

# Corridor Transport Observatory Guidelines

Olivier Hartmann

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## Acronyms

B/L	Bill of Lading
C&F	Clearing and Forwarding
CCTFA	Central Corridor Trade and Transport Facilitation Agency
CTO	Corridor Transport Observatory
DI	Destination Inspection
DO	Delivery Order (release by shipping agent)
FCL	Full Container Load
GIS	Geographic Information System
ICD	Inland Container Depot
IT	Information technology
JBP	Joint Border Post
LCL	Less than Container Load
NRTA	National Road Transport Association
NTB	Non-Tariff Barrier
ODCY	Off-Dock Container Yard
OSBP	One-Stop Border Post
PSI	Pre-Shipment Inspection
REC	Regional Economic Communities
RO	Release Order (release by Customs)
SSATP	Africa Transport Policy Program
SW	Single Window
TB/L	Through Bill of Lading
TFF	Trade Facilitation Facility
TTC	Trade and Transport Corridor(s)
TTCA-NC	Northern Corridor Transit Transport Coordination Authority
VTs	Vessel Traffic System
WAEMU	West Africa Economic and Monetary Union



## Foreword

The Northern Corridor, connecting East Africa to the World through the port of Mombasa, is one of the oldest corridor authorities in Africa, as it was established in 1985. Throughout its years of existence, it has been a source of ideas and knowledge that contributed to the thinking on trade facilitation. To a large extent, it is the birthplace of the concept of Corridor Transport Observatory, and through successive models and revisions, it helped shape what Transport Observatories are.

Transport Observatories emerged as the result of the efforts made over the years to address the specific challenges faced by landlocked developing countries. Most of these countries rely heavily on overseas markets as outlets for their productions and as source for their imports, but for that, they must transit through a coastal country. They are at a disadvantage when it comes to competing on equal terms with other economies for integrating into the world market. The handicaps attached to that remoteness are well known and many: a longer time to import or export, a time rarely predictable, higher costs, with sometimes a double toll when input into production must also be imported. Moreover, little can be done by the landlocked countries alone to improve the conditions of crossing transit countries. Indeed, transit trade flows may even be considered as a nuisance or even a threat when similar economies are competing for similar markets.

Trade and transport facilitation aims at reducing those disadvantages. The challenges faced by landlocked countries need to be taken into consideration in a holistic manner, either from a corridor perspective, under the angle of transport and logistics service effectiveness, or from a regional perspective, under the angle of institutional efficiency. The corridor approach has been developed to focus and align interests of countries served by a trade route for their mutual benefits. Over the years, this approach has emerged as an effective and focused way to address both intra-regional and international trade.

Since the formalization of the first corridors in Africa, their role and purpose has evolved to cover a broader range of development goals, as enablers of deeper regional integration, or catalysts of economic development through creation of industrial clusters. Their scope also evolved from a pure transit perspective essential for landlocked countries to a broader perspective that includes facilitating regional trade and connecting remote or lagging regions to the corridor routes. However,

that broader range is hinged on the essential role of corridors, which is to offer efficient logistics systems to promote trade and development.

Increasingly, logistics systems rely on information exchange between operators and control agencies along the supply chain, both within and across countries, anticipating documentary stages to expedite the physical movement of the goods. Right time information is critical in optimizing logistics operations. But the value of the information generated as by-product of logistics operation extends beyond optimizing the shipment of a consignment, and contributes to improve the performance of the corridor system in its entirety. Data collected under the pilot transport observatories reveals far more complex corridor operations than expected. A one-solution-fits-all approach is rarely applicable to such a level of complexity, and making the right decision requires obtaining precisely the right information made available at the right time.

The present Guidelines compile, in a well-structured and easy to use package, a series of tools, instruments and methods that take advantage of the wealth of information generated by logistics operations to apprehend the multiple dimensions of corridor performance. These tools and instruments provide corridor management institutions, Regional Economic Communities, and corridor stakeholders in general with the means to develop a Transport Observatory in order to diagnose bottlenecks along the transport and transit supply chains, and to assess the performance of the corridor at system level or at component level – modes and nodes, services and procedures.

The instruments and tools have been developed through concerted efforts by Regional Economic Communities and Corridor Authorities throughout Africa, but their relevance extends beyond the context of African corridors and can be adapted on trade corridors of all kinds in other developing regions of the world.

For those of us who were part of the UNCTAD staff working in the design and adoption of the Northern Corridor Transit Agreement in the 80s, these guidelines look like there is a light at the end of the tunnel and here I would like to pay a tribute to our always regretted and never forgotten Simon Thomas, the Transport Economist who pioneered and instigated our work in the Northern Corridor.



José María Rubiato  
Head Trade Logistics Branch  
UNCTAD

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## Introduction

A Trade and Transport Corridor (TTC) defined as ‘*a coordinated bundle of transport and logistics infrastructure and services that facilitates trade and transport flows between major centers of economic activity*’<sup>1</sup> is the cornerstone of the development of trade. The programs under which these guidelines have been developed seek to promote the development of trade along African corridors that include:

- ♦ In West Africa, the hinterland corridors serving the landlocked countries of Mali, Burkina Faso and Niger, and the Abidjan Lagos coastal corridor;
- ♦ In Central Africa, the Douala corridors serving Chad and Central Africa Republic, and the Congo River Basin Corridor;
- ♦ In Southern Africa, the Walvis Bay Corridors to Zambia, DR Congo and Angola, and the North-South Corridor serving Southern Africa from the port of Durban; and
- ♦ In East Africa, the corridors originating from the ports of Dar es Salaam (Dar Corridor and Central Corridor) and Mombasa (Northern Corridor).

Corridors are complex on several levels: the trade functions they perform are diverse and so are the characteristics of the trade infrastructure and the trade and logistics services that comprise corridors. Trade flows along corridors notably include: (i) international trade flows from overseas, such as those passing through the maritime gateways to final inland destinations that can be either within the coastal country or deeper in the hinterland for international transit to landlocked countries; (ii) intra-regional trade flows<sup>2</sup> between neighboring countries; and (iii) domestic trade flows between the economic and commercial centers within the same country. Trade and logistics infrastructure of corridors comprises seaports,

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<sup>1</sup> ‘Trade and Transport Corridor Management Toolkit’, 2013, World Bank.

<sup>2</sup> It is important to note that small scale cross-border trade and movement of people are generally not formally monitored at border crossing, and are therefore not considered in the present framework, although information should be collected when available.

Inland Container Depots (ICDs), roads, railways, border-posts, bonded warehouses and modal interchange facilities. Transport and logistics services at corridor level include the transport services (roads, rail and maritime), logistics services, clearing and forwarding, customs and other border management agencies such as immigration, police, sanitary and phytosanitary services, to name a few.

### **Objective and nature of Corridor Transport Observatories**

The complexity of corridors can pose a challenge to the movement of trade, which is the basic function of TTCs. From a trader's perspective, corridor performance is all about cost, time and predictability associated with the seamless movement of freight along TTCs. TTC performance depends on a complex combination of factors involving public and private entities (logistics operators, control and enforcement agencies), *hard* and *soft* (transport infrastructure and facilities, legal and regulatory environment, procedures and practices). Improving corridor performance requires therefore a good understanding of the obstacles to trade in order to determine the causes for lack of performance and not just the symptoms.

The objective of Corridor Transport Observatories (CTOs) is to help reaching that thorough understanding of the obstacles so that remedial actions be identified and implemented. A CTO is primarily an analytical tool that analyses corridor performance in its multiple dimensions. It can be developed as a permanent mechanism anchored to corridor management institutions<sup>3</sup> or specialized agencies of regional / national institutions<sup>4</sup> for regular monitoring of corridor performance – a dashboard for corridor management institutions in which red flags can trigger additional investigation and remedial action; or as an ad-hoc expanded diagnosis to help undertaking a deep-dive into selected aspects of corridor performance, using for instance the diagnosis tools to investigate in detail a specific challenge at the preparation phase of an intervention on a corridor. The present guidelines accommodate both options, introducing corridor performance indicators and reviewing in detail different data collection methods, while the results presented in the last module illustrate analysis and diagnosis conducted during the extensive field tests for the CTO tools throughout Africa.

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<sup>3</sup> In East Africa, the Transit Transport Coordination Authority of the Northern Corridor (NCTTCA) is responsible for designing a CTO as a corridor performance monitoring tool.

<sup>4</sup> For instance anchored to a specialized agency of a REC as intended for the West Africa Regional Transport Observatory, or a National Statistic Office.

## Contents of the Corridor Transport Observatory Guidelines

The CTO guidelines comprise eight modules: the first three provide a framework for corridor performance monitoring; the next four review several methods to collect the required data, and the final module illustrates aspects of corridor performance revealed by data collected on selected pilot transport observatories.

### *Framework for corridor performance monitoring*

- ♦ **Module One** is the introductory module. It highlights the importance of measuring corridor performance, discusses the corridor monitoring framework, and describes how CTOs can be a powerful tool for corridor diagnostics, analysis, and monitoring corridor performance.
- ♦ **Module Two** identifies the core performance indicators required for monitoring corridor performance along the entire corridor and along parts of it.
- ♦ **Module Three** describes the data & resources requirements for designing CTOs.

### *Data collection methods*

- ♦ **Module Four** describes the process of getting existing automated data by the port and container terminal process and customs process.
- ♦ **Module Five** provides guidelines on designing industry surveys with a particular focus on the road transport industry.
- ♦ **Module Six** provides guidelines on designing land-border crossing surveys.
- ♦ **Module Seven** describes the process of getting secondary data on delivery of transport and logistics services along TTCs.

### *Highlights of CTO diagnosis*

- ♦ **Module Eight** illustrates through selected case studies, based on analysis conducted during the CTO field test, how corridor performance, at synthetic and disaggregated levels can be exploited further for conducting corridor diagnostics and analysis.



# Module 1. Introduction to the Corridor Performance Framework

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This module addresses three questions:

- ♦ Why is it important to monitor corridor performance?
  - ♦ What is an appropriate corridor monitoring framework?
  - ♦ How to benchmark corridor performance?
- 

## Why is it important to monitor corridor performance?

As Lord Kelvin used to say, ‘if you cannot measure it, you cannot improve it’<sup>5</sup>. The whole point of measuring corridor performance is that it is a pre-requisite to increasing corridor efficiency. There are several layers in performance monitoring. The most immediate layer is the answer to the not so simple question: is the corridor performing sufficiently well to fulfill its role of enabler of economic development? A negative answer will lead to further questions on what needs to be fixed to improve efficiency, and how to achieve this. Answering this first question supposes the criteria defining corridor performance have been agreed upon, that it is possible to measure performance according to these criteria, and to compare the measure to a reference to finally determine whether it is a sign of good health or a symptom of deeper problems. This is comparable to blood work results indicating

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<sup>5</sup> ‘I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science, whatever the matter may be’. Lord Kelvin, lecture on "Electrical Units of Measurement" (May 3, 1883).

reference values for each of blood component analyzed. This last assumption on the possibility to benchmark corridor performance is critical and equally complex.

The second layer, once it has been established that performance is not adequate, is the identification of the causes for dysfunctions on the corridor. This is where performance measurement has an analytical dimension. The performance criteria are measuring symptoms: high prices can be the result or combination of several very different causes. Understanding the causes, in other words, identifying what in the corridor needs to be fixed, supposes that a diagnosis is conducted, relying on facts and evidence.

There is a parallel layer which relates to the quantification of the impact of inefficiencies: how an under-performing corridor prevents economic growth and how it affects economic operators. This layer is not addressed in these CTO guidelines, as they focus on providing the tools to measure and analyze corridor performance as input in a process that identifies and implement solutions to improve corridor efficiency by fixing the problems revealed by the symptoms.

The third layer of corridor performance measurement is the monitoring of the effectiveness of the solutions, by comparing performance over time and verifying that the measure is returning to the 'norm'.

### **What is an appropriate corridor performance framework?**

Performance has different meanings for different categories of actors involved. The definition of performance criteria must therefore take into account those respective meanings. The framework which has emerged from dialogue conducted both across and within corridors includes two critical perspectives:

- ♦ the **perspective of the traders**, who are primarily concerned by the impact of corridors on their competitiveness, through the cost of moving goods, the length of time associated to this movement, and also the uncertainties on the delays which may prevent them to meet delivery deadlines; and
- ♦ the **perspective of the policy makers**, who have the responsibility to ensure the long term adequacy between the demand, expressed by the trade volumes, and the offer, expressed by the characteristics of the infrastructure and the logistics services delivery.

Performance needs therefore to be measured according to four dimensions:

- ♦ Prices
- ♦ Time and uncertainties
- ♦ Volumes
- ♦ Infrastructure & services

However, overall corridor performance is the result of the combination of the individual performances of the corridor components, which need to be assessed separately. A typical hinterland corridor—defined by a network of nodes (or platforms) linked by transport modes—comprises three functional components: the maritime gateway, the inland transport, and the destination (or origin in the opposite direction). In the specific case of corridors radiating from a feeder port when alternative options through a main port exist<sup>6</sup>, it is important to also consider the shipping component, between the feeder port and the main port.

Each of the corridor components in turn is a complex entity combining multiple interventions by logistics operators and control agencies, across several locations:

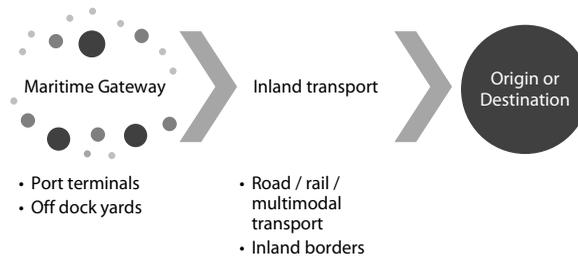
- ♦ The maritime gateway can include off-dock yards alleviating port terminal congestions;
- ♦ The inland transport can be segmented into different modes (rail / road combination for instance) and include one or more border crossings;
- ♦ The destination (or origin) can be a dry port close to a consumption area, directly the shippers' premises, or simply the border<sup>7</sup>.

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<sup>6</sup> An example of that situation is the options for Zimbabwe to route its overseas trade through Mozambique, where the goods are likely to load on a feeder vessel which will transship to a mainline vessel in Durban, or to take the longer land route to Durban, but load directly on a mainline vessel.

<sup>7</sup> In some countries, border clearance is mandatory.

**Figure 1: Corridor components**



The proposed corridor performance framework combines dimensions of performance with corridor functions:

- ♦ Prices for the trader, but also the cost factors for the logistics service providers and control agencies entering into the composition of that price, across the main corridor components;
- ♦ Times, corresponding to the combination of the individual processes times, and the idle time between successive processes, but also the variations of those times resulting in the uncertainties of delays, for port dwell time, transport time, and final clearance;
- ♦ Volumes, by corridor routes and components (modes and nodes) and by nature (intra-regional, international, transit);
- ♦ Characteristics of the transport and logistics infrastructure and services, in terms of design capacity, and efficiency, for each of the main corridor modes and nodes.

The definition of the corridor performance monitoring framework must address the different layers of utilization, i.e. allow for synthetic measurement for periodic performance diagnosis and monitoring, and also more disaggregated levels for deeper analysis.

The requirement for analysis at disaggregated levels has two critical implications:

- ♦ Firstly, indicators need to be derived from a large amount of raw data. This is often overlooked, due to the escalating cost of collecting data, but

mainly because of the trust in expert knowledge, based on the assumption that a professional will provide accurate information<sup>8</sup>;

- ♦ Secondly, that data must be accompanied by sufficient contextual information to explain the important parameters of the measure. For instance, collecting transport prices without knowing if the price is based on a truckload of a designated capacity, between A and B, for a certain cargo type or a certain commodity, with specified return conditions, would make it difficult to compare with other prices and to exploit in a significant manner.

The notion of size of the data collected raises also the question of its statistical value as representative of the population to be analyzed. The preference for collecting data is census rather than sampling in order to avoid the verification of the statistical value of the sample. However, when the census option is not available, notably when the lack of adequate operational data imposes conducting dedicated surveys, a sampling methodology will have to be defined.

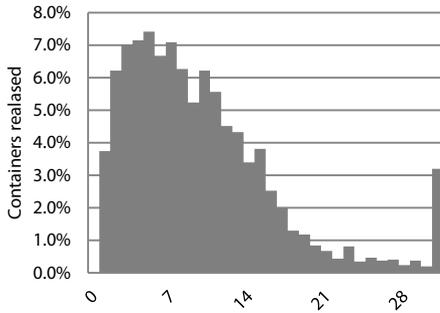
An indicator is a summary of a number of observations. Assuming the observations are statistically representative, the choice of the summary in itself requires attention. Times and prices tend to vary from one shipment to another, even when their characteristics are similar. For instance, all analyses conducted on the measurement of time systematically revealed a large dispersion, with a distribution conforming to either one of the two main types: for processes measured in days, the usual distribution is an asymmetric curve with a peak corresponding to the most frequent case (and usually much lower than the average) prolonged by a broad tail, while for shorter processes, measured in hours, the usual distribution is a decreasing cycle with a 24h period. A second characteristic revealed by those analyses is that processes are not directly additional: simply adding the most frequent cases on the different stages along a corridor does not necessarily reflect the most frequent case for the total operation.

Although frequently used, the average as measure of the indicator is misleading, particularly when the range of variation of the values is wide. Whenever possible, the nature of the distribution should be specified, and additional descriptions provided (for instance, the quartile values, or a graphical illustration).

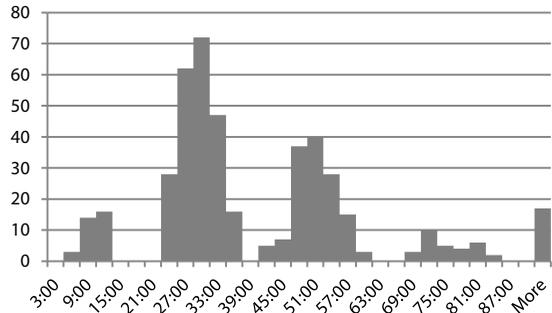
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<sup>8</sup> To a large extent, the whole methodology for trade and transport facilitation assessment (TTFA) is based on interviews of various stakeholders.

**Figure 2: Process measured in days**



**Figure 3: Process measured in hours**



### How to benchmark corridor performance?

To determine if the level of performance of a corridor is satisfactory, it is necessary to have a reference for comparison, and also to compare measures which are comparable. The purpose of the CTO guidelines is to propose harmonized definitions for the performance indicators, which should address the above latter condition. Unfortunately, there is little agreement on reference values, because of the diversity of the specific characteristics of the corridors:

- ♦ Volumes depend primarily of the level of economic activity in the catchment area of the corridor (the hinterland), and only marginally, for a limited portion of trade, to inter-corridor competition;
- ♦ Prices are largely influenced by volumes, notably the balance of trade in terms of cargo types and direction, but also the absolute volumes, which largely determine the level of competition among logistics operators;
- ♦ Times are partly influenced by the decisions of the traders, as the World Bank analysis of port dwell time<sup>9</sup> highlighted, with the importance of arbitrage between storage strategies for traders;
- ♦ Infrastructures and services are evolving according to volumes.

<sup>9</sup> *Why does cargo spend weeks in African ports, Lessons from Six Countries*, World Bank, 2012.

As a consequence, performance indicators must be assessed within their context in order to determine if they are symptoms of deeper dysfunctions or are ‘acceptable’. In logistics, there is usually a range of services which offer different combinations of cost, time and reliability in order to meet the diversity of demand. Shippers of bulk cargoes and low value commodities are more concerned with minimizing cost than time, whereas the logistics of containerized cargoes and especially high value goods are more concerned with time and even more with reliability. These trade-offs have become more complex as production patterns have changed and become more integrated with the logistics processes themselves.

Corridor analysis tools such as FastPath<sup>10</sup>, use corridor performance metrics to assess the overall performance and analyze the possible impact of corridor interventions, enabling the benchmarking of their effectiveness.

A partial solution to this question is to compare performances within the same corridor:

- ♦ Across operators, by comparing what is achievable by the best performers on the corridor with the ‘standard’ performance for a set of comparable shipments. However, the drawback is that in a low performance environment, even the best performers on a corridor can actually display poor performances.
- ♦ Across time, by comparing indicators measured at different times, which is essential to measure improvement of corridor performance, in particular the impact of various interventions through operations.

The performance indicators included in the framework constitute a representative summary of a large range of values corresponding to a variety of situations. This is particularly relevant for time-related indicators, but applies also to prices and costs. If the top of the distribution (for instance the top quartile) is considered as representative of what can be achieved by the best performers on a given corridor, the median can be considered as representative of the ‘standard’ situation. The gap between the two will provide an indication of what improvements can be realistically envisaged for the corridor.

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<sup>10</sup> Developed by Nathan Associates Inc. and Sophia Yu Consulting Inc., with support from USAID.

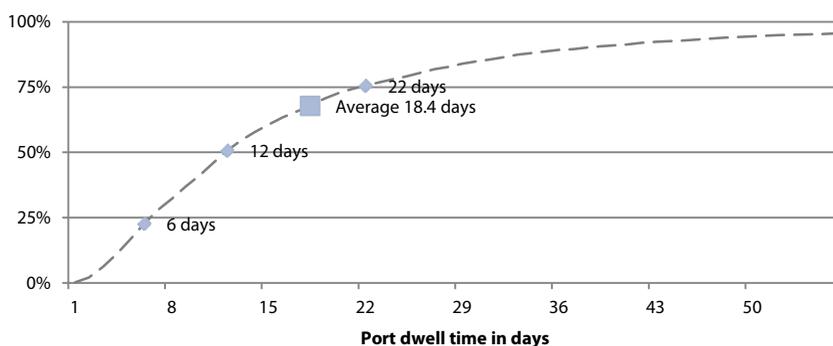
The analytical dimension of the framework demonstrates its value, as it becomes possible to isolate the specific characteristics of the best performers in order to determine how they become efficient. For instance, in the case of port dwell time, low duration of the port stay is regularly associated with submission of the Customs declaration prior to the arrival of the ships. This partial solution, comparing best performers to standard ones, has the merit of being applicable to all corridors where an observatory has been established.

Another possible partial solution to benchmark performance is when corridors compete for an overlapping hinterland. This is notably the case in West Africa, where the landlocked countries have the choice between several routes radiating from maritime gateways which have comparable shipping services; or the landlocked countries of East Africa, with a possible choice between Mombasa and Dar es Salaam. However, for Southern Africa, the difference in shipping services offer in Durban compared to other ports introduces a distortion in the comparison.

*Illustration 1: Port dwell time in Douala (Automated Customs and Terminal data)*

Data collected from the Cameroun Single Window (GUCE) for the year 2011 included information on physical movements of containers and on the Customs declaration, for a random sample of 4,457 containers, of which around 10% were in transit to Chad, CAR or Congo.

**Figure 4: Port dwell time in Douala**



The percentage of containers released from the port according to the duration of the dwell time is illustrated in the graph below. The average dwell time of 18.4 days corresponds to very different scenarios: a quarter of containers are released in 6 days, while a quarter of them stay over 22 days in the port. For the best performers

(for instance the first quartile), the dwell time is half that of the median, and one third of the average.

Using the additional information attached to the data, notably the declaration date compared to the arrival of the vessel and its nature (transit or import to Cameroun), it is possible to better understand the reasons why the best performers are achieving shorter dwell time. Transit containers are generally released faster than Cameroun import containers, but the difference comes from the pre-arrival submission of the declaration.

