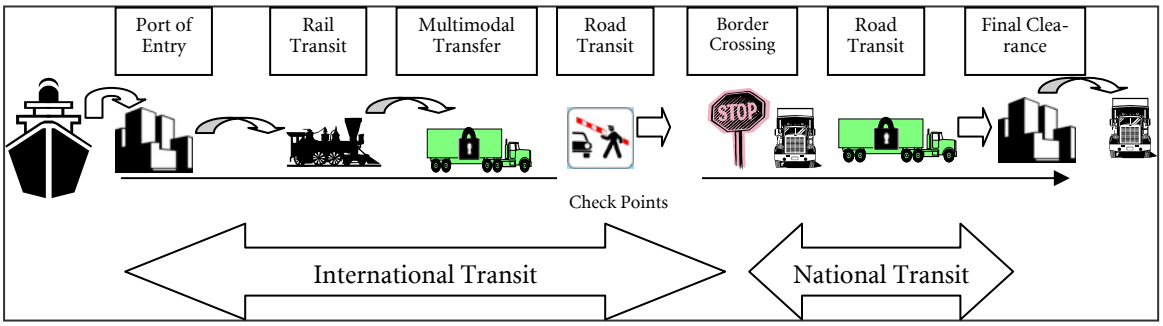
[8] For more detail on the Abidjan-Lagos Corridor Organization (ALCO) www.corridor-sida.org

[9] Permanent staff from the institutions involved (UEMOA, NCTTCA and ALCO) spent several weeks to support this process.

3. Monitoring Indicators

3.1 What are the indicators available?

Most sets of corridor indicators include measures of time and cost, but which time and cost vary from one corridor to another. Cost for instance could be measured per ton, consignment, truck, container or TEU. There is an increasing focus on costs and times per TEU[10], but on many corridors the measure used by customs administrations, or often by transporters to price their offers is still per ton or per consignment. As a minimum, any package monitoring corridor performance should also take transport time and reliability into account. The various steps in the logistics chain is summarized in Figure 1 below:



Typical Sources of Data						
Port	**Rail**	**Road**	**Road Transit**	**Border crossing**	**ICD**	**Destination**
Freight forwarders						
Customs Port operators	Rail operator	Truck operators	Drivers	Customs	ICD operators	Firms
Volumes, disaggregated processing times	Volumes, duration and cause of stops, costs	Volumes, costs, overload control	Location, duration and cause of stops	Disaggregated processing times (both sides)	Dwell time per mode of transport	Total trip time, costs, reliability

[10] The unit of cost should be in Twenty Foot Equivalent Unit or truckload, whichever is the most relevant to the corridor. Since a single TEU can usually legally be carried on a three axle truck or a 40 ft container on a five axle truck, these could be used as the truck/TEU equivalents. An alternative would be to accept overloading reality and use a 12 ton GVW (gross vehicle weight) two axle truck and a 20 ton GVW four axle truck as the equivalents.

3.2 Why is reliability an important indicator?

Unreliability and unpredictability increase transportation costs. In an uncertain environment, transport companies strive to cope with these problems by investing in costly information systems or employing additional people in charge of smoothing transactions. Transport operators invest in costly communication systems such as satellite phones, tracking systems and finally charge the exporter/importer accordingly. In a context where transport companies themselves are part of the unreliability, the freight forwarder or the shipper needs to hedge the unreliability risk either by tracking goods itself, using one's own account or paying more for a better service… or, in the case of the shipper, passes on the risk to the consumer through shortages or overpricing.

Fafchamps (2004) demonstrates empirically in nine African countries that the incidence of delayed deliveries has a strong positive effect on inventory holdings. Based on large firm-level surveys in Africa, he finds that firms hedge delivery risk by building up inventories, notably inputs for manufacturing industries. In Africa, firms hold, on average, the equivalent of three months of input needs (among the surveyed firms). A strong correlation exists between late deliveries and inventories. Firms experiencing late deliveries hold, on average, 133 to 198 percent more inventories of inputs and 130 to 147 percent more total inventories. 1 out of 4 firms surveyed declares experiencing late deliveries. In economies where the cost of funds is high, this strategy is costly and considerably limits economic efficiency. This implies that measuring uncertainty is key for business.

