



The World Bank

Best Practices in Corridor Management

Trade Logistics Group

Prepared by John Arnold

Co-team leaders: Gerald Ollivier, ECSIE/Jean Francois Arvis, PREM

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Abstract

This report examines measures to improve management of international transport corridors. From a physical perspective, these are defined as a collection of routes constructed from the transport networks of adjoining countries and bounded by gateways. They are somewhat complex because they are usually multi-modal and include multiple border crossings.

From an economic perspective, the function of a corridor is to promote both internal and external trade by providing more efficient transport and logistics services. The primary reason for designating these routes as part of a corridor is to focus attention on improving not only the routes but also the quality of the transport and other logistic services in the corridor. This **quality** is measured in terms of the **transit time**, and **cost for shipment** of goods along the corridor, the **reliability** of the services in terms of transit time and the **flexibility** provided in terms of diversity of services offered on multimodal routes.

The formal designation of a specific set of routes as a corridor is generally part of a government endeavor to focus its efforts on improving the quality of transport services to these routes. The title of this report “Best Practices in Corridor Management” is somewhat misleading. The term management implies some form of control, but the variety of demand for transport and other logistics services and the large number of providers of these services limits the opportunities for exerting any form of control. Nevertheless, it is important to **create a single point of coordination** given the diversity of stakeholders and the large number of government agencies that oversee different activities within a corridor. This coordination requires a **public-private partnership** to address a wide range of problems including investment in infrastructure, regulation of transport and trade, facilitating the improvement in private sector transport and logistics.

The report is divided into three sections. The first examines the **characteristics** of an international corridor and the parameters that define its performance. The second examines the **mechanisms** available for improving corridor performance, especially at the border crossings. The third considers **management techniques** available for coordinating the development of corridors. For more information, visit the website of the Global Facilitation Partnership for Transportation and Trade, www.gfptt.org.

Abbreviations

ADB-Asian Development Bank
ASYCUDA = Automated System for Customs Data
EC – European Commission
ECOWAS – Economic Community of West African States
EDI – Electronic Data Interchange
EU – European Union
EWEC – East-West Corridor (Myanmar-Vietnam)
GMS – Greater Mekong Subregion
ICD – Inland Container Depot
IGC-TRACECA – Inter-government Commission of TRACECA
IRU - International Road Transport Union
NAFTA – North American Free Trade Agreement
TEU – Twenty-foot equivalent unit (measure of unit of volume of container traffic)
UIC - International Union of Railways
SAARC – South Asian Association for Regional Cooperation
SACU - Southern African Customs Union
SAD - Single Administrative Document
SADC – Southern African Development Community
SDI – Spatial Development Initiative
TEN – The Pan European Transport Network
TRACECA – Transport Corridor Europe, Caucasus, Asia
TTCA - Transit Transport Coordination Authority
TTFSE – Trade and Transport Facilitation in Southeast Europe Program ([site](#))

Disclaimer:

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I. Framework for Transport Corridor Management

A. Defining a Transport Corridor

The concept “transport corridor” lacks a precise definition. It has both a physical and functional dimension. In terms of physical components, a corridor includes one or more routes that connect centers of economic activity. These routes will have different alignments but with common transfer points and connected to the same end points. These routes are composed of the links over which the transport services travel and the nodes that interconnect the transport services. The end points are gateways that allow traffic with sources or destinations outside the corridor (and its immediate hinterland) to enter or exit the corridor (see Figure 1).

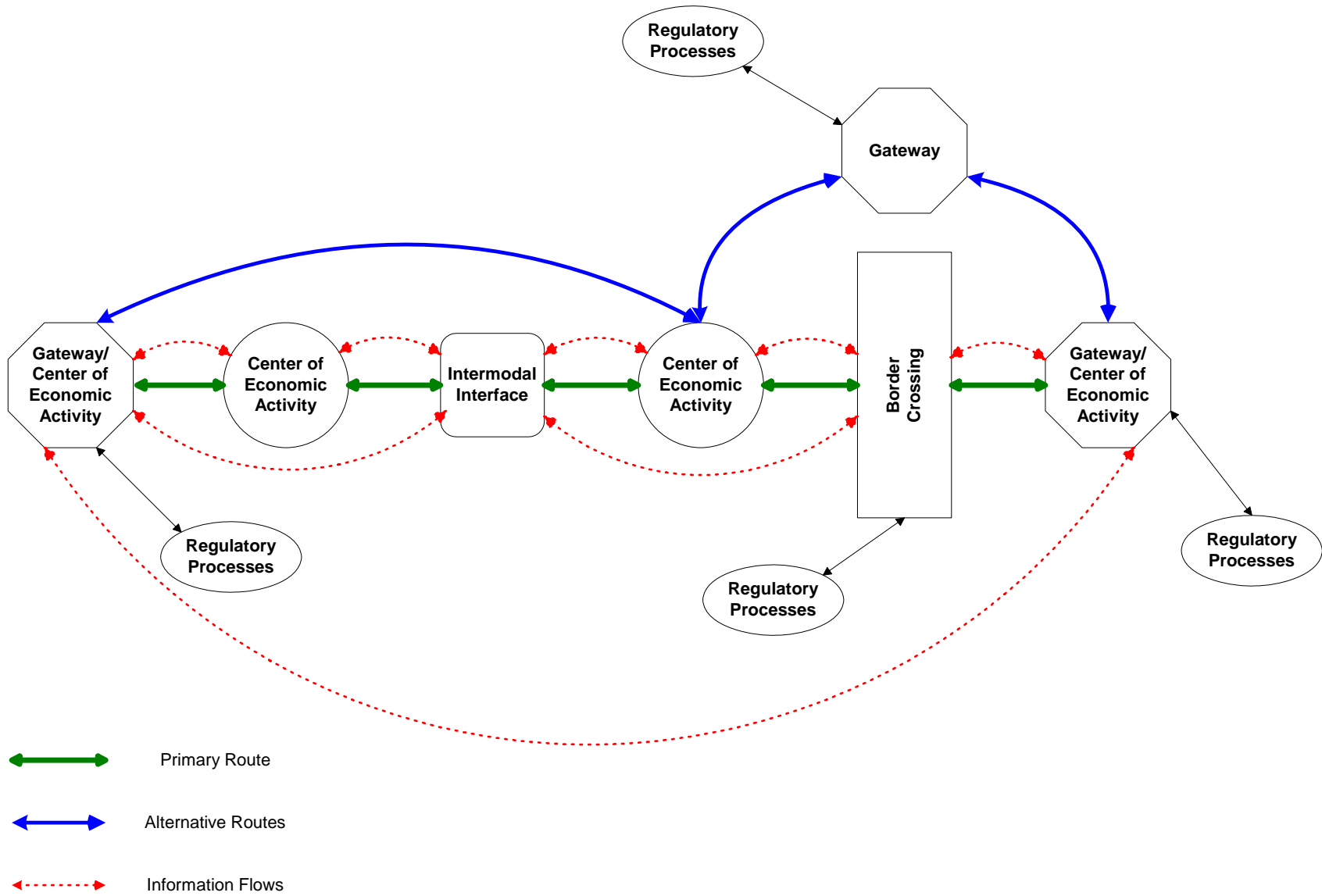
An international transport corridor connects one or more adjoining countries. It may also connect countries that are separated by one or more transit countries or provide a landlocked country with access to the sea, e.g. the corridors connecting Bolivia with the Pacific through Chile and Peru and the corridors connecting Nepal with the Bay of Bengal and the Arabian Sea.. Some corridors have a single mode, e.g. Can-Mex, or a single route, e.g. the Trans-Kalahari corridors, but most have multiple routes and modes. Some are relatively short and defined by principal gateway, e.g. the Maputo Corridor, which connects the port of Maputo to the industrial area around Witbank in eastern South Africa. Others are defined by the region they serve, e.g. the West Bengal corridor connecting the ports of Kolkata and Haldia with Eastern India, Bangladesh, Bhutan and Nepal. Still others are defined as part of a set of corridors serving a larger region, e.g. Trans-European Networks (TEN) in the European Union.

While it is important to separate the concepts of economic corridors and transport corridors, the fact is that most transport corridors are developed to support regional economic growth. They provide transport and other logistics services that promote trade among the cities and countries along the corridor, e.g. the corridors connecting the countries of the Greater Mekong Subregion. The significant relationship between transport and economic corridors has least-developed countries in Eastern and Southern Africa to incorporate the development of corridors into Spatial Development Initiatives (SDI).

Corridors are rarely developed as Greenfield projects. Most have been developed from existing routes, many of which date back to ancient trading routes, e.g. the Silk route (see box). Nearly all evolved from existing land-based multimodal transport networks. Coastal and shortsea routes are less common but important for archipelagic countries, where they are the principal connection among the islands, e.g. the Manila-Davao Strong Republic Nautical Highway, and for countries separated by large bodies of water e.g. the TRACECA corridor across the Caspian and Black Seas. Inland water routes are less common although important in riverine countries, e.g. Bangladesh and Vietnam. Ocean and air routes are not usually included in the definition of the corridor because there is little need to develop the links on these routes. However, airports and seaports are included since they serve as the international gateways.

Transport corridors serve both passengers and freight traffic, but the characteristics of demand and the equipment used differ dramatically between the two. While this report focuses on freight transport, the quality of transport and logistics services will be affected by passenger transport competing for route capacity. Trucks duel with buses and passenger cars for right of way. Slower freight trains are slotted in between faster passenger trains. Barges and freighters compete with passenger vessels for space at wharves and in navigation channels and locks. Most airfreight is carried on a space-available basis in the belly of passenger aircraft.

Figure 1: Sample Corridor Model



Silk Road – The Continuing Challenges

The “Seidenstrasse” was named in the late 19th century long after its decline. The route was established by the Han dynasty in the middle of the 2nd century BC as a means to strengthen its military and political position in the region. Initially, it was used to secure access to the markets in central Asia following military conquest of this region. This corridor evolved into a network including routes connecting to Northern India, the Black and Caspian Seas, the Arabian Peninsula and Istanbul eventually linking the Roman Empire with the Imperial court in China.

The volume of trade was relatively modest until the middle of the 1st century BC when the Romans began a rapidly expanding trade in silk. Trade then diversified to include a range of goods including gold, ivory, glass, perfumes and textiles moving east and furs, ceramics, spices, jade, lacquer objects and silk moving west. During its long history the Silk Road acted not only as a trade route but also as a means for exchanging information. Over this route traveled the concepts of mathematics and technologies for gunpowder, printing press and even sericulture.

Trade was conducted by caravans that transported the goods from one border to the next where the goods were sold to a trader of the nationality or ethnic group of the adjoining region. This trader would then transport the goods to the next border. Thus Chinese traders would sell to Central Asians who would trade with Persians. They, in turn, provided the goods to the Syrians who would ship them to the Romans through Greek or Jewish traders. While goods moved slowly under this system, they produced substantial profits for the middlemen with limited risks.

The decline of the Han dynasty in the early 3rd century AD led to a decline in trade on the route. The route regained its importance in the 7th century with the rise of the Tang dynasty but then declined along with the dynasty in the early 10th century. In the 13th century, it was revived with the rise of the Mogul Empire, which stretched from China to the Mediterranean only to once again decline in the 14th century with the demise of the Mogul empire and the isolationist policies of the Ming. Perhaps the most important reason for its final decline was the discovery of the sea route to India.

Current efforts to revise parts of this network are confronted with similar problems of political integration, significant financial risk, transshipments at the borders and competing sea routes.

B. Role of Corridors

International transport corridors may serve the foreign trade of a single country or several adjoining countries. They are composed of national corridors, which also serve domestic traffic. As a result there are often competing functions for the routes that make up an international corridor, conflicting objectives for the development of these routes, multiple jurisdictions responsible for maintaining these routes and different sources of funding for their development and maintenance. It is, therefore, important to distinguish between the roles of corridor in serving domestic, foreign and transit traffic.

Domestic Trade Corridors

A domestic trade corridor is a designated route within the national transport network that is used to distribute goods within the country. It includes links and nodes for the various modes as well as nodes that connect different modes and different service areas, e.g. interurban and interurban transport. These corridors usually cross over provincial borders and are established through national legislation.

Responsibility for the development and management of these corridors is given jointly to the national and provincial governments. Both provide funding for development of the basic infrastructure. Similarly, both usually share responsibility for regulation of the activities within the corridors, but the enforcement activities are generally assigned to the provincial government. The objective of establishing domestic corridors is to promote internal trade and economic growth along the corridors. The costs for developing and maintaining the corridors are generally covered through general revenues.

Foreign Trade Corridors

Foreign trade corridors are used to transport the imports and exports of a country. As such, they have an endpoint at either a border crossing or international gateway. The corridors are determined by a combination of the market the location that determine where production of exports and consumption of imports are concentrated and by national legislation that stipulates the locations where foreign trade may enter and exit the country. Corridor may be defined more precisely by regulations that allow the movement of cargo under customs bond between a border crossing/gateway and an internal facility for clearing cargo.

The national government would have jurisdiction over the corridor, but the provincial governments would have responsibility for maintaining individual links. The national government would control the land border crossings but only regulate the international gateways, which are usually administered by the provincial government. In the case of the land borders, the customs and other agencies that control the crossings generally have provincial offices of these agencies responsible for administration. The objective of establishing foreign trade corridors is to promote economic growth of the country through increased trade and competitiveness. The costs for the gateways and the border crossings are generally recovered through user fees but the costs of the links and other nodes are usually covered through general revenues.

Table 1: Types of Corridors

Project	Corridor
TEN	Domestic/Transit
TRACECA	Foreign/Transit
Can-Mex (NAFTA)	Domestic/Transit
Pan American	Foreign/Transit
Bolivia-Chile	Transit
Mercosur	Foreign
Northern	Transit
Maputo	Transit
Trans-Kalahari	Transit
ECOWAS	Transit
Turkey-Jordan	Transit
Asian Highway	Transit
Mongolia-China	Foreign/Transit
SAARC Corridors	Foreign/Transit
GMS Corridors	Foreign
Northern West Borneo	Domestic/Trade
West Bengal	Foreign/Transit
West Bank-Gaza	Domestic/Foreign

Transit Trade Corridors

Transit trade corridors are used to transport the cargo of other countries. They are bounded by a border crossing at one end and an international gateway or border crossing at the other. While these routes are determined by national legislation, this legislation governing movement of transit goods is often coordinated with adjoining countries through bilateral agreements or, in a few cases, regional agreements. These agreements stipulate the procedures to be followed at the end points. The jurisdiction for transit corridors is similar to that for the foreign trade corridors with which they normally overlap. The objective of these routes is to promote regional integration and economic cooperation between neighboring states. The costs are covered in the same way as for the foreign trade routes but in many cases there is also a transit fee collected to cover the marginal costs for maintaining these routes.

C. Development Objectives

While all corridors are nominally developed to support regional economic development, there are nuances to this objective that have a big impact on the way the corridor is developed. Some corridors have been developed to **promote economic activity** along the corridor. This was the case for the Maputo corridor, which was developed as part of a Spatial Development Initiative. The route had earlier served as the outlet for the import/export trade of the industrial region around Johannesburg. When the route was closed due to civil war, trade was diverted to Durban and Richards Bay. As a result, the economy along the route declined. The restoration of the corridor was intended to help rebuild this economic activity. While successful in achieving its objective, this outcome contrasted with the lack of success of other economic corridors developed under the same initiative.

Other corridors were developed to **increase activity** at the **international gateway** at the end of the corridor. As an example, the Trans Kalahari corridor was developed largely to increase the use of the Port of Walvis Bay as the principal gateway for the customs union of Botswana, Namibia and South Africa. In the US, the Alameda corridor was developed to provide a high-density rail connection between the ports on San Pedro Bay and the transcontinental rail network. In some cases, corridors have been created simply as a means to channel funds for infrastructure development to specific routes and to promote reforms of the regulations and procedures that restrict movement of goods along these routes.