**Table 1: Quartile distribution of port dwell time in Douala**

	Cameroun Post arrival	Cameroun Pre-arrival	Transit Post arrival	Transit Pre-Arrival	All
<b>25%</b>	10.5	4	7	2.5	6
<b>50%</b>	18	7.5	14	5.5	12
<b>75%</b>	30	14	27	9	22
<b>Average</b>	28.5	12.1	23.0	7.8	18.4

Source: Derived from GUCE 2011 data

*Illustration 2: Road transport prices across corridors (East Africa road surveys)*

In 2012, a survey of the road transport companies based in Tanzania collected transport prices for the main hinterland areas served through the port of Dar es Salaam. The median values for a truck fully loaded with containerized cargo are indicated in the table below. On all routes, the high volume leg corresponds to the transport from the port to the hinterland, and only Zambia and Southern DR Congo have a significant volume on the return leg.

**Table 2: Road transport prices on the Dar es Salaam corridors**

	Rwanda	Burundi	Southern DRC	Zambia	Malawi
<b>Distance (km)</b>	1440	1430	2350	1810	1510
<b>From Dar to ... (\$)</b>	3,835	4,050	6,500	4,500	4,500
<b>From ... to Dar (\$)</b>	3,871	3,871	4,000	3,661	2,052
<b>Import \$/km</b>	2.66	2.83	2.77	2.49	2.98
<b>Export \$/km</b>	2.69	2.71	1.70	2.02	1.36

Source: Road transport surveys 2012 – CCTTFA / SSATP / TFF

Even in comparable conditions, for the main haul the price per kilometer varies within a range of 20%, for comparable transport companies. In the opposite direc-

tion, the price ranges between 45% of the main haul to slightly higher than the main haul. The lower value of prices for Zambia and the Democratic Republic of Congo on the main haul compared to other routes can be explained by the availability of return load, or also by the larger corridor volumes which are promoting competition among operators. The pattern for Malawi is rather typical of imbalanced corridors, with a return haul at less than half price. However, the abnormally high prices of transport for the return from Rwanda and Burundi are an indication that this situation should be further investigated.

## Module 2: Corridor Performance Indicators

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This module proposes a harmonized definition of corridor performance indicators.

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**Figure 5: The four dimensions of corridor performance**

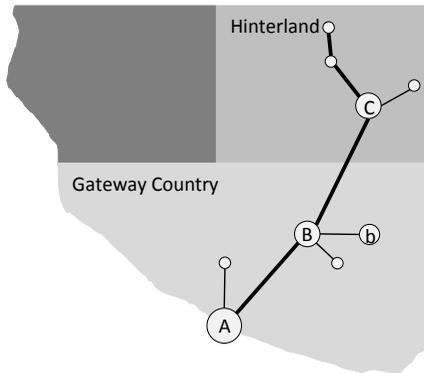
Volumes	<ul style="list-style-type: none"><li>• By corridor components (Modes &amp; Nodes)</li><li>• By trade types (intra-regional, transit, international)</li></ul>
Time & Uncertainties	<ul style="list-style-type: none"><li>• Processing time, idle time</li><li>• Distribution of delays and uncertainties</li></ul>
Prices & Costs	<ul style="list-style-type: none"><li>• Cost factors of operators</li><li>• Total logistics costs to the trader / shipper</li></ul>
Services & infrastructures	<ul style="list-style-type: none"><li>• Quality and capacity</li><li>• Efficiency and capability</li></ul>

### Volume indicators

The trade volumes indicators focus on the logistics of trade rather than measuring only the bilateral trade, in order to have a better understanding of the actual routes and therefore more focused interventions on problem areas. Two examples illustrate the need for this approach linking trade and logistics: the reorganization of the inland logistics in West Africa in response to the Cote d'Ivoire crisis, showing how external events impact trade flows, and the case of Nigeria, showing how internal regulations impact the routing of external trade. The Cote d'Ivoire crisis has had deep repercussions for the landlocked countries that were traditionally relying on the port of Abidjan. Trade flows had to use different outlets, and alternate corridors suddenly faced increased volumes, with logistics service providers not fully prepared to handle such surge. When only bilateral trade is considered, it is not possible to observe how the trade routes have evolved to adapt to the new situation. For Nigeria, trade barriers and import restrictions have not prevented trade in prohibited goods: they have simply promoted smuggling through land borders,

which are more porous than maritime gateways, artificially boosting activity of the neighboring maritime gateways.

**Figure 6: Sample corridor route**



The volumes, expressed in tonnage and/or vehicle counts, must differentiate between four different types of trade flows:

- ♦ Maritime trade through the maritime gateway A destined or originating from the gateway country (for example from A, B or b);
- ♦ Maritime trade through the maritime gateway A destined or originating from an hinterland country (for example C), more commonly designed as international transit;
- ♦ Intra-regional trade, for example between B and C;
- ♦ Domestic trade, for example between B and b.

Volume indicators, including border volumes and traffic counts<sup>11</sup>, measure the trade volumes for the first three categories of trade flows, using two primary sources of information:

- ♦ Port statistics for the maritime trade
- ♦ Customs trade data for intra-regional trade

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<sup>11</sup> For example the Average Annual Daily Traffic (AADT).

Additional layers of disaggregation are possible, by main cargo type (differentiating containerized goods, general cargo, liquid bulk and dry bulk) for maritime trade, by inland mode of transport when multimodal options exist, or by vehicle for intra-regional trade, supplementing the volume information with traffic counts—critical for dimensioning infrastructure or facilities such as dry ports and border crossings.

### **Time indicators**

The notion of delays has been more commonly used in the context of corridor performance: port delays, border crossing delays, etc. However, delays have a negative connotation since the term suggests that the optimal would be zero delays. The Transport Observatory Guidelines, the term ‘time’ is synonymous to ‘duration’, and is therefore more adequate than ‘delay’ since even after elimination of unnecessary delays, some logistics processes can still take time, for instance a truck moving along the corridor routes.

The time indicators are measuring the duration of critical stages along the corridor: the total transit time (also named lead time) for the movement of the goods from ship to final destination, plus its components, at the maritime gateway, at destination, and between the two, during land transport. Total transit time is defined as the total time between the discharge of the cargo and its delivery at the final inland destination for import cargo, or from acceptance by carrier up to loaded on board of a ship for export cargo. It must be assessed by route, from origin to destination, and by modal combination.

In addition to measuring time for the movement of cargo, it is important to measure the time for the movement of carriers (ships, trucks, wagons), idle time being a critical parameter for transport costs.

#### *Port times*

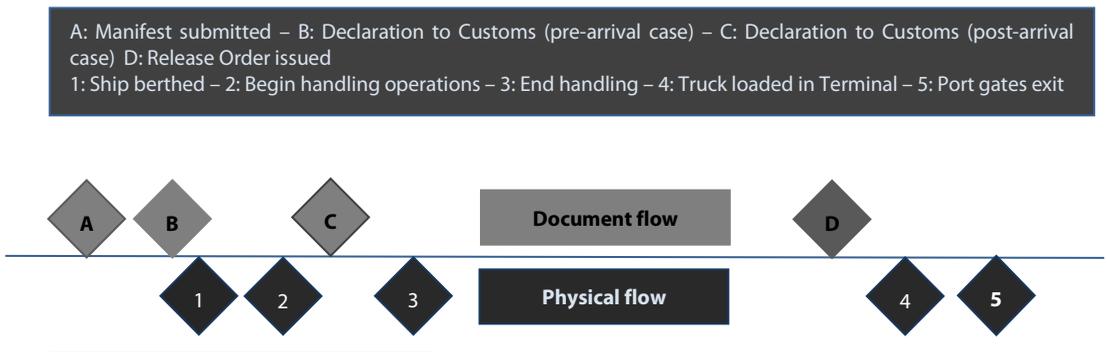
The maritime gateway is a critical node in the supply chain, where many operators and agencies are involved in a complex documentation process, and a rather basic physical process. The complexity of the documentation process is linked to the number of steps and stakeholders involved, and also to the fact that some of those processes can be conducted in parallel, while others are strictly sequential. The indicators are measuring the two categories of processes: physical and documents.

At the analytical level, it is often necessary to observe the interactions between the two processes for understanding the possible causes for unnecessary delays.

The indicators for the physical movements are straightforward: the time counter starts with the arrival of the ship at berth and stops when the goods are en route on the corridor. However, an intermediate stage can take place between the two events. Several maritime gateways recorded high growth of containerized trade, but did not increase capacity accordingly, either through increased productivity or the development of new facilities. The quick fix solution was generally to shift port congestion to off-dock container yards<sup>12</sup> (ODCY). From a port operational perspective, the immobilization in the terminal yard is reduced, but from the shipper's perspective, the duration of the stay in off-dock facilities is an integral part of the gateway time, and it is the sum of the two which matters, making measurement a more complex undertaking:

- ♦ In the case of direct departure from port terminal, the Gateway dwell time (equal to the Port dwell time) is the difference between the exit from terminal on truck or wagon and the berthing time for the ship;
- ♦ In the case of transfer via off-dock facility (ODCY), the Gateway dwell time is the sum of the Port dwell time and the ODCY dwell time, measured by the difference between the exit from ODCY and the berthing time for the ship.

**Figure 7: Timeline and milestone for maritime gateway**



<sup>12</sup> Designates a container yard in the close vicinity of the port used to alleviate terminal congestion.

Indicators measuring the efficiency of the clearance or transit process are more complex, for unless they are broken down into elementary steps, the time measure taken by a complex process is not per se an indication of the process efficiency, but at best an indication of the coordination efficiency of stakeholders involved.

The main documentation process is the Customs clearance / initiation of the transit regime, with the submission of the declaration as starting point, and the issuance of the release order as ending point. The two flows (physical movements and documents) are represented in a simplified manner in the timeline above.

In addition to the main milestones, complementary information is required to characterize the scenario, notably:

- ♦ Customs channel
- ♦ Customs status (local or transit)
- ♦ Stripping of containers or not (for containerized goods)
- ♦ Transfer or not of the goods to an ICD in the port area, a case not represented in the simplified timeline

The measure of ship delays prior to accessing the port, between arrival at outer anchorage and berthing for instance (alternatively, pilot on board), provides an indication of port congestion. That measure must be disaggregated at terminal level, as waiting time is particularly relevant and sensitive for container vessels.

#### *Inland transport time*

In the case of transit, the transport time is not only due to the physical movement of freight from the gateway port to inland destinations, but includes the transit regime documentation process (border crossing, check points, and so on).

Ideally, the indicator should measure the total time defined by the difference between departure from the maritime gateway area and the arrival at destination for final clearance; it also measures the idle time between those two events, when the vehicle is not moving (driver rest, border crossing, checkpoints, etc.).

Border crossing is a key stage in the inland transport, and the total duration of the crossing must be counted from the arrival time of the vehicle in the vicinity of the Country A exit border (usually the start of the queuing or a parking area) to the departure from the Country B entry border.

Experience in monitoring border crossing time shows that the documentation process at the border represents only a fraction of the total time spent by vehicles at the border. It is therefore critical to break down the border crossing time into finer components. However, some very critical stages (notably arrival and departure of vehicles) are rarely linked to a specific process, and therefore not recorded<sup>13</sup>. Actual parking locations may be informal and not necessarily close to the border facilities.

Considering the complexity of border crossings and their importance in corridor efficiency, a specific module has been dedicated to the presentation of the different ways to obtain information on border crossing time, either through physical surveys, or through utilization of GPS tracking data.

In addition to transport time for cargo, measuring the utilization of the trucks for a full cycle (from one loading at the port to the next) provides information that is needed for understanding the cost structure of the road transport services, notably the availability of return loads, and idle time before obtaining the next load<sup>14</sup>.

#### *Final clearance time*

It represents the time to clear the goods for home consumption in the destination country. Depending on the conditions, this may affect indirectly the efficiency of the inland transport, when vehicles are delayed by the documentation process. It is important to distinguish between different clearance modalities due to their varying impact on time, e.g. if the goods are temporarily stored in a warehouse before final clearance.

The indicators are similar in nature to time indicators for the maritime gateway.

- ♦ Physical movement indicators measure the time between the arrival of the vehicle at the final clearance area (dry port, shippers' premises or entry border) and the exit of the goods after Customs has issued the release order;

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<sup>13</sup> Except by the trucking companies, when trucks are equipped with GPS tracking devices, or when drivers are required to fill trip sheets recording main stops.

<sup>14</sup> Module 5 includes a description of the stages for a truck full round-trip cycle.

- ♦ Documentation process indicators measure the time between submission of the final clearance declaration and the issuance of the release order.

### *Combination of times and uncertainties*

It is important to measure the total time from ship to destination and then measure the time for the corridor components at shipment level, and construct the time indicators from all the measures. This is contrary to the current practices, which rather measure time for the corridor components and infer the total time from their addition. In practice, it has been verified with actual data that individual components times cannot simply be added-up. The following example corresponds to containers delivered by rail from Abidjan to Ouagadougou, showing total transit time and its breakdown. This example is further detailed in Module 8, and it invalidates methods based on an addition of process time to reconstruct a total, and proves that the only legitimate manner to measure time indicators is by considering supply chains in their entirety. This is logical, considering the propagation effect of bottlenecks in the supply chains: physical bottlenecks tend to propagate upstream (such as berth congestion at port terminals leading to queuing of vessels, increasing pre-berthing delays), while bottlenecks associated with documentary process tend to propagate downstream (such as delays in securing the Customs release order delay the preparation of the land transport, further increasing port dwell time).

**Table 3 : Distribution of transport time on Abidjan Ouagadougou corridor**

Rail Abidjan-Ouagadougou 2012	Time in port	Time in train	Time in terminal	Total time
<b>10%</b>	5	4	3	17
<b>median</b>	16	5	8	31
<b>90%</b>	36	7	20	59

Source: SSATP / TFF West Africa pilot transport observatory

### **Cost and price indicators**

The price and cost dimension requires an approach by functions, identifying who pays what to whom. Each function is likely to mix operational costs with administrative processing costs and overheads. This breakdown is needed in order to iden-

tify which are the contributing factors to the cost of each intervention in the logistic chain, and the likely impact of changes in their composition.

The proposed breakdown for the price paid by the trader (or shipper) is:

$$\text{Logistics services} = \text{Gateway} + \text{Inland transport} + \text{Final clearance}$$

This breakdown does not preclude one operator overseeing the whole process on behalf of the shipper, for instance:

- ♦ In the case of Through Bills of Lading<sup>15</sup> (TB/L), the shipping line assumes responsibility and coordination of the delivery to inland destination terminal, a designated Inland Container Depot (ICD). Individual services (port clearance and inland transport) are sub-contracted, with margin;
- ♦ For standard Bills of Lading (B/L) in which the responsibility of the shipping line ends at the maritime gateway, there are still several options:
  - The entire inland logistics can be organized by a freight-forwarder. The only difference is that the freight forwarder is offering the service separately from the maritime freight;
  - The piecemeal approach, in which the shipper directly contracts in isolation the various logistics services providers.

The proposed indicators focus on collecting the total price paid by the shipper from ship to delivery, for common shipments on the corridor:

- ♦ A truckload corresponding to a 40' container, including return of the empty container to the port. For corridors where stripping is common practice, an additional indicator can concern a stripped container;
- ♦ A large truck fully loaded with break-bulk cargo (for instance cement, grain or fertilizers);
- ♦ Where relevant, a large tanker truck loaded with petroleum products destined to an inland storage facility;
- ♦ Shipment by rail or multimodal combination of a 40' container;

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<sup>15</sup> In shipping, the B/L constitutes proof of ownership of the goods and represents the contract for the carriage of the goods.

- ♦ Shipment by rail or multimodal combination for break-bulk cargo.

At the analytical level, additional indicators will focus on the cost factors: existing tariffs, and cost factors for the trucking industry such as vehicle operating costs, formal and informal payments, etc.

### *Gateway*

The gateway prices breakdown, although generally arranged through a Clearing and Forwarding (C&F) agent responsible for the organization and the payment of the individual interventions includes:

- ♦ Control agencies fees: Customs payments (either destination clearance or mobilization of the guarantee / bond);
- ♦ Logistics operators administrative fees: Clearing fees (usually lump sum for the intervention of the clearing agent), Shipping agent<sup>16</sup> (B/L fee, Delivery Order (DO) fee, etc., supplemented by demurrage<sup>17</sup> for overstay), Port authority (usually, with independent handling companies, only cargo related dues), Other Government Agencies (OGA), for various fees such as Pre-Shipment Inspection (PSI) / Destination Inspection (DI) certification, Shippers' councils, etc.);
- ♦ Cargo handling: Terminal Handling Charges<sup>18</sup> (THC) / Movements related to border control (scanners, positioning for physical inspection, etc.), Storage (beyond grace period, escalating storage fees), Truck loading (applies only for stripped containers, otherwise, included in THC).

Most of the payments at the maritime gateway are based on published tariffs, but most are complex to use, due to presence of application criteria (for instance stor-

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<sup>16</sup> Shipping agents used to be remunerated from a commission based on freight rate, but with the competition on rates, this has been replaced with an increasing list of fees based on the B/L, charged directly by the shipping agent.

<sup>17</sup> Demurrage is the charge, related to the use of the equipment only; the merchant pays for carrier's equipment kept beyond the free time allowed by the carrier for taking delivery of goods in the port, terminal or depot.

<sup>18</sup> Terminal Handling Charges are handling fees charged to the consignee by the shipping line based on the prevailing liner terms.

age only applies at the end of the grace period) and different reference units (some tariffs are based on a price per B/L, or per ton, or per container, or per unit).

### *Transport*

In the transport industry the price may not necessarily be strictly linked to the cost factors of the transport itself, but more to the result of imbalances between supply and demand and the level of competition existing on a specific route. This is particularly clear for the shipping industry, where the freight rate is linked to market conditions, with shipping lines competing on the same market with totally different cost structures (for instance, direct services competing with transshipment services) but still proposing similar freight rates. Another illustration is the example of wide disparities between the inbound and outbound road transport rates along the Northern Corridor in East Africa (ratio of 1:4). This wide disparity is almost entirely due to the imbalance between the two flows.

The services associated to inland transport are limited to:

- ♦ Trucking services corresponding to the movement of the goods from the port area to either an inland terminal, or to an inland clearance area followed by terminal delivery (in which case this is combined with the next function);
- ♦ Sub-contracting of trucking services through intermediaries (without necessarily the knowledge of the shipper or clearing agent); in that case transport operators rely on sub-contracted capacity for the effective movement of goods;
- ♦ Border clearance agents, for processing the documentation at the border.

On corridors with multimodal options, it is important to clarify the reception and delivery conditions attached to the price of transport, due to the additional handling linked to the transshipment between rail and road.

### *Final clearance*

The nature of the services at destination depends on the conditions of the terminal delivery:

- ♦ Possible additional transport operation
  - In case of mandatory passage through an Inland Container Depot (ICD), such as in the case of TB/L, the inland transport is divided in-

to two legs, the main one in the previous section, and the final delivery, with handling fees charged by the ICD for offloading the main haul truck and reloading the goods on the delivery truck;

- In all other cases, the final leg of the transport is the continuation of the main haul;
- ♦ Customs clearance by a clearing agent, equivalent to the gateway intervention, with either direct clearance at the border, clearance after warehousing regime, or clearance after domestic transit regime.

Most of the final clearance services prices, like for the maritime gateway, are based on published tariffs.

### **Transport and logistics infrastructure and services indicators**

This set of indicators aims at qualifying and quantifying the transport and logistics offer, in order to determine its present and long term adequacy to the demand. The nature of the indicators differs according to the nature of the infrastructure, facilities and logistics services. The indicators focus on the main ones: port facilities and terminals, transport network, road transport enterprises, and dry ports. Infrastructure and services are largely static over the short term, and capacity development for large infrastructure and facilities are planned well in advance. Accordingly, the indicators tend to be descriptive of a context and constitute an input in the assessment of the corridor performance, rather than representing directly a parameter of that performance.

#### *Port facilities and terminals*

The relevant information for port facilities and terminal is related to the capacity (measured from several factors such as number of berths, quay and yard handling equipment, yard area). In addition, most port authorities and terminal operators are monitoring utilization and productivity indicators (waiting time before berthing per terminals, berth occupancy per terminal, berth productivity, vehicle turnaround time for container terminals to name a few).

Transport network

Figure 8: North-South Corridor network (road conditions as at December 2012)



Map Notes  
 1. The map represents the road network that includes the North-South Corridors and Dar es Salaam Corridors and parts of the Trans-Kalahari and Nacala Corridors.  
 2. Road conditions (as at December 2012) are based on visual inspections and information provided by National Road Agencies.

The corridor road network is designated as such by Customs authorities and/or corridor management institutions. The status of the network is monitored by the line ministry for roads/transport. Figure 8 above is an illustration of the GIS map for the North-South Corridor, which provides information on the network condition (Green for Good, Amber for Fair, and Red for Poor). Critical locations need to be indicated on the network map.

- ♦ Border crossings
- ♦ Permanent weighbridges
- ♦ Major Customs checkpoints

For the railway network, the gauge and the rail capacity (weight of the rail, wagon axle limits) are important. In addition to the physical description of the rail network, most railway companies provide information on the capacity of their rolling stock (availability of wagons and locomotives).

#### *Road transport companies*

Unlike rail transport, the road transport industry includes numerous companies, and the diversity of their situation is not easily summarized in a few indicators. However, two contextual indicators emerge as important indicators to better understand the performance of the industry:

- ♦ The ranging of the size of companies according to their fleet, usually monitored by regulatory authorities through transport licenses for commercial freight based on the truck and its owner / operator;
- ♦ The age distribution of fleets usually monitored through plate licensing.

#### *Dry ports (and inland border facilities)*

The physical description of dry ports or inland border facilities is very similar to port terminals: yard area, handling equipment, annual capacity or intermodal options. An important aspect to note for dry port is its mandatory or optional character, as it is directly linked to the level of its tariffs (mandatory platforms are de facto in a monopolistic position, with very limited regulatory oversight).

#### *Economic anchors*

Corridor authorities frequently adopt a broader perspective than pure logistics, with a mandate extending to spatial development. In that context, the corridor map could include the economic resources, such as mining and extractive industries, large market centers, agricultural production areas, etc.



## Module 3. Design of a Corridor Transport Observatory

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Designing and operating a CTO requires expertise and resources. This module addresses the following questions:

- ♦ How to obtain the data to measure the relevant indicators?
  - ♦ How to Develop and manage a transport observatory?
  - ♦ How to utilize and disseminate the data produced by corridor transport observatories?
  - ♦ How to ensure sustainability of the corridor transport observatories?
  - ♦ What are the suggested indicators?
- 

### How to obtain the data to measure the relevant indicators?

The performance indicators are all related to the logistics operations along the corridors, performed by the logistics operators and regulatory agencies involved in trade and logistics. The Corridor<sup>19</sup> transport observatories are the practical complement of the performance monitoring framework as they constitute the toolbox of instruments that collect process and combine the data required for the calculation of the indicators. The design of the framework relies on the use of operational data for the construction of the indicators. However, the granularity of the data needed varies according to the dimension to measure, with minimal and static data for the characteristics of the infrastructure and logistics services, an intermediate level for prices and costs, an intensive needs for times and volumes.