Measuring transport time variance can be approached through the following: standard deviation of transport time, minimum and maximum values, or transport time within which 95 percent of cargo can reach destination.

Usually, transit time distribution conforms to an asymmetric curve with a broad tail. This distribution shape is well known for port dwell time data (see section 4.3 for details in Mombasa) , but most data collected under SSATP initiatives, the World Customs Organization sponsored time release studies or the World Bank projects preparation studies led to similar results for the studied corridors. The comparison between median and average values is interesting, and shows how some indicators (average) may seem irrelevant to operators, as being different from their daily perception (median).

3.3 Criteria to choose appropriate performance indicators

The selection of Indicators depends on the purpose of the corridor performance measurement exercise: for advocacy and benchmarking purposes, comprehensive measures such as total transport time, costs and their variance need to be sought, whereas for donors' project

monitoring, more detailed indicators to highlight the impact of donors' investment can be developed such as border-crossing time or port dwell time. For corridor management institutions, they can be interested both in the global corridor monitoring, and on the detailed segments, disaggregating the supply chain.

For regional trade and transport projects, the selected indicators for data collection should in any case, for the sake of sustainability:

- be easy to measure and collect,
- be based on consistent and defined parameters readily understood,
- capture excessive transport costs and/or time,
- be as much as possible already measured regularly by the main logistics stakeholders.

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4. The Northern Corridor Performance Indicators Initiatives – History and Principles Applied

4.1 The Northern Corridor

The Northern Corridor is defined as the transport infrastructure, facilities and services radiating from the port of Mombasa to the landlocked countries in the Great Lakes region. The corridor covers the transport routes from the port of Mombasa to Uganda, Rwanda, Burundi, and Eastern DRC, as well as Northern Tanzania and Southern Sudan. Various modes of transport and modal combinations, which include roads, railways and inland waterways, are applicable and used along the corridor. Among Northern Corridor Countries, only Kenya and Uganda are connected by rail, although multimodal combinations are possible fro other countries (see Table 1).

Table 1: Modal Split along the Northern Corridor

Year	Total	Kenya Rail	Transit rail	Total rail	Total	Kenya Rail	Transit rail	Total rail
	IMPORTATIONS				EXPORTATIONS			
1999	108,983	24%	17%	22%	108,314	19%	17%	18%
2000	112,346	20%	29%	23%	106,915	19%	27%	20%
2001	134,497	17%	25%	19%	130,234	15%	32%	18%
2002	143,359	15%	21%	17%	134,700	15%	30%	17%
2003	173,539	14%	19%	15%	157,209	11%	14%	12%
2004	173,539	14%	16%	15%	157,209	12%	16%	12%
2005	207,796	12%	15%	15%	201,587	28%	12%	12%

The institutional framework for the management of the corridor has been established by the Northern Corridor Transit Agreement (NCTA), a Treaty signed by the countries of Kenya, Uganda, Rwanda, Burundi, and DR Congo, for the facilitation of transit traffic and trade along the corridor. The Treaty created the Transit Transport Coordination Authority of the Northern Corridor (NCTTCA), a Council of Ministers in charge of transport from the signatory countries, as the supreme body for the implementation of the dispositions of the Treaty, backed by a permanent Executive Secretariat.

4.2 Lessons learnt from the Northern Corridor

Monitoring on the Northern Corridor is led by the NCTTCA Executive Secretariat.

Corridor performance measurement initiatives were divided in two phases:

The initial phase was conducted in 2004 and 2005 in order to raise the awareness among stakeholders from the public and the private sector on the cost and impact of delays along the Corridor and to identify what could be the main constraints for trade and transport facilitation along the corridor. The pilot phase was centered on transport time measurement (delays/border-crossing time/delays at weighbridges…) with the methodology of trip diaries' surveys.

This phase yielded some initial lessons in terms of data collection methodology. Indeed, it appeared that accuracy to obtain trip sheets filled by truck drivers (without pre-selecting them) was questionable, which led to the fact than less than 200 observations were usable (including 120 questionable observations) despite a cost of almost $100,000.

Based on these lessons, the second phase of the Northern Corridor Transport performance measurement exercise (2006) was based on two main building blocks:

- **data collection of pre-existing information**, such as computerized data from revenue authorities, port authorities and railway operators; and

- **primary data collection complementing computerized data through interviews of a dozen of targeted trucking operators**, with the view of obtaining, if possible, consolidated and computerized data. Pre-existing data were then complemented with data from private operators in order to check for the accuracy of official data.