Alternatively, a corridor may be developed to provide an international **gateway for one or more landlocked countries**. While there is usually substantial trade between the landlocked country and its neighbors, trade with third countries must often be conducted through intermediaries in neighboring countries that have access to the sea. Corridors are developed to allow the importers and exporters of landlocked countries to interact directly with the markets in which they trade and thereby reduce transaction costs. This was the rationale for the development of corridors such as the Northern Corridor in Eastern Africa, the West Bengal Corridor in India and various corridors leading to and from Laos.

Still other corridors have been developed as part of a broader effort to **develop an economic union**. This was the rationale underlying the development of the corridors in the Greater Mekong Subregion, and the Mercosur region. This objective may be extended to expanding an existing economic union. This was the case for the extension of the TEN network to Eastern Europe through TRACECA in support of the enlargement of the EU.¹

Alameda Corridor – Short and Green

The Alameda Corridor is a series of bridges, underpasses, overpasses and street improvements constructed to separate road transport, freight rail, and passenger rail. The total corridor is only 20 miles but cost more than \$2 billion. It includes 10 miles of depressed rail line that eliminate more than 200 at-grade crossings thereby reduce congestion and air pollution from idling trains, trucks and cars. It consolidates branch lines of railroads connecting to the ports of Los Angeles and Long Beach, including Burlington Northern, Santa Fe Railway and Union Pacific Railroad. This corridor provides access to fast rail connections to the Midwest, East and Gulf coasts. The Corridor is managed by an Authority operating under the joint powers of the cities of Los Angeles and Long Beach, the ports of Los Angeles and Long Beach, and the Los Angeles County Metropolitan Transportation Authority. It was funded through a combination of federal and state funds plus contributions from the ports.

¹ The stated goals were specified as follows: smooth functioning of the internal market, strengthening of economic and social cohesion; and ensuring the sustainable mobility of persons and goods taking account of their comparative advantages (Annex 5)

Finally, there are some corridors that have evolved with no objective other than to **facilitate bilateral trade and multi-country trade** that is controlled through back-to-back agreements. They are not intended to develop regional routes or to facilitate extra-regional trade. This has been the case for the land routes in the Middle East including those from the Eastern Mediterranean through to Iraq, from Iran up through the Central Asian Republics, and from Jordan through to Syria and Iraq. Efforts to create an Asian Highway have followed this incremental approach. The individual components are national roads interconnected to foster bilateral and transit trade.

A similar rationale seems to have guided the development of the Pan-American Highway. Though a single road route, it is primarily a collection of interconnected national roads extending from Alaska to the southern tip of South America. The designation of these routes allowed for upgrading and rehabilitation with funding from the United States government. However, the construction was not coordinated with other efforts to facilitate cross-border movements. These efforts began much later under the auspices of NAFTA. The Can-Mex corridor appears to have a similar objective but a more limited scope.

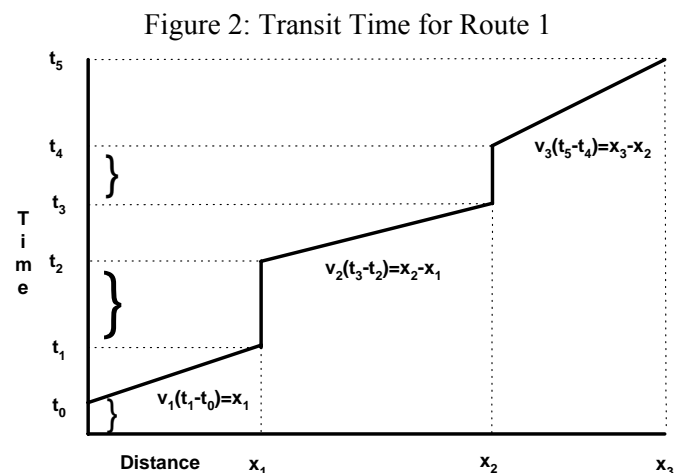
D. Evaluating Corridor Performance

The performance of a corridor can be evaluated from three perspectives. The first is an **infrastructure** perspective. This considers the physical capacity of the links and nodes in a corridor and the utilization of these components. This approach is often used when deciding on requirements for additional capacity but provides little insight into the effect of corridor performance on trade. The second perspective examines the **quality of the services** provided for the goods moving on the various routes. Performance is measured in terms of average time and cost for transport units moving through this corridor. These may be broken down into the time and cost for specific links and nodes. The third perspective is the **movement of goods** in the corridor. Again cost and time are measured but this time for each of the principal supply chains. The costs and time can be disaggregated for the transport services on the links and the processing services at the nodes.

Corridor Services Analysis

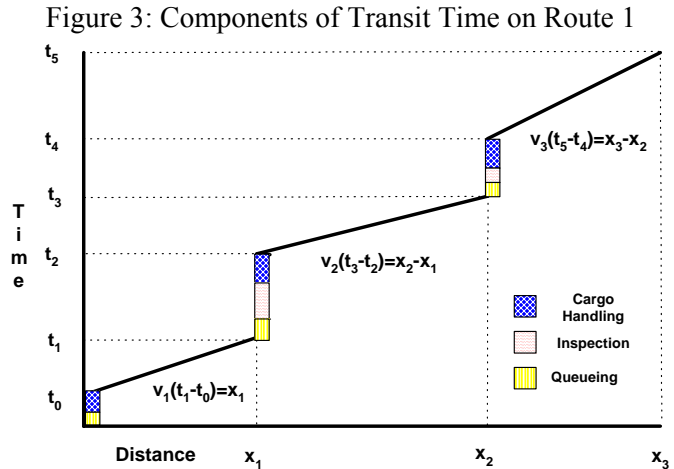
Cost and Time

Since a corridor is generally composed of several alternative routes, it is necessary to measure the performance of each route. The costs are measured in terms of the out-of-pocket costs plus any loss or damage to cargo while enroute. The time is measured as the time to complete all the essential activities in moving from the beginning to the end of the route including delays associated with the frequency of services and congestion at the nodes. This time can be presented as a function of distance along the route using a graph of the form shown in Figure 2.

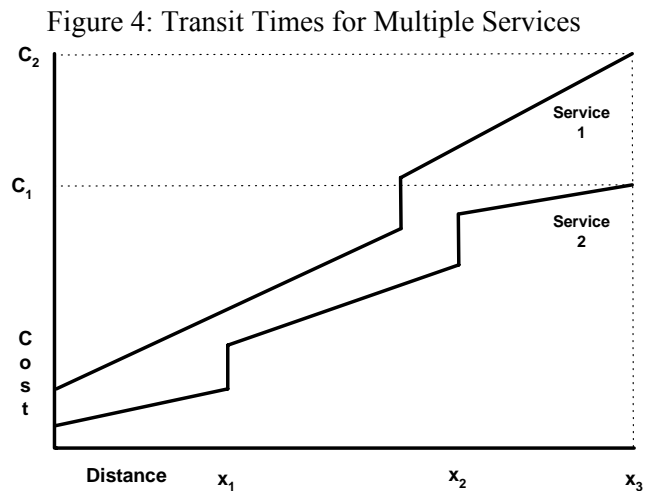


The sloping lines represent the time spent moving along a link with the slopes inversely proportional to the average link velocity, v_j . The vertical segments represent the time spent at the nodes that connect these links. A variety of activities can occur at these nodes, some required and others discretionary. One required activity is the transfer of cargo

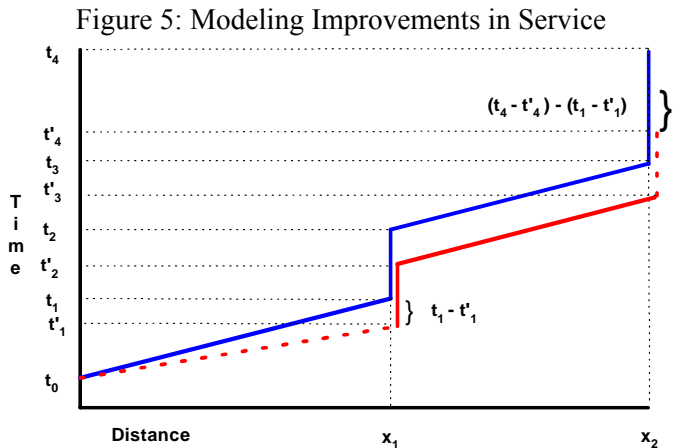
between transport units where there is a change of mode, physical constraints or regulatory requirements. Another is the inspection of the vehicle and its cargo occurring at the boundaries between jurisdictions. The most common discretionary activities occurring at the nodes are storage, intermediate processing, consolidation/ deconsolidation, repackaging and labeling. It is important to exclude these activities when evaluating the performance of a route.² The graph can be modified to display the non-discretionary components shown in Figure 3.



Where there are alternative routes including modal combinations, the times can be compared as shown in Figure 4. In this example, the first service is the fastest over the entire length of the route. In other situations one service might be faster over a certain portion of the route but not over the other in which case the lines might cross.



The performance of the services on a route can be improved by reducing time either on the links or at the nodes. Time on a link can be shortened by improving infrastructure, better traffic management or a change in the regulations affecting use of infrastructure, e.g. limits on type of vehicle, speed and frequency of service. The times at nodes can be reduced by introducing new technologies and equipment, improving management of services, simplifying procedures and providing additional facilities to handle the traffic without significant delays. These improvements can be modeled, as shown in Figure 5 with the dashed lines showing the changes that have occurred. The reduction in slope indicates where average travel speed on a link has increased, $x[1/t'_1 - 1/t_1]$ whereas the shortening of the vertical lines indicates where time at the nodes has been reduced, $(t_4 - t'_4)$.



² There are situations in which storage or consolidation/deconsolidation are complements to a required change of transport unit, in which case they would be included in the evaluation of the route performance.

This comparison is useful not only for determining savings in total time in corridor but also for identifying those components that offer the greatest potential savings in time. While it may be possible to make a significant reduction in the time at certain nodes, if these nodes do not account for a significant portion of total transit time, then it is better to focus on other nodes where there is a larger vertical component. Similarly, links with the steepest slopes will usually offer the best opportunity for improvement but if the time on this link is small relative to total transit time, then it is better to focus on other links.

An analysis similar to that shown in Figures 1-4 can be performed for the cost of using the corridor. The costs include the out-of-pocket costs plus any loss or damage to cargo while enroute. The sloping lines in Figure 6 represent the costs incurred while transiting a link with the slope proportional to the average variable cost, c_j . The vertical lines represent the costs incurred at the node for non-discretionary activities and any fixed costs associated with using the subsequent link. The components of these costs can be presented explicitly as shown in Figure 7.

Improvements in the performance of the transport services can produce a reduction in fixed and variable costs or both. These can be achieved through the introduction of larger transport units, e.g. longer trucks and trains, bigger vessels and aircraft or through complementary improvements in physical infrastructure. It can also be achieved through policy changes that reduce restrictions on the size of transportation units or barriers to entry for competing suppliers of transport services. Reductions in the cost of the services at the nodes can be achieved through greater competition between logistic service providers as well improvements in the technology and infrastructure at the nodes. They can also be achieved through a change in the procedures performed at the nodes and the regulations that govern these procedures. As with the measurement of time, a reduction in costs for transiting a link is represented by reducing the slope and a reduction in the costs incurred at a node is represented by shortening the vertical line. A comparison of the costs on two or more transport services can be presented by multiple lines in format similar to that shown in Figure 4.

Where there are multiple services on a route or in a corridor, each service can be represented by its average cost and time for transit. These combinations can then be combined to form a curve showing the services offered for movement through the corridor (Figure 8). For movements that do not extend the full length of the corridor, i.e. shipments that have an origin, destination or both within the corridor ($x_2 < x_3$), this curve would shift down and to the left.

Figure 6: Transit Cost for Route 1

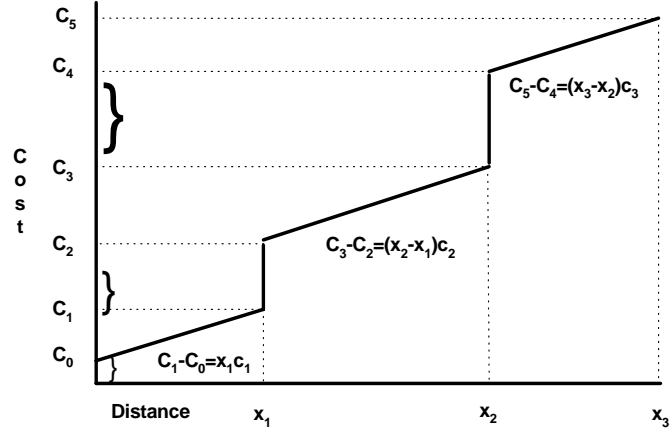


Figure 7: Components of Transit Cost for Route 1

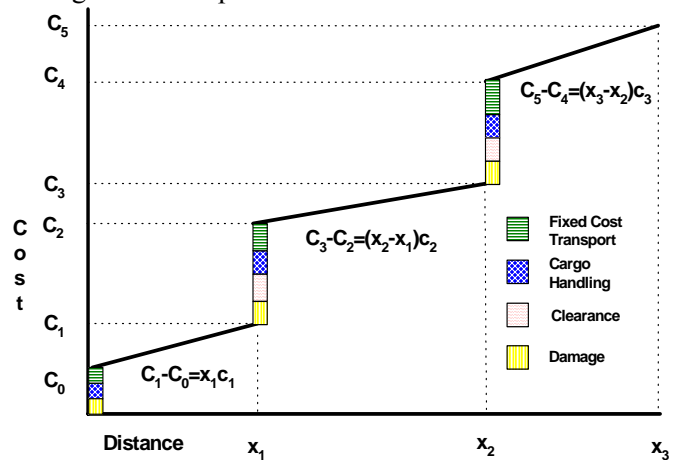


Figure 8: Corridor Time-Cost Options

The impact of improvements in both time and cost can be modeled by combining the time and cost relationships using the graph shown in Figure 9. In this example, it is assumed that the improvements at node x_1 increased the costs by 25% and that the increase in average speed in the last link increased the transport cost for that link by 50%. The effect of these improvements is to shift the time and cost from c_5, t_4 to c_6, t_5 . This improvement is attractive for shipments where the value of time is greater than $(c_6 - c_5) / (t_4 - t_5)$.