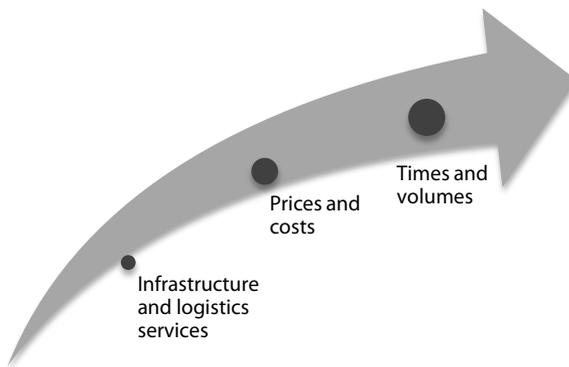
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<sup>19</sup> Or network of corridors, as for instance for the West Africa hinterland corridors, combining several routes originating from several maritime gateways.

The CTO is based on the analysis of supply chains, reconstituting to the largest extent possible the complete sequence of events associated with the movement of freight from the gateway port to final destinations for individual consignments:

- ♦ Changes in the status of the consignment (for instance its customs status) marked in time.
- ♦ Physical movements of the goods and associated transport means - from the gateway port to final inland destination or vice-versa.

**Figure 9: Granularity of data**



Thanks to the generalization of IT systems among logistics operators and control agencies, most of the operations are recorded in databases that extend far beyond the transport observatory data needs. The challenge is therefore to combine the data corresponding to the same consignment across systems. However, despite the increased use of IT, there are still some important gaps that require different approaches, i.e. dedicated surveys to generate the missing information.

The overall process to collect the required data is therefore based on a priority given to pre-existing IT operational data among logistics operators and control agencies, in general sufficient to calculate the main volume and time indicators. Indicators for infrastructure and logistics services are generally available directly from the facilities operators and the regulatory agencies, and also the tariffs corresponding to the services they provide, which addresses partly the issue of costs. Covering the full scope of requirements for prices and cost requires the organization of dedicated surveys conducted among road transport enterprises, clearing and forwarding agents, and shippers / traders. The only critical gap in the time

indicators correspond to border crossings, for which a specific survey needs to be developed (either through physical surveys or relying on GPS data).

The practical modalities for data collection and organization of the surveys are defined in:

- ♦ Module 4 for IT operational data
- ♦ Module 5 for industry surveys (trucking enterprises, clearing and forwarding agents, and shippers / traders)
- ♦ Module 6 for border crossings
- ♦ Module 7 for facilities operators and regulatory agencies

### **How to develop and manage a CTO?**

The steps for the establishment and utilization of a transport observatory are:

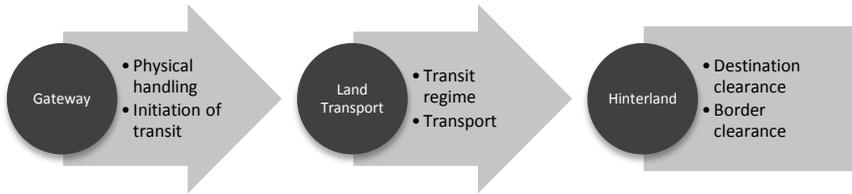
- ♦ A review of the corridor processes and IT systems
- ♦ An iterative process with the main data providers to define the scope and modalities of the data exchange. It is also at this stage that the requirements for the preparation and processing of the data prior to its treatment will be assessed
- ♦ A parallel process to define the dedicated surveys to cover the gaps

#### *How to perform the initial survey?*

In order to determine which sources to privilege and which process to include in the design of the CTO, it is necessary to undertake a full review of the corridor processes, identify which ones are automated, assess the information content and their interfaces with the other corridor processes, and build a data model for the logistics chains scenarios to monitor. This stage requires a multidisciplinary expertise: logistics specialist, IT specialist, statistical / economics specialist.

The review of the corridor processes needs to be done for different scenarios, typically clearance at the maritime gateway, transit to a hinterland destination, and the reverse for exports. In addition, variations of the base scenarios must be explored for different types of cargo or commodities (notably containerized or not).

Let's illustrate the review for the most complex scenario: transit to the hinterland.

**Figure 10: Transit to hinterland**

**Maritime gateway.** The maritime gateway is primarily characterized by a high intensity of documentation processes, with limited movements of the goods. The key stakeholders are: Customs, the port authority, the terminal operator, the shipping agent, the C&F agent, and the transporter (trucking company or railway). The documentation involves the exchange of several documents: the manifest, the declaration, the transit title, the Release order (RO), the Delivery order (DO), the appointment for cargo pick-up, and the gate pass. The surveys entails reviewing the sequence (to determine if processes and sequential—completing one is required to initiate the next – or can be conducted in parallel) and modalities for the exchange and process of documentation, reviewing existing IT systems processing the documentation, and reviewing the data content of each system.

Increasingly, the exchange of information among operators is organized through Single Windows, which therefore constitute the ideal point where to collect data. Depending on the scope of the Single Window, additional documentation flows can be considered: other border management agencies, payment of fees and services, freight bureau and shippers' council consignment notes, etc.

When conducting the review, attention must be given not only to the processes and the manner in which they are recorded by the IT systems, but also on the contextual information attached to the documents. This contextual information is critical for at least two reasons:

- ♦ To differentiate between different scenarios (by nature of trade, by nature of commodities, etc.);
- ♦ To establish links across data sets from different stakeholders and ensure that it is possible to reconstruct all the sequence of the supply chains for the same shipments.

**Figure 11: Stakeholders at the maritime gateway**

The functions of the documents, from the perspective of the transport observatories, are summarized as follows:

- ♦ The Manifest constitutes the starting point for the documentation process, and usually provides all the necessary contextual information on the characteristics of the shipment;
- ♦ The declaration by the Clearing agent constitutes the starting point for the clearance / initiation of transit process, and contains additional contextual information on the shipment;
- ♦ The transit title establishes the link between the transporter and the shipment, and provides additional contextual information on the routing of the shipment along the corridor;
- ♦ The Delivery Order (DO) indicates to the terminal operator that the shipping agent has released the shipment;
- ♦ The Release Order (RO) marks the completion of the Customs process and indicates to the terminal operator that Customs has released the shipment;
- ♦ The Appointment by the transporter indicates that the preparation of the inland transport has been made;

- ♦ The Gate pass marks the end of the port terminal dwell time (but not necessarily the gateway dwell time if the goods are transferred to a port ICD) and provides additional contextual information on the characteristics of the goods (for instance for containerized goods, if the container has been stripped or not);
- ♦ The Exit pass records the departure of the goods from the gateway and marks the end of the Gateway dwell time.

**Inland transport.** From the perspective of automated data, the focus of the review for inland transport mainly concerns the IT treatment of the transit regime across different Customs administrations, from one transit country to the next, up to the destination country.

The principle is that the transit transport title is validated at the exit Customs bureau (which normally releases the Customs bond). The transit title constitutes the manifest for the entry Customs office. In the entry country, there are two options:

- ♦ Border clearance, and the Clearing agent submits a Customs declaration for home consumption (the process is detailed in the section on destination clearance);
- ♦ Transit (either domestic transit to an internal Customs bureau, or international transit to another country – in that case the process is repeated until the shipment reaches the destination country).

The analysis of the border process is critical to establish the link between the information related to the same shipments across countries. The contextual information attached to the Customs documents usually includes the identification of the vehicle (truck or wagon, which has relevance for the traffic counts at the border), the nature of the Customs regime, the identification of the shipment (container number if any), and cross references to the pre-existing documentation.

There is an increasing trend to multiply controls on transit shipments, with GPS tracking emerging as an additional process to the regular bond or guarantee regime securing Customs revenue to prevent fraud. From the transport observatory perspective, that constitutes an additional source of valuable information (without taking a position in the debate of the merits or disadvantages of the system from the traders' perspective). Independently from Customs requirements, an increasing number of trucking companies rely on GPS-based fleet management systems,

and the transport observatory can obtain that tracking information either through the trucking companies or the GPS service provider.

GPS data attached to a Transit transport title provides the opportunity to further analyze the transport patterns along the corridor: location and duration of the stops (weighbridges, night rests, checkpoints, etc.). GPS data can also assist in the analysis of the arrival to the exit border.

**Destination clearance.** At destination, there are several options to consider:

- ♦ Border clearance
- ♦ Destination clearance, with two options for the physical process (unloading of goods or not), and two options for the documentation process (warehousing or not)

The differences between the options are in the interaction between the physical movements of the shipment and the documentation process. When the goods are cleared, the release order (RO) issued by Customs constitutes the final stage of the supply chain on the corridor, from the performance monitoring framework, but not the final stage from the shippers' perspective. When this occurs at the border, there is no further documentation process that would allow obtaining data on the final delivery to the shipper, despite the fact that the final transport leg may take some time. When this is done at destination, it is assumed that the final delivery is purely local. In the case the goods are offloaded into dry port, there is usually a record of the exit of the goods by the dry port operator that can prolong the description of the supply chain up to that final event. This is generally automated for containerized cargo.

The destination clearance process review needs to focus on the sequencing of the Customs regimes and the cross-references to the preceding regimes, which includes an optional domestic transit regime (omitted in case of border clearance), an optional warehousing regime (in theory possible for border clearance but rare in practice) and a final clearance for home consumption.

#### *How to establish the pilot for automated data?*

There are usually divergences between the theoretical content of the IT systems and the practical content: the most frequent reason is that the integrity of a specific element is not ensured because that piece of information is not critical for the logistics operator or the control agency. For instance, terminal operators do not

need (except when it is linked to specific incentives, such as lower rates for transit goods) the inland destination of the goods, or Customs administration do not impose a fixed format for container numbers.

A practical phase with the creation of a pilot that will validate the data model and the feasibility of the linkages between the different datasets is critical. This is likely to be an iterative process during which the queries on the respective databases maintained by the data providers are refined. It is therefore critical to involve in that stage both the IT department and the operations departments of all the potential data providers.

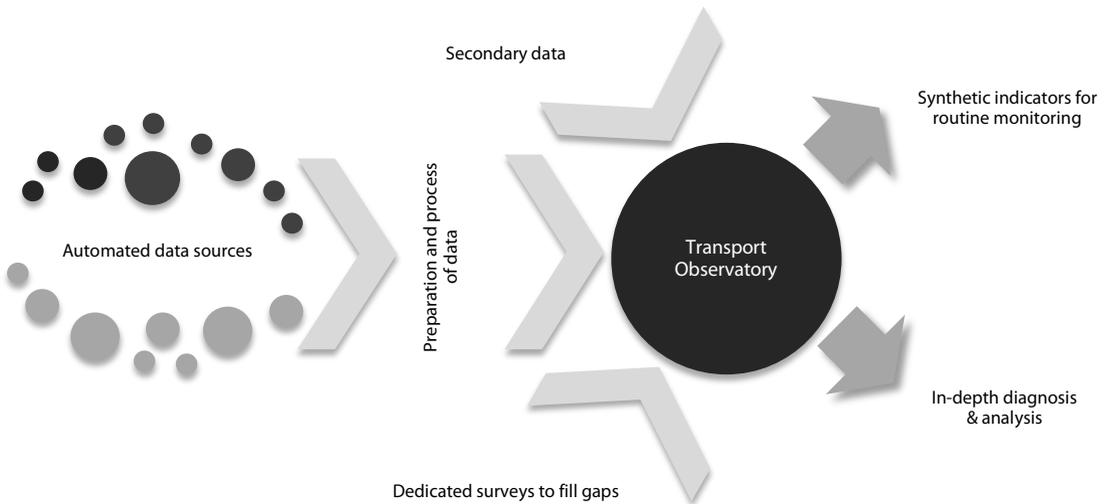
Module 4 on automated data provides more information of the data model and the linkages between datasets.

Once the data requirements and the data models have been validated, the modalities for the data donation to the transport observatory (content, periodicity, scope of use, etc.) can be formalized into an interchange agreement.

#### *How to address the gaps?*

IT systems and automated data only cover the partial reconstruction of the supply chains along the corridors. Border crossings, because they constitute a breach between IT systems, are often areas where existing data is not sufficient to measure efficiency, and therefore understand the causes when they constitutes obstacles to smooth operations along the corridors. Module 6 is dealing with several approaches that can be applied to border crossings.

The other important aspect of corridor performance is the manner in which the logistics industry organizes itself to respond to the transport demand resulting from trade. This requires engaging the industry to better understand the challenges it is facing, and how these challenges affect their structure, how it impacts on their costs. Module 5 provides guidelines on how to conduct this engagement.

**Figure 12 : Input and outputs for transport observatories**

### How to utilize and disseminate the data produced by transport observatories?

The transport observatory data will enable the preparation of periodic reports of corridor performance, combining standard reports and indicators providing the historical perspective, and ad-hoc analysis for areas of under-performance, which should lead to the formulation of recommendations for improvements.

The first stage of the analysis is the compilation of standard reports for the indicators. At this stage, abnormal values of the indicators must be flagged for discussion with the stakeholders, in order to determine their causes. That may entail a second stage for analysis at disaggregated level to better understand the causes, but it is critical to involve in the analysis the operations departments for all data providers, and possibly extend the consultations to other industry stakeholders. Those precautions are critical to ensure the credibility of the data and the validity of the recommendations that will derive from the diagnosis.

The formulation of recommendations based on the diagnosis should however be left to the relevant institutions in charge of the policy dialogue.

## How to ensure sustainability of the transport observatory?

There are three parameters for the sustainability of the transport observatories which are inter-related:

- ♦ Cost
- ♦ Relevance
- ♦ Mandate

### Cost

To enhance its financial viability, the corridor monitoring framework relies, to the maximum extent possible, on pre-existing data collected by logistics operators and control agencies while performing their respective functions. That data can readily be accessed at relatively low cost. Securing access to the required data can be achieved through Memoranda of Understanding (MoU) or interchange agreements between the various logistics operators/control agencies providing the data, and the institution hosting the transport observatory. Ultimately, transmission of the information can be automated, although this may prove more difficult. When the data required for monitoring performance needs to be obtained through dedicated surveys, it will be necessary to assess the usefulness of the information compared to its cost. Involving industry associations in the collection of the information is a promising option, which can be applied for all the industry surveys as highlighted in module 5.

For more resource intensive surveys, several avenues will have to be explored:

- ♦ Attach the survey to a specific program (for instance, perform border crossing surveys as preparation to major reform or facilities remodeling);
- ♦ Engage stakeholders in the development of automated operating systems to expand the scope of automated data (for instance, a gate recording system for Customs controlled zones at the border, or the computerization of transport authorizations from licensing authorities, or GIS systems for roads authorities that will enable extraction of roads condition data for the corridor network);
- ♦ Develop proxies to the data, at a lower access cost (refer for instance to the discussion on border crossing surveys in module 6).

### *Relevance*

In that context, relevance means that the information provided by the transport observatory is accepted by all stakeholders as a proper starting point for the formulation of policy recommendations aiming at improving corridor performance. The first part of that proposition is the reason why the diagnosis and the analysis of the transport observatory data must be a shared exercise with the stakeholders. The second part of that proposition supposes that countries, corridors, regional economic communities for the policy organs, and industry associations for the logistics operators, have adopted a structure that promotes fact-based dialogue. It is therefore important to organize the dissemination of the corridor performance review across all institutions:

- ♦ Expert meetings of the National Facilitation Committees
- ♦ National / regional Non-Tariff Barriers (NTB) monitoring committees
- ♦ Control and enforcement agencies
- ♦ Line ministries
- ♦ Port Communities
- ♦ Industry associations
- ♦ Corridor authorities Expert and Board meetings
- ♦ Transport / Infrastructure / Trade committees of the RECs
- ♦ Development organizations

Starting from a common diagnosis and understanding of the corridor characteristics will promote coherence between the facilitation programs supported by the different institutions.

### *Mandate*

Since designing and managing CTOs requires expertise and resources, CTOs need to be anchored to an institution. This institution can be a transport and trade corridor coordination authority, consisting of the stakeholders from public agencies (customs, ports and other regulatory agencies), and private sector representatives (providers of transport and logistics services).

An example is provided by the Northern Corridor in East Africa. The institutional framework for management of the corridor was established by the Northern Corridor Transit Agreement (NCTA), a treaty signed by the countries of Kenya, Uganda, Rwanda, Burundi, DRC, and South Sudan for the facilitation of transit traffic and trade along the Northern Corridor. The treaty created the NCTTCA, a

council of Ministers in charge of transport from the signatory countries. NCTTCA is responsible for designing and operating CTO's in the Northern Corridor.

However, other institutions or options for anchoring CTOs are feasible as well. CTOs can be anchored to a specialized agency of a REC as this option is considered in West Africa, or a National Statistic Office can take the lead for designing and operating CTOs. Independently of the institution to which the transport observatory is anchored, the main criteria must be that this institution has a mandate to drive or facilitate the policy dialogue, or at least has an important consultative role in that policy dialogue.

### What are the suggested indicators?

By choice, the corridor performance indicators are not strictly defined and large latitude is left to adapt the principles to the prevailing circumstances on a given corridor. However, policy level indicators must not be complex, and it is possible to establish a simplified list of synthetic indicators for permanent monitoring.

**Table 4 : Suggested synthetic corridor performance indicators**

<b>Volume</b>	<b>Time and uncertainties</b>
Port total throughput in tons by direction and by country of hinterland destination / origin.	Port dwell time for containerized cargo (frequency distribution, not only average) by country of destination (coastal and hinterland).
Port containerized throughput in tons and TEU by direction and by country of hinterland destination / origin.	Gateway clearance time (difference between submission of the declaration and issuance of the release order) for coastal and for transit goods.
Border traffic volumes in tons and in average number of vehicles per day for all main land border crossings.	Inland destination clearance time. Border crossing time at the main inland borders. Total time to final clearance at destination by country of hinterland destination for containerized goods.
<b>Costs &amp; prices</b>	<b>Infrastructure &amp; services</b>
Port handling tariffs for containerized goods (20' and 40' containers, for coastal and for transit countries)	Number of Heavy Goods Vehicles registered by country (for commercial freight transport).
Total price charged to the shipper for 40' container by country of hinterland destination / origin by road (by rail if it exists).	Status of the road transport infrastructure (length by condition – good, fair, poor).
Truck market price for a full truckload (equivalent to 40' container) from port to hinterland destinations (with repositioning of the empty container).	

## Module 4: Automated Data

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This module provides an overview of the generic functions of IT systems used by critical data providers for the observatories. Those include the VTS system for Harbor Master managing vessels movements, terminal and ICD IT managing cargo movement and association deliveries to/from vessels and land transport, Customs IT, and railways IT. This overview suggests data elements required from each IT system to create the transport observatory data.

The last section of the module presents the data model, or how to link the different datasets to reconstruct complete supply chains.

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### Overview of the logistics operators and control agencies IT systems

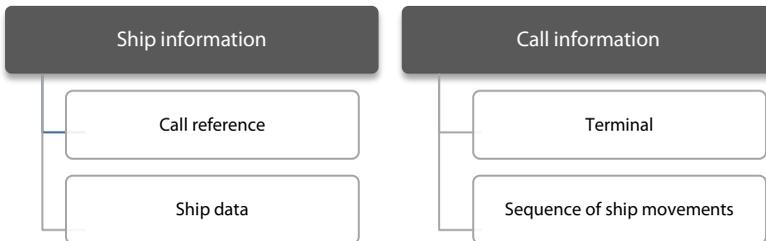
#### *Port IT*

**Maritime information: Vessel Traffic Systems (VTS).** Maritime operations are controlled by the Harbor Master unit of the port authorities, which organizes the access of vessels to their allocated berth and mobilizes the required marine services (pilots, tugs, mooring teams). From a transport observatory perspective, only the main events in the sequence of movement of the vessels is relevant: arrival of the ship at the outer port waiting area, the beginning of the entrance into the port, the arrival at berth, the departure from berth, and the release of the ship.

Harbor Master IT usually also records the use of auxiliary nautical equipment (the pilot's ship dropping the pilot on board to oversee the entrance into the port, and picking the pilot up once the ship has been safely guided out of the port, the tugs that assist the vessel's movement in the port and to access and leave berth, etc.) but this is outside of the scope of transport observatories.

The data items that need to be extracted from Harbor Master VTS are summarized in the following chart:

**Figure 13: VTS data**



Ship information includes contextual information on the ship, such as name, voyage number (the combination of the two provides unique identification of the manifest in the Customs system), and call reference for the port authority (usually a sequential unique number identifying a specific call). Additional information may include shipping line, service name, and shipping agent. Call information provides details on the destination terminal and the sequence of the ship movements. The required data from Harbor Master VTS is the following.

**Table 5 : Data requirement from VTS**

Necessary	Optional
Ship name	Shipping agent
Voyage number	Shipping line
Port call reference	Service name
Terminal (or quay)	Beginning of tug operation on entry
Arrival outer anchorage (or waiting area)	Internal movement in port
Pilot on board	
Berthing	
Sail from berth	
Sail away (when pilot left ship)	

**Gate pass.** The Gate pass records the physical exit of the goods from the port area: it associates transport means (wagon or truck) to a consignment. For containers, the Gate pass is usually done by the Container terminal IT.

**Table 6 : Data requirement from gate pass**

Necessary	Optional
B/L reference	Date/time entry wagon/truck
Customs Declaration / Transit transport title reference	Clearing agent
Container number (if containerized)	Transport company
Truck / wagon reference	
Date/time exit	

### *Terminal IT*

From a transport observatory perspective, container terminals and ICDs are very similar in terms of data content.

**Port container terminals.** The shipping agent transmits to the Terminal instructions for the cargo handling, under the form of a bay plan, which generally includes the following information:

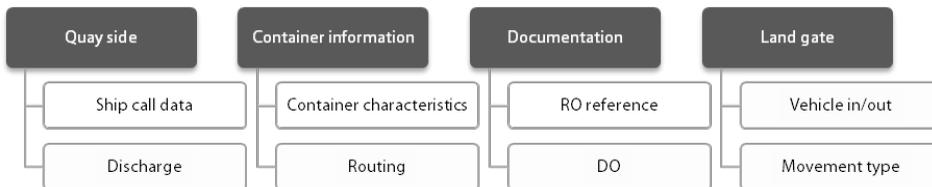
- ♦ Vessels information (name, voyage number, date of arrival)
- ♦ Container information (container number, size and type, status—FCL/LCL/ empty, temperature, dangerous goods instructions, weight)
- ♦ Routing information (port of origin, port of loading, port of discharge, port of destination)
- ♦ Location on board of vessel

Container movements are recorded: from ship to yard (date of discharge), and from yard to vehicle (truck or wagon). Internal movements (for instance positioning a container for inspection or scanner) are also recorded, but not needed from a transport observatory perspective.

Vehicle movements are recorded from their entry at the terminal gate to the exit. Containers loaded on the vehicles upon entry and exit are recorded, with generally a code corresponding to the movement, to distinguish for instance an empty exit for positioning at an exporter's premises from a delivery. Some terminals have established appointments schemes, in which a truck is given a window for picking-up the containers. The delivery conditions are important to clarify, because they determine whether the container has been stripped or not. For instance, in some ports there is a dedicated area for stripping containers. Transfers of the containers into that area is usually not done by trucks but using the yard handling equipment.

