CROSS-BORDER AND TRANSIT TRANSPORT PROCESS MANAGEMENT
“CT-TPM” TOOLKIT

REFERENCE MATERIAL

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Introduction

Landlocked developing countries depend on transit countries for their national economic and trade development. They are linked by transit transport corridors. Transit corridors have seen their development increased in recent years as a response to trade liberalisation reforms undertaken by developing countries at regional and global level. Market access and trade facilitation are among the main requirements of trade development. Landlocked countries are in need to address the cross-border and transit transport related issues so as to fully benefit from the globalized trading system. This requires greater efficiency of the corridors’ management as well as smooth and easy cross-border relations among the stakeholders involved in landlocked and transit countries to ensure fluidity and increase in volume of trade flows.

However, cross-border and transit transport suffers from numerous difficulties due to the existence of physical and non-physical barriers. Control authorities and transport operators in landlocked and transit developing countries lack capacity to identify problem drivers in their international transit transport corridors and to prioritize and coordinate various facilitation elements. As such, these issues impact on the level of performance of the corridors which can be defined in terms of:

- Time;
- Cost;
- Reliability.

It is therefore critical to the development of transit corridors that problems are identified and managed in the most efficient and effective manner. In order to resolve these cross-border and transit transport issues, there is a need for coordinated policy, legal and institutional changes with joint efforts of government authorities and business sector as well as the use of appropriate facilitation methodologies.

The following comprehensive toolkit provides two methodologies which aim at assisting transit corridor stakeholders in improving the performance of the corridor, these are: the Cluster Development (CD) Methodology and the Time/Cost-Distance (TCD) Methodology.

The CD methodology was developed by UNCTAD and offers a governance methodology to improve strategic decision making at control points on a corridor. It is based on a collaborative structure entitled “clusters” to bring stakeholders involved in transit transport in landlocked and transit developing countries together so as to define actions plans and a common vision to address the transit transport issues and coordinate their facilitation measures. The cluster would benefit from a performance measurement tool to assess and monitor the performance of transit transport operations. The Time/Cost Distance (TCD) Methodology introduced by UNESCAP is there to respond to this need.

The toolkit as a whole combining the two methodology aims at helping transit corridors stakeholders formulate common strategies and joint actions to improve transit performance through greater efficiency, better coordination and shared information, at management and operational levels. It also helps organize the corridor governance through the formation of clusters at various key stages where issues are most frequent. It furthermore provides a simple and easy-to-use performance improvement and measurement tool to help the clusters identify and resolve these issues.

This toolkit publication is part of the activities of a project executed by UNESCAP, in cooperation with UNCTAD and UNECA titled “Capacity Building for Control Authorities and Transport operators to improve Efficiency of Cross-border Transport in Landlocked and Transit Developing Countries” (7th Tranche of the UN Development Account - Project 0809 AP).

The toolkit, from now on be known as CT-TPM Toolkit consists of a conceptual first part introducing the concept of Transit Transport corridors and the challenges faced by these corridors in their development. The second part describes the response to these challenges through the implementation of the two methodologies, namely the Cluster Development Methodology and the Time/Cost-Distance
Methodology. These methodologies are presented in a practical way including references and examples of previous projects of both UNCTAD and UNESCAP so that the stakeholders involved in the corridors can use them easily following a step-by-step guide.
Part I. Corridors

1. Description and classification of corridors

The purpose of a corridor is to physically link areas that were not previously connected within a country or a region. Any given corridor focuses not only on the physical connection but also on how the flow and storage of freight, people and vehicles is optimized in the corridor with the support of capable service providers and a facilitating institutional environment provided by relevant agencies.

The main involved corridors stakeholders are shippers and consignees that are using the various routes along the corridors, service providers offering different types of logistics services, and governmental agencies involved in the infrastructure as well as the rules and regulations on movement and storage of freight along the given corridor.

The potential strength of any corridor relies primarily in the possibilities they offer in confronting the concerns and interests of all relevant stakeholders, public and private, who can focus on policies and initiatives to cater to specific routes and border crossings. Corridors thus, offer the possibility of tackling logistics and supply chain issues in a holistic manner (institutional, administrative, and infrastructural), initiating and effecting changes that may otherwise be difficult to achieve at a wider national and/or regional level.

In a corridor, economic development does not need to be solely concentrated in the large cities located along the corridor. Investment and economic development will need to reach smaller towns and rural areas along its route. Incentives to attract private sector investments need to be reviewed and harmonized between different countries along the corridor to facilitate economic activities in less developed areas of the corridor. Success of a corridor will depend on the attraction of investment. Attraction of investment in turn relies on appropriate infrastructure and facilitation policies.

It is impossible to establish fully developed economic corridors at the outset. There is a gradual evolutionary phase that must be followed if their establishment is to be sustainable. The stages of development are illustrated in Table 1.

Table 1: Corridor Development Level

<table>
<thead>
<tr>
<th>Stage</th>
<th>Corridor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Transport Corridor</td>
<td>Corridor that physically links an area or region.</td>
</tr>
<tr>
<td>Level 2</td>
<td>Multimodal Transport Corridor</td>
<td>Corridor that physically links an area or region through the integration of various modes of transport.</td>
</tr>
<tr>
<td>Level 3</td>
<td>Logistics Corridor</td>
<td>Corridor that not only physically links an area or a region but also harmonizes the corridor institutional framework to facilitate the efficient movement and storage of freight, people, and related information.</td>
</tr>
<tr>
<td>Level 4</td>
<td>Economic Corridor</td>
<td>Corridor that is able to attract investment and generate economic activities along the less developed area or region. Physical linkages and logistics facilitation must first be in place.</td>
</tr>
</tbody>
</table>

Source: Banomyong (2008)
The provided typology can be used as a reference framework related to the development level of corridors which could be targeted for enhanced performance and integration through a cluster development approach. Below we will see the most common types of corridors in the context of landlocked and transit developing countries.

A. **Transport corridors**

A transport corridor is a set of routes linking physically hub centres where maritime, fluvial, land and air transportation systems converge. It improves efficiency of transportation networks through two fundamental attributes for economic development: lower distribution costs and faster transit times. The corridors by means of transport are described below:

**Maritime corridors** are very flexible in terms of choice of routes as they almost have an unlimited capacity depending on the capacity of ports and vessels used. Ports are often the primary facilities linking national economies with global markets maritime corridors and therefore represent the main trade hub centres. Most importantly ports are above all places where the intermodal transfer of goods takes place between sea and land transport.

The world has become a system of maritime corridors in which individual ports are linked into intricate patterns of dependency in hub/feeder relationships as well as into end-to-end shipping linkages that reflect the increasing trade dependencies between regional and global economy.

**Fluvial corridor**, even if slow, offers continuous capacity and flow. Ports perform the role of hub centres by providing fluvial/land and fluvial/maritime interfaces.

**Land transportation corridors** can be divided into two modes having separated but often integrated logistics systems: road and rail.

- **Road transportation** is by far the most flexible land transportation mode as it offers door-to-door type of services. The corridor associated with road transportation is not limited to places adjacent to major road axes, but also to points and other facilities located within a peripheral zone. Warehouses, truck yards and any land transportation structures are located at road hub centres.

- **Rail transportation** offers simultaneously speed and capacity, but usually at the expense of flexibility. It offers an efficient interface between maritime and land transportation systems. Rail logistics are highly complex and imply network management strategies under several constraints of capacity, schedule, and the nature of shipments, origin and destination.

Land corridors emerge between major hub centres, they are regional extension of a maritime/land interface where ports have access to their hinterland.

**Air transportation** offers a fast and efficient way to link major international centres. The strategy of the majority of international airports is to consolidate regional links, create new national and international services for passengers and freight, to raise their capacity and to make land transportation systems converge towards them. The vitality of the air transportation hub is tied to its global accessibility.

B. **Multimodal transport corridors**

International Multimodal transport is defined as "... the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place in one country at which the
goods are taken in charge by the multimodal transport operator to a place designated for delivery situated in a different country.”

Multimodal transport offers many benefits to transport users and service providers but also to the community in general. Multimodal transport enables economies of scope within a transportation system where modes are used in the most productive manner. Travel time, reliability and costs take a fundamental importance in the globalization of trade and consequently in transportation. An international multimodal network converges at hub centres allowing linkages with the transportation system through a maritime /land/air interface. The use of containers facilitates the multimodal freight transportation modes by offering a higher fluidity of movements and standardization of loads.

It is possible that within corridors there exist other modal alternatives than just road transport. It is possible that multimodal transport corridors do exist. It is a corridor that physically links an area or region through the integration of various modes of transport. The importance of multimodal transport is well established. The usage of containers shows the complementary between freight transportation modes by offering a higher fluidity to movements and standardisation of loads. Multimodal transport enables economies of scale within a transportation system where modes are used in the most productive manner.

It is also possible that within a given corridor there might be more than one route from origin to destination. If this is the case then it will be important for the cluster group to explore not only the main routeing but also all other routes in existence in the corridor.

These alternatives in terms of modal and route combinations will also need to be assessed in a multimodal transport corridor in order to reflect the best possible modal selection from corridor origin to destination. Multimodal transport corridors can provide efficient solutions to improve the efficiency of transit transport systems for landlocked countries.

C. Transit transport corridors

Landlocked countries must rely on transit transport corridors in order to gain access to the sea. Since landlocked countries do not have seaports, it is important for them to benefit from efficient and effective transit transport corridors for their overseas exports and imports. The transit transport corridor is therefore a specific transport corridor that supports the movement of goods to and from a landlocked country to seaports in adjacent and coastal neighbours. The transit transport corridor is usually multimodal. The fundamental difference between a transit transport corridors and other types of transport corridors is that the goods must transit a third country, no matter the origin of destination of the goods.

The main characteristics of transit transport corridors are summarized as follows:

- Landlocked country commercially oriented users require easy access to efficient transit transport services in terms of timeliness, reliability and cost-effectiveness;
- Transit and landlocked country governmental agencies require overall confidence in terms of fiscal reliability, physical security, environmental safety, transparency and compliance, as well as the best use of existing infrastructure;
- Transit and landlocked countries commercially-oriented service providers require unrestricted and profitable access to transit transport support services markets in terms of fair competition and regional market growth.

The key role of transit corridors is to assist in the production, consumption, and distribution of goods and services of landlocked countries so that they can take full advantage of the trade and investment opportunities offered by liberalization and globalization. As a result, there is a need to identify existing and alternatives transit corridors for a landlocked country which would want to develop its trade relations.

and appraise the performance and limitations of these corridors. The analysis of operational and documentary procedures is equally important in order to understand physical and institutional capacities of such corridors and their impact on trade and national economies. Ultimately, the analysis would allow the stakeholders working along the corridor to develop a strategy and a Corridor-based Action Plan in order to maximize the use of the corridor and increase trade flows.

2. Challenges in the development of corridors

The most visible challenge of the transit corridor is the fact that a landlocked country depends on a transit country for its trading activities. These two countries have a common border but have their own national systems and regulations, different stakeholders involved along the corridor, and might even differ in the way they envisage transport corridors in their national development strategies. In addition, there are also other challenges in the development and performance of the corridors.

However, these challenges are all related to three conditions which ensure fluidity, efficiency and cost-effectiveness, hence the Key Performance Indicators (KPI) of the corridors: time, cost and reliability. Therefore, in order to perform and function in an efficient way, the corridor stakeholders should meet the following conditions:

- Information;
- Dialogue;
- Coordination

However, these features represent also the most important challenges in the development and performance of the corridors since, if not in place, they can impede the fluid and efficient traffic along the corridor and consequently impact negatively the trading flows through the following aspects:

- The nature of the goods that are transported;
- The level and quality of existing transport corridor infrastructure;
- The basic aspects of transit operations and traffic;
- Transit Trade Institutions;
- Trade and transport facilitation issues.

- The Nature of the goods that are transported

Transport cannot exist without trade. This is particularly true for international trade where both sellers and buyers are located in different countries. Therefore, the foremost issue that needs to be resolved is the method of product transportation and distribution across borders. In the case of landlocked developing country, another dimension is added: the goods must transit through a third country. During product transportation and distribution selection, traders will be trying to achieve at least five objectives: (i) maximizing sales opportunities, (ii) achieving high levels of product availability, (iii) achieving high levels of customer service, (iv) minimising costs; and (v) ensuring smooth integration of both commercial and physical aspects of the transport and distribution chain across borders.

Therefore data on the landlocked developing country main export and import must first be collected before any assessment is made. It should include trade flows for at least the previous 5 years in terms of export/import value but also export/import volume as well as direction of trade.

The type of products is also decisive on the choice of the mode of transport to be used. Indeed, perishable products or products with relatively short life cycle are not well suited to slow modes of transport. This is true for products with high value to weight ratios where speed is a competitive factor for market access and penetration. Operating strategies of each mode of transport must be evaluated to understand the
nature of competition among modes and the types of services offered such as containerization, consolidation, block trains, truck convoys, etc.

- **The level and quality of existing transport corridor infrastructure**

Landlocked developing countries are not only dependent on the quality of physical infrastructure available in their own country but also in neighbouring countries for fast and efficient sea access. Infrastructure limitations are considered as a major constraint to the economic development of landlocked countries as well as a bottleneck for trade expansion and transport facilitation. Where transport infrastructure is poor, the development of efficient transit transport corridors may not occur smoothly. In order to be able to gain maximum benefit from efficient transit transport corridors, infrastructure that is capable of handling containers must be in place.

The minimum level of transport infrastructure must be in place in order to benefit fully from efficient transit transport corridors. Exporters in landlocked developing countries can then benefit by being more competitive in reaching the foreign buyer at minimum costs, minimum time with goods delivered in good conditions. Importers in landlocked developing countries can also benefit from integrated transit transport corridor systems, as goods ordered are delivered at lower cost and better conditions.

The appraisal of the level and quality of the infrastructure may require cooperation from the authorities and actors using the corridor all the way until the seaport in order to get the required information about the availability, accessibility and capacity of transport infrastructure both within the landlocked and transit countries. After having identified the broad outline of the transit corridor, a clear delimitation of the origin and destination of the transit corridors must be agreed upon. This defines the transit transport corridor assessment scope. Transit routeing provides an indication of the transport infrastructure and nodal links to be appraised in terms of capacity and efficiency in the short and long run.