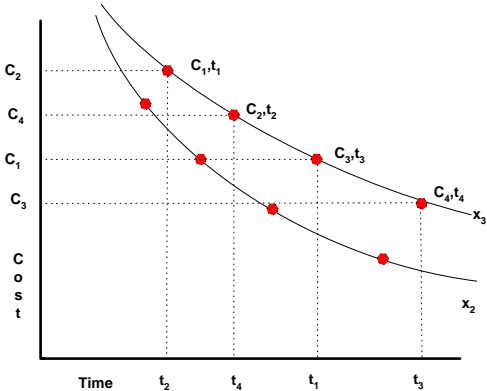
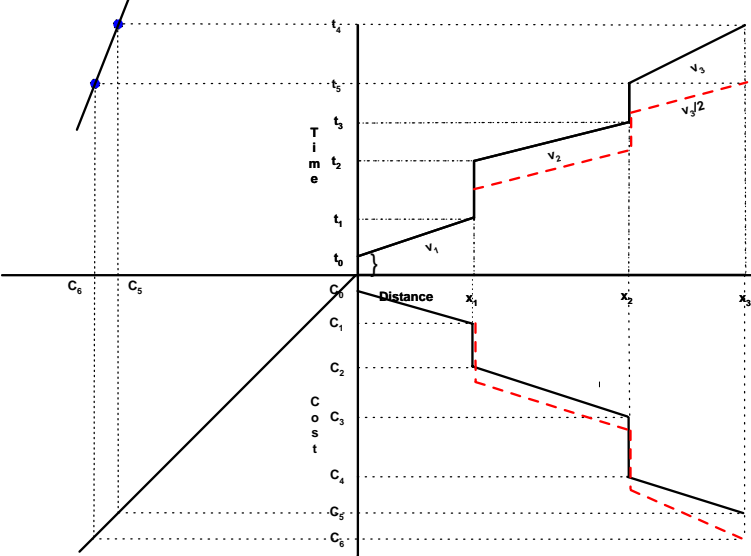


Figure 9: Relationship Between Changes in Time and Cost



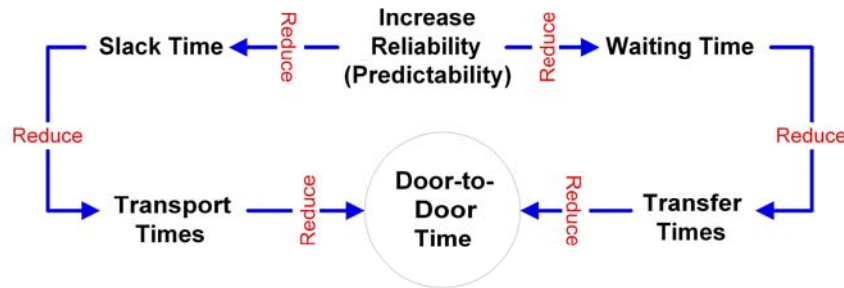
Reliability

Two additional parameters should be considered in evaluating corridor performance, reliability and flexibility. Because of increasing attention to the timeliness of shipments and the importance of order fulfillment as a component of competitive advantage, it is necessary to consider not only the average time and cost for movement through a corridor but also the reliability in meeting delivery times. For purposes of this discussion, reliability refers to the variation in transit time for a specific form of shipment and origin-destination pair. This variation is due to a combination of controllable factors, such as condition and availability of equipment, coordination of sequential activities, and labor productivity and uncontrollable environmental factors such as fluctuations in demand, level of background traffic and weather conditions.

The greater the variation, the harder it is to predict actual transit time and therefore to coordinate sequential activities in the supply chain. Shippers and consignees accommodate this uncertainty by adding slack time to their planned delivery times. This increases the average order cycle time. An improvement in the quality of a transport service that reduces the variation of transit time, allows shippers/consignees to reduce their slack time and thus the average order cycle. It also reduces the

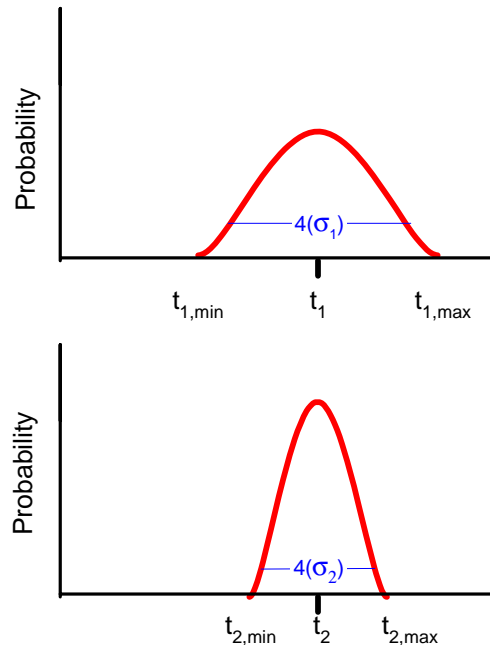
likelihood of bunching of arrivals and departures and of the associated delays. This positive feedback is modeled in Figure 10.

Figure 10: Impact of Reliability on Transit Time



The benefit from reducing the variation in transit time can be measured by estimating the slack time required to achieve a certain probability of arriving on or before the scheduled time. For the example given in Figure 11, a reliability of 95% for delivery at or before an agreed time would require that slack time equal to 1.65 times the standard deviation of the transit time, σ_1 , be added to the time allotted for delivery. If the variation in transit time is reduced so that the standard deviation decreases from σ_1 to σ_2 then the slack time will be reduced by a factor of $1-\sigma_2/\sigma_1$. The value per unit of reduction in slack time will be similar to that for savings in transit time since they have the same effect. However, the reduction in variation has the additional benefit of reducing the waiting time for subsequent services and thus additional savings in slack time.

Figure 11: Reduction in Variation in Transit Time



The alternative to shippers adding slack time to their schedule is for the transport service to add slack time in order to operate to a fixed schedule. This increases the cost for transport services because the transport equipment is used less efficiently. However, this increase is offset by the savings from allowing better coordination in the supply chain, and less time at the nodes waiting for the connecting transport service.

Flexibility

Flexibility is a more elusive feature but of growing importance. Manufacturers and other suppliers are having to increase their flexibility by producing to smaller order sizes, changing designs more frequently and responding to changes in orders up to the time of shipment. Retailers are becoming more flexible as shelf life decreases and consumers become more demanding. In this more competitive environment, it is necessary to have flexible supply chains. Some orders may require shorter delivery times others lower shipping costs. The shipping date and the destination may be revised up until shortly before the actual

shipment. In some cases, the cargo may be rerouted while in transit or even resold to another customer while enroute (see box).

The availability of multiple routes and modes is an important source of this flexibility, but more important is the availability of different types and qualities of transport services. The growing role of logistic service integrators (4PLs), who provide different combinations of logistics services in order to meet the needs of individual customer, is evidence of the growing importance of flexibility. The industry leaders are capable of handling any size shipment, anywhere in the world using various combinations of air, ocean, rail and road transport.

As global competition increases and the difference in the production costs of competing suppliers diminishes, greater attention will be given to the quality of logistics that links buyers and sellers. In this environment, transport and other logistics service providers must compete in terms of the cost, time, reliability and flexibility (C/T/R/F). In a competitive market, there will be a range of transport services offering different combinations of cost, time and reliability. In combination they will provide varying levels of flexibility. The total demand for transport services in a corridor depends on how well these services match the requirements for specific cargo movements.

Cargill – Flexibility in Trading

Cargill is one of the largest grain traders in the world. It does not produce grain but instead acts as a logistics company organizing the flow of grain from the farm to the international markets. Grain trading itself is a business of large volumes, narrow margins and rapid execution of trades. Despite the large volumes in which the grain is traded, there is increasing emphasis on flexibility. One consignment may be traded several times before finally being shipped. In the US, grain continues to be traded after being loaded into the barges for the journey down the Mississippi. The decision as to which ocean-going vessel the grain will be loaded into is delayed as long as possible in hopes of obtaining a better price for the shipment. Even after it is loaded onto the vessel, it can still be traded and the vessel rerouted. In this business, flexibility is the source of profits.

Cargill is now combining this flexibility with tighter control of its supply chain to deliver higher value identity-preserved grains. These are grains raised under specific conditions, e.g. organic, exotic varieties. These grains are shipped using the same logistics as other cargoes but are kept isolated lest they become mixed with inferior grains. Separate holds are used in the barges. The conveyor belts at the loading terminals are cleaned prior to handling the grain. Because the shipments are often too small to occupy a full hold, the grain is placed in a separate layer in the hold sealed above and below to avoid contamination. By preserving the identity of the product throughout the supply chain, Cargill is able to earn a substantial premium. By using its normal supply chain in a more flexible way, it is able to minimize the cost of providing this service.

Corridor Supply Chain Analysis

For each trade that uses the corridor, there is an average cost and transit time for the complete movement from origin to destination of which only a part may be in the corridor. There is also a level of reliability for the complete movement, which is equated with the variation in the transit time. These factors can be combined into a generalized cost function by assigning values to time and reliability. Since reliability is measured as the additional time required to ensure on-time delivery, the values for the two can be estimated using the same value. As a result the generalized cost function for a unit of trade k is:

$$C_k = c_k + \alpha_k(t_k + \beta\sigma_{t,k})$$

where

- c_k = direct cost for the movement of a unit of trade k from origin to destination
- α_k = value of time for a unit of trade k,
- t_k = average transit time from origin to destination
- $\sigma_{t,k}$ = variation in transit time from origin to destination used to measure unreliability
- β = reliability criteria, e.g. $\beta = 1.96 \Rightarrow 2.5\%$ missed delivery dates

Value of Time

The marginal value of time can be estimated as the reduction in costs resulting from a reduction in transit time or, where there are alternative services, as the willingness to pay for a faster transit time. The lowest value of time can be computed as the daily cost for financing goods in transit and in inventory. For goods valued in the \$2000-\$5000 per tonne range, this cost amounts to only \$0.75 to \$2.50 per day per tonne.³ An intermediate value of time can be computed for situations where a range of services with different combinations of cost and time is offered. For example, some container shipping lines may provide more expensive direct services and others lower cost, more circuitous routes. A typical trade-off would be in the range of \$20-\$30 per TEU day, or about \$2.0-\$3.0 per day per tonne. A higher value would apply for higher value cargoes where there is significant competition between modes that offer substantial differences in cost and time. For example, the Bangladesh garment industry ships about 10% of its output by air to provide a shorter order cycle or to compensate for missed ocean shipments. Airfreight costs about \$2500 per tonne to N. Europe whereas ocean freight plus port charges for containerized cargoes costs about \$180 per tonne. The reduction in shipping time is 20-25 days implying a value of about \$100 per day per tonne.

Another approach to examining the impact of improvements in the corridor is to consider the discreet impacts. A reduction in delivery time may allow a shipper to compete in markets that require a shorter delivery times. For example, a reduction in transit time that allows for a decrease in order cycle from 2 months to 1-½ months allows a shipper to compete in market niches that require more rapid replenishment. In this situation, the benefit to the shipper would be the profits earned from the additional volume shipped to this market niche. A similar but more dramatic impact occurs for trade in perishables where the reduction in transit time allows the shipper to extend the range in which goods can be sold.

Reliability

The importance of reliability varies for different trades. It is very important for manufacturers with capital-intensive production facilities that must coordinate the shipment of a wide range of inputs from multiple suppliers. It is also very important for just-in-time manufacturers that must adjust output to meet changing orders for the quantity and mix of different products. It is become increasingly important for large-scale retailers and wholesalers who achieve cost advantage by minimizing their inventories in warehouses, in transit, and on their shelves. They accomplish this by reducing order sizes, shortening order cycles, and increasing their requirements for on-time shipments. Finally, it is important for pipeline-type operations where the time in transit is less important than ensuring a continuous flow of product at the destination.

³ This assumes average inventory is equal to half the average order size plus a 25% cushion. The annual cost of inventory is spread over the annual amount shipped. The cost in transit is the financing costs during the period of transit. For an annual financing rate of r%, the carrying cost of the cargo with unit value C is $C \frac{r\%}{365} * \left(1 + \frac{1.25}{2}\right)$

The cost of unreliable service can be estimated by considering the direct cost for missed delivery dates. In some cases, the buyer will charge a penalty or refuse to accept the shipment until the price has been discounted. In other cases, the buyer will cancel subsequent orders. The extent of the penalty is related to the impact on the buyer due to missed sales and/or overstockages as well as the availability of competing suppliers. As discussed above, shippers introduce slack time to avoid missed deliveries. The slack time will be set proportional to the standard deviation of the transit time. The greater the penalty the greater the multiple of standard deviation used for slack time.⁴ A shipper normally establishes a standard for on-time deliveries, and adjusts the slack time to meet this standard.

An initiative to improve the performance of some of the services in a corridor will change the cost, time and/or reliability for all of the trades that use these services. The resulting change in total cost for a unit of trade k would be:

$$\Delta C_k = \Delta c_k + \alpha_k (\Delta t_k + \beta \Delta \sigma_{t,k})$$

Following from the example in Figure 9, if an improvement in the corridor increases the cost by 25% from \$200 to \$250 but reduced the time in the last link by 50% from 10 days to 5 days and, in so doing reduces the standard deviation in total transit time by 3 days, then the net savings can be estimated for a typical shipper based on their value of time and demand for on-time delivery. Assuming the shipper has a target of 97.5% on-time delivery and values each additional day in transit at \$10, then the improvement provides a savings per shipment of $-50 + 10(5 + 1.96 \cdot 3)$ or \$58.8 per shipment

If this change is significant as a percentage of total cost for the door-to-door movement, then it may also affect the volume of traffic. The change in cost for trade k would be computed by multiplying this changes in cost per unit of trade by the expected volume of cargo as follows:

$$V_k \Delta C_k \left[1 + \epsilon_k \left(\frac{\rho \beta \Delta C_k}{2 C_k^T} \right) \right]$$

The parameter ϵ_k is the elasticity of demand with respect to total delivered cost of good k, C_k^T and ρ is the proportion of the reduction in cost that is passed on to buyers. These relationships highlight the importance of the volume of the trade, V_k , the sensitivity to transit time, α_k , and the combination of the elasticity of demand ϵ_k and the percentage savings of origin-destination cost that is passed on to the buyers.

The elasticity generally has a limited impact. Although most international trades involve competition for market share and the sensitivity to a change in cost can be relatively high, the costs incurred in the corridor are only a small portion of the total delivered cost of the product. For example, transport costs will typically account for about 10% of delivered cost. If the corridor accounts for about 1/2 of this amount and an improvement is introduced which reduces the cost for services in the corridor by 1/4 of which 1/2 is passed on to the buyer, then the impact for the buyer is only 0.6%.

⁴ For example, with a normal distribution, a slack time of 1.65 times the standard deviation would result in a 5% probability of missed deliveries, whereas twice the standard deviation would result in a 2.5% probability of missed deliveries. If the goods have a value of \$2000-\$5000 per ton and the penalty for a missed shipment is 25% of the delivered cost, then the savings from increasing the slack time from 1.65 to 2.0 times the standard deviation would be \$12.5-\$31.0 per tonne. For a standard deviation of 2 days, the marginal benefit of increasing slack time is \$18-\$44 per tonne per day but this is offset by the marginal value of the resulting increase in transit time.

II. Mechanisms to Improve Corridor Performance

The concept of a corridor is a powerful construct for addressing most of the major issues confronting freight transportation and especially for freight movements between and through adjoining countries. The concept includes not only a collection of routes but also a portfolio of transport services. It provides a mechanism for focusing efforts of the public and private sector on a common objective, moving goods efficiently through the corridor. It limits the scope of the effort to specific trades, routes, and transport services without avoiding issues related to multimodal transport and integrated logistics systems. It creates an environment in which initiatives can be defined, appraised and evaluated for cross-border freight movements.

The mechanisms available to the public sector include **capital investment, new legislation and regulatory reform**. Capital investment was the key component of the strategy for developing the Pan-American Highway, but its performance suffered from lack of attention given to the regulatory reform and legislation to facilitate cross-border movements. The Northern and Central Corridors in East Africa initially relied on investment but have since focused on legislation and regulatory reform to facilitate the movement of goods on the road and rail infrastructure. The EU relied on legislation to implement strategies for development of the trans-European transport network.

The basic strategies of the EU are worth noting:

- Insure interoperability through harmonization of technical standards for infrastructure and rules applied to transport service providers;
- Improve interconnections of national networks that have been designed primarily to meet domestic needs, and
- Increase market access for transport services provided by one member state in other member states.

Responsibility for investment in infrastructure was assigned to individual governments. The private sector was given responsibility for improving the management of transport and other logistics services.

All efforts to develop a corridor have employed some combination of these strategies. Two of the basic mechanisms for implementing these strategies are the trade and transit agreements and related procedures for clearing cargo.

A. Trade and Transit Agreements

The protocols and procedures governing cross-border movements in an international corridor are set out in bilateral, and occasionally multilateral, agreements covering trade and transit. The agreements covering **trade**, combined with the implementing rules and regulations, stipulate the documentation required for clearing import and export cargoes and the procedures involved in checking the documents and cargo. The agreements on **transit** stipulate the requirements for moving goods under bond either into or across the country, the cargoes to which this applies, the routes that can be used and the access granted to transport providers from other countries. These agreements specify the documentation and procedures required for clearing transit cargo. The latter is usually limited to an inspection of the cargo documents and customs seal on the vehicles and their cargo. The trade and transit agreements will set out the rights of transport companies in the participating countries to participate in these trades (see box). This will generally be complemented by other regulations covering the type of transport that can cross the border, the routes on which this transport can operate and the period of time over which this transport is allowed

to be in the country. As a result, these agreements have an important role in determining the efficiency with which the corridor operates.