Before release a container from the terminal, two important flags must be cleared: the Delivery Order (DO) from the shipping agent, and the Release order (RO) from Customs. The data items that need to be extracted from Terminal IT are summarized in the following chart.

**Figure 14: Terminal IT data**



The required data from Terminal IT is the following, for all containers handled.

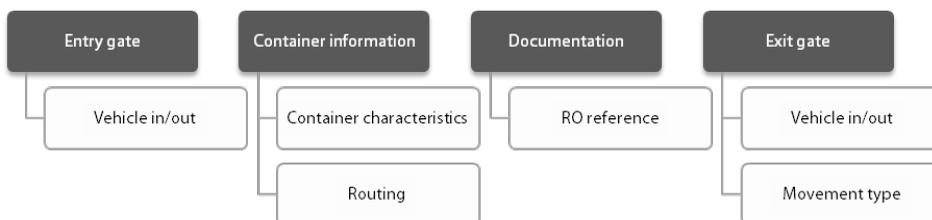
**Table 7 : Data requirement from terminal**

Necessary	Optional
Ship name, Voyage number, Berthing	Shipping agent
Port call reference (if identical to port authority)	Shipping line
Container number, Container size & type	Service name
Container status (FCL/LCL/MTY)	Temperature for reefer containers
Port of Origin, Port of Loading, Port of Destination	IMDG class for dangerous goods
Date/time of Discharge, Date/time of vehicle entry	Date/time of DO
Date/time of vehicle exit	
Vehicle ID (number plate or wagon number)	
Movement type, Date/time of RO, RO references	

**Inland Container Depot (ICD).** For ICDs, goods are entering and exiting through land transport means. The quay side information is replaced with information on the entry vehicle (identification, date and time of entry, and optionally date and time of exit). The DO does not apply in the case of ICDs in the hinterland.

The data items that need to be extracted from Terminal IT are summarized in the following chart.

**Figure 15 : ICD data**



The required data from ICDs IT is the following, for all containers handled.

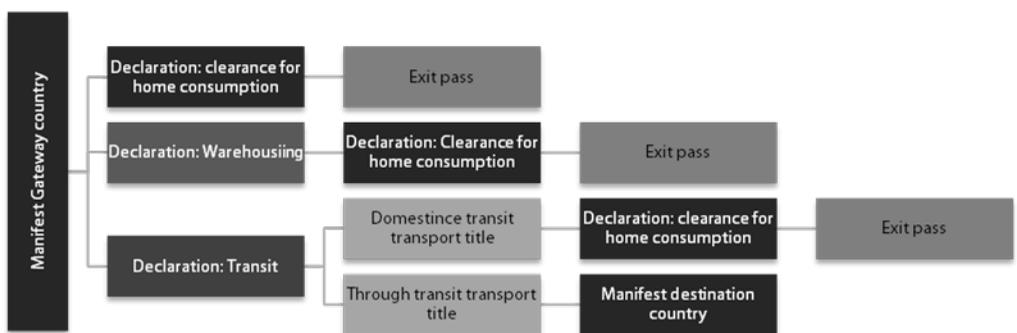
**Table 8: Data requirement from ICD**

Necessary	Optional
Date/time of entry vehicle in	Date/time of entry vehicle out
Entry vehicle ID (truck plate / wagon number)	Temperature for reefer containers
Container number	IMDG class for dangerous goods
Container size & type	
Container status (FCL/LCL/MTY)	
Port of discharge	
Port of Destination (for port ICDs)	
Date/time of exit vehicle in	
Date/time of exit vehicle out	
Exit vehicle ID (truck plate / wagon number)	
Movement type	
Date/time of RO	
RO references	

*Customs IT*

Customs IT will be presented according to the main functions: the manifest, which is the preparation to the clearance, and the two main options for Customs declaration, transit and home consumption. There is an increasing trend of imposing GPS tracking for transit goods, and this section includes an overview of the data content. Additional information on the potential use of the GPS data is available in module 6.

**Figure 16 : Sequencing of Customs regimes & documents**



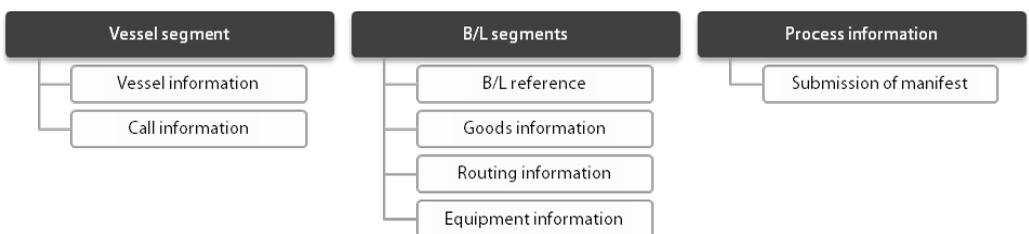
Depending of the Customs regime, several sequences of documents are possible after the manifest, illustrated in the figure above:

- ♦ Clearance for home consumption: the goods are released at the gateway after duties have been assessed and paid, and the physical release is recorded by an exit pass;
- ♦ Warehousing: the goods are stored in a bonded warehouse, duties are assessed but suspended. The regime is followed by a clearance for home consumption which conforms to the previous case;
- ♦ Transit declaration, either for a domestic inland Customs office (domestic transit) or for an exit Customs office (through transit), en route for another country. For domestic, the process at destination conforms to either one of the first two cases, while for through transit, the transport title forms the basis of the entry manifest in the destination country.

Understanding this sequence is particularly important for the reconstruction of the sequence of events of the supply chain. Depending on the preceding regime, the parent document will differ: for a declaration for home consumption, it can be the manifest (as in first case), or a warehousing declaration (second case) or a domestic transit (third case).

**Manifest.** The manifest is the summary description of all the cargo on board of a vessel and expected to be discharged during the announced call. The header section of the manifest provides information on the call, and its content lists all B/L information. Not included in the content of the manifest, but also important, is the date of submission of the manifest to Customs. In general, there is a rule imposing submission by shipping lines to customs 48 hours prior to the vessel’s arrival at the port. This advance information is in principle intended to enable the customs authorities to plan customs intervention (such as preparing for physical examination if deemed necessary, risk assessment, staffing arrangements and so on). It is a key event because it is only once Customs has acknowledged the manifest that clearing agents can start submitting Customs declaration for the manifested goods.

**Figure 17: Manifest data**



Generally, port authorities also receive a copy of the manifest, and it often constitutes the source for port activity statistics. Volume indicators are compiled using information from the manifest supplemented by information from the declaration (transit declaration) which provides the necessary information to identify the corridor route.

When the manifest is established at a land border, the vessels segment is replaced with information identifying the vehicle (wagon or truck). Often, Custom IT at land borders do not require the creation of a manifest before the submission of a Customs declaration. In that case, the parent declaration, when indicated, would be the transit transport title in the transit country preceding the entry.

Data elements required from the manifest are as follows.

**Table 9 : Data requirement from Customs manifest**

Necessary	Optional
Manifest reference (Customs)	Shipping line
Ship	Shipping agent
Rotation number	
Date/time call	
Date/time submission of manifest	
Total number of B/L in manifest <sup>20</sup>	
B/L reference	
Cargo description (commodity, weight)	
Cargo routing information (origin, destination, ports of loading and discharge)	
Customs regime (transit or domestic)	
Cargo type (container numbers)	

**Transit.** The transit regime is applicable for the transfer of goods between two Customs offices. The departure office, where the transit regime is initiated, can be a land entry border, or a maritime gateway. The destination office can be another Customs office in the country (domestic transit), an exit land border post (international or through transit) or a maritime gateway (for export of the goods).

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<sup>20</sup> For control purposes.

The principle is a two steps process: a transit declaration to initiate the regime, and a transit transport title to ensure that goods are properly reaching their declared destination. In ASYCUDA, the transit declaration is coded IM8, and the transit transport title T1. The information contained in the declaration includes the following categories:

**Figure 18: Declaration data**



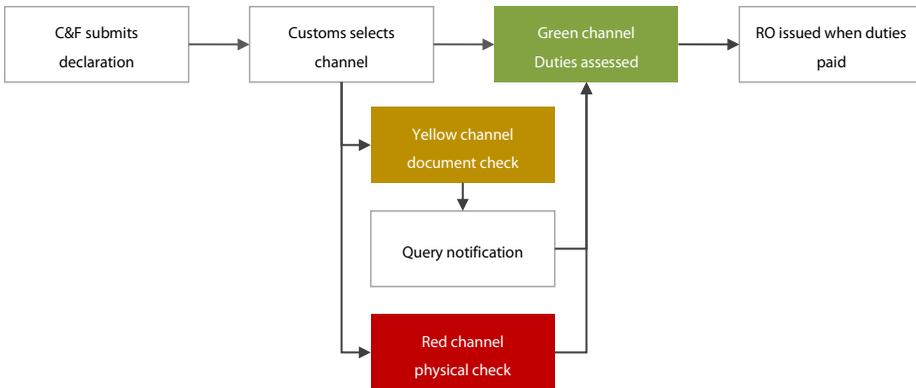
The transit transport title is created from the transit declaration and concerns part or the total goods declared (a single transit declaration can be broken down into several titles). The title specifies the transport means and the route for the transfer of goods between the departure and the destination office.

The data element requirements are indicated in the section on clearance, as all processes and documents share common data.

**Clearance of goods.** The content of the Customs declaration itself is similar, only the process information changes. It is important to differentiate according to the channel selected, because the routing has consequences in terms of additional steps in the process: (i) document check does not imply physical handling of the goods, but introduces a delay between the query notification and the time the clearing agent provides the requested information, and (ii) physical check implies that the goods are positioned for inspection, possibly by several border management agencies, and the coordination introduces additional delays.

The usual sequence is summarized as follows.

**Figure 19: Channels Red / Yellow / Green**



The other important item which possibly differs from the requirements for the transit declaration is the previous Customs regime, and therefore the nature of the parent document (manifest, transit declaration or warehousing declaration). The differences with the transit declaration are highlighted in the following graph.

**Figure 20: Clearance declaration data**



The exit pass which records the physical exit of the goods from the Customs area is very similar to the Gate pass issued by the port, and the same description and data element requirements apply.

**Table 10: Data requirement from Customs declaration**

Necessary	Optional
<i>Common section</i>	
Reference to parent document (usually manifest but may vary)	Shipping line
Previous Customs regime <sup>21</sup>	Shipping agent
Declaration type (transit, warehousing, home consumption)	Importer <sup>22</sup>
Ship	
Rotation number	
Date/time call	
B/L reference	
Cargo description (per item, for all items)	
- Commodity (HS position)	
- weight	
Cargo routing information:	
- origin	
- destination	
- ports of loading	
- discharge	
Cargo type:	
- container numbers (if any)	
- packaging	
Process information for declaration:	
- Date/time submission	
- Date/time release order	
- Date/time exit pass	

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<sup>21</sup> Reference to the previous status of the goods, e.g. transit or warehousing, in order to identify in which dataset is located the parent document.

<sup>22</sup> Although identity of the importer can be considered as commercially sensitive, it is important to differentiate performances of large shippers compared with more modest shippers. Alternatively, that information can be recoded, preserving the identity, but still enabling consolidation of all shipments of one non-identified importer to assess its annual volume of activity.

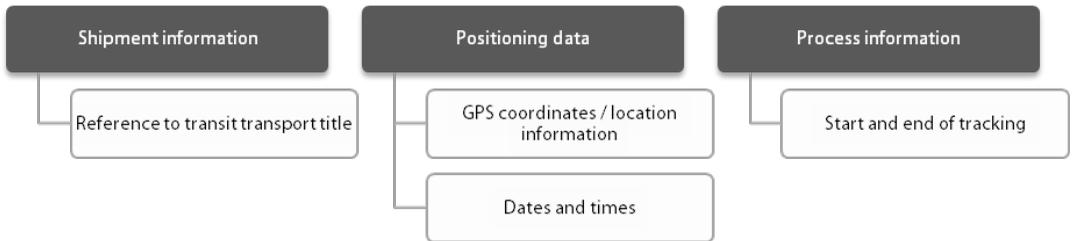
Necessary	Optional
<i>Specific to transit declaration</i>	
	Date/time establishment of bond Bond references
<i>Specific to transit transport title</i>	
Transit title reference Reference to parent transit declaration Destination office Commodity(ies) Weight Container number (if any) Truck / wagon reference Date/time transit title issued Date/time transit title validated at destination	
<i>Specific to home consumption / warehousing</i>	
Data/time selection channel (initial) Channel color Date/time re-routing Green Date/time payment of duties	

**Tracking of transit goods.** Tracking of transit goods is not as such a Customs IT function, but this practice is generalizing and constitutes a source of data in an area for which information is scarce: physical movements of trucks.

When tracking is imposed by Customs, a GPS unit is attached to the truck at the time of the release, and removed once the truck has reached the exit Customs office. The GPS unit is linked to a Customs transit transport title which provides the information on the shipment.

Data items contained in the GPS tracking systems usually covers the following groups, illustrated in the figure below: shipment information which provides the contextual information required for analyzing the location and duration of the stops during the transport, the positioning data itself which is a collection of coordinates with a time-stamp, and process information corresponding to the intervention of Customs officers (or their mandated operator) for attaching and removing the GPS unit.

**Figure 21 : GPS data**

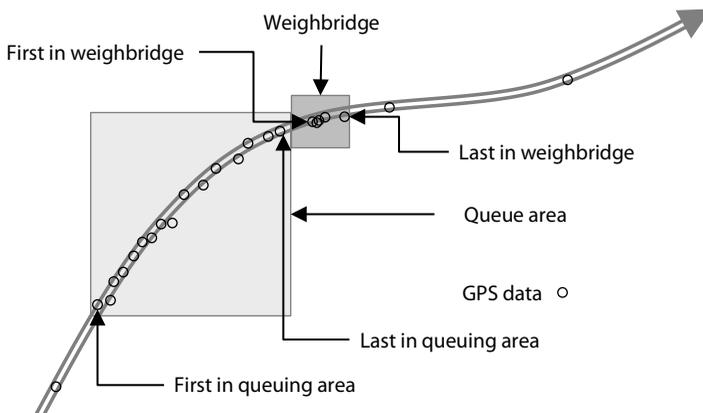


The functionalities of the GPS tracking services vary, and some are able to generate report showing the location and duration of the main stops, which is the relevant information from the transport observatory perspective.

If this is not available, the GPS data must be processed to isolate long duration stops (defined as GPS position stable below a certain threshold – for instance a distance of less than 50m – for duration over a certain threshold – for instance more than 15mn). This filter can eliminate slow movements linked to road congestion, and keep only stops that can be further analyzed.

The second treatment entails geofencing, i.e. defining specific geographic locations (weighbridge, borders, Customs checkpoints, etc.) by the envelope rectangle, and measuring the time the GPS unit remains within the boundaries of the rectangle.

**Figure 22: Monitoring delays with GPS data**



The necessary data fields are as follows.

**Table 11 : Data requirement for GPS**

Necessary
Reference to transit transport title
Date/time GPS unit attached
Date/time GPS unit removed
Series of GPS coordinates with time-stamp

### *Railways*

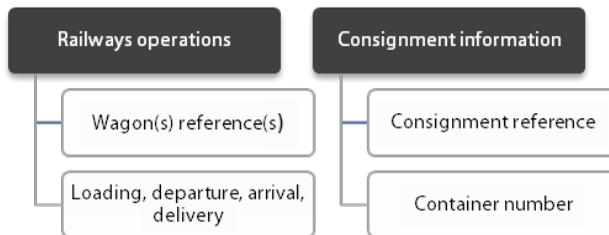
Railways IT aim at monitoring train and wagon operations, as well as consignments loaded on wagons. The usual cycle for transport by rail is as follows:

- ♦ A group of wagons is delivered to a port terminal. When the terminal is notified of the composition (the wagon numbers) of a train, this corresponds to the entry time into the terminal for the pick-up truck;
- ♦ The loading of the wagon is recorded by the terminal and notified to the railway operator. That notification triggers the association between a consignment and a wagon in the railway IT;
- ♦ The railway operator retrieves from the terminal a group (different from the first one, usually) of loaded wagons. That operation is not necessarily monitored by the terminal;
- ♦ A group (also different) of wagons are attached to a locomotive to constitute a train;
- ♦ The departure of the train is recorded in the railway IT. However, between the origin and destination, wagons can be detached and re-attached to several trains, with idle period in intermediate stations. Block trains, on the contrary, are expected to be maintained assembled from origin to destination, ensuring thus faster movement of the wagons;
- ♦ When the loaded wagon has arrived to the destination station, it is detached from the train;
- ♦ The wagon is unloaded to the platform's yard, or shunted to a private siding if the goods are destined to a shipper with rail siding.

From a transport observatory perspective, the intricacies of the wagon and train allocations are not critical, and only the loading and offloading of the wagons are. However, the variation of the duration of the rail time is largely explained by the train operations and the existence or not of block trains.

The data items that need to be extracted from Railways IT are summarized in the following chart.

**Figure 23: Railway data**



The required data from Railways IT is the following, for all containers handled.

**Table 12: Data requirement for Railways**

Necessary	Optional
Origin station	Wagon type
Destination station	Container type and size
Container number	Weight
Date/time of Loading	
Date/time of Departure	
Date/time of Arrival	
Date/time of Delivery	
Wagon number	
Consignment reference	

### Preparation of the data

In order to be meaningful and guarantee it can be used, the data must be formatted in a consistent manner. Divergence between different versions of equivalent data can have several explanations: mistakes during data capture, different formatting, and partial references. Although direct exchanges between IT systems are developing, the norm is still the manual capture of information that has already been processed by another system. That has severe consequences in terms of pro-

cessing of the data before it can be used, and to a much lesser extent in terms of possibility or not to use the data when erroneous entries have been made.

This section is a combination of tips developed while establishing pilot transport observatory databases on several Sub-Saharan Africa corridors.

### *Date formats*

Extraction of the dates from the IT systems can create conversion problems, notably between the US convention of MM/DD/YYYY and the common system DD/MM/YYYY. Similar problems arise from the AM/PM versus 24h convention on times.

A solution is to consider dates as text, and reorganize the information according to the proper format before converting it into a date that will be recognized by the different software systems used for the database and the statistical analysis.

### *Container numbers*

Container numbers are by convention a series of four letters (usually ending with U) and seven digits (the last one is in theory a checksum but this is not applied systematically). However, only terminal operators have structured the field containing the container number, and for most other systems, the format is relatively free, creating difficulties in linking the data sets. This is even more complex when the field containing the container number is free text, and can contain additional information (such as the size of the container, or seals numbers) or even several container numbers.

The steps required to prepare the data are:

- ♦ Eliminating unnecessary characters (filtering 'space', '-', '/' and separators)
- ♦ Recognizing container numbers as such

The first step is simple, using text functions to replace by a null string any unwanted character. The proposed solution for the second step is to use a comparison table to extract sequences of characters corresponding to a container number. The principle is that if a free text field contains a container number, it must be a container number that has been picked-up by another IT system using formatted container numbers, such as terminals and dry ports IT. Using a search function for each container in the comparison table enables to extract all container numbers recorded in that field.

### *Locations*

The UN-LOCODE is an international nomenclature for location, two letters identifying the country and three letters the specific location in the country. However, its use is not widely spread. Generally, port, terminal and dry port IT systems are using the UN-LOCODE, but Customs have their own coding for Customs offices.

In most cases, specific tables for converting locations from one IT system to another will be needed (notably for two Customs offices on each side of a land border) to link the datasets.

### *Truck plates*

Truck plates are recorded by most IT systems under a free format, and to the contrary of container numbers, there is no constant formatting as the structure of the number plate differs from country to country.

Considering the importance of truck plates as critical link between datasets, it is necessary to eliminate unwanted characters and keep only alphanumeric characters to maximize the likelihood of matching numbers plates across data sets.

## **Pulling all the threads together**

### *Identifying consignments across systems*

Reconstructing supply chains across different IT systems is a challenge: different IT systems refer to consignments using different identifiers (B/L and container number for shipping lines, container number for terminals, declarations numbers for Customs, etc.). In addition, the different processes can concern portions or groups of consignment (a single declaration can concern a cargo lot that will be removed by several trucks, for instance).

The solution is to combine several identifiers that provide a unique reference to a specific shipment, and recombine the data according to the level of analysis required. In that sense, Single Windows, not per se a distinct IT system, offer the advantage of solving the delicate issue of references across systems, as most SW operate with a central database which links datasets from the different operators and control agencies connected.

The typical linkages to refer to unique consignments are described in the presentation of the data models.

### *Data model*

**Gateway.** There are two scenarios at the maritime gateway: (1) correspond to direct departure from the port for the hinterland, and (2) transfer through a port ICD. Figure 25 below is a simplified view of the data model, containing only critical information for establishing the links between the different datasets, and the time stamps needed for the calculation of the time indicators. The events relating to the physical movements of goods are lettered (A, B, etc.) while the events relating to the documentation process are numbered (1, 2 and 3). Other information could be added to the base model:

- ♦ Payment information (for port authority, cargo handling, shipping agent, Customs bond, etc.)
- ♦ Other documentation processes (shippers' Council, other border agencies, transport authorizations)

The gateway dwell time is defined by the duration between B<sup>23</sup> and E in the scenario 1, and between B and H in scenario 2. In the last case, two intermediate times are important: the terminal dwell time (E-B) and the port ICD dwell time (H-F). Each one of the three main indicators must be disaggregated at least by means of transport (road / rail), by routing (direct departure and through Port ICD), and by nature of trade (national / transit, which may detail country of destination).

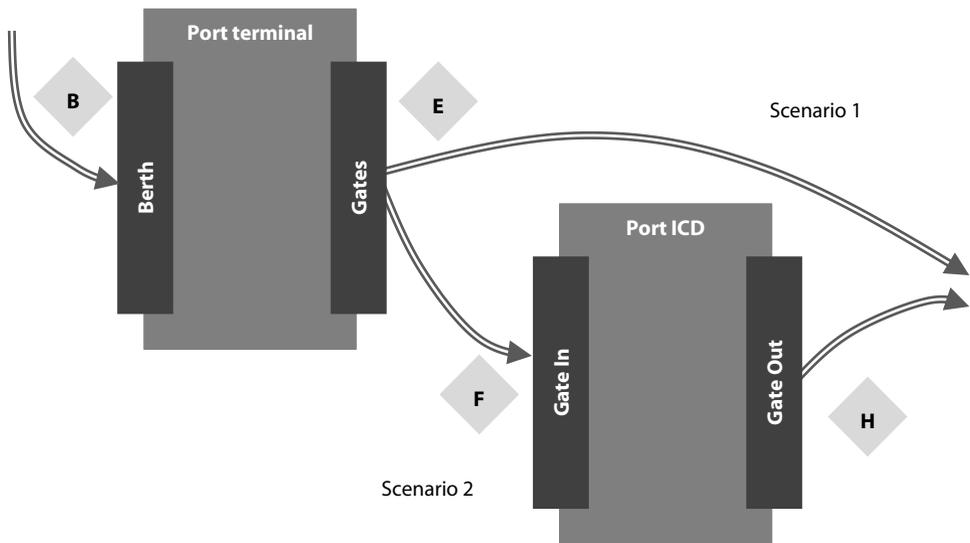
**Table 13: Events for the Gateway data model**

Physical movements events	Documentation process events
A: ship's arrival at outside anchorage	1: declaration
B: berthing	2: release order (RO) by Customs
C: goods offloaded	3: validation at exit border office (in case of transit to hinterland)
D: vehicle entry into port terminal	
E: vehicle exit from port terminal	
F: vehicle drop-off of goods in port ICD (optional)	
G: vehicle entry into port ICD (optional)	
H: vehicle exit from port ICD (optional)	

<sup>23</sup> Terminal operators may record C, and this time is used for storage invoicing, but in the context of transport observatory, ship berthing time is more relevant, and is more available.