Two main categories of indicators were selected for the Northern Corridor during the second phase, namely: traffic volumes and transit time/delays. Time-related indicators were further broken down into activity-specific indicators, to estimate the efficiency of the agents involved in each logistics process. For each indicator, standard deviation measures were also computed to assess service predictability. Also, as a supplement to the quantitative in-

dicators, some qualitative information on operators' efficiency and logistics practices was also captured.

4.3 Results from the Northern Corridor

The main indicators and their data sources are shown in Annex 1. Table 2 provides a summary of time and reliability of the main inland markets served from Mombasa.

Table 2: Transit time for deliveries by road[11]				
Days	**Uganda (Kampala)**		**Rwanda (Kigali)**	
Indicator	Average	St. Dev.[12]	Average	St. Dev.
Port Dwell Time	12.5	8.4	13.0	9.2
Land Transport	7.5	6.3	10.0	5.4
Total Transit Time	21.3	10.6	23.5	10.4

On average, a roundtrip to Kampala takes 10 days (6-8 days for the best operators). Irrespective of the intrinsic imbalance in trade, which implies that most return trips are empty or correspond to the repositioning of empty containers, some companies deliberately prefer to return empty, in order to avoid delays to get cargo, or at the border on the way back to Mombasa, so that they can reposition their trucks faster in Mombasa and benefit from the comparatively stronger inbound revenue.

Table 3:Distribution of port dwell time in Mombasa			
	Uganda	**Rwanda**	**DR Congo**
Average (%)	12.9	13.2	10.4
95	28	29	21
25	7	7	6
Median	11	10	9
75	16	16	13
Average 90	11.3	10.4	8.8
Average 95	11.2	10.3	8.9
St. Dev.	8.20	9.76	6.37
Min	0	1	1
Max	85	94	77

[11] Equivalent data are not available for containers at destination of Kenya for once goods are cleared in Mombasa, no record for arrival in Nairobi are available.

[12] Abnormal observations have not been removed.

5. Preliminary Conclusions

This paper presented the methodological lessons of transport corridor performance measurement and the first results of a pilot applied to the Northern Corridor. As mentioned, road transport data proved the most difficult to collect. Based on our monitoring experiences in Africa, we conclude that, while road drivers' trip diaries may be useful, the key issue is to frequently collect and disseminate statistically significant data at a sustainable cost. At the current cost of the various approaches, a recurrent survey of trucking companies or operators, and, to a lesser extent, freight forwarders may be preferable to physical surveys for a functional corridor monitoring tool. The core of monitoring activities should however rely mostly on existing consolidated data (customs and port data) and limited surveys (freight forwarders, major trucking companies, truckers and transport unions).

More specifically, the approaches tried in Africa have shown that with limited costs incurred, current trends in IT development in Customs and Ports made it easier to produce statistically significant time data, allowing an appropriate evaluation of transit time and reliability. Cost data required freight forwarders or transporters inputs and proved less easy to collect.

Expensive and detailed surveys are needed to do a micro analysis of bribes and illegal stops, but when a specific problem is targeted specific surveys with appropriate champions can succeed at limited costs, as was done on the North South Corridor at some key border crossings. Some detailed monitoring of bribes and illegal checkpoints has been done in West Africa at a substantial cost, leading to results such as these presented in Annex 2 , which can then be used to sensitize or influence decision makers.

Usefulness of transport corridor performance measurement has been demonstrated but the issue of their sustainability remains to be fully tested. That is an area, in which donors can make the difference by continuing or launching initiatives because this is an area, which do not have sustained funding sources. If this move is not undertaken, regional trade and transit facilitation projects will have difficulties to materialize into successes.