Mercosur Agreement – Cross Border Movements

The regional agreement for integration of the trading union among the MERCOSUR countries in Latin America introduced a uniform legal regime for international transport by authorized transport companies. It provided for the development of an international transport document, a customs regime modeled after the TIR Convention (but without a guarantee scheme) and obliged the participants to implement an international third party liability scheme. It provided for standards regarding carrier responsibility for lost, damaged and delayed goods. Among the general provisions is:

“Each contracting Party undertakes to give, on the basis of reciprocity, national treatment to the transport companies authorized by other Parties to carry out international transport under the terms of the Agreement. Such transport companies from other countries can also be given exemption from domestic taxes duties and rates to reciprocal basis.”

The agreement has provisions that apply to both bilateral and transit road transport. It provides for reciprocity in the allocation of passenger and goods traffic between the parties. It also distinguishes between goods carried on own account and those carried by third parties. Finally, it allows for temporary use of the vehicles of third countries by an authorized transport company.

From the perspective of an international corridor, the most important issues that these agreements address relate to:

- **Interconnection** – all major nodes along the corridor where processing takes place.
- **Border Clearance Procedures** - the documentation and clearance procedures applied for imports, exports and transit cargo
- **Interoperability** – technical standards for infrastructure and services
- **Transport market access** – ability to offer transport services in other countries, and
- **Liabilities** - the allocation of responsibility for damage or loss of goods and for duty due of these goods and associated requirements for insurance or guarantees
- **Route capacity** – Further development in available infrastructure

The following discussion covers each of these issues. It examines strategies available to the public sector acting alone or in concert with the private sector. Within each strategy there are various mechanisms that can be employed as shown in Table 2.

B. Interconnections

The major constraint on corridor performance is generally found at the interconnections. These include not only border crossings and international gateways but also the major nodes along the corridor. The former is where transport units and their cargo are normally cleared. It is at these points that most of the unnecessary delays and informal payments occur. The nodes along the corridor provide a range of services including intermodal transfer, equipment exchange and cargo inspection. If the interconnections are to operate efficiently, it is necessary to provide sufficient capital investment for infrastructure and ensure effective management of the services provided at these interconnections.

Public sector efforts to improve these interconnections have traditionally focused on investment in new capacity, but in the last few decades increasing attention has been given to the quality of services offered

Table 2: Strategies and Mechanisms for Developing and Improving a Corridor

Strategy	Mechanisms	Areas Affected	Impacts Affecting	
			Costs	Time
Increase and Improve Interconnections	Establish New Transfer Points Add Facilities Simplify Procedures and Documentation Standardize Documentation Consolidate CIQS Inspections Relocate Inspection Inland or at Marshalling Yards (for rail) Provide New Logistic Services Monitor Performance	Border Crossings And Gateways	Shorten Door-to-Door Routes Reduce Door-to-Door Delays Reduce Administration Reduce Processing Time Increase Transparency Simplify Handling of Vehicles and Cargo Value added Reduce Delays	
Establish Interoperability	Harmonize Technical Standards and Rules for Operators Simplify Allocation of Liabilities Standardize Certification	Transport Services	Increase Cross-border Competition And Provide Economies of scale Reduce Equipment Exchange “ “	Reduce Equipment Exchange “ “
Increase Market Access	Allow Cross-border Movements Eliminate Cabotage Deregulate Pricing Commercialize Public Services Regulate Anti-competitive Behavior	Transport Services Border Crossings And Gateways	Reduce Equipment Exchange and cargo handling Improve Variety and Quality of Services Increase Availability of Services Introduce Competitive Pricing and Variety of Services “	
Increase Route Capacity	Capital Investment (New, Expansion, Rehabilitation) Operational Changes	Transport Services	Improve Equipment Utilization and Reduce O&M	Increase Operating Speed and Reduce Congestion

with the result that the public monopolies have been replaced by competitive private sector service providers. More recently, efforts have focused on reducing the regulatory constraints on efficient interconnections. All three, capital investment, commercialization and simplification of regulations, continue to be important initiatives for improving corridor performance.

Improvements in Border Clearance Procedures

Nearly all of the corridors have adopted a strategy of improving the performance at the border crossings and international gateways, making it the most consistent strategy employed. In the case of TRACECA, it is the core strategy. This strategy has been most successful in corridors that pass through a Customs Union. The TEN network and the Trans-Kalahari Corridor have been able to significantly reduce cross-border procedures and delays through agreements developed as part of the Customs union. In contrast, the customs unions on the Pan American highway cover only the beginning (NAFTA) and the end (Mercosur). As a result, the efficiency of the border crossings has not improved in Central and northern South America and relatively little traffic moves through the middle of the corridor.⁵ The success of improving cross-border performance on the Maputo corridor and the resulting growth of traffic at the expense of South African ports contrasts with the difficulties in improving performance on the Northern and Central Corridors where there has been relatively slow growth in traffic even though these corridors provide essential outlets for landlocked countries.

The times for Customs clearance have declined over the last decade with many border crossings achieving clearance times for properly documented cargoes of less than 2 days for imports, a matter of hours for exports, and even less time for transit cargo. This improvement has occurred during a period in which the traditional responsibilities of the Customs authorities for revenue collection, enforcement and statistical reporting have broadened. Revenues to be collected include not only duties and excise taxes but also VAT, countervailing duties and duty drawbacks. Enforcement responsibilities have extended beyond prevention of smuggling and trade in banned commodities to enforcement of trade agreements and prevention of terrorist activities. During this same period, the participation of other agencies involved in certification of traded goods (CIQS) has increased and added to the total time for clearing cargo. In line with the [Geneva Convention on the Harmonization of Frontier Control of Goods](#) (1982), Customs is increasingly tasked with coordinating its activities with these agencies, especially those responsible for regulation of imports and exports, e.g. those responsible for product standards, sanitary and phytosanitary regulation, livestock, arms and illicit drugs, etc. Finally, the customs is responsible for collecting and publishing trade statistics and data on its activities.

Greater efficiency in border clearance has been achieved through simplification of procedures, greater transparency in implementing these procedures and providing better information to the public on these procedures. This has required a substantial increase in the use of computers, the quality of the data collection and the extent of information processing. Other reforms have been directed at improving operating procedures including improving training and compensation, extending operating hours on major international crossing points for freight and synchronizing operating times on both sides of the border.

Mechanisms for simplifying procedures include the introduction of:

- Single Administrative Document (SAD) with a standard format, e.g. UN layout key,
- Direct Trade Input for pre-notification using EDI and Internet-based systems,
- Channeling and risk management
- Movement of transit cargo under improved one-time seals without border inspections
- Better inspection facilities and equipment

⁵ In part because of the waterborne competition.

- One-stop services and
- Collocation of clearance facilities.

These mechanisms can significantly reduce the time for clearance and inspection and, by implication, increase the capacity of the border crossings and international gateways. They also reduce the costs of operating and maintaining these facilities.

The SAD replaces individual documents for imports, exports, and temporary imports and, in the process, reduces administrative costs for shippers, consignees and customs. It also increases the efficiency of the clearance process by reducing discrepancies between documents and preventing the proliferation of special procedures and signatures for each documents submitted. While, it is still necessary to provide a number of supporting documents from both public and private sources, the list of these documents, which includes commercial invoice, packing list and Bill of Lading or waybill, is relatively standard. The addition of documents beyond this standard list is generally associated with non-tariff barriers to trade.

The concerns of shippers with excessive documentation and lack of transparency are universal. In some countries specific entities have been created to improve exchange of information between shippers and the public agencies responsible for border control. e.g. Tradenet in Singapore. In other countries either Customs or the seaport authorities have taken the lead in developing information systems to serve the various parties involved in trade. These systems not only coordinate the flow of information on these cargoes but also provide information on their status to the various parties involved in the movement of the goods. Shipping lines, freight forwarders and other logistics providers have become more sophisticated in their use of EDI and cargo tracking systems. Increasingly they have taken over the function of providing information for facilitating cross border movements and for tracking cargo to shippers, Customs and other agencies involved in clearing cargo.

Channeling, the segregation of traffic according level of risk, can reduce the average time for clearance and permit better allocation of customs inspectors. Additional measures to assess risk can be introduced through computer-based analysis of past experiences with specific cargoes, trades and shippers. This is combined with information obtained from intelligence gathering and the experience of customs inspectors. Customs can then adjust its clearance procedures according to the likelihood of misrepresentation by the shipper. With this information, Customs can establish a relationship with “authorized traders” who assume responsibility for ensuring the conformance of their shipments and in return benefit from expedited cargo clearance procedures. Ultimately, this relationship allows Customs to audit the traders’ records rather than individual trades.⁶

Transit cargo that moves in a sealed container under bond requires minimum checking at the border or international gateways. For land borders, the processing time can be reduced to a few minutes through use of an express lane. Earlier practices requiring convoys accompanied by customs officials and movements along fixed routes are being gradually replaced by other forms of monitoring including time limits and RFIDs. These require better communication between the points of entry to and exit from the transit country.

Improvements in inspection technology including the use of in-motion weighbridges, different types of scanners, and tamper-proof seals can reduce the time and cost for inspecting import and transit cargoes, provided proper implementation strategies are put in place. Proper design of the customs facilities can reduce congestion by taking into account traffic flow, queuing requirements, segregation of traffic, fewer movements by inspectors and transport units, loading/unloading docks and space requirements for

⁶ This approach has limits since it depends on effective audits of company accounts which are harder to verify than a program of random sampling of shipments, in many developing countries.

physical inspections⁷. While most of these improvements have been introduced at the major gateways, it has been difficult to introduce them at land borders that are further from urban centers.

A much-touted effort to improve customs procedures, the one-stop shop, has been less successful. While customs in many countries have increased their use of EDI and computers to facilitate the clearance of cargo, the other border agencies have not. These agencies continue to require paper documentation and do not provide easily accessed information on cargo status. Efforts by Customs to introduce one-stop services have been frustrated by the lack of information and cooperation from these agencies.

Another tool for improving customs performance is to create incentives by introducing systems for monitoring and reporting this performance. This was the technique applied in the TTFSE project for Southeast Europe (see box). The type of performance measures to be monitored is shown in Table 3.

Table 3: Performance Measures

Measures for different cargo groups
(Transship/transit/re-export/export/import cargoes)

- percent in each group,
- percent cleared at border,
- average value for each group,
- percent requiring inspection,
- percent detections,
- average time for inspection,
- percent requiring more than specified time,
- average number of collateral inspections,
- average time for collateral inspection
- method of valuation
- average number of documents required, and
- average number of signatures

Relocation of Cargo Clearance Activities

One of the best options for increasing efficiency of clearing import and export cargoes is to relocate the clearance procedures away from the border. Indeed this is one of the basic insights of the EU's program. Inspections of truck registration, driver's licenses and certificate for road-worthiness can be conducted along the corridor but away from the border as part of the domestic program of roadside inspections. Train inspection can take place at marshalling yards where they are supposed to stop, instead of border crossing points. Cargo inspection and clearance procedures can be relocated at inland bonded warehouses, container depots and dry ports. This approach was pioneered to alleviate congestion in international seaports but is now being adapted for imports arriving through land borders. It allows movement of goods under bond from the border to inland customs facilities or special economic zones or other enclaves that are granted duty free status. This can include allowing cargo to be cleared at factories.

C. Interoperability

For international corridors, interoperability refers to the ability of transport units to operate across the countries through which the corridor passes. This requires compatibility of transport infrastructure on both sides of the border. It also requires harmonization of the physical characteristics, policies and procedures that would otherwise prevent cross-border movements. Without harmonization, it is necessary to perform back-to-back transfers of cargo between transport units at the border. This adds to the costs and time for the crossing and the losses during cargo handling. Most of the features of interoperability are achieved through bilateral agreements and back-to-back agreements where there are more than two countries within the corridor.

Harmonization applies to both **transport infrastructure and transport units**. It requires an agreement on a common set of technical standards or an acceptance of the technical standards applied by adjoining

⁷ Outline of border processing: <http://www.gfptt.org/Entities/ReferenceReadingProfile.aspx?id=18d15931-4fba-4857-83f0-9c28b68e8ccc>

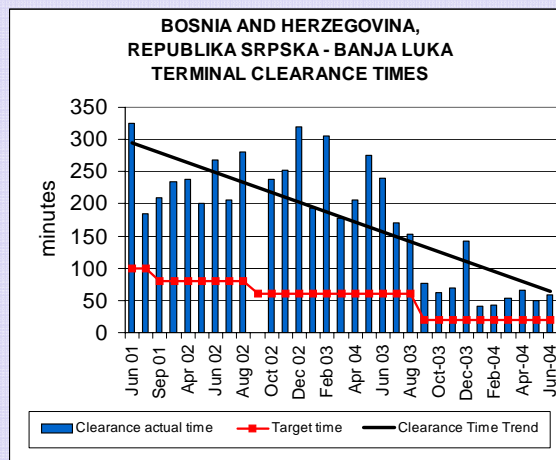
TTFSE – Measuring Performance (www.seerecon.org/ttfse)

The regional program of trade and transport facilitation in Southeast Europe (TTFSE) was developed by the World Bank in cooperation with the EU to support efforts to modernize the border agencies, in particular their Customs Administrations, in Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Moldova, Romania, and Serbia and Montenegro. The core components were institutional reforms including changes in laws and regulations, simplification of procedures simplification in line with EU practice, improvements in training of staff and investments to upgrade information technology and border crossing facilities. The program was overseen by a high-level regional steering committee supported by public-private partnership working committees. Over 25 pilot projects were established at specific border crossings and inland clearance facilities to reduce the impediments to trade.

An essential component of this effort was the introduction of harmonized set of indicators to measure general performance and to assess the impact of pilot project initiatives. Among the measures introduced were:

- % of documents inspected
- % of containers/trucks inspected
- % of containers/trucks cleared in less than 15 minutes
- Irregularities detected per number of inspections
- Average border crossing time for outbound vehicles
- Average border crossing time for inbound vehicles
- Revenue collected versus salaries for staff
- Average number of declarations processed/staff
- Average trade volume/staff
- Total administration cost/Revenues collected

The collection of data was done periodically and the results were reported in graphical form to provide an indication of how effective various initiatives had been. In addition, sampling techniques were developed to collect more detailed information on the time required for different activities in the border crossing and attitudinal surveys were developed to obtain users opinions as to the success of efforts to improve performance. These efforts not only provide a basis for assessing performance and evaluating the impacts of various initiatives but, equally important, provided a greater level of transparency.



The pilots improved interaction between border agencies, which increased productivity. While the program benefited from the requirement that the participating countries prepare for accession to the EU, it was also constrained by the reality that the procedures would be dramatically changed following accession. Perhaps the most important benefit was to introduce a greater level of attention to the problems of border crossings as an essential component in trade facilitation. (see www.seerecon.org/ttfse for more on the program and its indicators)

countries. The former is difficult to achieve because it implies a modification of existing infrastructure or a change in engineering practices. For roads, the latter approach is most common but there is often an agreement to gradually adjust designs towards a common standard. This was the approach taken for the corridors in the Mekong subregion.

For **railroads**, it is necessary to have a common set of standards. The critical standard, rail gauge, has been a problem for the countries in South Asia and the Mercosur area where there is a colonial legacy of mixed gauges but not for East Asia and Southern Africa where the rail system was developed on a regional basis. Other standards such as length of sidings and type of signaling, affect maximum train length. Additional standards such as rail strength and track geometry (minimum curvature and maximum incline) affect the type of wagons that can be used and their capacity. Even where a rail network is well integrated, there can be problems when modifying the system to perform new functions. For example, the introduction of double stack trains or high speed services.⁸

For **seaports and airports**, most of the standards are based on general engineering standards, many of which are promoted by international agencies, e.g. ICAO. The physical parameters for individual facilities, e.g. draft, backup area, runway length and terminal size, are determined primarily by market forces. As such there is less risk of incompatibility.