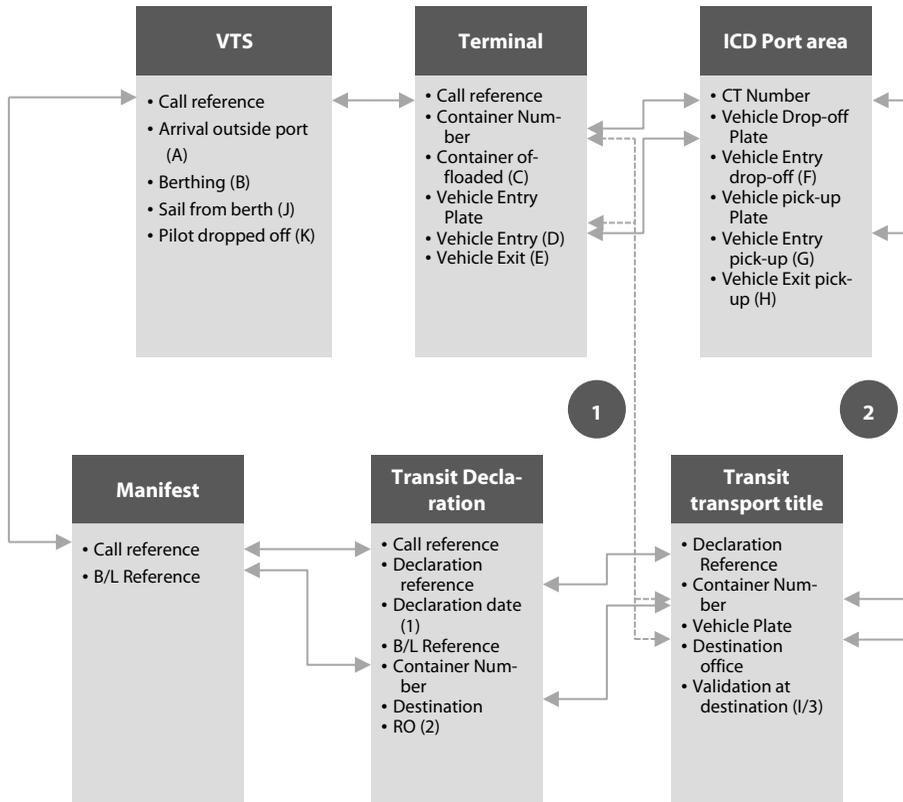
The clearance process is defined by the time between the Declaration and the Release Order (2-1). Pre arrival declaration occurs when 1 precedes B. The transport time in the coastal transit country is defined as the difference between the exit from the port (in scenario 1) or from the port ICD (in scenario 2) and the validation of the transit transport title at the exit border post (3-E or 3-H depending on the scenario).

**Figure 24 : Main stages of the gateway physical process**



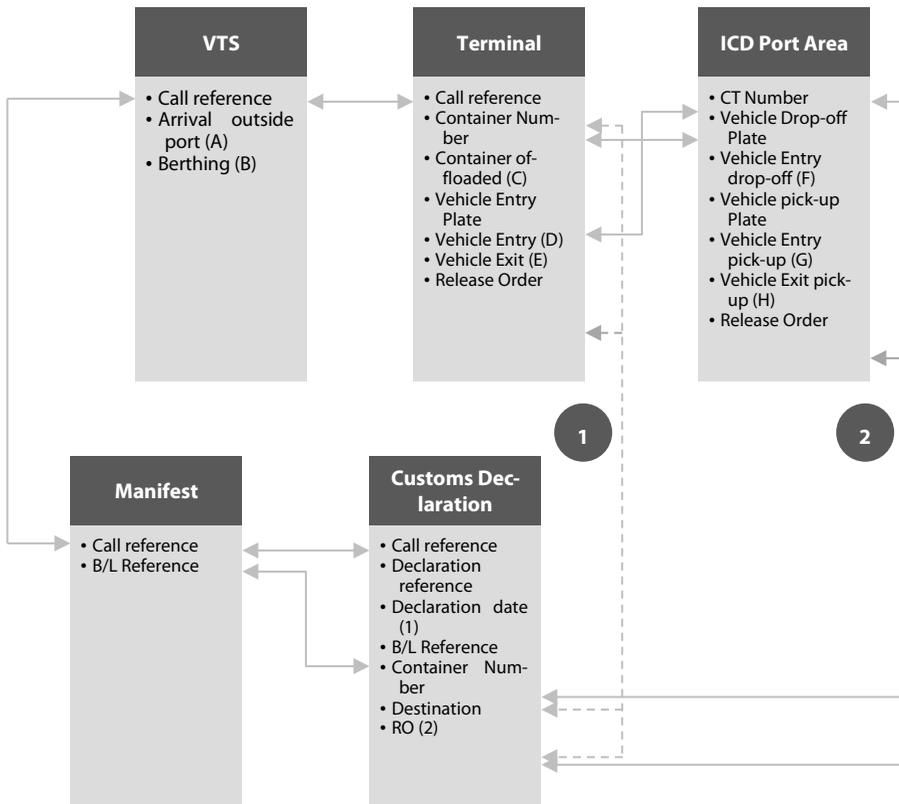
When port ICDs are not computerized, the calculation of the dwell time becomes less trivial, and a proxy to the exit of the ICD needs to be used. Generally, there is a Customs check point for transit cargo on the corridor outside of the port city limits (for instance Mariakani on the Northern Corridor or Yassa on the Douala corridors) that can be used, but there is usually no adequate proxy for cargo destined to the coastal country and cleared for home consumption in the port ICD.

**Figure 25: Data model for gateway transit**



**Gateway clearance.** The gateway process for goods cleared for home consumption in the coastal country differs on the documentation cycle, as the exit of the goods from the port / ICD is on the basis of the release order.

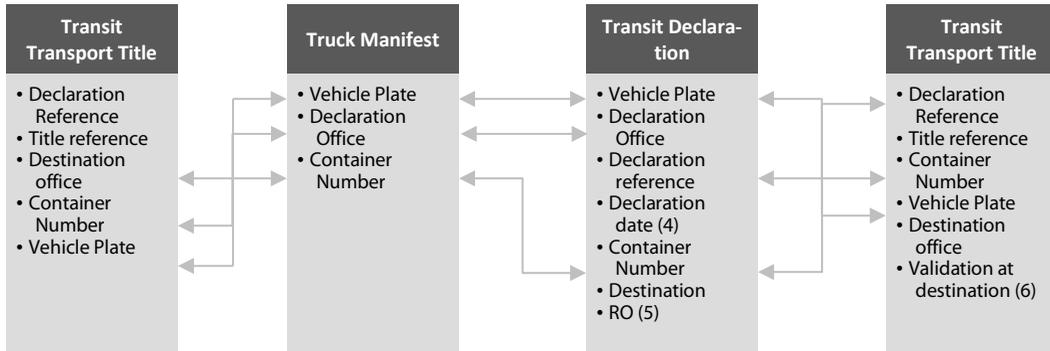
**Figure 26: Data model for gateway clearance**



**Inland border posts.** The following chart is a simplified view of the data model at the border, when the regime in the entry country is also transit (it is the same process whether it is domestic transit or through transit).

The intermediate stage of the truck manifest is frequently omitted, and there is not always a proper reference to the preceding document in the transit declaration in the entry country. In that case, the link between the different dataset must be based on the truck plates and the characteristics of the shipment (constraints on the date are also important to avoid references to another trip of the same vehicle).

**Figure 27: Data model for inland border post**



In theory, it should be possible to measure portion of the time at the border by using the difference between the validation of the transit title and the Release Order at the entry border (5-3), but in practice, the validation of the transit title is often done well after the actual arrival of the goods at the border.



## Module 5: Designing Industry Surveys

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This module addresses the following questions:

- ♦ How to formulate the survey question(s)?
  - ♦ How to identify the population and draw the sample?
  - ♦ What are the practical arrangements?
- 

In the Transport Observatory context, industry surveys are sources of data for two dimensions of the corridor performance monitoring framework, namely (i) costs and prices, and (ii) infrastructure and logistics services. The role of the surveys in the Transport Observatory has several important implications: they must be repeated from time to time to maintain collected information relevant; the cost of collecting the information must be kept as low as possible; and ideally, they should serve other purposes than just providing data for the Transport Observatory, to enhance their sustainability.

### How to formulate the survey question(s)?

From the Transport Observatory perspective, the main issues are linked to prices and costs, company characteristics, and transport capacity. However, in formulating survey questionnaires for transport observatories, it is important to diversify the audience and beneficiaries of the surveys to ensure their sustainability. Their design has therefore to take into account specific information needs from different categories of potential beneficiaries:

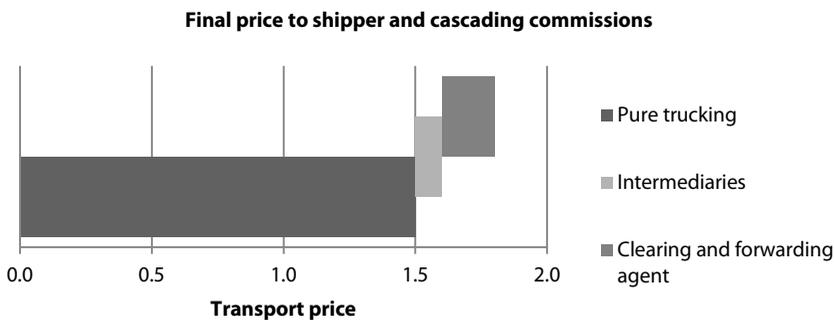
- ♦ Industry Associations will use the survey results and fact-based evidence to support position papers of the association and advocacy to policy makers. Also, sections of the survey will be dedicated to identifying the challenges faced by the logistics operators, so that their industry association can act upon them;

- ♦ Logistics Operators will use the statistics and reference information from the surveys to benchmark their activities versus their competitors. For instance, in South Africa, the Road Freight Association (RFA) publishes standard operating costs for several trucks and truck-trailer combinations based on responses to trucking company surveys;
- ♦ Policy and Planning organs and public agencies such as port authorities, corridor authorities and regulatory agencies / government ministries need data to identify and address trade and transport obstacles as well as monitor the effectiveness of their policies.

*Prices and costs*

**Access to freight.** The question of prices in the industry is complex, because of sub-contracting of logistics services. For instance, a shipper can either contract a freight forwarder to organize the delivery of its goods at destination, or contract separately a trucking company for the transport part, and a clearing agent for the documentation part, depending on its knowledge of the logistics industry and its strategy. In turn, a forwarding agent can contract a trucking company or an intermediary that will then sub-contract a trucking company. The whole process is generally not transparent, and each layer introduces its wedge between the apparent transport price to the shipper and the price paid ultimately for the trucking services. To a large extent, this is specific to the road sector where prices are mostly determined by the balance between offer and demand. Other logistics services providers usually publish tariffs and diversions are therefore difficult to justify.

**Figure 28: Prices and intermediaries' commissions**



The level at which logistics providers have access to freight in the supply chain has a direct influence on the level of revenue their activities will generate. It has also an indirect influence on the utilization of trucks, which is equally important for the

trucking industry. To understand these prices relationships, the industry survey will have to determine how trucking companies access freight, the form this access takes, and if access to freight is likely to differ according to the activity, for instance regional transport versus domestic.

**Table 14: Access to freight**

Access to freight	Qualitative assessment
<i>Own account</i>	
Own goods (including from parent / group companies)	Parent company or trucking arm of an industrial / trading company? Is it exclusive (all goods or part is transported by public trucking companies)?
<i>Sub-contracts</i>	
From another trucking company	Is this part of a regular formal contract/informal agreement or spot activity? From how many companies?
Through intermediaries (non-trucking companies or individuals)	Intermediaries targeted here have usually predatory practices on prices
Through intermediaries (non-trucking companies or individuals)	Clarify the freight allocation mechanisms (shippers' councils, trucking unions, freight bureaus) de jure and de facto, and the extent it impacts access to freight.
<i>Direct interaction with demand</i>	
Regular contract with shippers	Information on the contract, how many shippers? Are prices set in advance? By whom? On what basis and timeframe are they negotiated?
Spot activity with shippers	Who initiated contact? On what basis was determined the price?
Regular contract with C&F agents	Information on the contract, how many C&F agents? Are prices set in advance? By whom? On what basis and timeframe are they negotiated?
<i>Others</i>	
Through truck driver	Reward mechanism for driver? For which activity (for instance return loads)?

**Trucking costs, prices and operating conditions.** The question of prices and costs is particularly crucial for the trucking industry, since an important part of the costs can be related to the provision of a specific service (the voyage costs). For other logistics services, that link with the cost associated to a specific service is weaker:

- ♦ Clearing and forwarding agents are primarily performing administrative processes, and the prices are determined to ensure that the global activity is generating sufficient revenue to cover global expenses;

- ♦ Cargo handling companies have a high level of fixed costs: a given set of storage facilities (yard and warehouses) and handling equipment can accommodate widely different levels of traffic. Illustration can be given by the fact that container terminals for instance only expand their handling equipment in steps, while traffic fluctuates.

For the trucking industry, the information on costs will therefore focus on the identification of costs and revenue factors at truck level, with sufficient additional information on the operating conditions of the truck.

A World Bank publication, *Transport Prices and Costs in Africa: Review of the Main International Corridors*, conducted extensive trucking surveys on major SSA corridors to analyze why road transport prices charged by trucking companies were higher in Sub-Saharan Africa than elsewhere in general, and within Africa, higher in West and Central Africa than in Southern and East Africa. The research revealed the importance of market access and operating conditions in explaining the gap between road transport prices and road transport costs.

Operating conditions are dictated mostly by factors external to the road transport industry, notably (i) external trade imbalances—with import flows usually far exceeding export flows (when extractive industries related flows are excluded—petroleum products and bulk ores), (ii) rotation rate taking into accounts delays caused by third parties, and (iii) access conditions to freight (which have a critical influence on the duration of the wait between loads, or the availability of return load). This is illustrated by the divergence between road transport prices charged by trucking companies in the high volume direction compared to the backhaul prices (for which a ratio of 2:1 or even 3:1 is frequent), or over time, when prices are fluctuating according to the global demand (for instance seasonal variations).

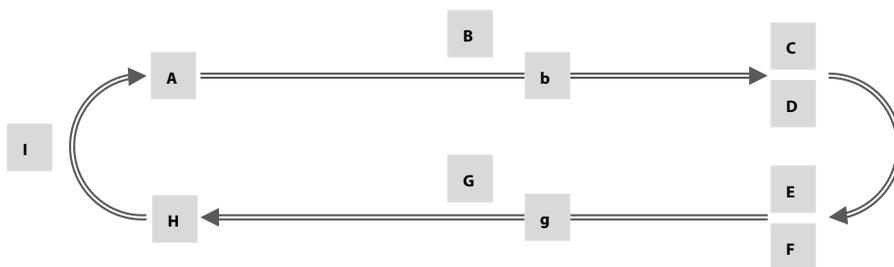
Prices need to be qualified with contextual information on the nature of the load, the characteristics of the truck and the characteristics of the trip, for typical routes and commodities combination, notably:

- ♦ Origin and loading conditions
- ♦ Destination and offloading conditions
- ♦ Nature of cargo and type (general cargo, containers type and size, tanker, dry bulk), weight (total actually loaded, not necessarily truck capacity)
- ♦ Characteristics of the truck (type, trailer characteristics, total capacity)

- ♦ Price (and conditions: per ton, per truck, per container), if in container does it include repositioning of empty (and same box or any?)
- ♦ Annual volume on that specific leg (to reconstruct the company activity)

Breaking down a full round trip into its components is important in analyzing the delays and idle time related to the movements of a truck. Typical stages are listed in the table below (some are optional), and an estimate of the duration of each stage must be made for several scenarios (domestic, regional, clearance on truck or cargo offloaded, empty or loaded return).

**Figure 29: Truck round-trip stages**



Stages		Remarks
A	Loading of the truck	Loading conditions (by shipper? Handling company?), nature of the load?
B	Trip	Are there pre-trip requirements (driver allowances to remit, additional documentation, etc.)?
b	Border crossing	For regional trips: nature of the border process (transit / border clearance)
C	Clearance on truck	For regional trips: Customs area or shipper's premises? Optionally, cargo can be offloaded and clearance takes place without immobilizing the truck
D	Offloading	Offloading conditions? Status of the goods (cleared or not)?
E	Waiting time to find return load	Who found the load (driver / company)? Is there a strategy for returns (empty or looking for return load)
F	Loading cargo on return leg	Loading conditions (by shipper? Handling company?), nature of the load?
G	Return trip	
g	Border crossing	For regional trips: nature of the border process (transit/border clearance)
H	Offloading return load	Offloading conditions? Status of the goods (cleared or not)?
I	Waiting time for load	Usually includes garage time for maintenance and repairs

Understanding the relationship between cost factors and operating conditions enables defining interventions on operating conditions that will result in reduced costs. In a non-competitive environment, prices evolution will not be determined primarily by costs factors nor by the most efficient operators. In such environment, understanding the relationship between costs factors, operating condition and price setting is equally crucial to define interventions that will result in increased competition and reduced prices.

**Table 15: Truck cost items**

Stages	Remarks
Fuel costs	Fuel consumption truck loaded and truck empty, in liters / 100 km
Tires	Mileage per tire, depending on quality (new, and which origin, or retreaded for instance), Number of tires on the truck (plus trailer if any), cost of a single tire
Lubricants	
Driver's salary	Modalities (monthly, per trip)? Including details for bonus (truck in good condition, return within certain period of time, etc.)
Driver's allowances	Trip expenses including 'facilitation'/non-official payments along the road
Maintenance	Average annual amount of maintenance and repairs for several truck types
Licenses, taxes and insurance	Based on the truck, not the trucking company

The price and cost information will be supplemented by the characteristics of the trucking company (staff, owned and operated facilities, characteristics of the fleet and its financing strategy) to understand how the cost factors at truck level impact on the cost structure of the trucking company.

#### *Company characteristics*

The main company characteristics have to be established prior to the survey, as they are necessary for drawing the sample. However, there are several other company characteristics that need to be detailed through the surveys:

- ♦ Company history (date of establishment, evolution of scope and level of activities)
- ♦ Company ownership
- ♦ Company activities and linkages with other companies

- ♦ Company facilities at headquarters and, if any, at branches (truck fleet for trucking companies is a separate item)
- ♦ Human resources (composition and size, level of education, age profiles, salary profiles)

Taking these variables into account into the survey design is important since its main objective is to obtain information on the industry's operating costs, market structure, prices and company organizations, and to provide a statistical database that is essential for understanding of the major issues facing the trucking industry.

**Facilities.** Knowledge of the company facilities at headquarters and at other locations should cover the information items included in the table below. For other locations, facilities can either be owned by the company or secured through partnerships.

**Table 16: Trucking company facilities**

<b>Parking space</b>	<b>Workshop</b>	<b>Yard</b>	<b>Warehouses</b>	<b>Handling equipment</b>
Truck capacity	For regular maintenance or more	Storage capacity (in TEUs)	Storage capacity and covered area in sq. m.	Yard and warehouses handling equipment (number and capacity in tons)

**Human resources.** The objective is to obtain a description of the human resources employed in the logistics industry, in terms of job profiles, age, education levels and salaries. In the trucking industry, for instance, the survey could focus on the following areas:

- ♦ At least four different job profiles: (i) management, (ii) other administrative staff, (iii) drivers / apprentices, and (iv) mechanics: number of employee for each profile (decomposed by gender);
- ♦ The age structure of the truck drivers is an important information for the definition of driver training programs;
- ♦ The level of education and experience in the trucking industry of the manager;
- ♦ The salary levels for the different job profiles, including the benefits (safety net, bonus, duration of contract, etc.).

### *Transport capacity for trucking industry*

The truck fleet for the surveyed companies is obtained from registered trucks and truck licenses. However, that information may be incomplete or inaccurate (for instance the trucking company operates rented trucks). It is necessary during the survey to confirm the truck fleet operated by the company, and the routes on which the trucks are operated. A table containing all truck fleet number plates needs to be updated by the company (adding the missing trucks, deleting rented trucks), adding possibly information on each truck, notably:

- ♦ Year of acquisition (year of manufacturing is known from registration)
- ♦ Exact vehicle type (for instance, type of trailer, or type of body for trucks)
- ♦ Number of axles
- ♦ Route mostly operated
- ♦ For missing trucks, mode of control of the truck

For the analysis of the truck acquisition and financing strategies for the trucks, the survey should request data on the last truck acquisition (alternatively the last few, up to three for instance), including:

- ♦ Make and brand of the truck
- ♦ Truck type, number of axles, Gross vehicle weight (max weight including cargo), tare weight (truck weight alone)
- ♦ Year of manufacturing, year of acquisition
- ♦ Purchase price
- ♦ Source of financing and their costs (leasing, company cash flow, bank loan – interest and duration, personal, etc.). As combinations are possible, the purchase price should be decomposed according to funding sources

Beyond that information on the last acquisition(s), it is important to supplement this by qualitative information on the financing sources used. Understanding the underlying causes for a choice of financing source against another is important to identify potential constraints to fleet renewal and operating costs.

Information on the management of the fleet are important, for instance how the company is keeping track of its fleet, either by direct communication with drivers

(cell phones) or GPS based techniques (in that case, the name of the provider should be obtained).

### *Industry challenges*

The survey can include sections on the regulatory environment and challenges faced by the industry. The regulatory section focuses on collecting statistics on time and other requirements to obtain licenses (domestic and regional) for companies and trucks and special permits (abnormal load for instance).

The challenges section is designed to collect qualitative data for assessing competition in the trucking industry both in the domestic and foreign markets, and other constraints. During the preparation phase, interviews with a number of trucking companies, regulatory agencies, shippers and clearing agents will enable identifying a list of the challenges typically faced by the industry, but this section should contain open sections to capture challenges that have not been identified, and also to qualify the listed challenges.

### **How to identify the population and draw the sample?**

The population of the logistics service providers to be surveyed can vary from one representative<sup>24</sup> to many, depending on the segment they occupy in the logistic chain. Accordingly, identifying the population, selecting a representative sample, and deciding which instrument is adapted will depend on that segment. The following table summarizes the main industry characteristics, from the survey perspective, and recommends the adapted instrument. Only the C&F and the trucking industry will be discussed in detail.

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<sup>24</sup> For instance in the case of railways, or container terminals.