Seaports are usually the main gateway for cargo and are a critical link in any corridor. The types of port facilities vary from country to country depending largely on what types of vessels and cargo are handled. An indicative factor when determining the capability of a port is to look into the physical measures of its berths - in particular the draft and length alongside the berths. Table 2 provides a generic framework for port assessment based on basic physical characteristics.

**Table 2: Generic assessment of transit port physical characteristics**

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Port Basic Physical Characteristics</strong></td>
<td><strong>Local Infrastructure And Transportation Network</strong></td>
<td><strong>Port Infrastructure</strong></td>
<td><strong>Depth of the port</strong></td>
</tr>
<tr>
<td><strong>Water depth</strong></td>
<td><strong>Port facilities &amp; equipment</strong></td>
<td><strong>Available number of berths</strong></td>
<td><strong>Degree of integration (EDI)</strong></td>
</tr>
<tr>
<td><strong>Inland freight rates</strong></td>
<td><strong>Connectivity</strong></td>
<td><strong>Back up space on terminal</strong></td>
<td><strong>Port equipment</strong></td>
</tr>
<tr>
<td><strong>Port accessibility (land &amp; sea)</strong></td>
<td><strong>CY Area</strong></td>
<td><strong>Infrastructure</strong></td>
<td><strong>Superstructure</strong></td>
</tr>
<tr>
<td><strong>Size of available Container yard</strong></td>
<td><strong>Size of port terminal capacity</strong></td>
<td><strong>Port service coverage</strong></td>
<td><strong>Inland freight rates</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Size of hinterland</strong></td>
<td><strong>Port accessibility (land &amp; sea)</strong></td>
</tr>
</tbody>
</table>

*Source: Adapted from Lirn, et al. (2004)*
Last but not the least; in particular for policy-makers knowledge of expenditure actually allocated to the maintenance of the existing physical infrastructure can help provide a clue on the future condition of the said infrastructure. This is particularly true when compared with the estimate of the expenditure, which should be allocated for adequate maintenance of each component of the infrastructure in place in a corridor.

- The basic aspects of transit operations and traffic

A transit transport corridor is composed of several modes of transport as well as various stakeholders coming from public and private sector, using different operating ways and pursuing different objectives. Therefore, coordination and dialogue should help find a common ground among all these different stakeholders and more clarity on sound economic decisions about the mode of transport to be selected. Each mode of transport operates on its own terms and regulations as well as the status of service providers operating in the transit transport corridor. Transportation terminology can sometimes be confusing. UNCTAD introduced transportation terminology definitions:

- **Modes of Transport**: The method of transport used for the movement of goods, e.g. by rail, road, sea, inland waterway or air;
- **Means of Transport**: The vehicle used for transport, e.g. ship, truck, or aircraft;
- **Types of Means of Transport**: The type of vehicle used in the transport process, e.g. wide-body, tank truck, passenger vessel, etc;
- **Unimodal Transport**: The transport by one mode of transport only, where each carrier issues his own transport document (Bill of Lading, airway bill, consignment note, etc.);
- **Combined Transport**: The transportation of goods in one and the same loading unit or vehicle by a combination of road, rail, and inland waterway modes;
- **Intermodal Transport**: The transportation of goods by several modes of transport where one carrier organizes the whole transport from one point or port of origin via one or more interface points to a final port or point;
- **Multimodal Transport**: Where the service provider organizing the transport takes responsibility for the entire door-to-door transport and issues a multimodal transport document.

Therefore an assessment of the qualities of the various modes of transport is first needed to determine the best possible modal solution available that is compatible with local conditions before studying means and types of means of transport. Table 3 and Figure 1 describe a generic assessment of the various transport modes.

<table>
<thead>
<tr>
<th></th>
<th>Road</th>
<th>Rail</th>
<th>Waterway or Seaway</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Very high</td>
</tr>
<tr>
<td>Door-to-door capability</td>
<td>Very high</td>
<td>Low</td>
<td>Very low</td>
<td>Low</td>
</tr>
<tr>
<td>reliability</td>
<td>Very high</td>
<td>High</td>
<td>High</td>
<td>Very high</td>
</tr>
<tr>
<td>Security</td>
<td>Very high</td>
<td>High</td>
<td>High</td>
<td>Very high</td>
</tr>
<tr>
<td>Safety</td>
<td>High</td>
<td>Very high</td>
<td>Very high</td>
<td>Very high</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Very high</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Availability</td>
<td>Very high</td>
<td>Low</td>
<td>Very low</td>
<td>Low</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>Low</td>
<td>Very high</td>
<td>Very high</td>
<td>Very low</td>
</tr>
</tbody>
</table>

*Source: Adapted from Adjadjihoue (1995)*

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However, appraising the qualities of different modes of transport is in itself not sufficient. This assessment must be done in conjunction with an understanding of product characteristics as we have seen earlier depending if the product is perishable or not, high-valued or not, etc.

Table 4 is a good representation of the steps involved in any door-to-door transport operation. This framework can be utilized to help identify detailed time schedules for each segment of the door-to-door transport operation, including schedules for each modes of transport as well as loading and unloading time or any transit time for that matter.

**Table 4: Typical steps in the transport chain**

1. Acceptance of cargo at shipper’s door (origin)
2. Inland Transport (road/rail/IWT)
3. Customs Clearance/handling (export)
4. Main Transport Leg (ocean/rail/road/air)
5. Terminal Activities (import)
6. Customs clearance/handling
7. Inland Transport (road/rail/IWT)
8. Delivery to consignee (Destination)

Source: Banomyong (2000)

Transport time schedules are not only dependent on the mode itself but also on the types of mean of transport used. Therefore it is important to understand the characteristics of the vehicle fleets used such as size and axle configuration of trucks and wagon, ship or airplane type and size, maximum and average speed along the transit corridor. Indeed, the choice of types of means of transport (i.e. types of trucks for example) will have an impact on freight cost itself as the capacity, speed and availability may be different in the transit transport corridor. The most utilized types of mean of transport for transit transport is transport by trucks and an understanding of the cost structure of truck operations could be helpful when assessing the adequate level of freight tariffs. Fuel is clearly the most important cost driver and is
reflected in the freight rates when there is a surge in fuel prices. Fuel cost is considered a long run variable transport operating cost for all the modes of transport.

The nationality of transport and service providers is another important factor to consider as depending on the nationality there may be preferential treatment and/or formal or even informal traffic sharing arrangements.

At the transit operation and traffic level, information and data about the number of operators involved in the transit corridor, type of services provided, modes and types of means of transport, number of available vehicle as well as the nationality of these operators is a prerequisite to understand the current transit situation from a supply-side perspective.

- **Transit Trade Institutions**

Knowledge of transit transport infrastructure, operation and traffic is important but not sufficient in assessing transit transport corridor efficiency. Transit trade institutions rules and practices or “software” must be appraised to understand the legal regime that may facilitate or hinder transit traffic from origin to destination. There exist a multitude of rules and regulations related to freight transit which often overlap. Transit Trade Institutions intervene at international, regional and bilateral levels.

**Bilateral transit agreements:** The movement of goods in transit between a landlocked country and a transit country can be based on a bilateral agreement on transit transport. The purpose of such agreement is to facilitate land-locked country’s exports and imports in transit, to and from a third country.

**Subregional transit agreements:** Subregional transit transport agreements are usually derived from broader economic integration type of agreement. Partner states of an economic integration will also need to negotiate specific framework agreements on issues such as transit traffic and interstate transport, as well as on facilitation measures.

**Transit conventions:** Several international conventions on transit exist which aim at facilitate transit for landlocked countries such as the Convention on Transit Trade of Land-locked States (1965). The application of that Convention is aimed at benefiting maritime travel and transport, including the movement of transit trade of landlocked countries. This is a formal recognition of the need of landlocked countries for adequate transit facilities in promoting international trade by the international community. Four key principles are stated in the Convention:

- The recognition of the right of each landlocked State of free access to the sea is an essential principle for the expansion of international trade and economic development;
- In order to fully promote economic development of the landlocked countries, the said countries should be afforded by all other countries, on the basis of reciprocity, free and unrestricted transit, in such a manner that they have free access to regional and international trade in all circumstances and for every type of goods;
- Goods in transit should not be subject to any customs duty;
- Means of transport in-transit should not be subject to special taxes or charges higher than those levied for the use of means of transport of the transit country.

All of these legal instruments are a reflection of the complexity involved when trying to understand the legal regimes behind transit transport corridor operations in recognition of the fact that harmonized transport and transit facilitation measures at national and international levels were a prerequisite for enhancing international trade and transport along road and rail routes of international importance. Nevertheless, inconsistency in administrative rules and regulations in landlocked developing countries is not only partly due to the overlapping authority of the various ministries but also because of the discrepancy between policies, interpretation and actual practice of these international and national legislations. Effective public and private sector partnership can foster closer cooperation in terms of transit transport.
These international conventions and other efforts, however, have not been totally adequate to address the wide range and complexity of issues faced by landlocked and transit developing countries in establishing efficient transit transport systems which allow them to get their goods to regional and international markets at the right time, place, quantity and cost.

- **Trade and Transport Facilitation issues**

There is no common definition of trade and transport facilitation, however trade and transport facilitation when defined broadly goes beyond the standard issues of administration, procedures, logistics at ports and customs, regulatory environment and standards, and information technology to include transport covering land access to ports and airports, maritime and aviation services, multimodal transport and services, transit and more recently, transport security. In that regard, the importance of trade and transport facilitation on the development of corridor is tremendous.

Documentation required for export, import and transit can be quite cumbersome as the number of agencies involved is high with overlapping authorities. The more complicated the rules the more difficult it is for traders in landlocked country to compete in the international arena. This leads to improper practices as traders may not have enough time to go through normal procedure and could resort to the payment of informal charges.

Financial regulations and administrative procedures can become the biggest hurdle to the efficiency of any transit trade corridor for both importers and exporters. For instance, a document that would not be in order or delayed can stop the movement of the goods along the transit transport corridor.

In this context, the importance of the transit service provider as the main facilitators of the transit transport corridor chain is significant. Transit service providers are referred to as freight forwarders and their knowledge of the network helps in identifying those who can provide effective transit services. Local freight forwarder may be at a disadvantage in terms of international networks but international forwarders may not have the local expertise in dealing with traditional practices in the transit transport corridor. There may be competition, between all operators involved in transit transport corridor operations, which must be identified beforehand.

Customs play a very important role in transit trade. In developing countries, customs is largely the principal source of revenue for the government. They are also aimed at enforcing laws at national borders. As world trade grows, so too do the complexity and workload of Customs. The globalization of the world economy has placed increased pressure on the world Customs administrations. Merchants require faster, more standardized and uniform services while governments require more revenues. Customs are faced with the prospect of balancing the requirement of facilitation with the necessity of law enforcement. However, each country has its own rules and procedures concerning the import, export and transit of goods that can still take longer to process than the cargo transit time, in other words, goods may arrive before the transport documents. Thus the need for transit and trade facilitation has increased significantly and puts pressure on governments to reduce time and distance of all trading flows.

Transit trade and transport facilitation can be done through the streamlining of the information flows on three levels:

- **Simplification**: Process of eliminating all unnecessary elements and duplications in formalities, processes and procedures;
- **Standardization**: Process of developing internationally agreed formats for practices and procedures, documents and information;
- **Harmonization**: Alignment of national procedures, operations and documents with international conventions, standards and practices.

Therefore, if all the challenges seen above cannot be addressed and mechanisms are not put in place to facilitate information, dialogue and coordination, then transit transport corridor performance will be
affected and consequently, the traders will not benefit from the full advantages of the corridor which are the potential for economies of scale and the existence of a value chain along the corridor.

- **Supply chain management**

Kent and Flint (1997), studied logistics “thought” and discovered that logistics has evolved from a transportation focus based primarily on agricultural economics to the view that it is a diverse and key component of business strategy, differentiation, and link to customers. They also discussed that logistics “thought” can be structured into six distinct eras, starting from the turn of the last century and ending as a projection into the future. The six eras, based on their findings, are (1) farm to market, (2) segmented functions, (3) integrated functions, (4) customer focus, (5) logistics as a differentiator, and (6) behaviour and boundary spanning.

Table 5 presents six definitions for logistics that have evolved during the twentieth century. This move from a focus on physical distribution within the marketing domain in the early 1900s to the contemporary process orientation focused on conforming to customer requirements.

**Table 5: Evolution of logistics definitions**

<table>
<thead>
<tr>
<th>Year</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1927</td>
<td>“There are two uses of the word distribution which must be clearly differentiated...first, the use of the word to describe physical distribution such as transportation and storage; second, the use of the word distribution to describe what is better termed marketing.”3</td>
</tr>
<tr>
<td>1967</td>
<td>“A term employed in manufacturing and commerce to describe a broad range of activities concerned with efficient movement of finished products from the end of the production line to the consumer, and in some cases includes the movement of raw materials from the source of supply to the beginning of the production line.”4</td>
</tr>
<tr>
<td>1976</td>
<td>“The integration of two or more activities for the purpose of planning, implementing, and controlling the efficient flow of raw materials, in-process inventory and finished goods from point of origin to point of consumption.”5</td>
</tr>
<tr>
<td>1985</td>
<td>“The process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods, and related information from point of-origin to point-of-consumption for the purpose of conforming to customer requirements.”</td>
</tr>
<tr>
<td>1992</td>
<td>“The process of planning, implementing, and controlling the efficient, effective flow and storage of goods, services, and related information from point-of-origin to point-of-consumption for the purpose of conforming to customer requirement.”7</td>
</tr>
<tr>
<td>1998</td>
<td>“Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow of storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers’ requirements.”8</td>
</tr>
<tr>
<td>2004</td>
<td>“Logistics Management is that part of Supply Chain Management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements.”9</td>
</tr>
</tbody>
</table>

*Source: Derived from Kent & Flint (1997)*

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4 National Council of Physical Distribution Management, Chicago IL, 1967
5 National Council of Physical Distribution Management, NCPDM Comment 9, Number 6, November-December, 1976, pp.4-5.
6 Council of Logistics Management, Oak Brook, IL, 1985.
7 *What It’s All About* (Oak Brook: Council of Logistics Management, 1992).
8 Council of Logistics Management, Oak Brook, IL, 1998.
The 1998 and 2004 definition of logistics acknowledges that, today, logistics is a part of the supply chain process\textsuperscript{10}. Supply chain management can be viewed as the systematic, strategic co-ordination of the traditional business functions within a particular company and across companies within the supply chain, for the purposes of improving the long term performance of the individual companies and the supply chain as a whole.