Standards are also applied to the transport units crossing the border. The EC has developed an extensive set of technical standards for transport units covering the parameters shown in Table 4. For trucks, the principal criteria are the gross vehicle weight, which is constrained by the capacity of bridges, and overall vehicle length, which is limited by road geometry in urban areas and safety of operation on the main arteries. There are also standards regarding emissions. In general, it has been difficult to develop a common set of standards for road transport or to gain acceptance of the standards applied by the other countries. This has not been a serious impediment to efficient corridor operation where private operators are allowed to procure trucks that would satisfy the different sets of standards applied on the route. Where there have been restrictions preventing trucks from crossing borders, these have generally been associated with efforts to create barriers to trade (see box).⁹

Table 4: Technical Parameters for Transport Units

Road	Truck length overall Axle Weight Gross Vehicle Weight Registration Plate
Rail*	Axle Load Vehicle Loading Gauge Minimum Braking Distance Maximum Train Length
IWT-vessel Coastal Vessel	Freeboard Vessel Class and Certification
Aircraft	Type Certification Certification for Airworthiness

Source: EU Directives

* many derived from UIC (Intl Union of Railways)

For rail transport, the compatibility of rolling stock depends on physical constraints associated with both the rail network and the characteristics of the domestic rolling stock. Differences in axle configuration and braking systems can prevent efficient operation and thus discourage cross-border movements. There is almost always an exchange of locomotives at the border. The power and availability of the locomotives determine total train weight. Differences in power supply type (AC/DC in particular), between countries or within countries also require either changes in locomotives, short of investing in new locomotives, or shifting to diesel-powered locomotives. If there are differences, trains must be reconfigured at the border, leading to wagon inspection and brake testing, and increasing the

⁸ In Europe, there have been difficulties with the introduction of High Speed Train operations since this requires a much higher standard for rail strength and alignment

⁹ This was the situation on the US-Mexican border where Mexican trucks were prohibited from crossing over presumably for safety reasons, but in fact because of protectionism for US trucking companies.

likelihood of delays, particularly when multiple countries are crossed. The national railroads are given responsibility for deciding whether wagons can cross the border. Their decision depends not just on physical limits but also on agreement as to charges for track access and responsibility for returning wagons.

For **vessels and aircraft**, there are international and regional standards. These apply to both the transport units and the supporting navigational systems. For vessels, the IMO is actively involved in developing these standards, whereas for aircraft this responsibility is left largely to national civil aviation authorities. From time to time, countries have introduced restrictions on the foreign vessels and aircraft allowed to use their seaports and airports, but these are usually barriers to trade rather than technical standards. The growing international concern for security in the movement of goods is expected to introduce new restrictions, but it is unclear whether these will be determined by international standards or more parochial interests.

Certification

Associated with physical standards for transport units are the procedures for certification of transport units that meet these criteria and the documents that certify that these procedures have been performed. Harmonization of the procedures for and frequency of inspection can be accomplished on a bilateral or multilateral basis. The most common mechanism is bilateral agreements that provide for mutual recognition of the other country's procedures and documents.

The two modes that present the greatest challenge for certification are trucks and inland water and coastal shipping, since their certification has traditionally been governed by local rules. Where they operate on a multi-country corridor, it is necessary to have agreement on inspection procedures and reciprocal recognition of the documentation. Trucks are inspected for road-worthiness and emissions. Inland water and coastal vessels are inspected for seaworthiness based on domestic classification requirements. The procedures for licensing truck drivers and the officers and crew of inland water and coastal vessels are also determined by local regulation. There must be reciprocity through mutual acceptance of qualifications and licenses or each country must issue licenses for operators from the other country. These arrangements are generally achieved through bilateral agreement, but there have been efforts by regional associations to introduce regional procedures, e.g. ASEAN.

There is no demand for certification of rail equipment. Instead, the national railroad determines whether foreign wagons are in a condition to be hauled. For seagoing vessels, there are international societies that certify the vessels but the officers and crews are locally certified. Aircraft, pilots and crew are certified by their local civil aviation authorities but may also be subject to certification by the country of destination.¹⁰

D. Market Access

An important complement to interoperability is the ability of service providers from one country to compete in the provision of transport services in the other country. In order to have meaningful competition between countries, there must be a legal framework that gives transport operators access to the transport market throughout the corridor. Without this, an international corridor is merely a collection of interconnected domestic corridors.

¹⁰ FAA for the US.

Improvements in market access increase the pool of transport operators, thereby offering more options in terms of the cost and quality of service. To the extent that transport operators have access to a larger market, there is also a potential for economies of scale. In order to improve market access, it is necessary to have an effective transit agreement and supporting agreements on standards and certification. In addition, it is necessary to allocate the liabilities so that transport operators can obtain the necessary insurance coverage. Finally, the government must guarantee a level playing field in which the transport operators can compete.

Allocation of Liabilities

Effective allocation of liabilities requires identifying the parties responsible for various actions and providing financial services that cover these liabilities for the complete movement through the corridor. A general problem for intermodal freight transport, and a special problem for cross-border trades, is the liability in the event that cargo is lost or damaged. This is addressed at a national level by requiring transport operators or shippers to provide insurance for the cargo. For efficient corridor operations, it is important to have a regional insurance program that covers both the transport units and their cargo while transiting the corridor. While some regions have a liberalized insurance market, it is more often the case that the transporters must obtain insurance from local companies when entering each country. This is not usually a problem for ocean and air transport as these modes have access to regional coverage but is a problem for truck and rail transport. It is anticipated that this problem will diminish with the easier with liberalization of domestic insurance markets as part of reforms associated with the General Agreement on Trade in Services.¹¹

In addition to coverage for loss or damage of cargo, there is also a need for coverage of the liability for the taxes and duties on international cargo that in moving through a country under customs bond. For European road transport, this concern has been addressed through a self-insurance program managed by transport associations as part of the TIR convention coordinated by a secretariat in the UN/Economic Commission for Europe. Under this convention, the goods are transported under a bond covering possible duties. The transporter carries a carnet that is presented to customs at each border crossing. While this system has been extended for some shipments to Central Asia and the Maghreb countries, it has yet to achieve wider acceptance. Attempts to create similar systems in West Africa (the *TIE* system), in Southeast Asia (ASEAN), in Mercosur, and in Southern Africa (COMESA) have had limited success. Different arrangements are available for goods moving to an inland customs facility under a combined bill of lading or a marine bill of lading. The shipping lines and forwarders arrange for coverage through a Customs bond or guarantee that is maintained to cover all shipments.

Cabotage

After agreement has been reached on standards and certification and on the elimination of restriction for transport units carrying cargo into and out of another country, there still remains the contentious issue of

¹¹ The GATS provides for trade in financial services including insurance and insurance-related services. It covers trade

- from the territory of one Member into the territory of any other member,
- in the territory of one Member into the territory of any other Member,
- by a service supplier of one member through commercial presence in the territory of any other member,
- by a service supplier of one member through presence of natural persons of a Member in the territory of any other Member.

So far 102 WTO Members have multilateral commitments in these sectors. Nations accounting for over 95% of the trade in banking, insurance, securities and financial information have brought financial services under international rules.

cabotage. Most countries enforce cabotage laws to protect domestic shipping, trucking and air services but some allow cross ownership of transport companies or other forms of participation that allow cross-border movement.¹²

In order for transport services to operate efficiently, they must have the opportunity to carry cargo on all legs of their journey. If the bilateral trade is balanced, this can be accomplished by transport services carrying only the country's import and export cargo. However, it is more common to have a dominant movement in one direction leading to a significant proportion of empty backhauls. The result is higher transport costs. Savings in transport costs can be accomplished through an accommodation with neighboring countries to allow carriage of that country's domestic cargo in well defined situations, e.g. while enroute to the border. However, this concession has rarely been achieved outside of a customs union, e.g. the European Union and SADC, or in areas linked by regional trade agreements, e.g. NAFTA and SAARC.

Commercialization of Services

Another opportunity for improving market access is commercialization of the operations at intermodal transfer points along the corridor and at the gateways at either end of the corridor. In most cases, the replacement of public sector monopolies with private sector management of seaports, airports, rail and road ICDs and other intermodal terminals has provided significant improvements in the time and cost of moving cargo. With commercial management, fixed tariffs can be replaced by negotiated prices and uniform standards of service can be replaced with services designed to meet specific needs of the transport operators and their cargo. Specifically, different levels of service can be provided for high-value time-sensitive cargoes and for low value, time-insensitive cargoes. This change in management allows the replacement of policies that discriminate between domestic and foreign transport operators with ones that discriminate between efficient and inefficient operators. It encourages the introduction of value-added services including automated document preparation and cargo tracking. The overall result is lower cost and fewer delays when transferring cargo at intermodal transfer facilities.

Competition Policy

Assuming that market access has been improved for transport service providers and there is sufficient commercialization of the activities at the multimodal transfer points, then it is necessary to ensure that a high level of competition is maintained. This requires relatively little effort in road transport since there is little scope for economies of scale. Ocean and inland water transport offer economies of scale, but have traditionally enjoyed strong competition with few barriers to entry or exit. Rail transport does not have these advantages but faces strong competition from road transport, which has captured significant market share from the railroads. Air transport had been a problem in regions where national flag carriers are dominant but competition has increased dramatically as the markets for both local and international services have been liberalized.

The only area in which competition is likely to be constrained is the provision of services at the transfer nodes, especially the international gateways. For these, it is important to ensure either direct competition in the provision of services or sufficient contestability in the granting of concessions for these services. Further protection can be provided through general legislation against anti-competitive behavior. The EU has taken this approach as shown in the box below.

¹² While the EU restricts domestic movements, European trucking companies can employ foreign drivers and tractors and transport domestic cargoes provided the trailer is registered in the EU.

EU Competition Laws

The EU competition laws apply to the transport sector. These are set out in Council Regulation (EEC) No 1017/68 of 19 July 1968, which applies to transport by rail, road and inland waterway. As last amended by the Act of Accession of 1994, it prohibits:

- (a) “directly or indirectly fix purchase or selling prices or any other trading conditions;*
- (b) limit or control production, markets, technical development, or investment;*
- (c) share markets or sources of supply;*
- (d) apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;*
- (e) make the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.”*

Exclusions had been granted for air and maritime transport sectors including:

- “certain categories of agreements and concerted practices concerning joint planning and coordination of schedules, joint operations, consultations on passenger and cargo tariffs on scheduled air services and slot allocation at airports*
- exemption for agreements between carriers concerning the operation of scheduled maritime transport services, and exemption for agreements between transport users and conferences concerning the use of scheduled maritime transport services),*
- certain categories of agreements, decisions and concerted practices between liner shipping companies (consortia)”*

These were revised in Council Regulation (EC) No 1/2003 of 16 December 2002: “ On the Implementation of the Rules on Competition Laid Down in Articles 81 and 82 of the Treaty.”

The benefits from improving market access for transport operators from different countries within a corridor include not only lower costs and greater diversity of services but also savings in cost and time from not having to transship cargo at the border and greater ability to respond to peak demands without substantial price increases.

E. Route Capacity

Since the corridors reviewed for this study were developed from existing routes, investments in new links are relatively rare. The most notable exception are the domestic/trade corridors being developed as part of the Golden Quadrilateral in India (see box below). Most investments are made to remove choke points or increase quality of transport services by adding capacity or improving the configuration in order to reduce average transit time and accommodate larger transport units.

Capital investments for extensions of the transport network to the border are rare. A number of factors limit the opportunities for investing in these connections, especially physical constraints since borders frequently conform to natural barriers, e.g. mountains, rivers, etc. There are usually a large number of low capacity roads developed by local interests to facilitate informal cross-border trade, but national governments have been reluctant to formalize these connections because of the low volume relative to cost. Even where cross-border connections can be developed at reasonably little cost, there is the associated cost for the facilities and staff to monitor the additional cross-border traffic. Also, border areas tend to be in locations where the government has limited control and there is the concern that efforts to improve interconnections will facilitate cross-border movements of contraband, illegal immigrants and insurgents. Such concerns have prevented the completion of Pan-American Highway, and restricted the

official crossings between Sabah (Malaysia) and West Kalimantan (Indonesia) and Sabah and East Kalimantan to single roads.

For rail border crossings, the principal constraint is the relatively small volumes carried by branch lines between the existing network and the border relative to the cost for these extensions. This cost includes not only the branch line to the corridor but also significant investment in cross-border infrastructure including sidings for inspection, switching of locomotives and reconfiguration of trains. Furthermore, this investment must take place simultaneously on both sides of the border. Finally there is the difficulty of changing the allocation of network capacity to allow for through movements to the border and the reassignment of trains to this route.

Golden Quadrilateral – Upgrading Corridors

The Golden Quadrilateral is approximately 12 thousand kilometers of limited access four lane roads connecting the four major cities in India, Mumbai, Delhi, Kolkata, and Chennai. This massive construction program was begun in 1992 under the direction of the newly formed National Highway Authority and implemented through a mix of financing strategies and public-private collaborations.

The introduction of the four lane highways on traditional corridors has dramatically changed the freight logistics of India. Allowing for the introduction of modern trucking using articulated trucks and creating the opportunity for national trucking services. While the network has not been extended to the borders, it provides access to the seaports at Nhava Sheva, Kolkata and Chennai. It also connects to the West Bengal Corridor. This system is complemented by the expanding unit train services of Concors. The principal services are from Nhava Sheva to Delhi and other major markets but are expected to expand in parallel with improvements in Indian ports as a result of the increased role of the private sector in port operations.

All of these improvements are occurring as the country rapidly expands its trade and positions itself to become a major exporter.

The capital investment in road and rail connections to the border are undertaken as part of development of the domestic network and funded through the domestic budget. As such, these investments must complement the rest of the network while competing with other domestic priorities. Where fees are collected for the use of the national network by international transit traffic, they rarely cover anything other than a portion of the maintenance and operation costs.

The development of corridors can be used as a mechanism to mobilize support for the development of the links to the border that would otherwise receive relatively low priority in domestic budgets. This was the situation for the corridors in the SAARC region, East Africa and West Africa where financing for development of land routes to the borders has been justified in terms of the benefits of providing an outlet for the trade of landlocked countries. In some cases, corridors have been established to provide a focal point for investment. This is the case for the Can-Mex corridor where the various routes have been identified in order to obtain funding from the Federal government. For the GMS and SAARC regions, ADB has developed lending programs specifically for the development of corridors that serve two or more countries in these regions, e.g. the East-West and West Bengal Corridors.

Gateways

Since most of bottlenecks on corridors occur at the gateways and border crossings, especially seaports and land border crossings, much of the investment in improving corridors has focused on these facilities. Many of the bottlenecks can be eliminated by simplifying procedures and increasing efficiency of operations, but over the long run changes in technology and growth in traffic will require capital investment.

Public investment in **port infrastructure** is justified as a means to support a country's foreign trade and to maintain global competitiveness. Where ports handle transit cargo from other countries, this traffic normally uses the same facilities as import/export cargo and thus does not require additional

infrastructure.¹³ Instead, it improves the utilization of existing capacity and increases the profitability of the port. The exception occurs where customs and border agency regulations require isolation of these cargos and thus separate facilities and operations. This not only adds to the costs of port operations but can also reduce overall efficiency. This is less of a problem with the growth in experience of handling transshipment cargo, which has similar requirements. Also, the procedures for handling transit cargo have been simplified. It remains to be seen what the impact of new security regulations will have the handling of transit cargo, but over the long run there should be no reason for segregating this cargo.