**Table 17: Logistics services and recommended survey instruments**

<b>Logistics services</b>	<b>Industry characteristics</b>	<b>Survey instruments</b>
Cargo handling companies (including terminal operators)	Limited number, licensing agreement by the port authority, tariffs often public and regulated	No survey necessary, as it can be replaced by request for information on tariffs and facilities
ICDs	Limited number, licensing by Customs authority. Sometimes a mandatory and unique facility. Tariffs often public and regulated	No survey necessary, as it can be replaced by request for information on tariffs and facilities
Clearing and forwarding agents	Sizeable number, licensing by Customs authority	Survey recommended for information on prices, company characteristics, and possibly industry challenges to involve more beneficiaries than Transport Observatory

#### *Clearing and forwarding agents*

Clearing and forwarding agents are licensed by Customs authorities, and a register of companies is maintained. However, additional information is needed to define the stratification of the sample, notably:

- ♦ The volume of activity
- ♦ The extent of logistics services provided by the C&F agents (for instance, purely clearance or additional services such as warehousing facilities or trucking)

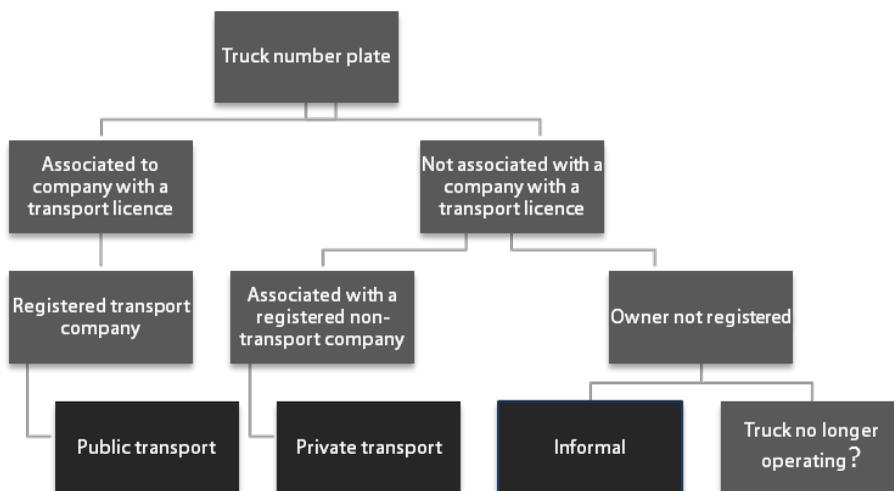
The volume of activity can be determined through automated Customs systems, by extracting the annual volume cleared by each C&F agent, separating domestic from transit, and measuring in number of declaration, in weight, and in value of the goods, for instance. However, except for the main C&F agents, it may be difficult to establish the extent of logistics services provided by each company. The stratification of the sample will therefore be based primarily on the volume of activity handled by the agent.

### Trucking industry

Usually, the term ‘trucking industry’ refers to trucking companies providing commercial transport services<sup>25</sup>, i.e. transporting goods belonging to shippers under a transport contract. However, not all the transport demand is satisfied by the commercial trucking industry, and it is necessary to widen the definition of the trucking industry to include companies and individual which have a profound impact on the way the sector operate: companies transport their own goods (own account transport, or private transport) and informal operators.

The main challenge is to establish a census of the trucking industry covering the extended definition, when private transport is rarely regulated (i.e. not subject to specific authorization or license), and informal operators are not registered.

**Figure 30: Identification of transport markets**



The starting point for the analysis should be the truck fleet, which is registered in the general registry of vehicles. Some of those vehicles are associated to a trucking license which has been applied to by a registered trucking company. Through this, it is possible to establish a census of public trucking companies with a description of their owned fleet. Generally, there is a specific license for regional operation as

<sup>25</sup> Also ‘for hire and reward’ and ‘public freight transport’.

opposed to domestic transport. This may be an authorization granted at company level<sup>26</sup>, or at truck level<sup>27</sup>. The vehicles not associated to a trucking license can either be owned by registered companies which do not have commercial freight transport as their main activity. In that case, it is likely that these trucks are used for private transport, and those companies are to be considered as such for the survey purposes.

The stratification of the sample could be defined according to the criteria that are likely to influence the nature of the responses to the questions the survey:

- ♦ The nature of the activity (public transport / private transport, formal / informal, company or individual, domestic / international)
- ♦ The size of the fleet

Some transport services subsectors may have specific regulations that can require a specific approach. For example, this is typically the case for the transport of petroleum products. A different sampling strategy may be developed for such specialized markets.

### What are the practical arrangements?

#### *The preparation stage*

**Building partnership.** Several options for conducting surveys have been experimented, with different advantages and constraints, such as hiring a consulting firm to conduct the surveys, building a partnership with local institutions, or considering a scaled-up case study approach. Depending on the situation, the knowledge of the local industry to survey may vary from one option to another and influence the choice. Similarly, the amount of data collected may lead to preferring an option over another. For instance, on competitive truck routes, there may be little variation of ‘market’ prices, and the case study approach may be indicated.

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<sup>26</sup> For instance in the CEMAC region, in which public transport companies operating on the regional corridors must seek authorization from the REC.

<sup>27</sup> The truck license specifies whether the truck operates on domestic or regional routes.

One recommended approach is to rely on local and regional capacity for the industry surveys, working through industry associations, academic institutions and, where existing, corridor institutions. This approach is preferred to outsourcing to a consulting firm, because national and regional institutions have a better access to logistics companies and other national statistical sources, and more importantly because it is more efficient to build local and regional capacity considering the periodic nature of the surveys.

The recommended partnership would include:

- ♦ An institution with recognized statistical capabilities, to ensure that survey results will represent the logistics industry and that valid conclusions can be drawn from the survey responses and analysis;
- ♦ An institution linked to the industry, preferably an industry association, to facilitate access to the logistics companies and ensure that lessons from the surveys will feed the policy dialogue from the operators perspective;
- ♦ An institution with a mandate for policy dialogue, such as a corridor management institution.

**Background information.** The objectives of this stage are to gather existing background information that will help shape the survey, confirm with stakeholders the questions to be answered by the survey, build a coalition of partners that will have an interest in the survey results.

Interviews with trucking companies, regulatory agencies, shippers and clearing agents are necessary in that stage to collect information that will enable clarifying the hypothesis to be tested and the nature of the questions the survey will have to answer.

#### *The launch stage*

The launch stage comprises the selection and training of enumerators and the sensitization of logistics operators to ensure that enumerators will be well accepted.

**Selection, training and evaluation of the enumerators.** Logistics services are diverse and constitute a complex industry. Understanding the responses of companies to the survey requires a minimum knowledge of the industry. It is therefore vital to properly select the enumerators, provide them with the basic knowledge that they will need to conduct the survey, train them on the survey instruments,

and test the enumerators and the survey instruments, to finally select the team of enumerators that will conduct the survey. A one-week program is recommended.

- ♦ Day One and Two: overview of the logistics industry characteristics, with added focus on the critical areas that are developed in the survey questionnaire. Full description of the questionnaire.
- ♦ Day Three: Actual interview with logistics operator to test the questionnaire and the enumerators' capacity.
- ♦ Day Four and Five: debriefing on the questionnaires that have been filled, analysis of responses and problem areas, possibly closing some open questions. Final selection of the enumerator team.

**Industry sensitization.** The cooperation of the logistics industry (companies and their representative associations) is essential for the success of the survey. The survey questionnaire is likely to require specific research by the trucking companies to respond to some of the sections. The questionnaire is designed in separate sections because not all the information will be collected from one unit or the same person. Providing accurate responses will require preparation.

An information workshop targeting the trucking companies to be surveyed can provide the opportunity to explain why this survey is conducted, how the results will be used to improve operating conditions, and the type of preparation and cooperation that will be required from the trucking companies. The survey schedule can also be defined during this workshop, allocating dates and enumerators to the trucking companies.

#### *The analysis and dissemination stage*

The stage includes reviewing the survey results and providing feedback to the industry. This involves the dissemination of results through industry forums, notably the participants to the initial sensitization workshop.

## Module 6: Border Crossing Surveys

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Border-crossing times in Africa have been identified as a major constraint for smooth trade flows, both for regional trade and for international transit. Delays at borders disrupt efficient trade logistics, impacting on the transport costs and prices, and ultimately on trade competitiveness.

This module addresses the following issues:

- ♦ The border crossing and the typical challenges it poses
  - ♦ Two diagnosis tools for border crossing: disaggregated surveys and routine monitoring
- 

### Border crossing

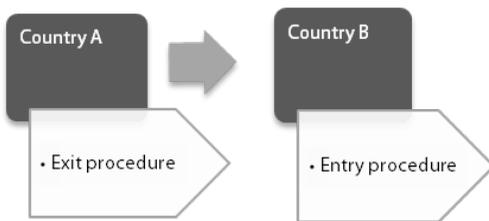
Delays at borders cost money: money for the trucking company because idle trucks do not generate revenue and money for the traders, because of inventory costs. In South Africa, the Road Freight Association publishes annually operating costs for various truck types. Large trucks have daily operating costs in the range 400\$-450\$: a delay of one day at a border is a direct cost for the trucking company. In East Africa, costs are lower, but a one day delay still represents an estimated cost of \$250 for a trucking company.

There is a growing recognition that customs are no longer necessarily the main constraint at the border, and there is a need to clearly identify the role of the other agencies. To achieve this, it is necessary to record whether other agencies have intervened on the crossing and obtain the respective time stamps for their intervention(s). Numerous surveys also showed that the documentation process represents only a fraction of the time trucks spend at borders. Sometimes, truck drivers' behavior is a factor in the duration, sometimes also the clearing agent is responsible for the delays. It is therefore important to assess the respective duration and se-

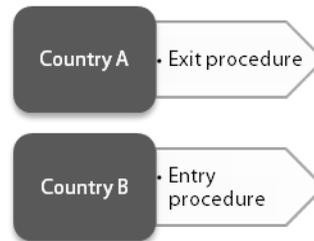
quencing of all the individual processes conducted at the border, identifying which party is responsible and for which reason(s). The disaggregated survey methodology aims precisely at that fine analysis of the border crossing times.

But before presenting the various options available to conduct that analysis, it is necessary to present a brief overview of border crossings. A border crossing is a combination of physical movements of the trucks and the associated documentation process for the transfer of the cargo from the exit country to the entry country. The stages of the border crossing, which tended to be sequential, are now adopting more complex patterns, with a tendency to develop parallel processes and anticipate treatment of the documentation. Parallel processes are in use in the different variants of One-Stop Border Posts (OSBP, sometimes also referred to as Joint Border Posts – JBP), while anticipated treatment refers to the possibility to submit a Customs declaration prior to the arrival of the truck at the border.

**Figure 31 : Sequential border post**

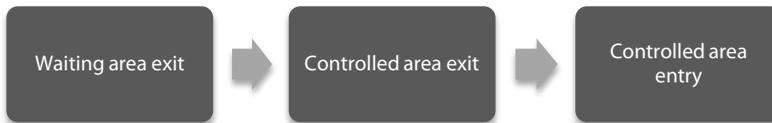


**Figure 32: Parallel (OSBP or JBP) border post**



In the parallel process, documents are handled by the border management agencies from both sides simultaneously (either by combining agencies from both countries in a joint zone or specializing each side of the border for the entry flow).

The physical movements are broken down into three main stages: waiting area on the exit side of the border, controlled area of the exit side, controlled area on the entry side (both control areas are combined in the case of joint facilities). The arrival of the truck is recorded when the truck is reaching the border area, either when it is reaching the queue (if there is a queue) or when it is parking while waiting to join the queue for the border formalities. With this convention, the actual waiting time of the truck is recorded and can be isolated from the border-crossing process itself. The departure time recorded is the actual time when the truck resumes its journey. With this convention, it is possible to measure the time the driver spends at the border after the completion of all formalities.

**Figure 33: Physical movements at inland borders**

The documentation process is more complex, and individual stages for the follow-up of the documentation can be of two types:

- ♦ Simple events, such as handover of documents from driver to agent, for instance. In that case, only the time of the event is recorded
- ♦ Processes with a duration, such as customs checks. In that case, both times (for the beginning and for the end) are recorded

Typically, border management agencies involved in the documentation process include Immigration services, Customs, sanitary and phyto-sanitary Services, Bureau of Standards, and Ministry of Transport. This list is however not exhaustive as other agencies may be represented at the border.

The sequence for each side of the border for the documents is as follows, as a rule:

1. The driver remits the documents to the agent (even in the case a declaration has been submitted prior to the arrival of the truck, Customs do not release cargo before arrival)
2. The agent submits the declaration to customs with supporting documents
3. Customs declaration process (begin and end)
4. Additional customs and other border agencies checks (begin and end)
5. Release of the truck by the agent once all formalities are completed

### Typical challenges

#### *Documentation process and total border crossing time*

Border management agencies interventions are clearly identified at the beginning and end of the process, with observation of the customs on each side of the border, as well as customs and other border agencies checks on each side of the border. Two possibilities:

**Figure 34: 'two stops' border**



**Figure 35: 'one stop' border**



It is important to understand the reasons for the time between the two successive border agencies checks in the case of two stops border posts: sometimes, distance between the two posts imposes Customs escorts between the two controlled zones.

### *Parking areas*

Controlled areas at the border have limited parking facilities for truck while the documentation is processed, and trucks are either queuing on the access road to the controlled area, making it difficult to separate flows for priority trucks (for instance tanker trucks), or are directed to a waiting area until the time they can be admitted to the controlled areas (when the documentation is ready, or when it is their turn).

### *Arrival patterns*

Operating hours for border vary, from regular office hours to 24 hours operations. Different border agencies may have different operating hours, and they may also differ between the exit country and the entry country; logistics operators too may have different operating hours. At the same time, truck arrival times depend on traffic conditions and individual trucking enterprises driving rules.

The issue of 24/7 operations for border posts is important, because of its implication in terms of staffing for border agencies and operators. Extended hours of operation only make sense if all parties involved have compatible operating hours and if trucks take advantage of the extended period.

It is therefore important to assess the distribution of the arrival times for the trucks, in order to assess the adequacy of the operating hours compared to traffic patterns.

### *Advance information*

Computerization of border posts is becoming the norm, and Customs IT, when transit functions are activated, enables the transfer of the declaration information

to the exit border. The possibility to use that advance information to prepare the truck crossing has proved to be effective in reducing border crossing time.

### Diagnosis tools

Analyzing border delays can be done through three different types of diagnosis which are not mutually exclusive but could (and should) be combined with:

1. A review of the border facilities and processes, involving primarily pre-existing information and interviews with critical stakeholders
2. A disaggregated survey involving field questionnaires over a period of time
3. Routine monitoring

The first diagnosis is a pre-requisite to the two other approaches, which can also be sequenced with a disaggregated survey establishing a baseline and evolutions of the situation through routine monitoring.

The decision between disaggregated surveys and routine monitoring must be based on the need for analysis, and on the respective strengths and limitation of the each type. Disaggregated surveys should only be used when it is necessary to conduct a fine analysis of the border crossing time components. Routine monitoring combined with disaggregated surveys provides the opportunity to calibrate the data, in order to determine the performance of the panel of trucks compared to a wider sample, and follow over time evolution of performances.

**Table 18: Disaggregated & routine monitoring**

	<b>Disaggregated surveys</b>	<b>Routine monitoring</b>
<b>Strengths</b>	Detailed information on the duration of individual stages of border crossing	Low cost of data Perfect for time series for a panel of trucks Replicable on several borders and for additional critical stops (weighbridges for instance)
<b>Limitations</b>	Cost, which imposes limits in the duration	Selection bias of the sample Lack of contextual information on the crossing conditions

### *Border crossing review*

The review aims at establishing the characteristics of the border, in terms of facilities (in the controlled zones, but also the rest / parking areas for trucks), border management agencies represented, description of the processes (parallel or sequential, transit or border clearance, etc.), operational conditions (for instance office hours), traffic and trade volumes.

Traffic and trade volumes can easily be extracted from Customs IT system, or far less easily from manual registries. It is important to note however that empty trucks are not recorded in the Customs IT system, and that usually, exit data is less reliable than entry data. Customs declarations for loaded trucks on the entry side include at least the following information, relevant for the surveys:

- ♦ Truck number plates (which can be converted into country of vehicle registration)
- ♦ Date and time of submission of the declaration (the date enables daily traffic counts)
- ♦ Type of declaration (to distinguish between through transit and border clearance)
- ♦ Commodity (which may with appropriate treatment allow for separation of the crossings between different categories of trucks – containerized goods, tankers, and others)

During the review, interviews with border management officials, clearing and forwarding agents and truckers will enable the identification of a set of challenges that will guide the definition of the more detailed surveys.

As most of the main border crossings in Africa are undergoing rehabilitation or development of new facilities, additional sources of information have become available. For instance, in Malaba (at the border between Kenya and Uganda), the Uganda Revenue Authority has developed a computerized registry of truck arrivals and departures linking vehicle movements to the declarations, named CURES (Customs Reconciliation System). Using this system, the authorities are able to keep track of trucks and cargo entering and leaving the control zone. For the time being, the monitoring covers only the Uganda side of the border, but its extension to the Kenya side is planned. This could be an example to follow, as including a recording system at the entry and exit gates of the facility would provide comprehensive information on the duration of the crossing on a routine basis. Similarly,

in West Africa, the operator of the Cinkanse border facilities (between Togo and Burkina Faso) registers truck arrival and departure at the gates of the Customs Controlled Zone (which includes the parking area) together with reference to the transit documentation. It is important to include such recording in the development of border facilities as part of an ongoing performance management system.

### *Disaggregated surveys*

**Sampling.** Border-crossing times can differ greatly according to the nature of the trade (type of goods, border formalities, etc.), but also to the conditions of arrival at the border (day, time, congestion, etc.), resulting in a vast range of crossing scenarios. Combining all the scenarios to measure an ‘average’ border-crossing time for a statistically representative sample is therefore not the primary objective of the survey. The objective is to measure border-crossing times for an homogeneous group of trucks conforming to typical border-crossings scenarios, and decompose the total time between the different parties involved (customs and other border management agencies, C&F agents, and drivers) to identify where possible efficiency gains exist.

As a result, the construction of the sample focuses on prioritizing some scenarios over others that are less frequent. The positive aspect is that the results are representative of the typical border-crossing scenarios privileged, instead of summarizing in a single figure different patterns. However, the negative side is that specific analysis for widely different patterns cannot be completed from the sample.

The sample must be constructed so as to contain sufficient observations for each stratum, identified by the three factors:

- ◆ Type of load (containerized, tankers, break bulk)
- ◆ Trade (empty, domestic transit or border clearance, through transit)
- ◆ Arrival time (day, evening, night for instance)

In the preparation of the surveys, interviews with border agency officials, clearing agents, trucking companies and drivers will collect information on the border processes and reveal the perception of the problems by the logistics operators and the control agencies. This information, combined with additional data on the nature of the trade, the volumes, and the arrival times at the border, will determine the major scenarios that will be surveyed.

**The survey questionnaire.** The survey questionnaire comprises two main sections:

- ♦ Characteristics of the truck / trip (origin, destination, type of load, description of the cargo, truck identifiers, etc.)
- ♦ Sequencing of border crossing events

*Characteristics of the truck / trip.* The information obtained through this section is important to differentiate the border crossing scenarios. It is necessary to clarify the nature of the customs process at the border. For instance, when the entry country is the destination country, it is necessary to clarify whether the process is a domestic transit or a border clearance.

Surveys must collect the following information on the characteristics of the trip:

- ♦ Nature of the goods (using possibly their classification under the Harmonized System Code)
- ♦ Origin of the goods (pick up point)
- ♦ Destination of the goods (delivery point)
- ♦ Regime at the border (border clearance, domestic transit, through transit)
- ♦ Identity of the transporter (and its nationality)
- ♦ Truck plate number
- ♦ Truck type
- ♦ Exit clearing agent
- ♦ Entry clearing agent

*Crossing events section.* The principle is to follow the truck movements as well as the documents movements. The section on border crossing events consists of a series of time stamps for the processes selected at the preparation stage, during the review of the border facilities and procedures.

**Table 19: Sample section for border crossing events**

Agency	Date / time begin	Date / Time end	Remarks
			Arrival at the parking facility
			Documents remitted to agent
			Documents in Customs
			Etc.

**Practical organization of the survey.** Enumerators need to be familiar with the border clearance process (for instance recruiting candidates with a background in the clearing and forwarding industry is an advantage), and be granted the necessary clearance to access the controlled zone and the border management offices.

It is critical to survey a truck crossing from arrival to departure from the border even in the case the two controlled zones are not adjacent. Coordination between the two can be maintained through communication equipment, to ensure that the selected trucks were observed during a complete crossing.

**Presentation of results: averages, deviation and frequency distributions.** An important question is what is the relevant indicator to consider for the presentation of the results? Using the average is usual, but at the same time highly misleading. To avoid oversimplification by just using the average, the standard deviation is frequently added to qualify the average.

A more relevant indicator for this type of situation would be for instance the proportion of trucks crossing the border on the same day. An alternative is to produce frequency distributions which adequately reflect the variation in the crossing time.

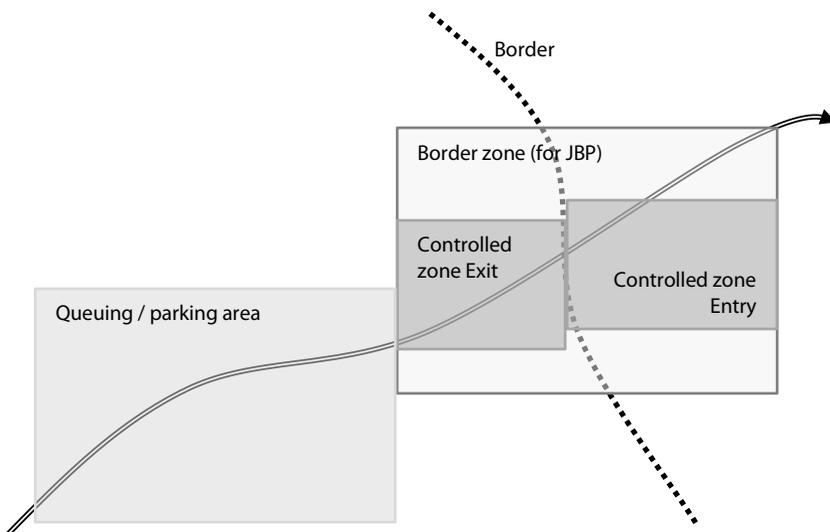
#### *Routine monitoring*

The generalization of fleet management solutions based on GPS for trucking companies is providing an additional opportunity to measure border crossing times: it is possible to define geographic areas at the borders and measure directly from GPS data the duration of the stay of a large population of trucks in the different areas. Those areas are notably: the waiting area before entering the controlled zone, and the controlled zone (single in case of joint border posts, or for each side in case of disjointed facilities), as defined in Figure 33.

The principle is simple: the first GPS location/time in the fenced zone is considered as the beginning of the stay in the zone, and the last location/time the end time. It is therefore possible to obtain for a sample of trucks the various durations:

$$\text{Total border time} = \text{Queuing} + \left( \begin{array}{l} \text{Exit process} + \text{Entry process} \\ \text{Border process (in case of JBP)} \end{array} \right)$$

**Figure 36: GPS monitoring of border crossing time**



Additional information can be derived from GPS data, like the arrival patterns of trucks during the day (distribution of hourly arrival in the queuing area).

The main challenge is to target the population of trucks, and several avenues are possible. Data can be obtained from a GPS service provider, accepting to share information on trucks positions for several enterprises which are using its services<sup>28</sup>. Alternatively, trucking enterprises equipped with GPS fleet management systems can be approached to share their positioning data.