Logistics management is a systematic and holistic approach to managing the flow of materials and information across the whole supply chain from raw materials sources to end-user consumption. Supply chain management is seen as the extension of logistics management principles to customers and suppliers, crossing geographical and organisational boundaries.

The supply chain therefore includes all parties involved starting from the point of raw materials to the point where final products or services are being delivered to customer. The term ‘chain’ conveys that among these various activities, they are linked. The link between each activity is the transportation that provides the movement of raw materials and products from one activity to the others.

A typical supply chain includes procurement of raw materials from suppliers, production of items from manufacturing plants, storage of stocks in warehouses, and shipment to the customers. In the context of the transit corridor, the supply chain will link activities and companies involved in the chain of production of transit shipment on a given corridor.

Supply chain management is a set of approaches used to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that the merchandise is produced and distributed in right quantity to the right place at the right time, in order to minimize system wide costs while satisfying service level requirement. The objectives of supply chain management are the following:

- **Efficiency**;
- **Integration**;
- **Cost effectiveness**.

**Efficiency**: in the supply chain of the production of transit services, time is the key factor determining the efficiency of the system.

**Integration**: originates from a systems perspective in which optimisation of the whole value stream is considered to achieve better performance than a string of optimised sub-systems. This is due to better interface management, trade-offs, and wider-ranging decisions based on shared information and co-ordination.

**Cost-effectiveness**: it depends on the actions of each member which have an impact on both factors, cost and time. Therefore, it is crucial that every concerned party has an understanding of the others’ work processes and is aware of how their own actions could affect other’s performance both positively and negatively. Supply chain management involves the entire system.

Therefore, to achieve the integration of coordinated corridor-based decisions and actions, understanding the processes within the supply chain and information sharing are crucial.

**Fundamental Principle:**
The fundamental principle of supply chain management is that all parties understand the whole process and their own position in the chain as well as the impact of each action on the system-wide optimization. A “holistic” system approach is needed.

This requires the understanding and knowledge on the role and position of each member along the corridor so as to better adjust their actions, respond to the needs of the corridor and ensure the chain fluidity and the system-wide optimization. A corridor is a supply chain that interlinks a multitude of stakeholders. The success of a corridor will depend very much on its how infrastructure, the institutional framework, the service providers and the shippers/consignees are integrated.

**Box 1: The importance of measuring supply chain performance**

<table>
<thead>
<tr>
<th>Performance measurement can be defined as the process of quantifying effectiveness and efficiency of action. Effectiveness is the extent to which customers’ requirements are met while efficiency measures how economically a firm’s resources are utilised. A practical assessment tool should be able to quantify both the efficiency and effectiveness of any given corridor.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The assessment of corridor performance can be categorised into qualitative and quantitative measures in which quantitative techniques such as benchmarking are frequently used by both commercial firms and academia.</td>
</tr>
<tr>
<td>The literature on performance measurement indicated that there is disagreement on the coverage and categorisation of dimensions and components of supply chain operations. Existing assessment tools seemed to have different characteristics both in terms of content and methodology. However, most supply chain diagnostic tools require detailed and precise quantitative data, which are sometime not available in most situations.</td>
</tr>
<tr>
<td>Criticisms were made on existing assessment tools such as data collection limitations, the unavailability of required data, complicated analysis, implementation difficulties, and limited time resource.</td>
</tr>
<tr>
<td>Quantitative measures such as cost and time are easy to understand since they are tangible. However, the availability of such data is usually an issue. If such data was recorded systematically, then it will be relatively easy to collect and compile the necessary information. Reliability is a more difficult construct to measure but assessment is still possible through the use of composite metrics in which multiple variables associated with the reliability of performance are measured through the use of metrics.</td>
</tr>
</tbody>
</table>

3. **Supply chain key performance indicators**

The Key Performance Indicators (KPIs) related to the production of transit shipments are the following:

- **Cost;**
- **Time;**
- **Reliability**

**Cost:** The typical cost of production in economic terms would refer to the return of four factors of production (Labour, Capital, Land and Entrepreneur (the cost of entrepreneurial organization that facilitates the productive conduction of the process). All these costs should be included to measure the performance of the companies, hence the performance of the corridor.

**Time:** The total time spent or production lead-time is the length of time from point of raw material is ready to be processed to the point of completion of final product. If we follow the production process until the production is completed, we will see the flow of both information and material in the process. Both type of flow are necessary for the production to complete. The time spent of each flow determines the total time of production process.

The lead-time is the total time spent in the production process however the actual times required for completing the process are often lower. However, the actual time spent to complete the production process is just a portion of the total time and it is the time spent on value adding activities.
Reliability: The reliability issue is critical to the performance of the transit shipment in the corridor. A lack of reliability will hinder the overall corridor performance as users will not be able to plan their schedule accordingly as transit performance is uncertain. The significance of reliability or uncertainty for a decision situation depends on the cost of reversing a commitment once made. It is when high uncertainty is coupled with high cost that uncertainty needs to be acknowledged and allowed for in any analysis.

Uncertainty is a key risk when designing supply chains as supply chain members expect reliable level of services in the production of transit shipment. Guaranteed service levels are reflections of reliability in corridors.

![Figure 2: Corridor process breakdown](source: UNCTAD (2005))

A supply chain perspective on transit corridors need to recognise that each stakeholder can be considered as an input-output model where each stakeholder receive inputs from their respective suppliers and delivers output to their respective clients. It is the integration of these input and output among stakeholders that enables the supply chain linkages and further integration.

In many cases, the proportion of value added activities to total time depends on the type of process design. This process design can also be influenced by policy or regulatory requirement. And as seen earlier, process design depends if one takes the internal or external process as a reference. Yet, it will affect the performance of the corridor by its nature and its management.

Each corridor member therefore needs to identify who its supplier is as well as its customer. A supplier provides input or raw material which is needed for the production of an output. A customer is the one who requires this output to start its process. Trying to map out this supplier-customer relationship will help understand the requirements of each member.

Following the flow of materials or information in the system the mapping of both processes could be done. The flow of materials is simple to observe from the shipment to its final destination and the kind of activities or process that are undergone. The mapping of information is less obvious. Information flow may not necessary be intangible. The flow of documentation such as invoice and packing list can be considered flow of information. Although, they are actually documents, but the purpose of the flow is to transfer information listed in that flow from one point to the other. Flow of information differs from the flow of material mainly because the movement of material to the next point means the absence of material.
in prior point, while flow of information is multiplying, it does not really leave the prior point, but rather multiplying from one point to the other.

It is usually required that all processes of every flow are completed before the product turns into the final product. The process mappings allow to take a look into the current practices of each member and to spot out the potential improvement opportunities.

The existence of a supply chain makes the corridor unique compared to other routes as it adds value to the product to be transported. More, all members work together pursuing a common objective leading to the efficiency of the corridor, hence the increase in trade and national income.

A. Corridor value chain

Supply chain management approaches can be adopted when understanding how transit corridors links landlocked countries with seaport located in transit countries. In a corridor’s supply chain, the transit transport operation is the product of an assembly line in which the transit transport corridor is the manufacturing industry, and the input suppliers are the services provided by all stakeholders along the corridor. These include both business sector companies and governmental agencies. The end product of such an assembly line is the consignment delivered either to the consignee at destination for inbound traffics or to the shipping line for sea transport in outbound operations.

In this assembly line there is a production process starting when the goods are made available for the land transit transport operation to start. Each time a different party intervenes in the process, some value is added to the final overall cost of the transit transport operation. This value can come from a service rendered like the one provided by a road carrier, but it can also come from the cost derived from the idle time along the road or at the border when transport is stopped waiting to comply with required formalities, transhipment procedures or because of traffic congestion.

The figure 3 below illustrates the value that can be derived when supply chain management concepts to transit transport operations to measure and improve its performance as a production process.
**Corridor value chain**

*Figure 3: Corridor Value Chain*

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**Transit service production**

**Land Locked Country**

**Transit Country**

**END PRODUCT: GOODS DELIVERY**

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*Source: UNCTAD (2005)*

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**The production of transit services**

Transport corridors linking inland origins and destinations in landlocked countries with entry and exit seaports in transit coastal countries can be analysed making use of the supply chain management approach: an end-to-end sequential approach in which suppliers are the trade and transport support services and the line of production is the trade operation itself. From a manufacturing perspective, it is simply a transit service production process as described below:

- **In the case of exports**, the exporter acts as a raw material provider who provides an export consignment. This raw material will undergo the production process of the transit transport value chain. By adding value of transit service during the production, the final product will become transit export as explained earlier.

- **In the case of imports**, the consignment delivered at the port is raw material to the transit transport production process. This raw material will undergo the production process of the transit transport value chain. The final product will become transit import with the added value of the transit transport service.

With such an approach, measurements may be developed to identify weakest stages or significant cost and delay factors and take actions for improvement. The “output” of the line of production being the completed import delivery or export shipment, the quality of the corridor product can be measured in terms of timeliness or delays, unnecessary costs, and proportion of goods transferred undamaged to next agent.

**Borders are key corridor interfaces**

The transit transport service production process of a landlocked country is usually less efficient than the one of the transit country, using the same infrastructure and services. This stems from the additional steps imposed by cross border transit thus resulting in higher costs, longer times and greater risks of delays.
which constitute factors of lesser competitiveness of landlocked countries international trade. The border is not only a fiscal boundary but also a regulatory, cultural and technological limit.

Therefore, integrated supply chain management concepts can help reduce these disadvantages and limits by making inbound and outbound consignments of the landlocked countries and those of the transit countries part of the same transport service value chain.

Supply chain management applied to transit transport corridors is aimed at helping landlocked countries benefit from transport service production process as efficient as the one of transit countries and reduce their bottlenecks that is specific to their landlocked status.

B. Role of cluster development

As seen with the supply chain, the transit transport corridor is organized along a landlocked country, border and a transit country.

In order perform efficiency, these main corridor components need to organise themselves to meet the required conditions as seen earlier: information, dialogue and coordination. The cluster responds to this need allowing members of corridors (at local and corridor level) to organize themselves in a way to address challenges and solve problems that they are unable to solve when operating as an isolated entity. Indeed, a cluster is a “sectoral and geographical concentration of enterprises, which produce and sell a range of related or complementary good and are faced with common challenges and opportunities”\(^{11}\).

In the case of corridors, the clusters would help in facilitating the fluidity of the supply chain through the setting up of a coordinating governance mechanism organized by the members themselves. We will see in Part II what a cluster should do and how it should be organized in order to provide the necessary governance, be it formal or informal, of the corridor.

The clusters could be managed at various control points of the corridor to reinforce the efficiency at local level and then increase the overall performance at corridor level. The clusters are based on consensus building on common objectives and actions. In order to facilitate the strategic decision making, the clusters require a simple tool to measure and assess the performance of the corridors in order to guide the stakeholders of the clusters in their formulation of a vision and the cluster-level action plans. The Time/Cost-Distance Methodology will respond to this need and will help enhance the capacity of the cluster in identifying and addressing the bottlenecks existing on the corridor.

The cluster methodology is a collaborative approach which can be implemented at all levels of the corridor as much as needed and is composed of stakeholders which are involved on a daily basis and who are in a position to bring the right responses and strategies to common problems linked to the transit transport corridors. A more detailed explanation of cluster development is provided in part II.1.

C. Role of the time/cost-distance methodology

The Time/Cost-Distance Methodology is a simple assessment tool that can be utilised to measure and assess the performance of any given corridor. The Time/Cost-Distance Methodology explained in this CT-TPM Toolkit includes both transport (road, rail, inland waterway, maritime) and intermodal transfer (ports, rail-freight terminals, inland clearance depots) as cost and time components.

The Time/Cost-Distance Methodology includes costs and time associated with transport by any mode (road, rail, inland waterways and sea) and with transfers between modes (at ports, rail freight terminals and inland clearance depots) as components. The methodology is based on the premise that the unit cost

\(^{11}\) UNIDO definition of Cluster
of transport varies between modes and this will be reflected in the cost curves. In terms of volume movements, sea transport is generally cheapest per tonne per kilometre and road transport is normally the most expensive, with transport by waterway and rail in an intermediate position.

This graphical output may be used as a useful tool in the debate over the value of time in freight transport operations by analysing transit times by mode and route. The longer freight takes to reach its destination (including dwell times at terminals), the greater will be the implicit interest costs of working capital. Total implicit costs may, however, be a good deal higher, since some goods may be needed more urgently and business may be lost if goods arrive too late.

The Time/Cost-Distance Methodology will need to be used by clusters as a mean of describing the current situation of a corridor and its bottlenecks. The results of application of the Time/Cost-Distance Methodology can be further analysed to find the root cause of the problems encountered in a corridor. Clusters can then use the analysis to devise strategic and operational actions to remedy the situation. Figure 4 illustrates the linkages between the UNCTAD Cluster Development methodology and the UNESCAP Time/Cost-Distance Methodology.

A more detailed explanation of the Time/Cost-Distance Methodology is provided in part II.2.

**Figure 4: Linkages between Cluster Development Methodology & Time/Cost-Distance Methodology**

The cluster members agree on the application of the Time/Cost-Distance Methodology as a tool to assess the performance of the corridor and help in providing the required data to apply the methodology.

The results from Time/Cost Distance Methodology will feed into Cluster Action Plan formulation and the cluster strategy.
Part II. Methodology on Application of CT-TPM Toolkit for Corridor Development

1. The UNCTAD Cluster Development Tool

   A. Cluster Basics

   a. What is a Cluster?

   A CLUSTER is a sectoral and geographical concentration of enterprises, which produce and sell a range of related or complementary good and are faced with common challenges and opportunities.\(^{12}\)

   The cluster enables its members to organize themselves in a way to address challenges and solve problems that they are unable to solve when operating as an isolated entity.