Investments in **border crossings** have similar benefits for foreign trade but often receive less attention. Because the borders are usually far from the major urban centers, congestion and poor service quality at these crossings receive less attention than at the seaports. As a result, the facilities provided are generally minimal and the performance of customs and other border control agencies is of a lower standard. In some sense, this has benefited cross border trade. While there is less transparency there is also less opportunity for delaying shipments because of the lack of facilities for storage and inspection of goods and queuing of transport units. The crossing between Bangladesh and India at Petrapole/Benapole provides a useful lesson in this regard. Petrapole has experienced horrific queues because of the lack of processing capacity. In contrast, Benapole has a land port with several big parking areas and a large number of godowns.¹⁴ However, transit time at the latter is longer because the additional capacity compensates for inefficient procedures and encourages rent-seeking activities by the participants in the land port.

In the case of seaports and airports, the physical requirements for efficient operation are well understood and the planning techniques are relatively standard throughout the world. Inefficiencies are generally caused by insufficient investment and ineffective management. Unfortunately, less attention has been given to the design and operation of land border crossings. In most countries, the design and traffic engineering for similar type of facility is understood, but this knowledge is rarely applied to the design of land border crossings. The result is elaborate facilities developed in locations where there is relatively little traffic, e.g., Savannahkhet on the EWEC and Karkarbhatta and Birgunj on the India/Nepal border, while minimal facilities are provided at sites where there is a large volume of traffic. The design of these facilities is more difficult in remote area with relatively poor infrastructure, lacking reliable power and communications, and subject to minimal management oversight. There the border crossings must be simple but designed to encourage transparency and consistency in clearance procedures.¹⁵

Capital investments address physical capacity constraints but not underlying problems of efficiency. If the objective is to have a seamless border, then the number of activities occurring at the border and the time to complete them need to be minimized. The only reason for providing substantial infrastructure facilities at the border is to accommodate structural impediments to the free movement of goods and transport. Two areas in which capital investment can increase productivity are the facilities for cargo inspection and supporting ICT systems. The former are truck docking facilities that allow quick off-load and reload cargo for physical inspection and full trucks scanner for goods that are, fragile, perishable, or otherwise require special handling. Communication systems link border crossings with central customs offices and other border agencies to better coordinate activities with shippers and transport companies and to facilitate the submission of cargo documents. They also provide links with other border crossings to monitor the entry and exit of vehicles and cargo moving in transit. These are supported by information

¹³ There are exceptions such as Djibouti, where the volume of transit cargo is much greater than domestic cargoes or Aqaba, where fluctuations in transit cargo can create serious shortages of capacity.

¹⁴ This is partly explained by the dominance of export traffic at Petrapole and import traffic at Benapole.

¹⁵ Where border crossing procedures are not uniformly applied, the traffic will usually shift to those border crossings that are more efficient or where procedures are less intrusive and total cost including informal payments is lower.

systems that expedite the processing and inspection of cargo and their documents, e.g. ASYCUDA and ACIS, as well as the transmission of documents and trade data through EDI.

Other Nodes

While the border crossings and gateways are the major nodes for the international corridors, there are additional nodes that are part of the domestic transport networks but contribute to the performance of these corridors. These include intermodal terminals that increase diversity of routes by providing an efficient exchange of cargo between modes. These are primarily rail-based terminals of which the most important are Inland Container Depots. There are also single mode terminals that provide an interface between urban and interurban transport. Among these are truck terminals and rail yards located at the periphery of cities. The development of this infrastructure is usually a local undertaking and is increasingly funded by the private sector.

A summary of the basic strategies that were applied in the corridors examined in this study is shown in Table 5. Most of the corridors employed a combination of strategies but nearly all included a strategy for improving interconnections, in particular land border crossings. The next section examines the management structure used implement these strategies.

Table 5: Strategies Employed in Different Corridors

Project	Establish Interoperability	Increase Interconnections	Improve Interconnections	Improve Market Access	Increase Route Capacity
TEN	√	√	√	√	√
TRACECA	√		√		
Can-Mex (NAFTA)		√	√		√
Pan American					√
Bolivia-Chile (Mercosur)	√		√		
Northern Corridor	√	√	√	√	√
Maputo Corridor			√		√
Trans-Kalahari			√	√	
West African Corridors			√	√	
Turkey-Jordan			√	√	
Asian Highway			√		√
Mongolia-China			√		
SAARC Corridors			√	√	√
GMS Corridors	√		√		√
Northern West-Borneo		√	√		

III. Corridor Management

The subject of this report, "Best Practices in Corridor Management", implies that corridors can be managed. While both public and private entities have been involved in the development and regulation of the corridors that were reviewed, it is not clear that they managed either the development or continuing operation of these corridors. The term management implies some form of control, but it is difficult to create a single point of coordination given the diversity of stakeholders. Not only are there a large number of government agencies involved in the activities of the corridor but the users are a diverse set of transport and logistics service providers carrying a wide variety of trades. As a result, the management of a corridor is generally limited to organizations established by government, the private sector, or jointly to plan development, disseminate information and coordinate stakeholder efforts. The appropriate structure for corridor management depends on the nature of the corridor and the specific functions to be managed.

A. Role of Corridors

The three types of corridor, domestic, foreign, and transit, have different roles and require different management approaches. There are synergies since all foreign corridors are also domestic corridors and transit corridors also act as foreign corridors. Successful management of domestic corridors provides the basis for development of trade corridors. Successful management of the border crossings and international gateways for trade corridors provides the basis for development of transit corridors. The basic goals for management are to promote the use of the corridor, to provide sufficient capacity to meet demand, and to improve connectivity between modes and between transport logistics services. However, these corridors have different objectives and management requirements. Furthermore, there are differences in the jurisdictions responsible and the enabling legislation and regulations.

Public responsibility for the development of domestic corridors is usually limited to **construction and maintenance** of the infrastructure and **enforcement of regulations** regarding safe operation of transport vehicles. The agencies responsible will be national, provincial or some combination of the two. One of the difficulties in developing an efficient corridor is to eliminate the difference in throughput for links and their connecting nodes. Another is to minimize the conflict between passenger and freight transport. Cities have played an increasing role in the development and operation of corridors specifying not only the points of access to the city but also restricting the hours during which trucks are allowed in the city.

The goals for management of foreign corridors are similar to those for domestic corridors but add ensuring the security of the borders and enforcing trade agreements. The difficulties confronting management are greater due to the addition of the border crossings and gateways. These introduce the problems of avoiding monopolistic behavior and resolving the conflict between trade facilitation and increased security. While these facilities have less conflict between freight and passenger traffic, the problems of illegal immigration can reduce overall efficiency. For land border crossings, there is the problem of remoteness from headquarters, which makes it difficult to supervise personnel and enforce standard procedures.

The goal for transit corridor management is simply to provide efficient and safe movement of transit cargo through the country. The principal problems confronting the corridor management are issues

West Bank and Gaza – Securing a Corridor

Perhaps one of the most problematic set of corridors in recent history are those linking Gaza and the West Bank with each other, with Israel, Egypt and Jordan and through Israel to other countries. The difficulties derive from the security inspections required to restrict the flow of weapons in and out of the West Bank and Gaza and to prevent potential attacks perpetrated by persons approaching and crossing over the borders into Israel. The approach adopted by the Israeli government has been to introduce an extremely cumbersome inspection procedure on the border with Gaza, a less-intensive inspection regime on the border with the West Bank and a series of random inspections at internal checkpoints within the West Bank and Gaza. The effect of these inspections has been not only to disrupt the lives of civilians living in West Bank and Gaza but also to drastically reduce the trade that is essential for the economic development of the West Bank and Gaza. This, is one of the most critical issues to be faced as part of normalizing relations within the region

There are two difficulties with the use of border crossings as the major point of a security check. The first is that security's main concern is to reduce the risk of violence. As such, it is not concerned with the cost, delays, or damage caused to the goods moving across the border. Also, it relies on unpredictability as a means of reducing risk. The second problem is that by focusing on the border, insufficient effort is made it to secure the corridors that utilize the border crossing.

In recent years, there have been significant improvements in detection technology. The Israeli government is now in the process of upgrading its border inspection facilities to include container scanners and devices for detecting explosives. By itself, this technology can only marginally reduce risk. To be effective, it must be integrated with other sources of information about the cargo. It is also important that these be designed to reduce the costs and delays for movement of cargo across the border. This requires the introduction of simpler and more transparent inspection procedures. It also requires that some of the inspection procedures be moved away from the border. This means extending the security envelope from the border to the corridor and using information from upstream activities to minimize the interventions required at the border. This can be achieved through advances in supply chain management, which have significantly increased the amount of information available about the goods moving through a corridor, the means for monitoring this movement and the protection provided by the transport units used to convey these cargoes. Further security can be provided by establishing cargo consolidation facilities near the source/destination of the cargo.

There is considerable overlap between good supply chain management and improved security. Both require closer attention be given to the movement of goods through a corridor. Both also require better coordination between those involved in this movement. They also require more active participation by those who benefit from trade. One of the current problems with improving procedures is that various parties benefit from the current inefficiency and lack of transparency.

related to security and preventing leakage of the cargo into the domestic economy. As such, management must focus on improving coordination between border crossings and gateways and developing effective methods for verifying that the cargo is not tampered with during its journey across the country. The problems become daunting where there are serious security concerns as discussed in the box below.

All the corridors considered for this study are domestic corridors that act as foreign corridors and, in most cases, transit corridors. Because of this overlap, it is important to have collaboration between the public authorities responsible for development and maintenance of the transport network, for administration and operation of the border crossings and gateways, and for setting trade policies and CIQS procedures.

B. Corridor Functions

For each corridor, there are three general functions requiring management oversight – **operation and maintenance of public infrastructure and facilities, provision of transport and logistics services, and**

regulation of trade and transport. While there should be some level of integration of these functions, the management responsibilities are different for each function. A list of the management activities that are included in these functions is shown in Table 6.

Infrastructure and Facilities

Corridor infrastructure, which include links and nodes along the routes as well as border crossings and international gateways, are developed and funded primarily by the public sector but increasingly constructed and maintained by the private sector. On the other hand, an increasing proportion of the facilities constructed at the nodes and gateways are developed, financed and operated by the private sector. The principal exceptions are land border crossings, which so far continue to be developed by customs and other border security agencies.

Management's role is to guide the planning and procurement of these assets. Its goal is to insure that these assets are:

- designed to provide efficient movement of transport and cargo along the infrastructure and through the facilities
- constructed and maintained so as meet required standards,
- of sufficient capacity to meet projected demand,
- used efficiently and
- fully utilized.

The capital costs for the infrastructure are covered through general revenues but maintenance costs are often covered by user fees. For facilities, capital and maintenance costs are generally recovered through activity charges. Corridor management can promote efficient use of infrastructure through judicious use of user fees and efficient operation of facilities through commercial operation. The latter raises two concerns. The first is to avoid public or private monopolies from controlling these assets. The second is to provide reasonable access for potential users while at the same time allowing for the specialization of facilities and activities so as to increase efficiency. The management can address these concerns by ensuring a contestable commercial operation or by introducing economic regulation.

Transport and Logistics Services

The primary services offered for freight moving through a corridor are transport, handling and storage. Increasingly these activities are undertaken by the private sector in a competitive market with costs recovered through user charges. The objective of the managers of individual services is to capture significant market share by offering a competitive combination of cost, time and reliability. This often means offering a variety of services with different combinations of these factors and with the flexibility to adjust them to meet the needs of individual clients.

Significant improvements in quality of service have been achieved by transferring these services from public to private sector management. To the extent that corridor management is responsible for overseeing these services, its objective should be to promote more efficient services, usually by encouraging competition but often by allowing vertical and horizontal integration. Vertical integration offers advantages to shippers who want to contract for door-to-door services rather than a sequential series of services. Horizontal integration offers economies of scale in the marketing and information services necessary to achieve efficient utilization of transport equipment.

Regulatory Procedures

Corridor management generally has some oversight over the regulatory procedures that affect the movement of goods in the corridor and the transport and logistics providers that operate in the corridor. Rarely are they involved in the enforcement of the regulations or even in the enactment of these regulations. Instead they perform an advocacy role discouraging excessive regulation and reforming regulation that leads to inefficiency in the movement of goods through the corridor especially unnecessary delays and informal payments. They can encourage reform by supporting efforts to simplify of documentation and procedures, introduce greater transparency regarding procedures, encourage expanded use of ICT and risk management and promoting harmonization of procedures on both sides of the border.

Implications for Management

These corridor functions require different management approaches. One involves the private sector, another the public sector and the third both. One involves provision of services in a competitive market with full cost recovery, another provision of assets in a market with limited competition and partial cost recovery, and the third with enforcement of laws and regulations as well as tax collection. It is difficult to imagine a management structure that encompasses all three. For most corridors, the focus has been on only one and different management structures have been employed (Table 7).

C. Recent Approaches to Corridor Management

The history of corridor management is mixed. Large regional arrangements have proven more difficult despite the initial success of the TEN network.¹⁶ The progress achieved by regional trade blocks such as GMS, ASEAN, SAARC, and GCC has been limited because of the time required to reach agreement on protocols acceptable to all participants. This consensus can also yield more cumbersome procedures, as was the case with the ASEAN's harmonized tariff, which is far more complex structure than that of any of the member states. In this regard, bilateral arrangements have been more effective since it is easier to achieve consensus, pass legislation and harmonize physical standards, procedures and regulations. For example, ASEAN's member states have already developed bilateral arrangements that allow relatively unencumbered movements between Singapore, Malaysia, and Thailand.

Table 7: Focus of Corridor Management

Project	Corridor
TEN	Infrastructure and Facilities
TRACECA	
Can-Mex (NAFTA)	
Pan American	
Northern Corridor	Infrastructure; Regulatory Procedures
Maputo	
Trans-Kalahari	
ECOWAS	Regulatory Procedures
Asian Highway	
Mercosur	
SAARC Corridors	
GMS Corridors	
Asean	
TTFSE	

Leadership in developing a corridor can come from different sources. For the TEN network, there was no separate organization to guide its development. Instead, it was developed through legislation formulated by the European Commission with implementation left to the responsible agencies in the Member States. In most other corridors, the central governments have not offered direct legislative support but rather established or supported autonomous organizations that promote the development of the corridor. In this regard, high level working committees are a popular mechanism but their effectiveness depends on their support staff. The function of these entities is quite diverse, reflecting differences in objectives and in the scope of the agreements that they are meant to support.

¹⁶ This success required more than ten years and the network was established on the back of efforts to develop a regional transport policy that spanned more than 40 years.

ICG-TRACECA, an intergovernmental ministerial commission, was established to implement the Basic Agreement signed at Baku in 1998. It receives some funding from the EC and member states and with this

- Designs and funds small projects for alleviating bottlenecks in the network
- Conducts technical studies related to improving the efficiency of border crossings,
- Collects performance statistics, and
- Organizes conferences to address issues related to the corridor

The Commission is supported by a small Secretariat that serves in a consultative role and is staffed primarily by consultants. Since the Commission operates on consensus, it is not able to respond rapidly to the problems involved in integrating corridors. Most improvements have been accomplished through the initiatives of local government.

In the case of the **Can-Mex** corridors, the impetus for development was US transport legislation that encouraged bilateral and multilateral efforts to develop corridors. This spawned a number of regional lobbying groups to promote the development of specific routes and capture Federal funds to upgrade the highways that make up these corridors. There appears to be no method for coordinating these proposals beyond the budgetary review process.

A different situation applies in **West Africa**, where there is no formal organization. The Economic Community for West African States (UN-ECOWAS) has taken the lead in efforts to facilitate cross-border movements but has been unable to get participating countries to develop regional agreements. Instead, there have been some bilateral agreements. The major initiative was to have the Chambers of Commerce introduce a system for bonded movement of transit traffic similar to the TIR carnet (TRIE). This system, combined with the bilateral agreements, permitted the development of some transit routes, but traffic remains small because of poor infrastructure.