Both approaches raise several concerns about confidentiality of the information and security of the trucks. Trucking companies are reluctant to share the positions of their trucks to third parties, particularly if there is information on the consignment attached to the position, as it would constitute a risk.

The GPS information is therefore often limited to only the reference of the GPS and the location/time data. The characteristics of the trucks are not available (for instance, no possibility to differentiate tanker trucks or container trucks from other types) and the characteristics of the shipment neither (route defined by origin

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<sup>28</sup> This the approach adopted by TradeMark Southern Africa to analyze border crossing times at the Chirundu border between Zimbabwe and Zambia.

or destination, if the truck is loaded or empty, nature of the goods, if there is border clearance or transit, etc.). One way of overcoming reluctance of trucking companies to share data on security grounds is to introduce a delay between the positioning data and its transmission. Truck positions and shipment information of the previous week are no longer posing a security threat.

There is also a selection bias: only trucks equipped with GPS units can be monitored, which implies that the fleet of trucks in the panel is operated by companies which are probably better organized than the average. However, as the focus is on monitoring performances over time, the evolutions are representative of the evolving border conditions for that panel of trucks, and any significant divergence in the performances can be considered as a reliable indication that border crossing conditions have been modified, triggering eventually a more detailed survey.

The other non-negligible advantage of routine monitoring is that GPS data is not limited to border areas, but covers the entirety of the truck trips and it is easy to expand the scope of the monitoring to additional locations if those are properly geo-fenced: other borders, permanent weighbridges, ports and ICDs.



## Module 7: Secondary Indicators

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Existing indicators and information represent the final source of data for Transport Observatories, primarily for the Costs and Prices and the Infrastructure and Logistics Services dimensions, notably in the form of registries of companies, published tariffs, or published description of facilities. The issue of registries of companies has been discussed in the section on the industry surveys, considering its importance in the definition of the sample.

This module therefore addresses the following questions:

- ♦ What is the information typically available for the Costs and Prices dimension?
  - ♦ What is the information typically available for the Infrastructure and Logistics Services dimension?
- 

### **What is the information typically available for the Costs & Prices dimension?**

#### *At the maritime gateway*

Port authorities, terminal operators, and most ICDs have public (and sometimes regulated) tariffs that provide information on the costs and prices associated to the physical treatment of the goods: handling from ship to shore, yard to yard movements, handling from yard to vehicle (truck or wagon), but also all fees associated to storage.

It is important to clarify who pays what in that context, because some fees and payments may be intermediate costs factored into a service price. For instance, the shipping liner terms determine which part of the port handling is to be paid by the consignee, and which one is to be paid by the shipping line, and therefore already included in the sea freight. Similar conditions apply for the loading and offloading of vehicles.

**Table 20 : Party responsible for payment according to liner terms**

	<b>From cargo hold to ship's rail</b>	<b>From ship's rail to yard</b>	<b>From yard to inspection area &amp; back</b>	<b>From yard to truck / wagon</b>
<b>Free In Out</b>	Consignee	Consignee	Consignee	Consignee
<b>Hook</b>	Shipping line	Consignee	Consignee	Consignee
<b>Yard</b>	Shipping line	Shipping line	Consignee	Consignee

The other important part of maritime gateway costs and prices is linked to the documentation process, consisting of a series of licenses and documents that are required for releasing the goods, with published tariffs:

- ♦ Shipping agents: B/L fees, Delivery Order fee, etc., usually on a per shipment basis
- ♦ Various Ministries involved in trade: import / export permit, authorizations and licenses, PSI / DI certificates, etc.
- ♦ Port authority: usually, some fees are levied on the goods, usually on a per ton / volume basis
- ♦ Shipper's councils: Cargo Tracking Note (shipping and/or land transport)
- ♦ Road transport unions or freight bureaus: consignment note fees
- ♦ Etc.

#### *Inland transport and at destination*

Railway companies frequently operate with published tariffs, based on commodities, routes and volumes. On the contrary, for road transport, the multiplicity of trucking companies often results in varying rates, even when a reference tariff exists. That reference tariff is similar in content to railways tariffs: it provides an indicative rate based on commodities, routes and volumes. However, industry surveys are recommended in order to measure which prices are actually applied, and by whom.

If there is an ICD at destination, tariffs are often public, and cover the handling and storage fees. In addition, several agencies intervening in the final clearance of the goods also operate according to published tariffs for their various forms and documents, in a manner similar to their counterparts at the maritime gateway.

### What is the information typically available for the Infrastructure & Logistics Services dimension?

This set of indicators aims at qualifying and quantifying the supply of transport and logistics service along corridors, in order to determine whether it is adequate to meet its present and long term demand. The nature of the indicators differs according to the nature of the infrastructure (such as ports, roads, railways, and dry ports), facilities (port and terminal facilities) and logistics services.

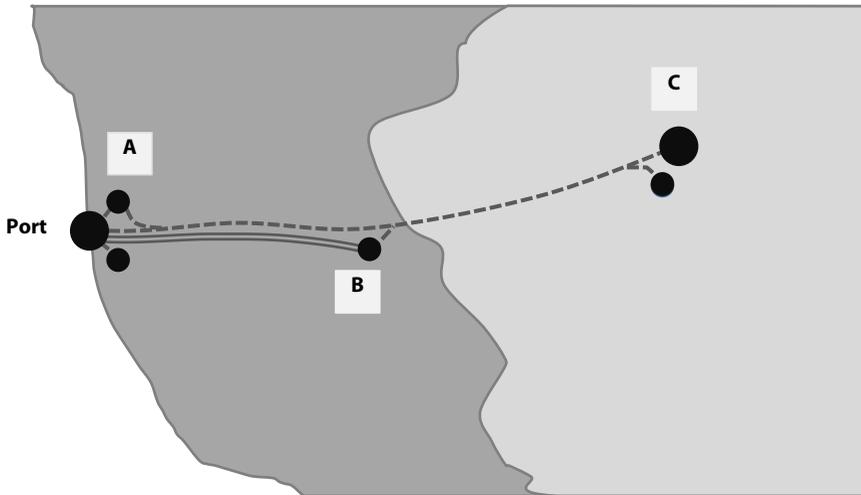
Infrastructure and services are largely static over the short term, and capacity development for large infrastructure and facilities are planned well in advance. The condition of the transport infrastructure (such as roads and railways) and capacity of the transport modes (such as in the gateway ports and dry ports) changes relatively slowly in the short and medium terms. Accordingly, the indicators tend to be descriptive of a context and constitute an input in the assessment of corridor performance, rather than representing directly a parameter of that performance.

#### *Port and terminal facilities*

Facilities are described in terms of physical characteristics of the terminals:

- ♦ Quay length and number of berths
- ♦ Depth
- ♦ Quayside handling equipment
- ♦ Type of the terminal (nature of the cargo handled – containers, dry bulk, tanker, etc.)
- ♦ Yard and warehouses (area, storage capacity, yard handling equipment)
- ♦ Inland access (whether rail connected or not)

**Figure 37: The three main categories of dry ports / ICDs**



Only the last three bullets apply to ICDs. There are three main categories of Inland Container Depots (ICDs), with different functions:

- A. ICDs in the port vicinity are often referred to as Off-Dock Container Yards (ODCY) and their role is often linked to port congestion. ODCY are usually developed and managed by private logistic operators, licensed by Customs because they are bonded customs areas
- B. ICDs linked to intermodal transfers, for instance rail to road, are often managed by the railway operator<sup>29</sup> as a transfer facility between modes. Tariffs are usually published
- C. Destination ICDs

Beyond the physical description, information on the management of the terminal (licensing agreement, leased terminal, or public facility) is important because of the consequences on the costs and prices dimension. This is particularly important for ICDs, because depending on their mandatory or optional character, the management type is directly linked to the level of its tariffs (mandatory platforms are de facto in a monopolistic position, with very limited regulatory oversight).

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<sup>29</sup> There are other options: for instance, the Kenya intermodal ICDs are managed by the port authority.

Most port authorities and terminal operators provide operational indicators that help qualify the facility annual capacity (such as waiting time before berthing for port terminals, berth occupancy per terminal, berth productivity, vehicle turn-around time for container terminals, capacity of the dry ports to name a few).

### *Road Transport*

**Infrastructure.** The status of the road network is monitored by the line ministry for roads/ transport in each country, with varying degrees of sophistication, although GIS management of the road network is becoming common. The corridor road network is a subset of the road network designated as such by customs authorities and/ or corridor management institutions.

From the Transport Observatory perspective, the main indicators are lengths of the sections forming the corridor network and their condition, using the Good / Fair / Poor rating.

**Border crossings, weighbridges and permanent checkpoints.** There are critical locations that need to be indicated on the network map:

- ♦ Border Crossings
- ♦ Weighbridges
- ♦ Permanent Checkpoints

The requirements for description of the border crossings facilities are part of the module 6 on border crossing surveys. Weighbridges with electronic weighing stations usually record at least the following information: date and time of the weighing, truck number plates, axle weights, Gross Vehicle Mass. Depending on the ratio of controlled trucks versus total truck traffic, and more importantly the level of compliance / corruption (high corruption context usually means that overloaded trucks escape weighing, and recorded trucks show a high level of compliance which does not reflect the true situation), that information can be processed to provide additional details on truck arrival patterns, traffic counts, and possibly level of compliance.

**Road transport companies:** The road transport industry comprises numerous companies, and the diversity of the situation of the different enterprises is not easily summarized in a few indicators, hence the interest of industry surveys described in module 5. However, two indicators emerge as important contextual indicators

to better understand the performance of the industry, which can be provided by the licensing authorities for transport companies and number plate registration:

- ♦ The distribution of the size of the enterprises according to their controlled fleet, usually monitored by regulatory authorities through the deliverance of transport licenses for commercial freight based on the truck and its owner/ operator;
- ♦ The age distribution of the truck fleet usually monitored through truck plate licensing.

### *Railways*

For the railway network, the length, gauge and rail weight (determining the axle load limits) correspond to the physical description of the road transport network. However, railway companies are usually capable to provide additional information related to operations:

- ♦ Traffic per route (volume and type of cargo – bulk, loose, container)
- ♦ Capacity of the rolling stock (availability of wagons and locomotives)

## Module 8: Illustrations of CTO Analysis

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This module illustrates selected outputs of the transport observatory program. The choice of illustrations was guided by two considerations – the value of the message they support, and the diversity of the corridor performance dimension they cover:

- ♦ Three illustrations are related to volumes
  - ♦ Three illustrations are related to time
  - ♦ One illustration is related to costs and prices
  - ♦ Two illustrations are related to infrastructure and services
- 

### Shifting routing patterns of the Burkina Faso trade

#### *Context*

Transport corridors in West Africa constitute a network organized along two main East-West routes: a coastal corridor between Abidjan in Cote d'Ivoire and Lagos in Nigeria<sup>30</sup>, and a trans-Sahel corridor, between Niamey in Niger and Dakar in Senegal<sup>31</sup>. Between those two routes, a series of North-South links originating from the coastal ports completes the ladder-like network supporting international and regional trade. This configuration enables landlocked countries such as Burkina Faso to benefit from alternative options for its maritime trade, and in theory competition across corridor should promote efficiency.

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<sup>30</sup> Passing through the ports of Takoradi and Tema in Ghana, Lome in Togo, and Cotonou in Benin.

<sup>31</sup> Passing through Bamako in Mali and Ouagadougou in Burkina Faso.

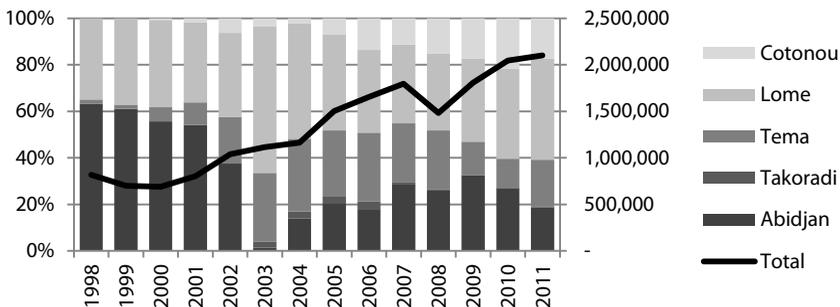
*Source of data*

Transit traffic to the landlocked countries represents a prized segment of the maritime trade for the West Africa ports, demonstrated by the establishment of representatives from all port authorities in the three landlocked countries, mirrored by similar representatives from the shippers’ councils in each of the maritime gateways. As a consequence, ports are closely monitoring the evolution of transit trade and statistics are widely available on the total volumes originating or destined to the landlocked countries. However, the quality and granularity of those statistics differ from port to port, and comparisons across port can only be made at the highest level of aggregation: total transit volumes. In future, with the development of transport observatories, finer levels of disaggregation will be available, but the advantage of existing statistics is that they enable a long term historical perspective on the transit volumes in West Africa.

*Results*

Over the period, economic and political events affecting one corridor or another had an impact on the routing patterns throughout the West Africa corridors, translating into expansion or contraction of corridor volumes.

**Figure 38: Maritime trade of Burkina Faso**



The main events that have affected the corridor volumes are:

- ♦ The ups and downs of the Cote d’Ivoire crisis (Coup in September 2002, reopening of the border in 2004, Peace agreement in March 2007, Post-Election violence in 2011) that resulted in increased cargo flows routed through alternate ports, and notably the emergence of the Ghana ports
- ♦ The enforcement of axle load limits in Ghana reducing the traction of Ghana ports (from 2009)

- ♦ Road damage in Togo (from mid-2008 to end 2009)
- ♦ Major changes in Customs procedures in Benin (2011) that scared away Burkina Faso traders
- ♦ The International economic crisis (2008 and 2009), that provoked a dip in the volumes, affecting equally all corridors.

### *Conclusions*

Over that long period of time, major changes affected most of corridors: port facilities were expanded, container terminal passed under private management, Customs administrations were reformed and computerized, etc. However, volume data shows that the actual routing patterns by traders depend probably more on the economic and political context of the corridor than their operational performance.

## **Entry border traffic counts in Tanzania**

### *Context*

Traffic along the corridors comprises international transit trade passing through the ports and intra-regional trade. Although corridor performance monitoring focuses on international transit, the regional integration efforts of the Regional Economic Communities aim at promoting intra-regional trade. Measuring those trade flows is therefore necessary to measure the progress towards this objective.

### *Source of data*

Customs declarations at inland borders include among other information the nature and identification of the means of transport, the weight of the goods, and the nature of the declaration. Traffic counts and traffic volumes can be easily derived from Customs declaration by summing up all unique truck plates (for road borders) per day, and the corresponding tonnage, for a certain type of Customs declaration (transit or border clearance).

The Tanzania pilot observatory collected information from Tanzania Revenue Authority for all border posts for the period October 2012 to March 2013 inclusive. However, due to the nature of Customs intervention, entry declarations are more reliable than exit declarations, and only the traffic counts for goods entering

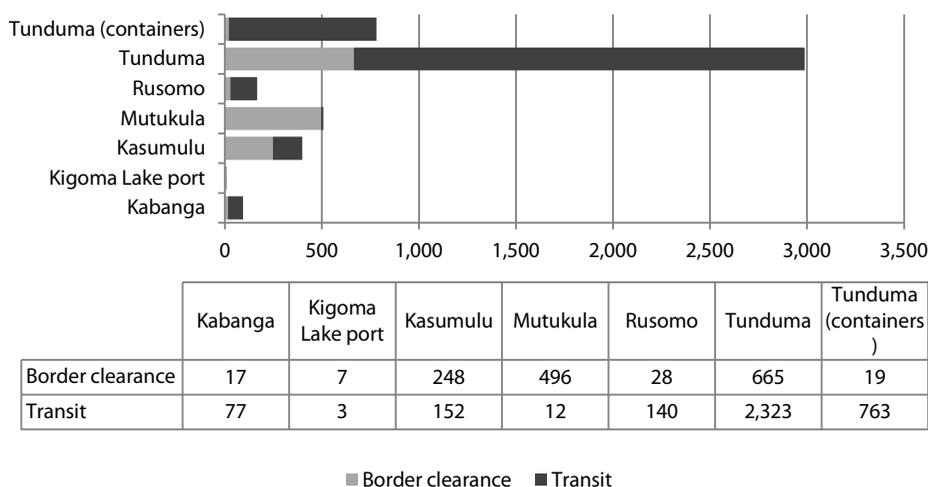
Tanzania are reported here. Obtaining reliable information for the opposite flow would require obtaining equivalent data from the neighboring country.

**Results**

The average monthly truck crossings for the main Tanzania borders (excluding maritime gateways) are illustrated in the graph below. Tunduma is the main border on the Dar Corridor, between Tanzania and Zambia. Most containers are processed ores (copper notably) from Zambia and DR Congo. The destination office for most transit is the maritime port of Dar es Salaam, where goods are to be shipped overseas.

Traffic counts and destination offices show that Mutukula (between Tanzania and Uganda, on the Central Corridor) and Kasumulu (between Tanzania and Malawi on the Dar Corridor) are predominantly regional border posts.

**Figure 39: Border traffic counts in Tanzania**



**Conclusions**

Customs computerized data at the inland borders constitutes a powerful tool for monitoring international and intra-regional trade volumes.

## Regional traffic volumes on the Abidjan Lagos corridor

### Context

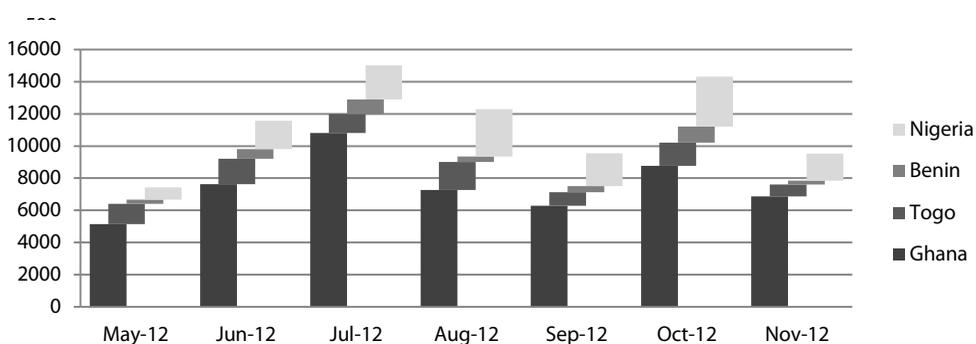
The Abidjan Lagos coastal corridor links important economic centers, through Accra / Tema in Ghana, Lome in Togo, and Cotonou in Benin. Except Lagos, all the ports on the corridor are also important transit ports for the region, for the landlocked countries of Mali, Burkina Faso and Niger, but also to some extent to the neighboring countries (transit to Ghana through Lome, and to Nigeria through Cotonou). There is little information on the traffic patterns along the corridor from origin to destination, and Customs data can provide insight in the length of the intra-regional movements.

### Source of data

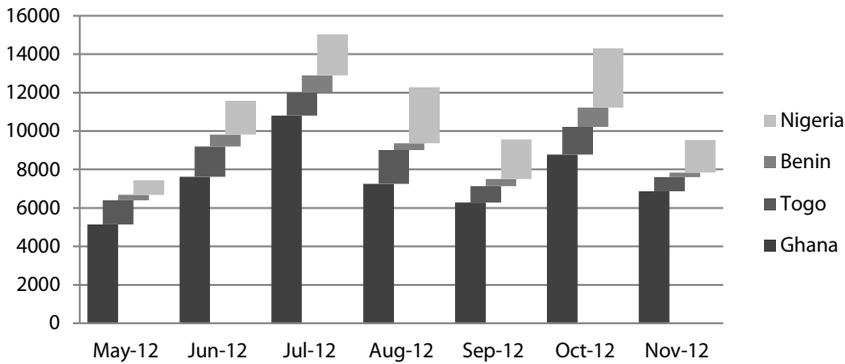
The source of the data is very similar to the previous example for border traffic counts: it is based on Customs declaration data. However, the data was used in a different form, to provide the destination of the trade. The same principle has been used, counting daily unique truck number plates, but using the destination country as contextual criteria.

### Results

**Figure 40: Monthly traffic counts for Cote d'Ivoire trade on Abidjan Lagos Corridor**



**Figure 41: Monthly traffic volumes for Cote d'Ivoire trade on Abidjan Lagos Corridor**



*Conclusions*

The objective of this example was to show how Customs data can assist in measuring regional trade flows. It must be noted that only Cote d'Ivoire properly records truck number plates at its inland borders. Ghana, Togo and Benin do not, although information is available on the origins and destinations of the goods. In future, it will be necessary to advocate for proper recording of the truck plates by Customs administrations.

**Impact of pre-arrival declaration on port dwell time**

*Context*

Port dwell time represents on most African corridors the longest time in the delivery of goods from ship to destination:

- ♦ 24 days in the port of Douala for a total delivery time of 39 days to N'Djamena
- ♦ 13 days in the port of Mombasa for a total delivery time of 21 days to Kampala

- ♦ 17 days in the port of Dar es Salaam for a total delivery time of 27 days to Kampala<sup>32</sup>

But in a context of low average performances, there are widely different situations coexisting in the same port, with certain containers released quickly from the port while others stay months. The length and the variation of the port dwell time is partly explained by the complexity of the interactions required to clear goods at the port, but also by the individual behavior and strategies of the private operators (clearing and forwarding agents, shippers / traders).

Understanding the reasons for quick release or for long stay is important to design policy measures that will target the right issues.

#### *Source of data*

The dwell time analysis illustrates the functionalities of the pilot transport observatories for disaggregated indicators. Dwell time frequency distribution were extracted for different scenarios:

- ♦ A comparison between the date of submission of the declaration and the date of berthing determined if the declaration was made prior to the arrival or post arrival;
- ♦ When transit and clearance information was available, the nature of the declaration was added as criteria for distinguishing the scenarios.

Information on the physical handling of the containers was obtained from the Container terminal operators (MTS in Ghana, DIT in Douala and TPA in Dar es Salaam). That information was combined with Customs information on the declarations (only on transit containers in Tema and Dar es Salaam, and for all containers in Douala).

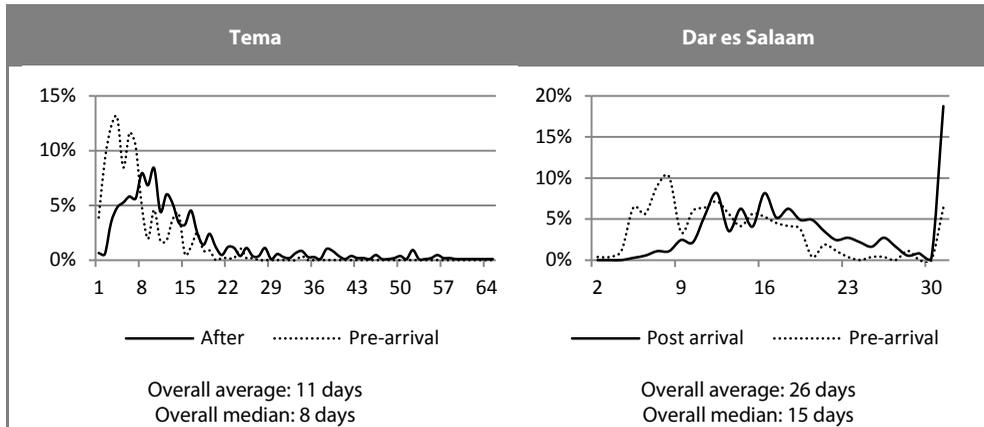
#### *Results*

The graphs below show the compared frequency distribution for container dwell time which were declared prior to the arrival of the vessel and after its arrival.