   In the context of transit transport, the clusters are composed of business enterprises and non-business organizations working on a defined geographical area, i.e., along one given corridor. The clusters are cooperative structures. They are based on the principle of cooperation and interdependence. They are based on the premise that a members of a corridor can realize higher levels of competitiveness when they looks beyond their own individual limited capacity and strategically cooperate with other stakeholders and support institutions to increase performance. **The incentive for participation in a cluster is the expectation of mutual benefits brought by the exchange and sharing of operational and practical knowledge to ensure tailored solutions to transit problems and ownership, to increase competitiveness of all business enterprises involved and ultimately to increase the performance of the transit transport corridor.**

   Most of the time, companies and public organizations working along a corridor do not meet or coordinate their work and activities; they sometimes even do not know each other in person. Therefore, bridging the gap through the setting up of a cluster, may facilitate dialogue, allow for mutual agreement on common objectives and ultimately increase trade and reduce customs-related bottlenecks.

   b. Objectives of a cluster

   It is an approach that encourages companies/institutions with common challenges and opportunities to come together and identify ways in which they can cooperate to their mutual benefit.

   The main objective of a cluster is therefore for all members to gain **mutual benefits** from their collective participation in the cluster. These mutual benefits can be defined as follow:

   - Provide members with a in-depth knowledge of their supply chain partners and operations along the corridor and allow for closer co-operation;
   - Allow members to develop collective complementary skills and capacities to achieve higher performance than individual units would be able to reach on their own;
   - Strengthening social and other informal links, leading to the creation of new ideas and new businesses;
   - Improve information flows within cluster;
   - Enable the development of a network of professional, legal, financial and other specialist services.

\(^{12}\) UNIDO definition of Cluster
All these mutual benefits stemming from the cluster dynamics will create **external economies** defined as positive economic effects of proximity among economic actors. This will also promote amongst members a sense of ownership and reliability to the cluster which will ensure sustainability and result-based actions undertaken by the cluster.

c. **Transit Transport Corridor and Cluster**

A transit transport corridor unfolds over two territories: one in coastal or land-neighbouring country and one in landlocked country for which trade has to cross the transit country to reach trading partners in distant markets. This situation makes the two countries become dependent on each other for transit trade and transport services. The level of cooperation between the two will affect positively or negatively overall trade volumes as well as transit time, cost and reliability of the corridor. The increase in cooperation and dialogue between the partners of the two countries can reduce inefficiencies along the corridor and facilitate business (increase trade volumes). In such a context, cluster(s) along the transit corridor will help tackling the challenges faced by the corridor in a collaborative and committed approach.

By gathering different parties from different backgrounds, i.e. landlocked and transit territories, users and providers, private and public institutions, Clusters should contribute to:

- Help overcome the apparently conflictive respective interests;
- Build trust and cooperation on cross-border issues;
- Create solutions that could benefit all participants.

**Lessons learnt:**

Based on UNCTAD a former project (see ANNEX I)\(^{13}\), it was noted that due to its geographical situation, the landlocked country is much more concerned with transit facilitation issues than transit countries which have direct sea access. Therefore, setting up a cluster as a platform of dialogue and knowledge/information sharing that engages both countries can help resolve misunderstandings and improve cooperation from transit countries.

Along a given corridor, a cluster can gather interested parties at various points such as seaport, border crossing area and or at inland destinations/origins of trade and transport operations. A cluster may provide for tailored solutions to specific transit problems that would help in the decision-making and planning structure to monitor and improve the operation of the overall corridor supply chain. In such a framework, the cluster will offer the means of collectively identifying major obstacles and agreeing on joint solutions and improving conditions for more efficient operations of transport corridors.

The cluster serves the purpose of sharing knowledge among its members and exchanging information and solutions with associated networked clusters in other locations along the corridor. It works on both the day-to-day operations as well as the medium and long-term solutions design. The cluster promotes partnership agreements among the supply chain participants on a given corridor.

- **Transit corridor clusters’ members**

As said, the cluster’s members are the business communities involved in international trade and transport activities from both transit and landlocked countries along a given corridor and the governmental agencies providing a regulatory framework for international trade and transport. Their active involvement is central to the successful development of the cluster and the achievement of its objectives.

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\(^{13}\) A first UNCTAD Project on “Capacity Building in Trade and Transport Facilitation for landlocked and Transit Developing Countries” was implemented in the three corridors: Paraguay –Uruguay Corridor, Lao P.D.R – Thailand Corridor, and Zambia-Namibia Corridor in 2006-2007 (See ANNEX I).
The cluster may comprise: traders, exporters and importers, freight forwarders, land transport operators, customs brokers, parties operating in inland terminals, terminal responsible authorities, governmental agencies monitoring, promoting and regulating trade and transport: Ministries of Trade, Transport and Finance / Customs.

Members of a cluster should be able to reach concrete practical solutions and more efficient and reliable services, designed through the analysis of inefficiencies and the sharing of specialised knowledge. These actions should result

Members should also be able to providing accurate information and data on corridor transport operations to competent authorities which will help to identifying the problems and developing a collective sustainable trade and transport facilitation capacity, which will grow over time through mutual trust and joint efforts.

The following sections of the guide describe how to form a cluster and its operation in the context of Transit Transport Corridor.

B. **Cluster development**

   a. **Cluster Development key features: Trust, Dialogue and Co-ordination**

Key features are essential to the cluster to develop and succeed in achieving its objectives:

- **Joint Actions**: the cluster should not remain a forum of dialogue only. Instead, it should lead to the concretization of objectives through joint successful actions.

- **Trust**: A cluster can only exist if there is trust and mutual agreement among members on the objectives, priorities, strategies and activities of the cluster. Trust is the cement of any joint action undertaken by the cluster.

- **Dialogue and “Co-operative Competition”**: Joint actions will be achieved if dialogue exists through regular meetings and platform (IT platform). Dialogue should be combined with the principle of cooperative competition, where every competitor benefits from partnering altogether.

- **Demand-based Approach**: the cluster should respond to the needs and realities of the cluster members in order to ensure strong participation and commitment from all members, be them public or private.

- **Flexibility**: a cluster can be formal or informal, small or big size, can decide to meet regularly based on a calendar or on ad-hoc basis. Flexibility would better respond to the operating way of all members.

- **Empowerment**: the cluster will be successful if only the members themselves are in the driving seat of the cluster decision-making process.

b. **Role of the Cluster Development Agent (CDA)**

The cluster has to build trust, guidance and co-ordination in order to achieve common objectives and joint actions. Yet, this may not be simple at the beginning of the process. Therefore, a Cluster may wish to use a Co-coordinator who would help activate the cluster dynamic. This Co-coordinator is called a **Cluster Development Agent (CDA)**.

Indeed, in the case of natural successful cluster, the cluster members can be sufficient in the operating work of the cluster, be it in formal or informal form of cooperation.
In the case of underachieving or a more complex cluster, concerned parties may find it difficult to foresee and determine the benefit of trust, cooperation and joint actions, thus the need for an external agent will be essential to perform the task of activating such process and motivate concerned parties to help them develop the capacity to manage cluster activities on their own.

In this CT-TPM Toolkit, the Methodology is based on the existence of a CDA for the first development stages of the Cluster.

**Lessons learnt:**

In the previous project undertaken by UNCTAD, the audit report\(^\text{14}\) shows that the role of the CDA was crucial in helping the cluster consolidate and create appropriate environment for the activities to be developed as well as generate awareness and keep motivation of all members of the cluster.

The role of a CDA is to:

- Understand linkages of cluster members;
- Form bilateral trust with cluster members;
- Forge trust based-relationship among cluster members;
- Help in collection required information and data;
- Help in sharing information;
- Help design, formulate and facilitate actions plan composed of joint actions.

However, the CDA, not being a cluster member, has to ensure neutrality and objectivity in the decision-making process. The role of the CDA should focus on facilitating and guiding the cluster development process. The CDA should foresee the initiation and activation of the cluster dynamics as well as when to leave the cluster members to function and drive the process independently. Therefore, it is critical that the tasks of the CDA are assigned within a well-defined time period.

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\(^{14}\) UNCTAD, Audit of the Project “Capacity Building in Trade and Transport Facilitation for landlocked and Transit Developing Countries”, Dec. 2007.

The examples selected were on the following corridors: Paraguay –Uruguay Corridor, Lao P.D.R – Thailand Corridor, and Zambia-Namibia Corridor.
- Timeline of a CDA

The objectives of CDA will evolve through time. There is no set duration of each phase of tasks, it mainly relies on the readiness of the cluster to move forward to the next phase. Four (4) phases can be summarized with the main actions of a CDA to carry out:

**Table 6: Phases of interventions of the Cluster Development Agent**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Functions of CDA</th>
<th>Objectives achieved</th>
</tr>
</thead>
</table>
| 1     | The CDA identifies and builds relationship with owners of main and supporting cluster partners | → to spot a potential driver of the cluster building mechanism  
→ To understand the pressure points of the cluster in order to focus activities at the earlier stage of the development toward these points. |
| 2     | The CDA identifies networks and concerned associations, including financial support, and defines their role in the activities of the cluster. | → To gain support in both knowledge and resources for the cluster |
| 3     | The CDA starts identifying and passing on the responsibility to a potential leader or an umbrella organization. | → To take over the CDA role and ensure sustainability of the cluster activities. |
| 4     | The CDA helps members implement the Action Plan and ensures they are fully empowered. CDA should avoid getting involved in new project initiated during that period and leave the cluster to work on its own. The CDA should inform the cluster early enough of its exit (6 months before). | → Preparation for EXIT of the CDA  
→ Cluster Action Plan is being implemented  
→ Cluster members are empowered and can continue to perform the cluster autonomously. |

C. Cluster development steps

1. Cluster formation and composition (private-public)

The composition of the cluster is crucial, as a balanced distribution will contribute to efficiency and sustainability. In the case of transit transport corridor, the cluster will involve stakeholders from landlocked country, border-crossing points and seaports or freight terminals. Each sub group may then create location specific clusters to interact at corridor level and to address systemic corridor issues.

**Lessons learnt from Clusters experiences:**
Past experiences show that at least two clusters can be set up: one in landlocked country and another in transit country (ex: Namibia – Zambia Corridor, Uruguay – Paraguay Corridor).

The composition of the cluster should give voice to all partners involved on the corridors (or at a specific point of the corridor) and should include private and public sectors.

The representation of the private sector will ensure that the cluster responds to all interests and needs to make the corridor function well and efficiently on the ground while the public organizations and government institutions will help harmonize the cluster’s objectives with the national development plan of the countries and will give the necessary legitimacy to any decision and/or projects the cluster undertakes.

The need for regional co-ordination is also important and therefore, representatives of the Regional Economic Communities (RECs) will be participating in the cluster in order to harmonize the corridor development with the regional transport strategies that may exist at regional level.
Lessons learnt from Clusters experiences:
The more members are selected based on their involvement in the corridor development and their proximity to the operation of the corridor activities, the more useful and efficient the cluster will be in responding to the challenges and needs.

2. Mobilization of interests and definition of the objectives of the cluster

Once the cluster is formed, the members should agree on the common objectives based on their own interests and should then define the strategy and approach to follow. This is where the key features of the cluster as seen above are crucial. Indeed, trust combined with dialogue will ensure that all interests, as competitive as they could be, lead to common goals which are the increase in competitiveness of the cluster’s members and trade volume along the corridor.

!!! It is important to note that while the cluster may pursue sustainability in its joint actions, the cluster itself has no ultimate objective to last. At a later stage, the cluster can choose to institutionalize or join formal entities (ex: Trade Transport Observatories, Trade Facilitation Committees, etc.), the main objective of the cluster being dialogue facilitation and coordination among members working along the same corridor.

The diagram below describes the process of setting up a cluster and its dynamics.

I. Individual product or service provider locate in proximity to each other.

II. They reach out for information to facilitate their works, but create barrier in linkages from conflict of interests.
III. Cluster development is to try to remove such barrier and create linkages among them.

IV. Once inter linkages has been created, information flow more freely, level of cooperation increase, hence, the opportunities for joint action and improvement increased.

V. The linkages extend to other player in value chain creating free flow of information, thus induce social capital and external economies. Cluster members are more connected, gain more bargaining power and achieve economy of scale. This linkage is facilitated by using ITC.

3. Cluster Stakeholders Analysis

One objective that has to be achieved by the cluster is a Cluster Stakeholders Analysis of trade facilitation issues which defines the challenges and opportunities of the corridor hence helps determine the Action Plan composed of Joint Actions that should be undertaken by the cluster. The objectives of the Cluster Stakeholders Analysis are to:

- Understand the socio-economic environment of the cluster;
- Identify the most effective leverage points for intervention;
- Provide a baseline for future monitoring and evaluation;
- Build initial trust and co-operation with and among the stakeholders.

It is actually the first joint action in itself of the cluster. The Stakeholders Analysis should indeed be done collectively with the strong involvement of all members. It has to take place at the early stage of the cluster and may be revisited and updated later as actions are implemented and new developments take place on the corridor. The Cluster Stakeholders Analysis consists of:

- Business segment analysis;
• Cluster members operating history;
• Cluster’s institutions and their functioning;
• Cluster Map;
• Suggested Vision and Strategy.

The formulation of the Cluster Stakeholders Analysis will require to use a performance measurement tool to assess the indicators of the corridor and define the appropriate analytical information and data to be collected in order to achieve the performance assessment, hence the cluster stakeholders analysis.

The cluster analysis, being carried out by the stakeholders themselves, needs to be simple and easy to undertake. As a matter of fact, the Time/Cost-Distance Methodology, introduced by UNESCAP, meets this condition as it requires simple calculations based on surveys and interviews. Therefore, it can be considered as the most appropriate performance measurement tool in the context of the clusters on Transit Transport Corridor.

The application of the Time/Cost-Distance Methodology should follow several phases and is further detailed in Part II-2 of the present CT-TPM Toolkit.

4. Agreement of the use of the Time/Cost-Distance Methodology

The stakeholders of the Cluster should first agree on a performance measurement tool. The Time/Cost-Distance Methodology is presented in this toolkit but in order to obtain the required data, it necessitates a consensus of all the stakeholders on the best model to be used. It also requires the identification of the entity which will be in capacity to collect the data, apply the Time/Cost-Distance Methodology and undertake the cluster analysis. In fact, among the members of the clusters, some representatives of institutions may be in a position to acquire and collect the needed data. However, the cluster may also decide to appoint an external entity to undertake this task, be it a public or private organization. The cluster can interact with this entity by providing the data they obtain at each level of their intervention on the corridor. It is therefore a collective decision that the cluster has to agree on at the beginning of the cluster stakeholders’ analysis.

5. Data Collection based on the Time/Cost-Distance Methodology

Once the data are collected and analysed for application of the Time/Cost-Distance Methodology, the cluster should start working on the structure of the cluster itself.