In **East Africa**, the Northern Corridor has a permanent organization, the Transit Transport Coordination Authority (TTCA). It was established to monitor the implementation of the agreement between Kenya, Uganda, Tanzania, Burundi, and Rwanda and has developed into a relatively strong professional agency. It promotes procedures for more efficient cross-border movement of goods and has been instrumental in introducing a single administrative document. It has also worked with Kenyan customs to develop efficiency indicators.¹⁷

In **Southern Africa, the Maputo Corridor** is quite different in terms of organization and effectiveness. The Corridor was established through a bilateral agreement between the Governments of South Africa and Mozambique to facilitate the cross-border movement. They concessioned the infrastructure to the private sector in order to rehabilitate and upgrade the toll road, rail link and Port of Maputo and to operate them efficiently. Since then traffic has grown rapidly.

A quite different approach was used for the **Trans-Kalahari Corridor** since the road and port infrastructure was already in good shape and there was an existing customs union (Southern African Customs Union, SACU). Also traffic was increasing rapidly, tripling between 1998 and 2003. The principal objective was to promote the use of Walvis Bay Port as an international gateway. For this purpose, the Walvis Bay Corridor Group, a public-private partnership, was created. The group, which had a high level of involvement by the private sector, facilitated the agreement between Namibia, South Africa and Botswana to introduce a SAD and to simplify border-crossing procedures. The agreement was formalized at the end of 2003.

¹⁷ These efforts have been supported by USAID and the UN Economic Commission for Africa.

While the experiences have been quite different, it is clear that these formal institutions can play an important role in each of the three functions. To do this, they must involve both the public and private sector in a meaningful partnership that works closely with the Customs Authorities and other border agencies. Their structure will depend on:

- relevant agreements between the participating governments,
- type of corridor,
- functions that the institution will address,
- management objectives,
- principal impediments faced in achieving these objectives, and
- budgetary resources available for its operation.

One of the more important activities of these institutions is to act as advocates for the development of their corridors in interactions with the participating governments. This can include:

- providing advice on current practices, available legislation and lessons learned for previous efforts,
- collecting and disseminating information to potential users concerning the costs for using the corridor, the procedures and performance at the border crossings, gateways, and choke points within the corridor
- quantifying constraints, evaluating efforts to remove these constraints and developing targets for future improvements

Role of Agreements

Depending on the protocols and formal arrangements among the participating countries, the corridor institutions may be granted power to coordinate:

- investments to improve the performance of the corridor,
- efforts to harmonize standards
- introduction of simplified documents and clearance procedures
- cost recovery mechanisms

The first is difficult, as it requires that the participating governments coordinate their capital investments. Since most of the investment is for upgrading existing infrastructure, the coordination of investment is not as critical. Where investment in new infrastructure in cross-border routes is required, then private sector concessions, such as those for the Maputo toll road and the proposed Kenya-Uganda Railways, can provide the necessary coordination.

There are three approaches to the harmonization of standards and introduction of simplified documents and procedures. The first is to adopt international conventions pertaining to transit procedures, and trade in transport services. A list of some of the more important conventions is provided in Annex 4. The second is to develop regional agreements on general standards and procedures that will be applied by member countries and serve as guidelines for long-term improvements in trade facilitation. The third is to implement back-to-back bilateral agreements that facilitate the movement of freight and transport through the corridor. These agreements can also specify cost recovery mechanisms to be introduced as well as complementary investments to improve cross border movements.

The most successful corridors development programs have taken place within customs unions since these simplify the border crossings procedures. In the case of the TEN network in the EU, the formalities for border crossings were addressed as part of the technical annexes to the treaty. These were prepared by the Director General for Transport. For Walvis Bay, the customs union between South Africa and

Namibia had already simplified the movement of trucks across the border. In the case of the Can-Mex corridor, the procedures for trucks crossing between Canada and the US were well established prior to the NAFTA agreement. In contrast, the procedures for trucks crossing the Mexican-US border were never fully addressed due to resistance from the US trucking industry and the Mexican customs brokers (see box below).

Mexican-US Border Slowdown

NAFTA came into effect in 1994 during a period in which trade between the US and Mexico was growing rapidly (~12% p.a.). However, this agreement did not specify the mechanism for regulation the movement of goods even through about 85% by value were moved by road across the approximately 3000 km border. The agreement includes a provision for trucks to operate in the transborder area, but this was unilaterally suspended by the US based on concerns put forth by the domestic trucking sector as to the safety of Mexican trucks. No effort was made to introduce a vehicle inspection regime or to recognize the considerable improvement in the trucking fleet over the last decade. As a result the delays at the border for the approximately 10,000 trucks crossing each day are considerable and the requirement for transshipment remains as a significant non-tariff barrier supported by vested interests on both sides of the border.

There are four corridors in Mexico, Chihuahua, Pacific, Central and Gulf Coast. About ½ of the traffic crosses at Laredo crossing which is part of the central Corridor. Because of the restrictions on cross-border movements, two back-to-back trailer exchanges are required with a separate movement between a Mexican parking area near the border, across the Mexican and US Customs to a US truck terminal near the border. For southbound movements, a further movement is required due to Mexican customs procedures. From the US truck terminal, the trailer is moved to a Mexican brokers' warehouse where the cargo is unloaded, inspected by the broker for pre-clearance and reloaded. From there, the trailer is transported through US and Mexican customs to the Mexican parking. Added to this cumbersome procedure is the lack of coordination between the customs authorities in terms of documentation, limited hours for customs inspections and significant congestions during peaking hours.

The impact of these procedures on direct costs is significant, adding an estimated 19% for the movement between Chicago and Monterrey (almost 3000 km). There is a similar impact on transit time adding only about ½ day to a 2 day trip. However, these problems are eclipsed by Mexican customs procedures, which can add up to three days for pre-clearance. This difficult border crossing contrasts with the seamless crossing at the US-Canada border where trucks cross over the border with minimum delay for checking. Both countries require the shippers to have a bond to guarantee payments for taxes and fees. There is no similar arrangement between Mexico and the US.

The unnecessarily complex procedure, which is maintained to protect the markets of the US trucking companies and the Mexican customs brokers, has been challenged in court. A 2001 decision by the NAFTA panel found the US in violation of the treaty but opponents then introduced a requirement for an environmental study of the impact of Mexican trucks on US roads. A 2004 ruling by the US Supreme Court overruled this requirement but it remains to be seen if the US congress will introduce new impediments to the implication of the NAFTA accords. While trade has continued to grow, one estimate is that these impediments have reduced trade by 1%-2%

Haralambides, H. and Londoño-Kent, P. "Supply chain Bottlenecks: Border Crossing Inefficiencies between Mexico and the United States, International Journal of Transport Economics, June 2004

Fox, A, Francois, J. and Londoño-Kent, P. "Measuring Border Crossing Costs and their Impact on Trade Flows: The United States-Mexican Trucking Case" (draft)

D. Three Management Structures

While there has been significant variation in approach to the development of international freight corridors, there are three general models that have been applied. The first is **disjointed incrementalism** as part of a general development model. This approach is characterized by a project focus. Governments undertake improvements in the corridor infrastructure based on local requirements and problems. Growth in trade combined with liberalization of the transport and logistics sector offers a steady improvement in

the variety, quality and competitiveness of the transport services. An evolving consensus on the concept of the corridor allows stand-alone projects to be related to the development of the corridor. Efforts to facilitate movements across borders or through international gateways begin with bilateral agreements. This model has been most effective in providing improvements in infrastructure. However, it lacks a formal corridor organization or other mechanism to identify and prioritize initiatives. An example of this type of model can be found in the development of the West Bengal Corridor as described in the following box.

West Bengal Corridor-Path to the Sky

The development of the West Bengal Corridor is part of a larger effort to develop freight corridors in SAARC region. This north-south transport corridor extends from the river ports of Haldia and Kolkata to northern West Bengal where the corridor divides into routes going northwest to Nepal and Sikkim up to the Chinese border and northeast to Assam, Bhutan and beyond. The corridor also connects with Bangladesh at various points along the border. After years of disjointed efforts by various donors to upgrade components of the corridor, a strategic investment plan was prepared in 1998 under a technical assistance grant from the ADB to the Government of West Bengal. This plan identified a number of high-priority investments in multimodal transport infrastructure. In the intervening years, ADB and World Bank have financed improvements in the interconnections to Nepal and Bhutan as well as various projects to upgrade the primary road route.*

Both India and Bangladesh have invested in new facilities at the Benapole/Petrapole crossing. Haldia and Kolkata have dramatically increased their efficiency as part of the on-going reforms in Indian ports. In 2004, the Nepal government awarded a concession for operation of the rail Inland Container Depot (ICD) at Birgunj that allows for unit train operations to Kolkata and Haldia. In Phuentsholing, efforts are continuing to develop a road ICD to facilitate cross border movements. These improvements have significantly improved access of the landlocked countries to markets outside of the region, however the majority of the traffic on the corridor will continue to be intra-regional. The profile of this corridor was raised when the Indian government designated it as an extension of the Golden Quadrilateral.

The development of this corridor has been undertaken as small projects by various state and national government agencies with little coordination. The activities of the various donors are guided by a similar vision but lack a common blueprint. Instead, the corridor remains a concept around which various projects are developed. While there is a growing interest in developing this region through trade and in improving security through economic development, there is no focus for this development. The corridor exists by virtue of its growing commercial activity rather than through any organizational structure or coordinated development program.

** North-South Corridor Development Project in West Bengal, 2000, Halcrow and Partners*

The second is the **legislative development** model. This is characterized by the use of legislation to provide formal recognition of the importance of corridors, designation of specific routes, harmonization of standards, simplification of cross-border movements and funding for corridor infrastructure. Implementation is left to individual jurisdictions and government agencies. Coordination is undertaken at the regional or ministerial level and is characterized by formal meetings to review progress made by others. Development of services on the corridor is left to private sector competition. Improvements in infrastructure are undertaken by government agencies responsible for transport. This approach emphasizes consensus. It is effective in targeting funding infrastructure and reducing formal impediments to movement of goods on these corridors. It is less effective for improving interconnections through modifications of regulatory constraints on cross-border and transit movements. It was used successfully in public sector development of the TEN network and private sector development of the Maputo Corridor but was less successful in producing an integrated Pan American highway and Can Mex corridor (Annexes 10, 17).

The third is the **consensus-building** institution model. This approach uses a regional institution to mobilize stakeholder support for improvements in the corridor and to push for trade facilitation reforms including improving border-crossing procedures. Its primary function is to provide information to stakeholders, including government agencies, concerning current performance, needs for improvement, and success of previous initiatives. The success of this model depends on the active participation of public and private sector stakeholders in a partnership to address issues related to regulation, investment and quality of service. This type of model has been most effective in addressing improvements in regulatory procedures in East Europe/Central Asia (Annex 7). It was also quite effective in the Trans-Kalahari Corridor where there was joint public/private participation but less so in the Northern Corridor (see box on following page). It can also be helpful for long-term efforts to develop large regional networks such as the Asian Highway.

The application of these different models in the corridors that have been studied is shown in Table 8. While it is not possible to control corridor development, it is important to have a single organization whose purpose is to promote and coordinate the development of the corridor. Where corridors have been successful, there have been strong political and market support for their development. A corridor organization provides a point of coordination for stakeholder efforts and a forum for identifying major impediments. It also provides coordination for the lending programs of multinational organizations, which typically develop their lending programs with individual line ministries. As a promoter, this organization must have the support of the private sector but be able to work closely with government agencies to improve procedures and policies. As a coordinator, it must have some form of public-private partnership as well as linkages with a regional ministerial committee that is tasked to address issues of regional harmonization.

Table 8: Functions of Corridor Managements

Project	Model
TEN	Legislative
TRACECA	Legislative
Can-Mex (NAFTA)	Legislative
Pan American	Disjointed
Northern Corridor	Consensus
Maputo	
Trans-Kalahari	Consensus
ECOWAS	Disjointed
Asian Highway	
Mercosur	
SAARC Corridors	Disjointed
GMS Corridors	Disjointed
Asean	

E. Developing and Managing Corridors

The development of trade and transit corridors has two phases:

1. organization of a coherent set of routes with services to transport domestic, foreign and transit traffic in a competitive manner and
2. gradual improvement in efficiency of these services.

The initial phase occurs in response to market forces but depends on the public sector for basic infrastructure as well as coherent regulatory structure and procedures to create the conditions for accelerating growth of the traffic. The time to complete this phase depends on the efforts to prepare and implement the bilateral agreements and supporting legislation required for efficient border crossing procedures. The second phase is a continuing effort following the introduction of a basic framework.

There are three complementary actions that can sustain the development through both phases - a long-term plan, a series of parallel initiatives and a program for monitoring performance. While simple in concept, they provide a basis for coordinating the activities of the governmental agencies involved in the performance of the corridor.

Eastern and Southern Africa - Private-Private Partnerships In Corridor Development

The corridors in the southern and eastern Africa have been developed using a variety of public-private partnerships both to improve the transport infrastructure and simplify the procedures for cross-border movements. Concessions were used to develop the Maputo corridor connects the port of Maputo with the industrial area around the, South African province of Gauteng. The concessions were used to rehabilitate the transport network while providing improved services. The port was converted to private operation through an operating concession that also provided for rehabilitation of its facilities. A BOT concession was used to rehabilitate 380 km of the highway between Witbank and Maputo and to construct an additional 50 km. It was to include a joint inspection facility at the border. A concession to provide rail services on the corridor, which included provisions to upgrade the rail link between Maputo and the border, was awarded to as joint venture that included South African Railways, Spoornet. This concession was also supposed provided for a one-stop inspection at the border. These arrangements were successful in producing a rapid improvement in service and increase in traffic. However, the emphasis on a purely private initiative meant that insufficient attention was given to improving border procedures.

The Trans-Kalahari corridor was established in 1999 through the efforts of the Walvis Bay corridor group, a public-private partnership. This corridor connects the port of Walvis Bay with the rest of Namibia, Botswana and the Gauteng in South Africa. It already had good road connections and required limited capital investment in the gravel road between Mamuno and the South African border. Also there was an existing customs union that simplified cross border movements. The Corridor Group, which was established to promote the use of the port, worked with Customs in the three countries to introduce a single administrative document, a single set of regulations and a single bond as security for payment. This arrangement provided the industrial area of South Africa with an efficient outlet to the Atlantic. It allowed Walvis Bay to compete against larger rivals in Richards Bay and Durban. Although its traffic levels remain small, its general cargo volumes have tripled since 1999 and the number of vehicles handled has increased eight fold.

The Central Corridor provides road and rail-road connections between Tanzania's port of Dar Es Salaam and the land-locked countries of Uganda, Burundi, Rwanda, and D.R. Congo. It competes directly with the Northern Corridor through Mombasa for transit trade and has a competitive advantage in terms of time for cost for the latter three. While there has been some investment in infrastructure over the past decades, the Central Corridor has had difficulty in improving the performance of its transit services. In 2000, the government concessioned the container terminal at Dar Es Salaam with the result that the rate of growth in traffic increased four fold and exceeded 200 thousand TEU. However, the transit trade continues to be constrained by the rail service. The government is now in the process of privatizing the operations of the Tanzanian Railways Corporation. The improvements should allow the Corridor to increase its market share vis-à-vis the Northern Corridor even in Uganda where the distances are greater.

The Northern Corridor offers a number of potential benefits including the size of the Kenyan economy relative to the its neighbors, its proximity to Uganda and its transport infrastructure, which though poorly maintained provides better access. In order to promote transit, the Northern Corridor Transit Transport Coordination Authority (NCTTCA), which consists of ministers from the four member countries, was formed to enforce transit agreements, harmonize policies and promote use of the corridor. It established a stakeholders' forum to develop consensus between the public and private sector, including manufacturers, logistics providers and financial institutions. It was able to convince customs to simplify clearance procedures and introduce a single administrative document for road transit. It was also able to harmonize and reduce transit charges. Largely as a result of these efforts, the volume of transit traffic doubled in the period 1998-2003. Nearly all of this increase was transit cargo moving by road to/from Ugandan. Despite the breadth of the participation and efforts to improve infrastructure, the Authority has been unable to improve the basic rail and port services. The poor condition of the Kenyan Railway, which had experienced a steady decline in traffic over the last three decades, prevented it from capturing much of this increase. It is now proposed to have a concession for joint operation of the Kenyan and Uganda railways, in order to improve their performance. Even if successful, it is unlikely to resolve the problem of moving the cargo out of the port of Mombasa, which continues to be plagued by congestion and corruption after an earlier attempt to concession container terminal failed.