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<sup>32</sup> Data collected in 2008, presented in the World Bank publication 'Why does cargo spend weeks in Sub-Saharan Africa ports? Lessons from six countries' by Gael Raballand, Salim Refas, Monica Beuran and Gozde Isik, 2010.

**Figure 42: Comparison of dwell time with pre-arrival declaration in Tema and Dar es Salaam**



For the port of Douala, containers destined to Cameroun were included in the database. The results are similar and show that advance declaration has an extremely positive effect on port dwell time. They also show that for Cameroun, port dwell time is shorter for transit container than for import containers, but this is not necessarily the case in all ports: sometimes, import containers clear faster than transit (for instance in Cotonou and Abidjan), sometimes it is the opposite.

**Table 21 : Port dwell time distribution in Douala**

Quartile	Cameroun		Transit	
	Post arrival	Pre-arrival	Post arrival	Pre-arrival
25%	10.5	4	7	2.5
50%	18	7.5	14	5.5
75%	30	14	27	9

**Conclusions**

Port dwell time cannot be reduced to a single number, as the average covers a very wide range of situations as revealed by the characteristics of the frequency distributions: in most ports, when traders and clearing agents need to have a container released quickly, it is possible, even when the overall performances of the port are low. In Dar es Salaam, where performance appear low on the basis of the overall figures, one third of the transit containers for which the declaration has been submitted prior to the arrival of the vessel are released in less than 8 days, and half in 11 days or less. On the other hand, when traders and clearing agent prefer to use

the port as storage facility, storage tariffs usually compare favorably with private warehousing, with long grace periods and lower storage fees.

The second conclusion that can be drawn from the frequency distribution is the effectiveness of promoting pre-arrival declaration as means to reduce port dwell time compared to other resource intensive approaches.

### **Transport time on Abidjan-Ouagadougou corridor**

#### *Context*

Several diagnosis methodologies are based on the principle that interviews with logistics and control agencies professionals can provide a clear picture of the challenges faced for cargo operations on a given corridor.

#### *Source of data*

On the Abidjan Ouagadougou corridor, interviews with clearing and forwarding agents, the operators of the container terminal and railway were conducted to assess the usual minimum, maximum and standard time taken by containers at the port, during the rail transport, and at destination at the inland dry port. The survey approach was adopted because the pilot transport observatory that would provide that data was still being developed.

When the pilot transport observatory was created, the historical data it contained also covered the interview period, and comparisons were made between the results of the two approaches, one based on perceived times by logistics professionals, and the second on actual times for a large sample of over 90% of the containers carried during the observation period.

#### *Results*

The comparison shows large differences between the perception and the actual data. In the following table, the total time for the interview results is by construction the sum of the individual times for each component. In the case of actual data, the times indicated correspond respectively to the best 10%, worst 10% and median time calculated directly for the components and for the total.

The difference between the two methods shows that simple combinations are not accurate. It also shows that the range of variation of the total is less than adding

ranges for each component: good and bad performances have a tendency to compensate themselves.

The table shows also that perception plays a large role in the responses: both the container terminal and the dry port have good standing, and the respondents tend to minimize the length of the delays in each.

**Table 22 : Transport time distribution on Abidjan Ouagadougou corridor (in days)**

Rail deliveries in 2012		In port	In railways	In terminal	Total
<b>Actual data</b>	10%	5	4	3	17
	median	16	5	8	31
	90%	36	7	20	59
<b>Interview results</b>	Minimum	4.1	4	1	9.1
	Average	10.4	6	3	19.4
	Maximum	17.6	6	5	28.6

### *Conclusions*

The difference between perception and reality constitutes a strong case for transport observatories generating factual data for a large number of shipments.

## **Border crossing times at the Kenya Uganda border of Malaba**

### *Context*

Land borders in Africa are difficult to cross. Long queues of trucks clogging borders are a common image throughout Africa, and routinely, crossing times are measured in days, even sometimes in weeks. Those delays have a cost: a cost for the truckers – as an idle truck is not making money – and a cost for the trader – because scarce resources are tied up in excess inventory. The Malaba border post (between Kenya and Uganda), a pilot in the East Africa One-Stop Border Post program and the busiest along the Northern Corridor (between the ports of Mombasa and the landlocked countries and regions of East Africa) constitutes a refreshing example, as successful reforms focusing on coordination and procedures rather than physical facilities have dramatically reduced crossing time.

### *Source of data*

The Secretariat of the Transit and Transport Coordination Authority of the Northern Corridor (TTCA-NC) commissioned a survey of the border post to establish a baseline prior to conversion into OSBP. The survey was conducted during the period November 2011 to March 2012<sup>33</sup>, with support from SSATP.

The time taken to cross a border can vary widely, depending on the characteristics of the crossing, notably the nature of the load, the nature of the transactions conducted at the border, and the arrival time of the truck. Rather than capturing an average crossing by combining contrasted patterns, the survey methodology aims to analyze the detailed characteristics of a limited set of patterns corresponding to the most common scenarios, complementing the decomposition of the physical and documentation processes for a sample of trucks with critical contextual data on the characteristics of the truck and the shipment.

### *Results*

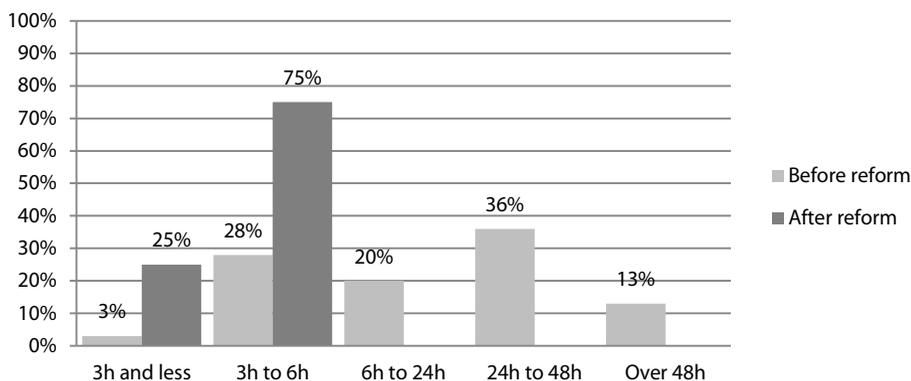
During the survey period, the Customs authorities in Kenya and Uganda modified selected business procedures that resulted in a dramatic decrease of the border-crossing times. This unexpected situation provided a unique opportunity to observe and measure the impact of these decisions. The measures targeted the three types of parties involved in border crossings:

- ♦ Border management agencies, through advance preparation with pre-arrival lodgment of the declaration, and when the trucks have arrived, through coordination between appropriate agencies;
- ♦ Clearing agents through mandatory pre-arrival lodgment of declarations (used to be optional and at the discretion of the agents, hence rarely used);
- ♦ Truck drivers through traffic and parking rules to decongest the Customs controlled zone.

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<sup>33</sup> 'Border crossing monitoring along the Northern Corridor', Mike Fitzmaurice and Olivier Hartmann, SSATP WP96, 2013.

**Figure 43: Border crossing time in Malaba (Kenya-Uganda) for containers**



**Table 23: Monthly border crossing time at Malaba (in h:mm:ss)**

	November 2011	December 2011	January 2012	February 2012	March 2012
<b>Average</b>	27:08:21	21:59:55	3:40:53	3:38:28	3:29:15
<b>St. Dev.</b>	17:07:02	19:31:06	1:16:48	0:33:07	0:20:30

Source: SSATP Working Paper 96

Crossing times that were routinely over 48 hours dropped to less than six hours; average border-crossing time, a measure that covers a wide range of situations, dropped from 24 hours to 4 hours. Based on estimates of the value of time for trucking enterprises (releasing capacity for increased activity and revenue) and for traders (through reduced inventory costs), the savings generated by the improvement of the situation represent up to \$70 million per year.

### Conclusions

A key aspect of these measures is that they have produced dramatic results even in the absence of infrastructure rehabilitation, which is expected to take place at a later stage. However, these measure build on all the preparatory work required for the creation of an OSBP: the culture of cooperation across border agencies (within and across countries), the legal framework enabling that cooperation, and the supporting IT infrastructure that allows preparing the documentation process prior to the arrival of the trucks.

## Trucking operating costs in West Africa

### *Context*

Road transport prices in West Africa are largely disconnected from the cost factors entering into the production of trucking services. This seems to be related to the fact that the main factors for the determination of prices are to a large extent dictated by external constraints: on one hand, trade volume characteristics have a critical influence on the determination of logistics services prices (imbalance of flows, total volume determining the intensity of the competition, and types of load are the principal factors), while on the other hand, operating costs have a limited influence on the determination of prices, due to the respective importance of fixed costs versus variable costs.

In order to further analyze this, road transport costs were disaggregated into voyage vehicle operating costs and non-vehicle related fixed costs. The objective of that breakdown was to test different operational scenarios for trucking operators based on the utilization of trucks, enabling thus the identification of vehicle acquisition and operation strategies compatible both with market transport rates and financing costs for trucks.

### *Source of data*

The data required for this analysis combines transport price information obtained by direct interviews of trucking enterprises, shippers and clearing and forwarding agents, with cost factors and operating conditions obtained by direct interviews of trucking enterprises only.

The term of survey is not fully adequate in this context, because even though the interviews were structured according to a formal questionnaire, the number of respondent was limited.

Information on prices and operating conditions constituted the source for the estimate of the annual vehicle turnover, while cost factors combined with operating conditions were the source for the voyage and fixed expenses. Finally, vehicle finance and depreciation was obtained through application of accounting rules considering the industry practice ascertained through the interviews and compared to the available residue resulting from the application of various scenarios for the operating conditions.

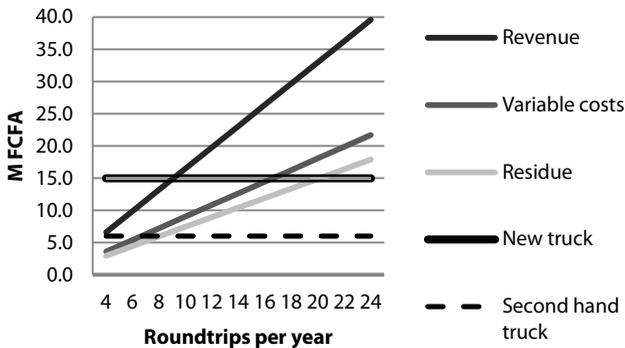
**Figure 44 : Cost component of road transport prices**



*Results*

The calculations are based on a truck loaded with a 40’ container in an Abidjan to Ouagadougou trip. Voyage expenses represent 55% of the income for the trip (the return leg is the repositioning of the containers to the port). The residue is the difference between revenue and travel costs. That residue is what is available to the trucking company to finance its truck. A new truck, costing for instance 90 M FCFA, financed for 50% under a Bank loan over 5 years, and depreciated over seven years, requires around 15 M FCFA per year. It is only beyond twenty roundtrips per year that operations start to be compatible with recent trucks, and at that lower threshold, nothing is left to cover for instance office and staff expenses (including the income for the manager / owner of the transport company).

**Figure 45: Residue according to number of round trips on Abidjan-Ouagadougou corridor**



Even a second hand truck, frequently costing 18 MCFA for a 10-years old truck, requires 6 M FCFA per year for a financing over three years<sup>34</sup>. This is only possible beyond eight roundtrips per year that it becomes possible to finance the truck, and in that case also, that lower threshold does not cover other fixed costs.

### *Conclusions*

Considering the current operating conditions on the Abidjan Ouagadougou corridor, only trucking companies with regular contracts with large clearing and forwarding firms or shippers, and shuttling containers between the port terminal and the dry port, can afford operating recent trucks. Others are likely to be excluded from that segment, and focus on non-containerized freight, where overloading is seen as a quick-fix solution to improve revenue per trip.

## **Concentration of the trucking industry in East Africa**

### *Context*

The trucking industry in East Africa is operating in a liberal environment. There are very few restrictions for access to freight for the companies that operate regionally, and the sustained economic growth that prevailed in East Africa until the International crisis provided a favorable environment for that industry to concentrate and expand. The growth of the demand was accompanied by an increase in the sophistication of the logistics chains, with the development of the container segment of the market, and the generalization of ICDs at the maritime gateways and inland.

As the trucking industry grew, so was its collective voice through national associations: the Kenya Transport Association has challenged, sometimes successfully, sometimes not, decisions of the Kenya Government affecting its members; the Tanzania Truck Owners Association was given responsibilities in the vetting process for approval of new trucking companies.

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<sup>34</sup> The hypothetical depreciation of a second hand truck in three years is based on surveys conducted in East Africa, but may not be applicable in West Africa. However, it remains true that limited annual roundtrips reduce the financing margin accordingly.

It was therefore high time for the trucking associations to obtain a better understanding the structure of the industry and the manner it provided logistics services, but also to understand how the enterprises in the industry perceived the environment in which they operated.

*Source of data*

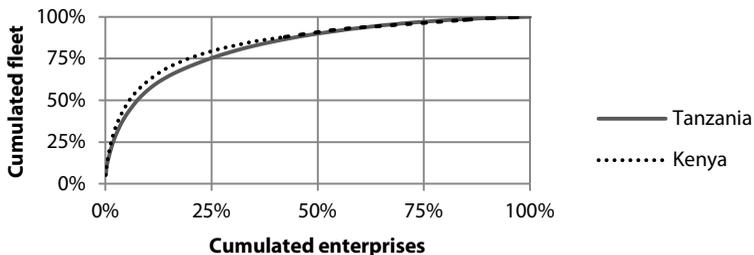
In Kenya and Tanzania, the Revenue Authorities maintain a registry of commercial trucks which includes the identity of the owner. That source of information is more focused than for instance registration number plates for vehicles, which includes also trucks used purely for own account. The extraction from the databases listed the number of trucks operated by company.

From the list of companies, stratified by size of operated truck fleet, a sample was drawn for each country, and a questionnaire administered. The questionnaire was designed to cover a wide spectrum of issues, considered as critical for the road transport associations and their members for advocacy purposes, and also for the policy making organs, as the efficiency of the trucking industry is essential to the efficiency of the regional corridors.

*Results*

The ownership of road transport industry in East Africa is concentrated: 5% of the companies operate 45% of the truck fleet in Kenya while that proportion is 40% in Tanzania. The industry is also diverse, and large companies co-exist and compete with much smaller companies: 50% of the companies in Tanzania operate 7 trucks or less, and 4 or less in Kenya.

**Figure 46: Concentration of the road transport industry in East Africa**



Although companies are large, their ownership is individual or familial in most cases (71% in Kenya, 89% in Tanzania). The form of Shareholding Company is not common, even in Kenya (only 19%), and foreign control is negligible.

In both countries, companies are managed by highly qualified professionals, and this reflects for instance in the high use of GPS fleet management in Kenya, where all large companies and more than half of small to medium companies have equipped their trucks.

### *Conclusions*

The preparation phase of the survey was critical, and closely involved regulatory authorities, corridor authorities and industry associations. Over 100 companies in each country provided responses, controlling on average 30% of the total commercial truck fleet.

**Table 24: Survey characteristics in East Africa**

	Kenya	Tanzania
<b>Total companies</b>	1,574	732
<b>Total fleet</b>	17,066	12,356
<b>Surveyed companies</b>	101	117
<b>% companies</b>	6%	16%
<b>fleet of surveyed companies</b>	4,531	4,393
<b>% fleet</b>	27%	36%

In West and Central Africa, there is a growing realization that liberalization of the trucking industry is necessary, but trucking companies and Governments fear that this reform will promote only foreign companies and gives them control of the sector. The situation of the trucking industry in East Africa proves that liberalization of the transport sector does not imply foreign control, and that regional and local companies can benefit and grow into large and professional ones.

### **Age and operating conditions of truck fleet in Cameroun**

#### *Context*

In Central Africa, road transport on the Douala corridors to Bangui and N'Djamena is mainly provided by Cameroun trucking companies. The combina-

tion of registration information with operational information on the corridor sheds light on the operating conditions of the companies according to their fleet size.

#### *Source of data*

The Cameroun freight bureau (BGFT) is the institution mandated to implement the dispositions of the two bilateral transport agreements signed by Cameroun with his neighboring landlocked countries (Chad and CAR). The agreement organizes the sharing of the maritime trade of the landlocked countries between the road transport operators of the transit and landlocked countries. Consignment notes are issued by BGFT (and the corresponding institutions in the landlocked countries) for each truck shipment, in application of the bilateral agreement, and the corresponding information captured in a database for statistical purposes. Despite a larger share granted to the truckers from the landlocked countries, Cameroun trucks are transporting the major share of the transit volumes.

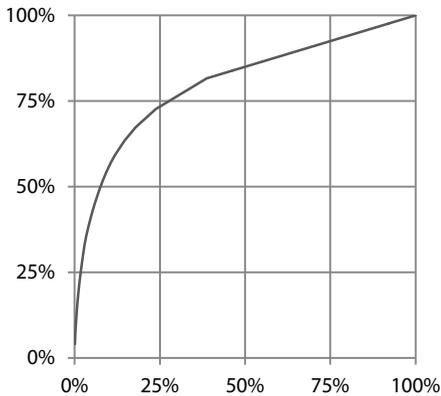
The Ministry of transport of Cameroun maintains a registry of vehicles, including notably the date of manufacturing of the vehicle, the date of its registration, and its type, for the information relevant to the purpose of corridor performance analysis.

Data extracted from the two sources was combined to analyze the age of the truck fleet, the acquisition conditions (notably new versus second hand vehicles) and the level of utilization of the trucks for corridor transport.

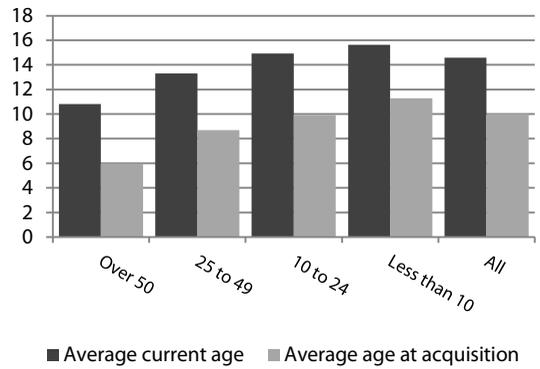
#### *Results*

The Cameroun trucking industry active in the Douala corridors to Bangui and N'Djamena is rather concentrated, with 5% of the companies controlling 40% of the truck fleet, while over 60% of the companies operate only one truck.

**Figure 47: Concentration of road transport industry**

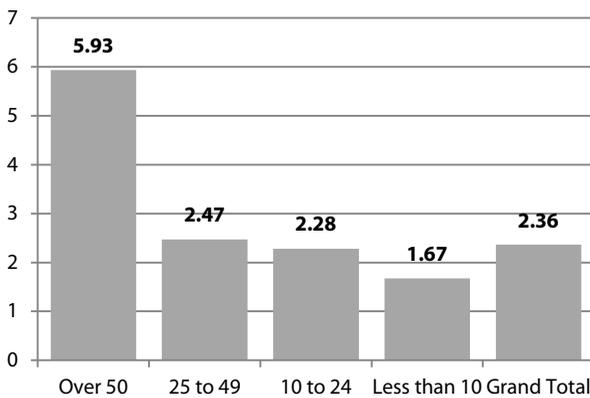


**Figure 48: Truck fleet age profile**



Both the average age of the operating fleet and its age at the moment of acquisition, increase when the size of the company decreases. The largest operators have the youngest fleet, and their vehicles were on average 6 years old when acquired. The number of corridor trips per truck and per year is also increasing with the size of the company, as illustrated below.

**Figure 49: Corridor trips per year in Cameroun**



**Conclusions**

Large trucking companies in Cameroun have younger fleets, and their trucks were purchased newer than smaller companies. In addition, they are accomplishing a greater number of corridor trips per year per truck than smaller companies. However, considering the importance of the number of annual trips in the capacity of companies to finance recent trucks, it is not simple to determine the direction of the causality between the two facts.



## What Next?

The *Transport Observatory Guidelines* are an important milestone in the development of corridor performance monitoring by RECs and Corridors, but this is not a final chapter. Information Technology (IT) is still spreading throughout all logistics activities opening new avenues and new data sources; open-source software solutions supporting the design of Transport Observatories are being tested and developed; lessons can be learnt from the gradual integration of Transport Observatories in the policy framework of national, corridor and regional institutions; and the role and influence of published indicators and data in that policy framework is growing but yet to be firmly established.

**Importance of using IT sources in corridor performance monitoring.** IT solutions for transport and logistics are still expanding, broadening the scope of available data and increasing its granularity by making available intermediate links in the supply chains that were not previously covered. The development of IT also opens the possibility to get closer to real-time information for a dynamic approach of corridor performance: observing black spots on the corridor through crowd reporting by the operators themselves is an example of such new development.

The Guidelines focus on corridor performance indicators and data sources. IT systems are the preferred source for two main reasons: firstly, data being a by-product of operations, the sustainability of the source is guaranteed; secondly, accessing comprehensive datasets avoids challenges on the statistical validity of reduced samples. However, large amount of data poses its own set of challenges: how to extract data from information systems, how to clean and process it automatically, and how to combine different dataset to construct the supply chain timelines as input into the Transport Observatories, and how to best illustrate the results and indicators as their outputs. In the support to the creation of the East and Southern Africa Transport Observatories, considerable work has been done to

address those challenges, and specific IT tools based on open-source software solutions have been built<sup>35</sup> that will be shared among institutions.

**Institutional framework.** Transport observatories were first conceived and developed as permanent monitoring instruments for Corridor Authorities—natural hosts for such tools. Establishing transport observatories in a different institutional set-up is still largely unexplored, although the West Africa Regional Transport Observatory is engaged in a shared approach based on a combination of national and corridor institutions as focal points for the data collection and process, with shared utilization of results. Alternatively, the option of using observatory tools for a deep analysis of specific challenges do not necessarily require a dedicated institutional framework, and can be embedded within a specific project. The respective values and drawbacks of the two approaches are still to be determined.

**Dissemination and awareness.** There are still limited examples of dissemination of indicators as sensitization and awareness material to influence policy development. In terms of public relation, the West Africa Road Transport Governance Initiative, which is monitoring road-blocks on the main corridor routes<sup>36</sup>, can be considered as a success. Obtaining similar awareness with a range of performance indicators covering all aspects of corridor efficiency will require addressing a particular attention to the communication associated to the results of the transport observatories.

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<sup>35</sup> Internet-based IT tools for the East Africa Corridor Transport Observatories supported by Trademark East Africa, and GPS-based IT tools for the Southern Africa Corridors supported by Trademark Southern Africa.

<sup>36</sup> It has been established to monitor the impact of a decision of the West Africa Economic and Monetary Union (UEMOA in French) to reduce eliminate road-blocks, considered as a major obstacle to trade in West Africa. The Initiative measures the number of road-blocks, the delays they generate and the amount of informal payments extorted at road-blocks on a quarterly basis.

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West Africa Road Transport Governance Initiative: [www.watradehub.com/competitive-environment/transport-infrastructure](http://www.watradehub.com/competitive-environment/transport-infrastructure)