6. Appraisal of the structure of the cluster

The cluster appraisal aims at evaluating two aspects:

- The strategy and incentive of each member of the cluster;
- The inter-members relations within the cluster.

At this stage, the analysis of the cluster and its context will help define the objectives of the cluster, its vision and strategy. All these elements will generate a Cluster-based Action Plan.
7. Validation of the Cluster Stakeholders Analysis

In order to get the approval and consensus on the Cluster Stakeholders Analysis and its outcomes (vision, strategy and action plan), a validation process is required as it gives to each member the opportunity to commit to common objectives and therefore helps enhance the dynamic of the cluster. Each outcome is crucial in the sustainability of the cluster and its potential for success.

8. Vision and Strategy

The agreement on a vision and a strategy will define the way forward and the main goal pursued by the cluster. It can envisage for instance the various ways of institutionalization of the cluster if there is any wish to go towards this direction and the issue of funding may also take place at this stage as it will impact on the approach of the cluster and its duration in time.

9. Cluster-based Action Plan

The objectives of action plan are to:

- Help the cluster realize its vision;
- Plan committed resources and responsibility of each activity among cluster members;
- Monitor progress and address shortcomings.

The action plan format and timeline are flexible and should include the vision, status of cluster, cluster strategy and a list and details of activities to be carried out within a defined timeframe (short, medium and long-term), with the addition of expected outcomes and lessons learned from prior activities for the successive implementation periods. Most importantly, the action plan should be transparent and realistic with a consistent focus.

In summary, the action plan should cover the following items:

- Status of the cluster prior to intervention;
- Vision;
- Cluster development Strategy for the year;
- Details of activity to be carried out (name, primary/secondary objective of each activity);
- Type of activities:

The type of activities will be demand-led, requiring joint actions and should achieve multiple objectives (primary and secondary objectives). The plan should be implemented by supporting members and be well balanced to take into account the short and long-term activities among enterprises.

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<th>Lessons learnt:</th>
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<tr>
<td>Examples of specific activities in the Action Plan of the three projects:</td>
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<tr>
<td>Lao PDR – Thailand: <em>Electronic Data Exchange between Customs and Port in Bangkok; Assessment of the railway system.</em></td>
</tr>
<tr>
<td>Zambia – Namibia: <em>Communication among cluster’s members; facilitation of cross-border movements; Harmonization of axle load limits and reduction of arrests for violation.</em></td>
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<tr>
<td>Paraguay – Uruguay: <em>border document to be processed in 2-3 hours instead of 5 days; reduction of port tariffs applicable to containers using river transport in Montevideo.</em></td>
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10. The relation between the cluster and the corridor: Formulation of the Corridor-based cluster Action Plan

The clusters along the corridor should work together and exchange information, data and share lessons and experiences. From UNCTAD previous pilot project, the corridors selected had formed two to three clusters. These clusters should then cooperate and coordinate their respective actions in view of ensuring the integration and system-wide optimization of the corridor. The Corridor-based cluster Action Plan can be broken down into national-based cluster action plans. Conversely, on a bottom up approach, the compilation of all the national-based clusters action plans will define the Corridor-based cluster action plan.

The corridor cluster stakeholders could define the corridor-based cluster action plan which would then be integrated into national-based action plans to develop. Otherwise, the corridor-based cluster action plan would be defined from the national clusters-based action plans and use the corridor-based cluster action plan in the monitoring of performance and progress achieved on the corridor.

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<th>AT CLUSTER LEVEL</th>
<th>AT CORRIDOR LEVEL</th>
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<td>National-based cluster Action Plans</td>
<td>Corridor-based cluster Action Plan</td>
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<tr>
<td>Landlocked country</td>
<td>Corridor</td>
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<td>Border</td>
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<td>Transit country</td>
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11. Implementation

The implementation will stimulate demand-led changes and activities, which involve the full chain of cluster members, as well as build implementation capacities. The activities to be implemented need to tackle the core problem areas of the cluster. The steps are as follows:

- Identify willing and appropriate implementers;
- Split jobs with clear responsibilities;
- Motivate unwilling interested partners;
- Monitor regularly and provide support;
- Set guidelines for implementation;
- Selection of best intermediaries.

During the implementation process, assistance from intermediaries will be necessary and shall be motivated. The intermediaries could be transport association, network, support service provider or facilitation agency. However the selection of these intermediaries depends on the relevance of their current work vis-a-vis the activities, the willingness, the current linkages with the cluster members.

- Implementation responsibility

**Stage one.** Cluster members and CDA will have most responsibilities for the implementation. The CDA assists in formulating the cluster vision and drafting action plans, identifies cluster partners, enlists local support institutions, and undertakes capacity building.

**Stage two.** Cluster members agree to work together and commit to achieve cluster development. The CDA should delegate as much as possible responsibility to cluster members as they agree to take charge.

**Stage three.** Cluster members have stronger ties among themselves, thus should contribute significantly to the cluster’s activities. At the end of this stage, the cluster members are the sole responsible for implementation of activities as the CDA has completed its exit from the cluster.

12. Exit and signals for the exit of the CDA

Successful exit of the CDA is important to ensure a smooth transition of responsibility to cluster members. The signals may be:

- Cluster member understand their problems and causes;
- They know the various ways to solve these problems;
- They have developed a cluster vision;
- They understand their roles in cluster restructuring further to the exit of the CDA;
- They have developed capacities for joint actions.

13. Monitoring

Monitoring should be done periodically. The purpose of monitoring is to review the performance of the CDA, the progress achieved and, if necessary, introduce corrective actions.

14. Evaluation

This step is to evaluate whether the project is delivering its outputs effectively and efficiently, the cluster’s members have been empowered and if trade volume and competitiveness have increased. It also helps identify the exit period.

- Sustainability issues

Once the cluster is managed by its members only, after the exit of the CDA, it may face several issues which can impact on the sustainability of the cluster. However, it is important to note that the cluster is
not intended to last indefinitely. On the contrary, the lifespan of a cluster may depend on various parameters and, particularly, on the willingness of the members to pursue the work undertaken within the cluster. The main factors of sustainability are the funding issue and the institutionalization of the cluster.

➢ **Resource mobilization**

Funding is a crucial aspect as the cluster will not be able to perform without financial resources. Even though resources may include time, knowledge, as well as financial contribution from various parties, the latter remains the most acute problem. The implementation of each activity would not come free of charge and may involve resource commitment among cluster members and others. The source of funding could come from:

- Cluster members;
- Supporting Institutions;
- Associations and Networks;
- Donor Agency;
- Implementation Agency.

The contribution can be mixed and depends on each cluster. Resource contribution from cluster member can be envisaged as it would reflect the level of commitment to the cluster development. However, financial contribution from the members through fees may imply consequences and must be coordinated with public authorities as fees may already be leveraged by public entities such as the road funds and thus it is important to avoid any double taxation for the users of the corridor. Indeed, some ground rules should be followed with regard to resource mobilization:

- Low member support for short-term commercial action;
- High agency support for long-term high risk activity;
- Low support for repeated activity;
- High support to member with limited financial means;
- No support when benefits only to individual members.

➢ **Institutionalization of the cluster**

After some years of functioning, the members of the cluster may decide to extend the scope of action of the cluster and this through the formalization of the cluster. This may take place by joining existing official entities working on trade and transport facilitation such as Trade Facilitation Committees or observatories of corridors. It can also become a component of corridor management institutions such as Secretariat or Commissions. This will be upon the decision of the cluster’s members based on the way forward as well as the progress achieved.

<table>
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<th>Lessons learnt:</th>
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<tr>
<td>Sustainability will vary largely from cluster to cluster. Some may decide to stop as the joint actions are completed; some others may join formal entities working on the corridors and trade facilitation; some may want to implement financing mechanism through the payment of fees from each member or, at the contrary, rely on donors funding. All these issues will influence the sustainability of the cluster of which members should remain the sole responsible to decide about the way forward.</td>
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Summary:

The Cluster Development is a tool which should facilitate and promote the three preconditions for the efficiency of the corridor, e.g. information, dialogue and coordination. The cluster is a platform gathering all the stakeholders of the corridor at one level of the corridor in order to address the main issues faced by stakeholders at cluster level and improve the value chain process along the corridor.

The success of the model is based on the level of coordination and exchange of information among the identified clusters of the corridor. This is also important in order to build on the work generated at cluster level and develop a corridor-based action plan aggregating the action plans of all the clusters along the same corridor.

A methodology is proposed to achieve concrete objectives and thus allow a dynamic collaboration of cluster. This methodology is formulated based on lessons learned and experience of UNCTAD pilot project on corridors in three different regions in the world (described in ANNEX I).

This Cluster approach has the main advantage of bringing flexibility in the system. Indeed, the structure of the cluster should be selected by the members themselves and the organization of the activities should also be guided by the interest of all members according to their opinions and views on the cluster. The methodology remains indicative and includes the best practices so that it can be used as references and guidance for the cluster members in benefit of greater performances of the transit transport corridor.
2. The UNESCAP Time/Cost-Distance Methodology

Trade, transportation, and development are by no means unrelated. Obviously, trade, whether within a country or overseas, is dependent largely upon various logistics networks and corridors, on the sea, on inland waterways, across the land, or in the air. Wherever economic activities are distributed in space, transport systems create transactions supported by distribution systems. This also means that whenever the economy is developing, the transactional demand will grow.

A national or regional logistics system is based on the interaction between (1) shippers, traders, and consignees; (2) public, private sector logistics and transport service providers; (3) provincial and national institutions, policies, and rules; and (4) transport and communications infrastructure. This conceptual approach is critical for the developed cluster group in their understanding of a corridor’s context.

Figure 6 shows how these four dimensions will need to combine in order to determine the performance of each part of the logistics system within a given geographical area in terms of cost efficiency, time responsiveness, and reliability. These 3 performance dimensions can reflect both on the level of integration of the macro–level logistics system and logistics services capability within the selected area. The sum of all these factors will determine the capability of the macro-level national and/or regional logistics system.

Figure 6: Macro-Logistics System Components

However, the data collected based on such reference framework can provide an initial evaluation of the capability of the macro-logistics system as well as its strengths and weaknesses. Nonetheless, this will enable cluster groups to obtain a broad view on what are some of the logistics issues involved.

Data related to the service providers, infrastructure and institutional framework is widely available on the internet such as in the “Doing Business” or in the “Logistics Performance Index” both maintained by the World Bank.

15 www.doingbusiness.org
2.1 Building consensus on the Time/Cost-Distance Methodology application for a particular corridor

The Time/Cost-Distance Methodology is the graphical representation of cost and time data associated with transport processes within a corridor. The purpose of the methodology is to identify inefficiencies and isolate bottlenecks along a particular route by looking at the cost and time characteristics of every section along a route.

The Time/Cost-Distance Methodology enables policy makers to:

- Compare, over a period of time, the changes of cost and/or time required for transportation on a certain route;
- Compare and evaluate competing modes of transport operating on the same route; and,
- Compare alternative transit routes.

The Time/Cost-Distance Methodology includes a detailed break-down of cost and time spent, for example, associated with border crossings. This may be particularly useful to policy makers focusing their policy approaches on the most critical issues related to transport. In addition, the inclusion of data on inventory costs for particular commodities, demurrage charges and other indirect costs may be useful to specific export/import industries in evaluating their logistics performance.

The use of the Time/Cost-Distance Methodology allows national stakeholders to track time and cost issues along transport routes. Thereby it helps to identify bottlenecks and barriers in international transport. The information on time and cost involved on certain routes informs general transport facilitation policy decisions (e.g. route prioritization, allocation of funds, allocation of socio-economic development efforts).

In order to assess a particular corridor, it is important for the cluster to agree upon the usage of the Time/Cost-Distance Methodology. The Time/Cost-Distance Methodology is the tool to measure corridor performance as it can reflect cost, time and reliability dimensions in an easily understandable manner.

A corridor approach is therefore needed to reflect the specificity of a location or a given geographical area. Corridor development combined with enhanced efficiency and efficacy can further accelerate economic growth in the given geographical area. In any given corridor all relevant stakeholders aim to work together to ensure the efficient and secure flow and storage of freight along specific routes in the corridors through a cluster development approach that is combined with a corridor performance assessment tool.

It is important when assessing the performance of a corridor that an understanding of the corridor infrastructure or the “hardware” is made; such as the availability and capacity of roads, railways and inland waterways both within a landlocked country if applicable and the accessibility to the neighbouring transit countries ports. The scope of the infrastructure assessment should be at least up to the port of export or import in the transit country. This initial assessment will be used as reference in the application of the Time/Cost-Distance Methodology.

2.2 Cluster members’ agreement on the application of the Time/Cost-Distance Methodology

The cluster members have to not only agree on the application of the Time/Cost-Distance Methodology but also have to identify the broad outline of the corridor. A clear delimitation of the origin and destination of the corridor under study must be agreed upon. This will help define the corridor
assessment scope. Such assessment will provide an indication of the transport infrastructure and nodal links to be appraised in terms of capacity and efficiency. Knowledge of surrounding transport infrastructure is important but not as vital as having a strong understanding of the transport infrastructure in specific corridors. For a many country, road is often the dominant mode of transport to and from seaports. It is therefore critical to understand the nature, capacity and efficiency of roads that are utilised for transit traffic.

When the preliminary assessment has been conducted, the cluster can then further focus on three key issues related to the utilisation of the Time/Cost-Distance Methodology. This will require the cluster to obtain agreement upon these issues.

1. The survey method

It is important for cluster members to agree upon the survey method for the utilisation of the Time/Cost-Distance Methodology. The survey approach will very much depend on the existing corridor context and purpose for methodology application. If respondents can willingly and freely provide data then a self-answering questionnaire may be possible but more often than not it will be necessary for the cluster to obtain direct access to identified respondents either via face-to-face meetings or databases. Ease of access will often depend on the existing business network between cluster members and respondents.

It is possible that cluster members themselves are also the main respondents for the application of the Time/Cost-Distance Methodology. It is critical for the success of the Time/Cost-Distance Methodology that primary data related to cost, time and reliability are collected.

2. Institution for study

The issue of neutrality when conducting such survey is often quite critical as it can be considered that cluster members are biased towards their own perspective. In order to reduce the risk of bias it will be necessary to identify a neutral body that could conduct the survey and present the findings to the cluster group. The recognition of the role of the identified neutral body could help in the ease of data collection as well as making respondents more comfortable when answering key questions related to costs or other sensitive issues.