Despite the non-linear and often chaotic nature of corridor development, it is clear that a long-term plan is important to identify problems that need to be addressed. This requires a consensus concerning the objectives for development of the corridor and identification of the impediments to efficient end-to-end transport services. The latter can be determined by an elaborate regional economic/ transport, as was the case for West Bengal, or a simpler supply chain analysis of major trades that use the corridor. For continuous development of the corridor, it is necessary to undertake parallel initiatives including:

- short-term improvements in customs and border crossing procedures and traffic control
- medium-term improvements in infrastructure and interoperability and
- long-term improvements in harmonization and trade facilitation

The possible initiatives, as discussed in section 2 and summarized in Table 9, are well established. In order to choose from among them, it is necessary to evaluate their expected benefits and costs using an approach similar to that shown in Figure 12. This evaluation should be done from the adopt the frame of reference of the shippers taking into account their requirements to move their cargo between origin and destination within a given time period . Since most of these initiatives will involve changes in policies and procedures rather than capital investments, it is also necessary to consider the level of stakeholder and governmental support.

Table 9: Types of Initiatives

Asset Management

- capital investments in capacity and/or quality of links and facilities at the nodes
- new transport technology
- improved maintenance of these assets
- private sector operations and maintenance
- private financing of facilities
- user fees to finance maintenance and improvements
- new transport technology

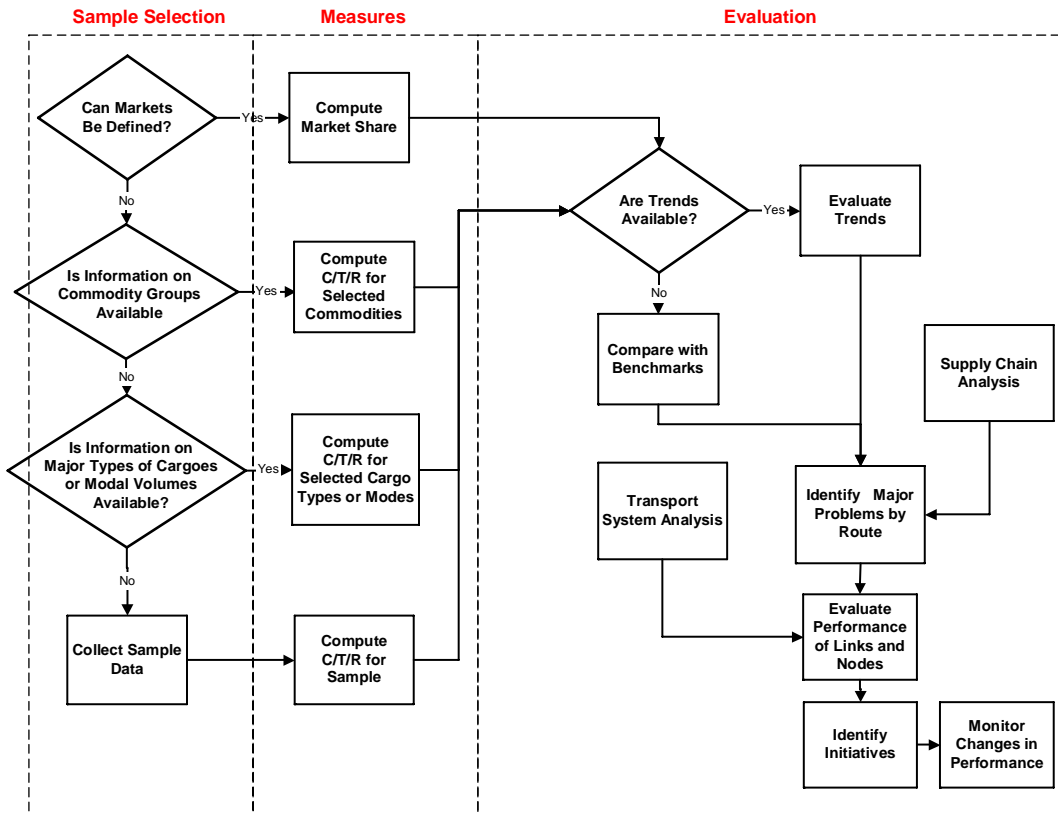
Regulation

- reduction in the level of regulation of transport and logistic services
- increased competition in the provision of these services
- reform of customs and transport regulations.¹
- simplified transit procedures
- relaxation of cabotage laws
- reduction in informal payments
- increase in transparency for border crossings
- change in incentive structures

Information

- Simplified documents
- simplified financial transactions
- ITC for
 - data entry and processing
 - electronic transfers and direct debit arrangements
 - scheduling and control of transport services
 - coordination between customs offices, between customs and other agencies involved in CIQS, and between officials on each side of the border.

Figure 12: Evaluation of Corridor Performance



Supply chain analysis can be used to determine the relative importance of different activities in overall corridor performance and to identify the features of these activities that contribute most to time, cost and unreliability. Transport systems analysis can be used to identify physical and operational problems that contribute to cost, time and delays. Transaction analysis can be used to evaluate the time and cost for processing the information associated with typical shipments. These techniques are also useful in estimating the potential improvement in performance and relative cost for various initiatives.

Although a corridor is often amorphous, it is essential that its performance be monitored. The collection and dissemination of performance data is one of the more important responsibilities of a corridor organization. This data can be used by providers of transport and logistics services to improve quality of services. It can be used to identify chokepoints and evaluate the effectiveness of different initiatives in eliminating them. It can also be used to justify improvements and additions to the corridor infrastructure.

Much of the data on physical performance is reported as part of specific activities within the corridor, e.g. port operating statistics, customs trade and operating statistics. Additional data on demand must be collected through surveys, in particular, through interviews with shippers and transport providers to determine demand for different levels of service, negotiated costs and range in transit times. There are several methods available for collection of the data needed to evaluate performance as summarized in Table 10.

Table 10 : Sources of Data on Route Performance

Measurement	Choke Point	End to End
Transport Provider Survey	√	√
Shippers Survey		√
Operator Diary	√	
O/D Survey		√
Entrance/Exit Data	√	√
Real Time Monitoring	√	

Benchmarks or comparison between routes with similar modes can be used to identify activities with potential for significant improvements, however, benchmarks must be used with care because of differences between countries in terms of external factors such as geography, types of trade, competitive requirements and skill levels.¹⁸ Comparisons based on historical data are more useful. Trends in costs (adjusted for inflation), time and reliability indicate how effective efforts have been in improving corridor performance in the past. Unfortunately these are not necessarily representative of what can be achieved in the future and provide little insight as to the cost of achieving these improvements.

IV. Conclusions and Recommendations

The current interest in corridors follows on earlier efforts to promote regional growth. These include efforts in the 1960s and '70s to create growth poles which had limited success, especially where they involved Greenfield developments. In the 1990's, there were attempts to create growth triangles and other relationships between neighboring countries that had apparent complementarities, but these produced little beyond what would have been expected from existing trends in intraregional trade. The development of trading blocs has been more successful since these efforts focused on removing barriers to existing intra and inter-regional trade.

Corridors offer a similar opportunity but emphasize the traditional expansion of economic activity from market centers along routes connected to these centers. The increasing interest in development of transport corridors can also be considered as a logical extension of themes in transport planning and development that have evolved over the last four decades. Among these are:

1. multimodal freight transport, which made significant gains since the 1970s when unitization of cargo allowed for more efficient intermodal transfers. This increases the flexibility of transport services but also requires efficient of intermodal transfers.
2. quality of transport services measured in terms of speed, and reliability. During the last decade, these have increased in importance for freight transport as greater attention has been given to supply chain management.
3. relatively simple mathematical procedures are available for evaluating the benefits to trade from improvements in quality of transport
4. efficient logistics as a source of competitive advantage - This is especially true for landlocked countries where the lack of effective access to global markets is a major competitive disadvantage.
5. timely interchange of information through EDI. This is important for the coordination of activities not only in multimodal networks but also for entire supply chains. Also, it has allowed for modernization of procedures at gateways and border crossings.
6. public sector efficiency and accountability – This is important for the provision of public infrastructure and services and generally involves commercialization of management through autonomous authorities or private sector participation

¹⁸ This is not to say that benchmarks don't have a demonstration effect making policy makers aware of what is possible, but this is quite different from what is achievable in the short to medium term.

7. reforms in regulation of transport and trade which emphasize trade facilitation- Important components of this effort are elimination of unnecessary regulations, simplification of remaining regulations and greater transparency in application of these regulations

A. Summary of Observations

This report has concentrated on corridors that service international trade. It has identified a number of issues related to the management of these corridors. A summary of these are as follows:

1. Corridors serve three types of trade - domestic, foreign and transit
2. A corridor is less a physical structure and more a collection of transport and other logistic services and a set of policies and procedures that control their activity and the movement of cargo.
3. Most of the transport and transfer activities that define the corridor are provided by the private sector.
4. The public sector that affect the efficiency of these services are by providing infrastructure and regulating their activities.
5. The effectiveness of a corridor depends on the availability of overlapping modes and services offering different prices and quality of service.
6. Quality of service is measured in terms of transit time, reliability of schedules and flexibility in routing.
7. The value of improvements in time and cost should be measured relative to the door to door movement for the different trades using the corridor.
8. The three leading sources of inefficiency in international corridors are poor interconnections, lack of interoperability and limited market access for transport providers.
9. The corridor components that offer the greatest opportunity for improvement are the border crossings and international gateways.
10. Customs reform and trade facilitation are critical for improving corridor performance.
11. Information is an essential component of all logistics and ties together the various transport and transfer activities.
12. The three institutional formats that have been used to “manage” corridors are disjointed incrementalism, legislative development, and consensus-building.
13. For all three, their principal function is to coordinate the initiatives of various parties involved in the movement of goods through the corridor and therefore must involve an effective public-private partnership.

Poor interconnections, especially difficulties at the border crossings, are the primary problem of most international trade corridors. This is most evident for TRACECA, North Borneo, West Bengal and the Central American portion of the Pan American Highway. It also applies to the corridors in West Africa,

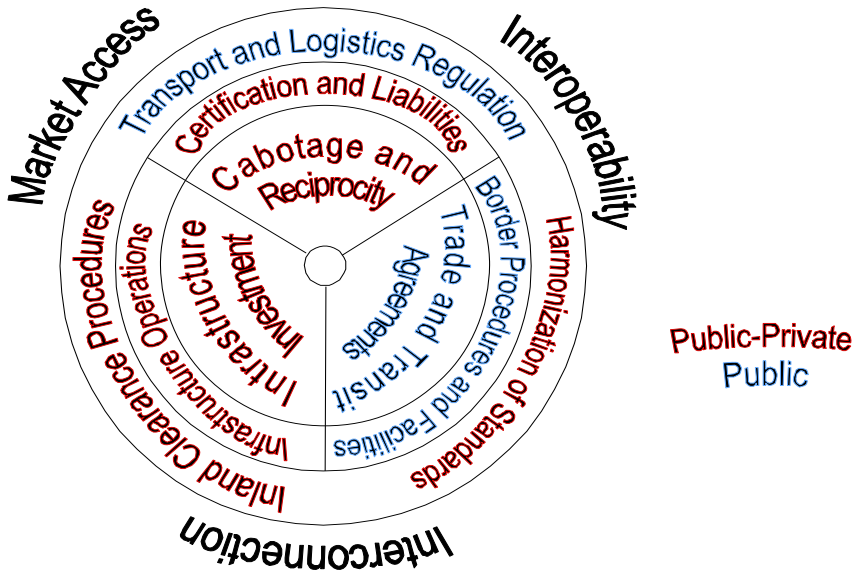
and Central Asia as well as the Northern and Central Corridors but the problems are compounded by limitations on infrastructure. Restrictions on transport market access have been the other major problem. Its most common occurrence is the requirement for transshipment or cargo at the border, as is the case on the US-Mexico border and in much of Asia.

Both governments and the donor community have had difficulty in coordinating the activities necessary to develop successful corridors. Improvements in public infrastructure continue to be planned on a modal basis. Investments in gateway ports and road and rail arteries often include a passing reference to the development of corridors but rarely provide the complementary inputs necessary to improve corridor performance. In particular, these investments are often made without efforts to improve the services that use this infrastructure.

B. Recommendations

The three factors that determine corridor performance are quality and competitiveness of transport and logistics services, capacity and condition of public infrastructure used by these services, and domestic, bilateral, and sometimes, multilateral regulation of these services and the trades that they serve. The organization responsible for corridor development must address all three factors, however, one area usually dominates. Transport and logistic services are rarely the primary concern. The exception occurs where the government is heavily involved in providing these services or there are significant constraints on market access. Where infrastructure is the problem, it may be due to poor condition, insufficient capacity or lack of physical integration. Policy and regulation is the more likely to be the major problem, especially as relates to border crossing procedures for both import/export trade and transit shipments.

Figure 13: Areas of Management Focus



Efforts to improve corridor performance require a cooperative effort by the public and private sector. While there are some initiatives that can be undertaken exclusively by the public sector (Figure 13), most require private sector involvement to insure that the quality of services offered in the corridor are improved. The configuration presented in Figure 13 suggests that most initiatives improve some combination of market access, interoperability and interconnection. The initiatives at the center of the figure take longer to implement but have amore substantial effect on corridor performance. These are

generally the subject of continuing efforts at improvement. The initiatives at the periphery can be achieved in a shorter time frame but must be built on developments in the core areas.

The range of public and private sector stakeholders involved in a corridor and diversity of their goals limit the ability to control development of the corridor. The major challenge is to define a common set of objectives and, based on these, to coordinate the activities of the stakeholders.. The private sector should take the lead where there is sufficient infrastructure and an appropriate regulatory environment. The public sector should take the lead where there is a requirement for significant improvements in infrastructure or for major regulatory reform.

The three institutional formats mentioned above can provide this coordination but their effectiveness depends on the situation. The legislative development model is useful when dealing with large networks including several corridors and several countries and , where there is already some level of political integration. This model was effective in organizing the TEN and TRACECA networks but less so for attempts to develop the Can-Mex and Asean corridors. The disjointed incrementalism model applies when dealing with a single or limited number of corridors that have poorly developed infrastructure and serve primarily domestic traffic. This approach is less effective for integrating corridor development across multiple jurisdictions. It works best where there is a broad-based effort to upgrade infrastructure as was the case in West Bengal, and Northern Borneo, or as required in the Northern corridor.¹⁹ The consensus-building model is most effective when the major concerns are simplification of regulations and border-crossing procedures and improving transport market access. This model was effective in developing the Trans-Kalahari corridor but less so in the Central corridor or in West Africa. It is being used to develop the Asian Highway, but, as this is a more extensive and difficult network, progress has been slow.

In all cases, the role of coordination is primarily one of facilitating the flow of information between the parties, advocating changes that the parties agree will foster the development of the corridor and building consensus on the initiatives to be taken. These three roles, facilitator, advocate and consensus-builder, can be most effective where there is an autonomous entity with regular staff, funding commensurate with the scale of initiatives required and an executive board that includes the principal stakeholders from the public and private sector.

Multilateral development organizations can contribute to this effort by providing advice on initiatives that have proven successful in other corridors and technical support for implementation of pilot projects as was done in the case of Trade and Transport Facilitation Program in Southeast Europe. They can also provide funding to support the development of infrastructure as was done in West Bengal and East Africa.

¹⁹ This categorization does not ignore the important effort of the TTCA to develop consensus among stakeholders but rather recognizes the need for substantial improvement in services and supporting infrastructure for the road, rail and port components and the likelihood that these will be addressed as individual modal initiatives.