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Annex 1

Indicators and Sources of Data for the Northern Corridor Performance Measurement

Indicator	Source(s)	Remarks
Transit-time indicators		
Total transit time between the port and economic centers in the hinterland	Customs/Port data	
Port dwell time	Port authorities	Monitored by port authority, but not for rail, although data exists with the rail operator
Transit time within countries (for example Malaba to Katuna)	Road surveys and Customs data	Customs data are simpler to get in an environment where operations are adequately recorded
Traffic flows		
Transit volumes	Port authorities	
Regional trade	Customs data is the only source. However, intraregional trade can be ill-tracked in customs unions, which can make inaccurate collected data.	
Border-crossing volumes at the main Northern Corridor borders	Customs authorities	This information is not yet computerized
Delays		
Border-crossing time	Surveys, and to some extent, customs though needs link between data relating to the same consignment as viewed by the various Customs systems (not very difficult technically once systems interconnected)	This information could still be included in a simpler version of the road delays survey or alternatively from C&F agents
Border-crossing traffic volume	Customs data and surveys	
Weighbridge delays	Road surveys	
Terminal delays	Road survey delays completed by Customs data	Requires further investigation due to variety of situations inland (bonded warehouses or customs areas)
Operator efficiency		
Port handling productivity	Port authorities	
Railways	Railway companies	Covered in railways reports, but would ideally need to be cross-checked with C&F agents
Annual distance per truck	Interviews with truck operators	
Tariffs		
Delivery to destination	C&F agents, through interviews	
Cost factors	Operators	

Source: adapted from Hartmann (2007)

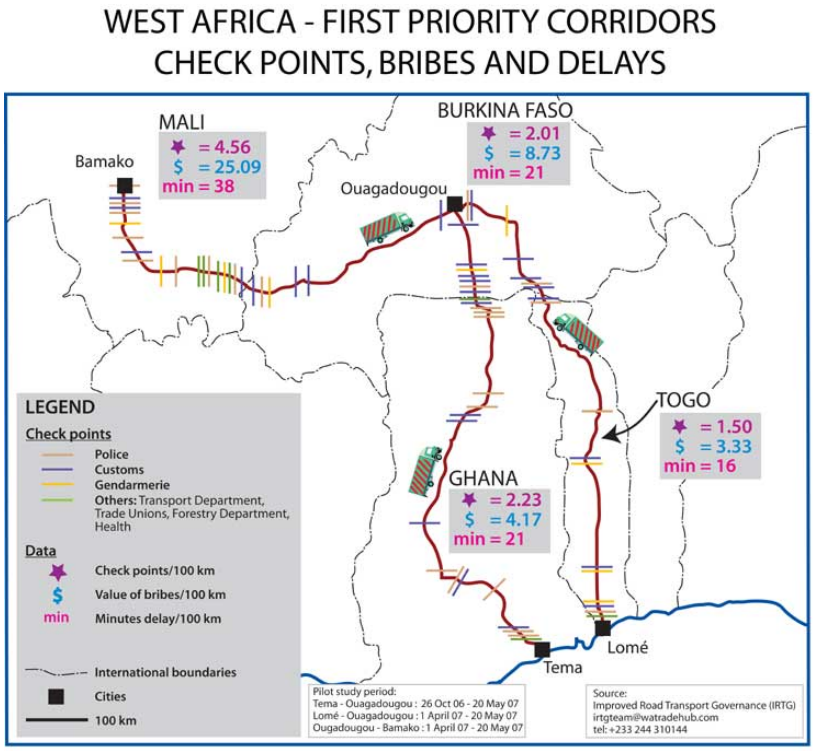
Annex 2

West Africa Checkpoints Survey

In West Africa the SSATP and its REC partners, UEMOA and ECOWAS, have collaborated with the USAID-funded West Africa Trade Hub in collecting information on the number of barriers to movement along corridors, including length of delays at road blocks, the agents involved and total bribes paid. The surveys have therefore used road surveys to collect the required pieces of data. The initiative has focused on three priority corridors: Tema-Ouagadougou, Ouagadougou-Bamako and Lome-Ouagadougou.

The preliminary results are illustrated on the map below (Figure 2). The WATH-led work has contributed to the quantification of the transit delays and costs and causing factors along the three corridors in West Africa.

Checkpoints on Three Selected Transit Corridors in West Africa



Source: www.watradehub.com

There are indications that the results of the surveys in West Africa are already having some positive impact. Checkpoints have a debilitating effect on the performance of the regional transport systems so their removal is of importance. Some practical steps have already been taken to remove some check points especially in Ghana where a new law was drafted to reduce the authorized check points between the port of Tema and the border with Burkina Faso. The complete analysis of accuracy of data and optimal ways of collecting them is not yet carried out.