Initial contact can be made via the cluster members but the actual conduct of the Time/Cost-Distance Methodology should be done through an independent third party. Universities and research institutes can be selected in the application of the Time/Cost-Distance Methodology, as there is no issue related to conflict of interest in doing the research. Clusters do not need to conduct the research themselves but can use the output of the Time/Cost-Distance Methodology in improving corridor performance.

3. Data sources

Data sources can be either secondary or primary. However, in order to obtain the most precise data, an emphasis on primary data sources is important. Empirical evidence, even anecdotal, can provide more insights than existing secondary data may have been compiled for a different purpose.

2.3 Defining the commodity for Time/Cost-Distance Methodology

1. The Pareto rule

In any given corridor, there is a need to identify freight flows. The type of freight moving along a corridor can provide a good indication of its performance as depending on commodities specific rules or

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17 For details of survey methods, see Section 2.4.
constraints that may affect its ease of movement as it may fall under different administrative jurisdiction. However, it is not practical to survey all existing freight flows within a corridor.

The proposed approach is to use the Pareto rule of 20/80 which basically means that 20% of the commodities will represent around 80% of the traffic flow in the corridor. This means that in order to assess the performance of a corridor, it is necessary to explore which are the main types of commodities that are using the corridor within a given year.

A possible rule of thumb would be to select the top five commodities of import and/or export as it would usually cover more than half of the total freight flow along any given corridor. If those commodities are using specific modes of transport such as pipeline or electrical cables then the next ranked commodity will need to be surveyed.

Table 7: Template for Commodity ranking

<table>
<thead>
<tr>
<th></th>
<th>Commodity</th>
<th>Value</th>
<th>Volume</th>
<th>Transport Mode</th>
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<td>1</td>
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2. Seasonality patterns

Freight flows within a corridor is seldom static and the dynamic behaviour of freight flow patterns needs to be understood as it often related to capacity bottlenecks with a corridor. Seasonal changes in freight flow patterns often occur with agricultural produce or other types of commodities that are required during certain period of the year.

These changes in patterns can drastically change the efficiency and efficacy level of the corridor under study by the cluster. During peak season the corridor may be overloaded and subject to extreme congestion while during the low season the facilities in the corridors are mostly idle. It is therefore important for the cluster to understand commodity seasonality when assessing corridor performance under the Time/Cost-Distance Methodology.

3. Means of transport

The means of transport refers to the vehicle used for transport, e.g. ship, truck, or aircraft. In a corridor the usual mean of transport will be trucks. However, this is not sufficient in terms of corridor assessment as the types of means of transport are also important to know. What are the types of vehicle used in the transport process, e.g. wide-body, tank truck, trailers, 6-wheel trucks, pick-up trucks, etc.

The knowledge of the main means of transport and its types will provide information for cluster members to also look at the existing type of traffic in the corridor.

2.4 Selection of data collection methods

When the top five commodities have been identified, it is therefore necessary to collect primary data that will be utilised in the Time/Cost-Distance Methodology, however, much of the data needed is usually not
publicly available. The reliability of the Time/Cost-Distance Methodology depends very much on the type of data available. There exist two possible cases related to data collection.

In case 1 the available data is scarce then it will be necessary to try to obtain quotes from logistics service providers in relation to their operations within the corridor. However most of their quotes will be all-inclusive and do not provide the necessary details for the Time/Cost-Distance Methodology. It is therefore important concurrently interview traders and related government agencies on the cost associated with using the corridor. If there is a border crossing, then border crossing cost and time data will need to be collected from all possible sources relevant to the commodity surveyed.

In case 2, if all the cost and time data is available then it would be of great use if multiple sources of data are used. This means that data can then be collected from the most active logistics service providers in the corridor as well as all related charges and fees are transparent. The data can be derived from actual shipments moving along the corridor.

The most common situation is often a combination between both cases data. In this situation, it is best to obtain quotes from at least two to three logistics service providers in order to obtain a range of cost and time data for each types of commodity surveyed. This would enable a more precise description of the performance of the corridor. Hereunder are five proposed data collection methods that could be utilised when applying the Time/Cost-Distance Methodology:

1. Corridor-wide monitoring based on drivers’ trip diaries or questionnaires filled by truck drivers

The relative strength of this data collection method is very much based on the fact that it is the truck drivers who are actually providing the data related to the time and cost involved when driving along the corridor. The truck drivers are probably more knowledgeable about what is happening within the corridor they are plying their trade.

However this approach is subject to limitations as drivers may not feel comfortable in providing accurate time and cost data as it may either affect their livelihood or job security. It is also possible that the truck drivers may not have the discipline to consciously fill in their trip diaries or questionnaires.

2. Bottleneck monitoring based on independent surveys

The success of this method collection method will depend on the access provided to the independent surveyors in terms of being able to not only observe border-crossing time but also to interview stakeholders involved in border-crossing activities. The strength of this approach is very much on its capability to provide a relatively accurate snapshot of the situation at a border crossing but that picture may not reflect the reality behind the obtained numbers.

3. Corridor-wide monitoring based on interviews of freight forwarders, shippers, consignees and a partnership with port authorities and/or Customs

This is probably one of the most commonly used data collection methods as it enables the involvement of key corridor stakeholders or even cluster members to play a role in providing data that will be used in the application of the Time/Cost-Distance Methodology. The obtained data will mostly be declared rates and quotes and may not reflect the actual cost of the service provider in their corridor operations. The issue of confidentiality of data and conflict of interest among stakeholders may also occur with such data collection methods. This is why the use of an independent third party may be critical for the success of such data collection method.

4. Demonstration-run

A demonstration run enables cluster members to actually observe what is happening with a corridor. The time and cost data will reflect the actual situation when the demonstration run is moving along the
corridor. However, the main problem with a demonstration run is that usually everything goes smoothly within the corridor because of the demonstration run. The actual issues and bottlenecks may not be identified during such a run as vested interest may prefer to present a better picture than in reality.

5. Secondary sources

The use of secondary sources can be used as an initial insight into a corridor performance. However, there is a lack of secondary data on corridor performance around the world. The existing secondary sources are scattered among numerous agencies and are not publicly available. The use of secondary data is also dangerous when the context of the secondary data is not understood.

6. Customs database or operators’ satellite positioning record

The use of new technology can be helpful in providing data to be used in the Time/Cost-Distance Methodology. A Customs database could theoretically provide information related to cost and time taken at the border, amount of time when goods are in transit but this will depend very much on the type of Customs database in place. The usage of Satellite Positioning System technology is also interesting, especially for time related data but the cost data will probably be missing.

There is no perfect data collection method. The cluster groups will have to select the most appropriate data collection method according to their respective context. It is also recommended that the cluster groups explore the possibility of using more than one data collection method in their application of the Time/Cost-Distance Methodology in order to reduce the limitations of each method.

2.5 Data collection

The data utilised when applying the Time/Cost-Distance Methodology need to be based on cost/quotes or transit time components that are obtained through various data collection methods as described here-over. The challenge is that these data are not usually publicly available but are of critical importance for the assessment of the corridor in terms of time and cost efficiency. However, depending on the quantity of goods transported, lower quotes may be possible that is why the data collected need to be not only commodity but also volume specific.

Data on transit times offered for each transit route and the variation in delays at critical nodal links must also be obtained from the same group of respondents. The minimum information needed to build the Time/Cost-Distance model\(^\text{18}\) includes (please refer to table 8):

- The origin and destination of the cargo;
- The full routing from origin to destination, with indication of the places where the cargo is essentially stationary (such as border crossings and points of intermodal transfer);
- Mode of transport for each leg;
- Distances involved for each leg;
- Transit time for each leg (in hours or days);
- Cost or quotes for each leg;
- Average traffic volume per day;
- Breakdown of different vehicles types and age;
- Breakdown of different vehicles fuel types; and
- Average load in ton.

A single respondent that is able to provide full cost and time data for a single shipment could provide an invaluable catalyst for the cluster itself.

\(^{18}\) The Time/Cost-Distance Model is the application of the Time/Cost-Distance Methodology for a particular transport corridor or route.
2.6 Data validity

Triangulation is the use of multiple methods in the study of the same object. The main objective of using triangulation or the use of multiple research methods is described as a plan of action that will raise researchers above personal biases that stems from single methodology. The use of triangulation as a technique may involve a variety of data, investigation techniques, theories or methods when conducting research. It is believed that triangulation will increase the research scientific rigour. There are basically four types of triangulation:

- **Data triangulation**, by using different data sources (not methods of generating data).
- **Investigator triangulation**, by employing multiple observers for the same phenomenon.
- **Theory triangulation**, by approaching empirical materials from various perspectives, theoretical framework and interpretations.
- **Methodological triangulation.** There exist two forms of method triangulation:
  - **Within** method triangulation is employed by choosing one method and employing different strategies to examine data;
  - **Between** method triangulation is on the other hand used when combining dissimilar methods to investigate a set of data.

The rationale for using triangulation in research is closely related to the issue of validity. In transport and logistics research, validation is conventionally equated with a different sort of replication that is called triangulation: the use by the investigator of different methods to produce the same findings. Triangulation can help capture a more complete, holistic, and contextual portrayal of the problem under study.

Nonetheless, triangulation is a useful technique when used carefully and purposely-in order to add breadth and depth to the research, but not for the purpose of pursuing the “objective” truth. In the Time/Cost-Distance Methodology, it is possible to use different types of triangulation approaches in order to obtain a more accurate description of corridor performance. This will enable cluster members to be more confident in terms of the reliability and validity of the collected data.

2.7 Sampling

The collection of one sample may not be sufficient to reflect what is actually happening within a corridor. There exist two options in terms of sampling approach in the Time/Cost-Distance Methodology.

1. Multiple shipments of same product from single firm:

   Data is collected from the same firm for the same type of product. It is possible that the volume may be different for each shipment but the idea is to obtain a picture that is as accurate as possible for the responding firm perspective.

2. Multiple shipments of same products but from different firms:

   This sampling approach could provide some interesting insights in terms of the possible variation in terms of cost and time in a corridor without explaining the rationale behind those variations.

In terms of sampling approach, the most appropriate method will depend on the purpose of the corridor assessment. If the purpose of the corridor assessment is the try to be as precise as possible then focusing on multiple shipments of same products from single firms should be preferred. However, if the objective
is to explore the variance in terms of time and cost then the second sampling approach would be more appropriate.

2.8 Data processing

The obtained cost and time data is plotted against the distance for each leg of the journey. In the case of costs or quotes, the methodology will graphically show the relative cost of each leg (or mode, where applicable), as well as indicate the approximate proportion of non-transport costs in relation to transport costs.

Similarly, by plotting time against distance, the relative speed of transit transport for each leg (or mode) can be compared, and the bottlenecks at transhipment points can be identified. As a rule of thumb; the higher the vertical step the more likely that the border crossing or the nodal link is a bottleneck in the logistics corridor.

This Time/Cost-Distance model can be done through the use of a detailed logistical activity map of specific products moving within a given logistics corridor. The following table is a template for the data that is needed to draw the logistics cost and time map. This table is similar to a simplified process activity map.

<table>
<thead>
<tr>
<th>Activity No.</th>
<th>Average Time</th>
<th>Range Of Time</th>
<th>Average Cost</th>
<th>Range Of Cost</th>
<th>Actors</th>
<th>Documents/ Operations</th>
<th>Distance (cumulative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the data is collected for a particular commodity along a particular corridor, the data can be graphically illustrated in a corridor cost and time model. This model will help describe the cost and time components of movement from origin to destination by each available route and mode as well as to illustrate the delays at borders or other inspection points up to the point of destination within a given logistics corridor. Further information, for example, a breakdown of costs at border crossings or ports, can highlight areas for action by policy makers.

These costs will also be broken down to reflect different types of charges or processes involving time, such as document fees, transit charges and cargo clearance costs. In this regard, bottlenecks at points of transhipment can be analysed in themselves and as part of the overall corridor. The use of a similar simplified process activity map for data collection will be needed but with a focused scope dedicated to border crossing and/or port operations.

The Time/Cost-Distance Methodology includes costs and time associated with transport by any mode (road, rail, inland waterways and sea) and with transfers between modes (at ports, rail freight terminals and inland clearance depots) as components. The methodology is based on the premise that the unit cost of transport varies between modes and this will be reflected in the cost curves. In terms of volume movements, sea transport is generally cheapest per tonne per kilometre and road transport is normally the most expensive, with transport by waterway and rail in an intermediate position.
This graphical output may be used as a useful tool in the debate over the value of time in freight transport operations by analysing transit times by mode and route. The longer freight takes to reach its destination (including dwell times at terminals), the greater will be the implicit interest costs of working capital. Total implicit costs may, however, be a good deal higher, since some goods may be needed more urgently and business may be lost if goods arrive too late.

The value of time will ultimately depend on the nature of the commodities being transported and the cost of delays must also be taken into account when appraising the risks attached to specific routes and transport modes. As part of the corridor analysis, it is important to examine the trade-off between the monetary outlays for transport and the implicit costs of time. Points of transhipment, at border crossings or between modes, are incorporated into the cost curves as vertical steps. For example, at ports and inland terminals, a freight handling charge is levied without any material progress being made along the logistics corridor; therefore, the costs incurred here are represented by a shift upwards in the cost curve at these points. The height of the step is proportionate to the amount of the charge.

The Time/Cost-Distance model will need to be used by clusters as a mean of describing the current situation of a corridor and its bottlenecks. The results of the Time/Cost-Distance model can be further analysed to find the root cause of the problems encountered in a corridor. Clusters can then use the analysis to devise strategic and operational actions to remedy the situation.

### 2.9 Graph development

The Time/Cost Distance model may be considered in four developmental stages, from its basic form (figure 7) through two intermediate stages (figures 8 and 9) to its final form (figure 10). These figures are presented in more detail here below.

*Model Basic form:* Figure 7 shows the distance and cost/time data plotted on the x-axis and y-axis, respectively. As can be seen, initially road transport may be cheaper than rail transport over shorter distances, due to the initial costs (or time) required transporting the goods to the railway station. However, as the distance increases, the two lines cross and beyond this point, rail transport has a lower per kilometre cost than road transport, as indicated by the flatter slope.

*Figure 7: Unimodal alternative, road versus rail*

![Figure 7: Unimodal alternative, road versus rail](image-url)
**Intermediate stage one:** Competition between just two modes of transport is somewhat simplistic. In reality, a combination of transport modes can also provide a competitive solution, where the cost of transport by combining both modes is less expensive than just road transport and slightly more expensive than rail transport.

In the first part of the journey, it is cheaper to transport the goods by road rather than by rail. However, if the distance to be travelled is further than the break-even distance, transport by rail becomes more economical. Therefore, an intermodal transfer can be arranged at the closest rail freight terminal or inland container depot (ICD). The vertical step in figure 8 represents the costs (or time) involved when goods are transshipped from road to rail at the rail freight terminal or ICD. The cost of rail transport, in reality, has not increased but the cost of the intermodal transfer is reflected in the combined transport cost from that point on.

*Figure 8: Combined transport, road-rail*

**Intermediate stage two:** Since the overwhelming majority of traded goods are transported by sea, the most likely destination for the freight in transit within a logistics corridor will be a seaport, where the goods will be transferred onto seagoing vessels. In figure 9, the additional costs (or time) incurred at the port are represented by the second vertical step. Thus, cumulative costs from the origin to the port are the sum of the cost of rail transport to the ICD plus the cost of intermodal transfer at the ICD plus the cost of rail transport from the ICD to the port plus the handling charge at the port.
### Figure 9: Combined transport, road-rail-sea

<table>
<thead>
<tr>
<th>Origin</th>
<th>Sea Port</th>
<th>Sea Port</th>
<th>Railfreight terminal or ICD</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of Intermodal transfer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port Handling Charge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Figure 10: Corridor from origin to destination

<table>
<thead>
<tr>
<th>Origin</th>
<th>ICD</th>
<th>Sea Port</th>
<th>Sea Port</th>
<th>River Terminal</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermodal transfer, road to rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port handling charge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea Port</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inland Waterway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transhipment to barge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transhipment to truck</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unloading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Final stage:** The final stage of the model, as illustrated in figure 10, shows that numerous modes of transport may be involved for goods to be moved from origin to destination. At each intermodal transfer point there will be a cost (or time) increase represented by a vertical step, which will be cumulated with the transport and other costs that have been incurred up to the point. Should a border crossing occur along the route, the border crossing charges (and time spent) can be represented by another vertical shift upwards in the cost curve at that point, which can then be cumulated with other incurred expenses.
Reliability:

The Time/Cost-Distance Methodology also considers the issue of reliability corridor performance assessment. However, reliability is not presented in a graphical manner but through a 5 point scale system. The measurement of reliability for each mode of transport, intermodal transfer, border crossing and other nodal activities is done via a perception of reliability index. This perception of reliability index is based on a five point scale: (1) = Perceived to be not reliable; (2) = Perceived to be not very reliable; (3) = Perceived to be fairly reliable; (4) = Perceived to be reliable; and (5) = Perceived to be very reliable. This perception of reliability index tries to capture some of the uncertainties involved in corridors. These ratings reflect the subjective values of the decision makers and related stakeholders.

This qualitative assessment can be conducted by clusters. Clusters can be assumed to be knowledgeable about international trade transactions, transport operations, documentary procedures, rules and regulations in their respective countries or region. Clusters can intuitively assign a rating for each transport mode, intermodal transfer charge, border crossing and other nodal activities. This intuition is based on clusters immersion in the history, culture, politics, experience in trading practices, transport operations, administrative procedures of their own country and up to a certain extent of their own region.

This perception of reliability index or rating is accurate as long as the national and regional environment has not changed. It is very important to continually assess and monitor the situation along the corridor under study. Turmoil in a country, changes in national or regional policies or infrastructure upgrading can have a significant impact on the selection of a particular logistics corridor. If changes occur, then there will be a need to re-evaluate which corridor is the most effective and efficient under the new circumstances. This re-evaluation can be done by following the same risk assessment approach.

If this approach is considered to be too cumbersome then it is possible to use insurance interest premium as a reference point in relation to reliability as the higher the interest premium, the higher the risk.

The graphical models obtained for each commodity can be used by the cluster group as a reference point in relation to the performance of the corridor. The obtained range or variation in transit time and cost can also reflect on the level of reliability for the movement of a particular commodity with the corridor. The higher the variation would mean a higher level of uncertainty.

1. Identification of bottlenecks along corridor

All the vertical steps illustrated in the graphical output of the Time/Cost-Distance Methodology are representations of location along a corridor when goods are not moving for whatever reasons. These bottlenecks are identified in terms of cost, time and reliability. The objective is to be able to reduce these bottlenecks.

2. Detailed composition of bottlenecks

It is important to obtain an in-depth understanding of corridor bottlenecks. The detailed composition of a bottleneck can be done through the use of the same process activity mapping at a more refine level. This is done by deconstruction all the processes involved at the bottleneck location. The output could be a detailed process activity map with clearly defined impact of each activity undertaken in the bottleneck.
Table 9: Bottleneck simplified activity map

<table>
<thead>
<tr>
<th>No.</th>
<th>Bottleneck activity</th>
<th>Average Time</th>
<th>Range Of Time</th>
<th>Average Cost</th>
<th>Range Of Cost</th>
<th>Actors</th>
<th>Documents/Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results from the bottleneck activity map can be represented in terms of time and cost as in the example illustrated in figure 11 hereunder. The level of details will depend very much on the precision of the collected data.

Figure 11: Example of bottleneck analysis

<table>
<thead>
<tr>
<th>Time</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customs clearance 20%</td>
<td>Customs clearance 30%</td>
</tr>
<tr>
<td>Immigration 20%</td>
<td>Immigration 10%</td>
</tr>
<tr>
<td>Technical control 15%</td>
<td>Technical control 10%</td>
</tr>
<tr>
<td>Sanitary Phyto-sanitary 15%</td>
<td>Sanitary Phyto-sanitary 40%</td>
</tr>
<tr>
<td>Other 30%</td>
<td>Other 10%</td>
</tr>
<tr>
<td><strong>TOTAL</strong> 100%</td>
<td><strong>TOTAL</strong> 100%</td>
</tr>
</tbody>
</table>

2.10 Detailed instructions for the Time/Cost-Distance Methodology with Microsoft Excel

The following instructions explain how to use the Time/Cost-Distance Methodology step-by-step\(^\text{19}\). The questionnaire for the application of the Time/Cost-Distance Methodology captures qualitative and quantitative information. The information required for every line of the questionnaire will be explained hereunder. Here is the preliminary information required:

- Decision on a corridor including place of departure, any kind of stops (e.g. border crossings) and final destination
- Decision on the type of goods transported (e.g. specification if only one kind or multi-packaging of goods) as well as on the quantity and/or value.
- One possibility to obtain the required data would be to directly contact transport operators and/or freight forwarders involved in cargo transport along the specified route. The national freight forwarders association may help to identify relevant transport operators or freight forwarders.

Please fill out all of the highlighted cells in Part A and Part B of the questionnaire.

\(^{19}\) Please note: The Time/Cost-Distance Methodology requires the installation of Microsoft Excel Software on your workstations.
- Navigate on each worksheet by moving the bars on the right side and on the lower part of the worksheet.
- Navigate between the worksheets by clicking on the various tabs on the bottom of the page.

*Figure 12: Screenshot of Time/Cost-Distance Methodology Excel questionnaire template part A*

<table>
<thead>
<tr>
<th>Questionnaire for Application of UNESCAP Time/Cost-Distance Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date of questionnaire completion:</strong> [date of filling out the questionnaire]</td>
</tr>
<tr>
<td><strong>Route description:</strong> [detailed route description]</td>
</tr>
<tr>
<td><strong>Goods:</strong> [type of goods(s) transported]</td>
</tr>
<tr>
<td><strong>Quantity:</strong> [TEU]</td>
</tr>
<tr>
<td><strong>Nationality of driver:</strong> [only applicable when road]</td>
</tr>
<tr>
<td><strong>Country of vehicle registration:</strong> [only applicable when road]</td>
</tr>
<tr>
<td><strong>Effective date of transport start:</strong> [date when transport leaves the place of departure]</td>
</tr>
<tr>
<td><strong>Effective delivery date of goods:</strong> [date when transport reaches the final destination]</td>
</tr>
<tr>
<td><strong>Was the transport performed under an international transit system [e.g. TIR, NCTE]?:</strong> [yes/no, please specify the type of international transit system applicable]</td>
</tr>
<tr>
<td><strong>Overall distance of route:</strong> 0 km</td>
</tr>
<tr>
<td><strong>Overall costs:</strong> 0.00 USD</td>
</tr>
<tr>
<td><strong>Overall duration:</strong> 0.00 days</td>
</tr>
</tbody>
</table>

The worksheets “Part A - General Questions” and “Part B - Route” require your input and information. Please fill out the highlighted cells only.

### 2.10.1 Questionnaire Part A-General Questions

- **Date of questionnaire completion:** Please insert actual date
- **Route description:** Either the route analysed is already provided or please fill in the detailed information starting with place of departure, over main cities en route, junctions or highway numbers to place of final destination.
- **Goods:** Please enter the type of goods transported (single type of goods vs. multiple types of goods)
- **Quantity:** Please enter the quantity of goods transported. (If multiple goods then please indicate quantity by type of good.)
- **Nationality of driver** and **Country of vehicle registration** refer to transport by road only. In case of multimodal transports along the route please name nationalities of all drivers and vehicles involved.
• “Effective date of transport start” and “Effective delivery date of goods” refer to the dates, when the transport physically leaves its place of departure and when then goods physically arrive at their destination.
• “Was the transport performed under an international transit system (e.g. TIR, NCTS)?”: Please reply with “yes” or “no”. Please also specify, which international transit system has been applied.
• Overall distance of the route: No data entry is required, as it is automatically calculated as the sum of the length of the individual sections of the route (based on the data of Part B).

2.10.2 Questionnaire Part B-Route

The following figure illustrate in detail how to fill out the template for the actual route. Please read each part top–down. Each part captures one section/leg of the journey (i.e. from one stop to another). Overall the template provides space for up to 20 stops from departure to final destination along one route. Please repeat the steps that are explained here as many times as necessary to provide information on the whole route including all stops.

- Place of departure: Please insert name of city and name of country.
- Mode of transport: Please choose from the drop-down menu, if the used mode of transport is “road”, “rail” or “ship”.
- Distance to next stop: Please insert the distance from the place of departure to the first stop on the route.
- Duration of travel: Please fill in the duration of the journey from the place of departure to the first stop. Please specify hours and minutes.
- Costs per leg: The costs per leg (or for each section of the overall journey) refer to the variable costs on that particular leg. Please insert all costs related to the transport while being en route on that particular section, but exclude costs at stops.
- Place of next stop: Please insert name of place (e.g. Name of city or village, junction or highway km) and of country
- Reason for stop: Please choose the most suitable reason from the drop-down menu. (“Intermediate stop” refers to all stops except place of departure, border crossings and final destination.)
- Description of stop: Please provide a short description of the individual activities undertaken at the stop, including their duration and the costs associated.
- Description of actions: Please provide additional relevant information.
Please note that from “Leg 2” onwards, the template automatically fills in the field for “Place of departure”, because this information represents the “Place of next stop” of the previous route section.

2.10.3 How to plot the graphs

The individual charts “Time over Distance” and “Cost over Distance” are plotted automatically as a function of the information you entered into the highlighted cells on worksheets “Part A – General Questions” and “Part B – Route”. The two charts are on separate worksheets in the file (please navigate between worksheets with the tabs):

- The time chart is on worksheet named “Graph Time–Distance”.
- The cost chart is on the worksheet called “Graph Cost–Distance”.

Figure 13: Time/Cost-Distance Methodology questionnaire template part B
Figure 14: Time-Distance output

Figure 15: Cost-Distance output
2.10.4: Data and graphs interpretation

The y-axis represents either the time or the cost incurred, while the x-axis represents the distance from origin to destination. It is also possible to have two y-axes, one for time and one for cost. Additional worksheets also contain a worksheet with time and cost depicted in one graph, data tables required to plot the graphs and background information for the drop-down menus. The unit costs and the time allocation of transport may vary between modes as well as over time, and the steepness of the cost/time curves reflect the costs (price) and/or time per distance.

The steeper the curve, the more time consuming or costly is a transport along the analysed route. Vertical steps in each curve indicate a sharp increase of time/cost without an increase in distance (i.e. without movement of the transport).

Vertical steps typically occur at stops (e.g. border crossings) and they indicate inefficiencies or bottlenecks on a transport route, since the larger the vertical step, the more time/cost are used for activities undergone at a stop.

The analysis can compare the efficiency between different stops along one route, since the graphs make visible differences in time/cost consumption. The degree of difference illustrated through the height of the bars reveals outliers and draws attention to potentially critical issues.

In conjunction with other data compiled with the Time/Cost-Distance Methodology it is possible to compare cost and time allocation at one stop during the transport with the cost and time allocation at the same stop, but occurring during another transport.

2.11 The next step in corridor assessment: the environmental and social dimensions

Corridors have a direct carbon impact in that it facilitates an increase in traffic, and it has an additional induced carbon impact in that it facilitates land use change and deforestation by providing access to previously inaccessible landscapes. In order to identify the impacts of a corridor and the focus of potential interventions, it is important to first understand where green-house gas (GHG) emissions are likely to arise as a result of the corridor. An estimate of carbon for a corridor would need to consider GHG emitted as a direct result of each of the different stages of corridor development, as well as the induced emissions arising as a result of corridor outcomes.

However, accounting for and measuring all the various sources of carbon that may be emitted as a result of a given corridor may not be feasible as it is important to consider all the significant sources of emissions resulting from the corridor and to understand which interventions could achieve the greatest reduction in carbon emissions. The main sources of emissions across a corridor occur during the ‘use phase’ and should include emissions from increasing traffic along the corridor.

The objective is to be able to achieve a carbon neutral corridor. This is the area surrounding a corridor that realizes net zero greenhouse gas emissions against a baseline through a parallel process of reducing emissions through increased efficiency, and offsetting unavoidable emissions through protection and enhancement of ecosystems and increased natural sequestration.

The other important issue which is to be addressed in the course of action to improve the efficiency of transport corridors is the social dimension of corridor development, including, without being limited to, matters of transport safety and security, poverty alleviation, creating additional possibilities for people employment, combating illegal human trafficking, etc.
2.12 Use of data processing results by clusters

It is important to note that the best obtained performance in terms of cost and time should also be used as a benchmark for corridor performance level target setting. However, setting targets can be dangerous if there is a lack of understanding in relation to the operations and processes involved within the assessed corridor.

1. Identification of reasons behind delay and high cost

The data collected and the generated graphs under the Time/Cost-Distance Methodology only provide cluster members with the existing symptoms of delay and/or high within a corridor. It is necessary to help cluster members in identifying the root cause behind such delay and cost. One possible technique that may be used in conjunction with the Time/Cost-Distance Methodology to help identify the cause of such effect is to use the “5 Whys” technique.

The “5 Whys” is a question-asking technique that needs to be used together with the fishbone diagram to explore the cause and effect relationships underlying a particular problem. The primary goal of the technique is to determine the root cause of a defect or problem.

**Box 2: Example of the “5 Whys” technique**

<table>
<thead>
<tr>
<th>Question</th>
<th>Example of answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Why are there delays at the border?</td>
<td>Because clearance is slow</td>
</tr>
<tr>
<td>2. Why is clearance slow?</td>
<td>Because they have to check the accuracy of documents submitted by exporter</td>
</tr>
<tr>
<td>3. Why does the control authority have to check the accuracy of documents submitted by exporter?</td>
<td>Because there are many errors in the documentation provided by the exporter</td>
</tr>
<tr>
<td>4. Why are there so many errors in the documentation provided by the exporters?</td>
<td>Because exporters do not understand data requirement for export documentation</td>
</tr>
<tr>
<td>5. Why do exporters not understand data requirement for export requirement?</td>
<td>Because there has been a lack of public dissemination related to data requirement for export.</td>
</tr>
</tbody>
</table>

Based on this “5 Whys” technique it can be inferred that the root cause of border delays come from a lack of explanation and dissemination of export data requirement.

The example given in Box 2 may seem simplistic but this technique is extremely powerful as it will help cluster member reflect on what are the actual bottleneck causes in their respective corridor. Clusters may not be able to deal with all the causes but at least clusters will be able to gain further in-depth understanding of the issues causing bottlenecks.
2. Strategic Action Plans

When the root cause of the problems has been identified, the cluster members can then start devising strategies to help solve the problems. However, the root cause may be outside of cluster members’ jurisdiction and therefore would require cluster members to raise such problems to competent authorities in order to address such issues. This could become challenging for clusters as members would not be able to solve the real cause of bottlenecks in corridors.

3. Operational Action Plans

It is important for the obtained data and Time/Cost-Distance model output to be further disseminated outside the cluster group for transparency purposes. This will enable the trading community, the logistics service industry as well as government agencies along the corridor to appreciate the efforts done by the cluster group in improving the performance within the corridor.

Summary:

The Cluster Methodology and the Time/Cost-Distance Methodology presented in this cross border and transit transport toolkit is a valuable tool that enables corridor stakeholders to not only better understand corridor performance but also work cooperatively in order to improve corridor performance.

Clusters will be able to play a key role in formulating strategic and operational plans to improve corridor performance and thus facilitate trade. Improved corridor performance and trade facilitation is part of the rationale for the establishment of clusters. Success of clusters can be measured by a reduction in corridor cost and time as well as increased reliability.

The Time/Cost-Distance Methodology is the main assessment tool that will help clusters monitor and assess corridor performance. Corridor benchmarking over time will be important in measuring corridor improvement in terms of cost, time and reliability.

References


ANNEX I: Examples of Clusters Development

1. Lao PDR – Thailand Corridor

Cluster Members:

Bangkok cluster
Marine Department (MT), Department of Land Transport (MT), State Railway Authority (SRT), Port Authority of Thailand, Royal Thai Customs, Thai International Freight Forwarders Association (TIFFA), Bangkok Ship Owner and Agent Association (BSAA), T.L Enterprise (1991), Designated Focal Point from Office of the permanent Secretary (MOT)

Vientiane cluster
Land Transport Management Division (Ministry of Public Works and Transport, MTPT), Trade Facilitation Division (Ministry of Industry and Commerce/MOIC), State Railway Authority (MTPT), Custom Department (Ministry of Finance/MOF), Lao International Freight Forwarders Association (LIFFA)

Border cluster
Thai Customs (at border), Lao Customs (at border & Thanaleng), State Land and River Transport Enterprise, State Railway Authority (MTPT), Lao Freight Forwarder Co Ltd, International Border Warehouse, Thanaleng, Lao PDR (T.L. Enterprise Lao Co Ltd.), I Friendship Bridge Administration Office, Immigration at I Friendship Bridge
2. Zambia – Namibia Corridor

Cluster Members:

Walvis Bay cluster
Ministry of Works, Transport and Communication, Namroad, Chamber of Commerce, NAFF (Forwarders), WBPUA (Port Users), MoF/ Customs, Transnamib Railway, Namport, Municipality of Walvis Bay Town, AvdWalt Transport, Eden International, Unifoods.

Zambia cluster
Ministry of Communications and Transport, Ministry of Communications & Transport, Department of Maritime and Inland Waterways, Department of Road Traffic and Safety, Ministry of Home Affairs, Ministry of Works and Supply, Zambia Revenue Authority, Zambia Investment Centre, Zambia Association of Chambers, Commerce and Industry, Zambia Clearing and Freight Forwarders Association, Maersk Shipping, Walvis Bay Corridor Group, Southern Province, Office of the Provincial Permanent Secretary, Western Province, Office of the Provincial Permanent Secretary, Representatives from Konkola Copper Mines and Kansanshi Mining.

3. Paraguay – Uruguay Corridor

Cluster Members:

Montevideo cluster
National Ports Administration (ANP), National Customs Direction, Association of Exporters, and Customs Brokers Association.

Asunción cluster
Ministry of External Relations, National Chamber of Commerce and Services, Paraguay Chamber of International Road transport, Association of Maritime Agents, Center of Importers, Chamber of terminals and private ports, Center of river and maritime shippers, Paraguay Chamber of Exporters, Center of Custom Brokers, National Administration of shipping and ports (ANNPP), Customs.
ANNEX II: Example of Time/Cost-Distance Model output:

The Bangkok (Thailand) to Kunming (China) corridor

The Bangkok (Thailand) to Kunming (China) corridor is expected to become important infrastructure in the Southeast Asia. It may function as a land bridge between southern China and other regional countries, particularly Thailand. Once the corridor is fully operational, significant impact can be anticipated, such as shifts in transportation mode, and short- and long-term economic and sociological changes.

For the Bangkok to Kunming corridor, 3 routes currently provide the connection between both cities as illustrated in Figure 1.

**Figure 1: Bangkok (Thailand) to Kunming (China)**
- Route No.3 West (R3W): Bangkok-Chiang Rai-Mai Sai-Keng Tung-Menghi-Jinghong-Kunming;
- Bangkok-Chiang Rai-Chiang Saen-Mekong River-Jinghong-Kunming;

The characteristics of the Bangkok to Kunming corridor are summarized in Table 1. The distances of these three routes are not significantly different. At present, the route via the Mekong River is the most popular; R3E route is also used through trans-loading at border crossings.

**Table 1: Characteristics of Kunming-Bangkok Routes**

<table>
<thead>
<tr>
<th>Existing Infrastructure</th>
<th>Route Choice (Distance in kilometres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>via Myanmar (R3W)</td>
</tr>
<tr>
<td>Bangkok-Chiang Rai</td>
<td>4-lane highway</td>
</tr>
<tr>
<td>Chiang Rai – Mai Sai</td>
<td>4-lane highway</td>
</tr>
<tr>
<td>Chiang Rai – Chiang Saen</td>
<td>2-lane highway</td>
</tr>
<tr>
<td>Chiang Rai – Chiang Khong</td>
<td>2-lane highway</td>
</tr>
<tr>
<td>R3W</td>
<td>2-lane highway</td>
</tr>
<tr>
<td>Mekong River</td>
<td>Mekong River Ports</td>
</tr>
<tr>
<td>R3E</td>
<td>2-lane highway</td>
</tr>
<tr>
<td>R3W/R3: Daluo to Kunming</td>
<td>6-, 4-, and 2-lane highway</td>
</tr>
<tr>
<td>R3: Jinghong to Kunming</td>
<td>6- and 2-lane highway</td>
</tr>
<tr>
<td>R3E/R3: Boten/Mohan to Kunming</td>
<td>6-, 4-, and 2-lane highway</td>
</tr>
<tr>
<td><strong>Total length</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Approximate distances after all projects are completed.*

Figures 1 and 2 describe graphically how cost and time increase along the 3 corridors of the Bangkok-Kunming route. The route via the Mekong River has the lowest total cost but takes the longest time. The route via Myanmar has the highest uncertainty from a user’s perspective.

Border crossings seem to be where there is the highest cost and time increase without any movement of goods. This clearly shows that actual transport in itself is not a major impediment, but effectiveness and efficiency very much depend on how costly and how quickly borders can be crossed.
Figure 1: Cost Model of Route No. 3 from Bangkok to Kunming

Kms = kilometres.
Source: Compiled from industry data.

Figure 2: Time Model of Route No. 3 from Bangkok to Kunming

Kms = kilometres.
Source: Compiled from industry data.
Tables 2 and 3 provide more details on border crossing charges as a proportion of total transit and border crossing costs. The pure transport cost on all three routes is less than the border crossing and transit charges. This shows that transport, even though a critical component of the corridor cost is not the biggest factor.

**Table 2: Cost summary**

<table>
<thead>
<tr>
<th>Route</th>
<th>Transport and Distribution (%)</th>
<th>Border Crossing and Transit fees (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R3W (via Myanmar)</td>
<td>42</td>
<td>58</td>
</tr>
<tr>
<td>R3E (via Lao PDR)</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>Via Mekong River</td>
<td>Road 32</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>River 15</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3: Border Cost Summary**

<table>
<thead>
<tr>
<th>Route</th>
<th>Border 1 Thailand (%)</th>
<th>Border 2 Myanmar Lao PDR (%)</th>
<th>Border 3 Myanmar Lao PDR (%)</th>
<th>Border 4 China (%)</th>
<th>Total Border Cost (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R3W</td>
<td>Mai Sai 1</td>
<td>Tachilek 33</td>
<td>Mong La 15</td>
<td>Daluo 51</td>
<td>100 (US$271/ton)</td>
</tr>
<tr>
<td>R3E</td>
<td>Chiangkhong 2</td>
<td>Hoeuy Xay 20</td>
<td>Boten 18</td>
<td>Boharn 60</td>
<td>100 (US$232/ton)</td>
</tr>
<tr>
<td>Via Mekong River</td>
<td>Chiangsaen 3</td>
<td>N/A</td>
<td>N/A</td>
<td>Zinghong 97</td>
<td>100 (US$141.5/ton)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N/a = not applicable

Tables 4 and 5 describe the proportion of total route time of transport as well as border crossing time. Pure transport operations take more than 80% of total corridor time, but when the infrastructure is completed, this time will probably be reduced.

**Table 4: Time Summary**

<table>
<thead>
<tr>
<th>Route</th>
<th>Transport and Distribution Time (%)</th>
<th>Border Crossing Time (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R3W (via Myanmar)</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>R3E (via Lao PDR)</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>Via Mekong</td>
<td>Road 32</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>River 54</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5: Border Time Summary**

<table>
<thead>
<tr>
<th>Route</th>
<th>Border 1 Thailand (%)</th>
<th>Border 2 Myanmar Lao PDR (%)</th>
<th>Border 3 Myanmar Lao PDR (%)</th>
<th>Border 4 China (%)</th>
<th>Total Time Spent at Borders (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Via Myanmar</td>
<td>Mai Sai 12</td>
<td>Tachilek 22</td>
<td>Mong La 22</td>
<td>Daluo 44</td>
<td>100 (9 hours)</td>
</tr>
<tr>
<td>Via Lao PDR</td>
<td>Chiangkhong 12.5</td>
<td>Hoeuy Xay 12.5</td>
<td>Boten 25</td>
<td>Boharn 50</td>
<td>100 (8 hours)</td>
</tr>
<tr>
<td>Via Mekong River</td>
<td>Chiangsaen 46</td>
<td>n/a</td>
<td>n/a</td>
<td>Jinghong 54</td>
<td>100 (13 hours)</td>
</tr>
</tbody>
</table>

N/a = not applicable
Table 6 provides a summary of the cost, time, and perception of reliability status for the 3 routes within the corridor. Perceptions of reliability by stakeholders fall short of “reliable” in all routes examined.

**Table 6: Cost, Time, and Perception of Reliability Summary**

<table>
<thead>
<tr>
<th>Routing</th>
<th>Cost/Ton (US$)</th>
<th>Time (hour)</th>
<th>Distance (kilometre)</th>
<th>Perception of Reliability(^a) (score out of 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R3W via Myanmar</td>
<td>470</td>
<td>45</td>
<td>1,867</td>
<td>3.0</td>
</tr>
<tr>
<td>R3E via Lao PDR</td>
<td>392</td>
<td>51</td>
<td>1,906</td>
<td>3.2</td>
</tr>
<tr>
<td>R3 via Mekong River</td>
<td>271</td>
<td>112</td>
<td>1,834</td>
<td>3.4</td>
</tr>
</tbody>
</table>

\(^a\) Reliability scale: 1 = perceived to be not reliable; 2 = perceived to be not very reliable; 3 = perceived to be fairly reliable; 4 = perceived to be reliable; and 5 = perceived to be very reliable.

Source: Compiled from industry data.

It is expected that the physical and institutional infrastructure will be in place in the near future. Freight charges may increase or decrease but the key logistics bottlenecks, the border crossings, would need still to be sorted out. Time is of the essence because the infrastructure development is moving a lot quicker than the institutional arrangement between countries.

The lack of standardized and harmonized border and transit trade procedures is the weakest link in the corridors under study and special attention must be made to deal with border issues. This lack, together with weak infrastructure linkages, is currently hindering corridor that can satisfy customers while controlling or even lowering all the total cost involved. The infrastructure linkages are the backbone in corridor development however the upgrading of infrastructure must be done in conjunction with the facilitation of trade, transit, and transport services to create an effective and efficient integrated supply chain within the corridor.

An integrated approach is needed in order to solve these problems. Such an approach should combine solutions to the physical or “hardware” infrastructure aspect with solutions to the “software” rules and regulation aspect. Most of the problems involved in the development of logistics system for cross-border and transit trade are related to the import/export and transport processes of the respective countries.