2

Reducing Logistics Costs

Efforts to facilitate trade among India, Nepal, Bhutan, and Bangladesh, and between these countries and the rest of the world, must look beyond improvements in the transport network to a general strengthening of entire logistics chains.[1] These chains include the complete set of services needed to move cargo from its point of production to points of sale or consumption. An effective trade regime requires a full range of efficient logistics services with tight integration between them. Each link of a logistics chain must have sufficient capacity and a simple and effective interface with the preceding and following links. The type of logistics services required for cross-border trade varies depending on the goods that are being transported and the markets for these goods. High-value, time-sensitive goods require more sophisticated logistics so that they can be delivered to the market in good condition as quickly as possible. Low-value, time-insensitive goods require simple logistics that reduce the overall cost of transport and provide reliable consistent service. In both cases, the objective is to reduce transaction costs as much as possible—which involves a balancing of the cost, time, safety, and reliability of delivery.

The following analysis of the shipments within the region divides logistics into the following three basic services:

- Line-haul transport. This may be by road, rail, inland water and ocean, and it may include intermodal transfers.[2]

1. Over the last 50 years, the scope of analysis of transport services has been expanding. In the 1950s and 1960s, engineering analysis was used to examine specific components of a transport system, such as a port, a road link, or an airport, or such subcomponents as a berth, intersection or runway. In the 1970s, systems analysis was used to evaluate the interaction between the links and modes of transport networks. The emergence of multimodal transport in the 1980's extended this analysis to multimodal routes and intermodal interchanges. Toward the end of the century, the growing emphasis on door-to-door movements and just-in-time shipments shifted attention to logistics and to market analysis.

2. Air transport was not included in this analysis although it is of increasing importance in the movement of high-value goods.

TABLE 2.1 CHARACTERISTICS OF SELECTED ROUTES

No.	Route links	Mode on land	Commodity
Domestic			
1	Calcutta-Gauhati-Agartala	Indian rail	Cement
2	Calcutta-Siliguri-Agartala	Indian truck	General freight
Regional			
3	Calcutta-Narayanganj-Ashuganj-Agartala	Indian-Bangladeshi barge/truck	Cement
4	Kathmandu-Phulbari-Dhaka	Nepalese-Bangladeshi truck	Agricultural produce
5	Thimpu-Burimari-Dhaka	Bhutanese -Bangladeshi truck	Limestone
6	Calcutta-Benapole-Dhaka	Indian-Bangladeshi truck	Yarn
Third country			
7	New Zealand-Calcutta-Rauxal-Kathmandu	Indian-Nepalese truck	Wool
8	Karimganj-Calcutta-United Kingdom	Indian truck	Tea
9	Kathmandu-Rauxal-Calcutta-Germany	Nepalese-Indian truck	Carpet
10	Singapore-Calcutta-Jaigaon-Thimphu	Indian truck	Polypropylene
11	Dhaka-Chittagong-United States	Bangladeshi truck	Cotton garment

Source: Logistics cost study data, World Bank.

- Border crossings. These are at seaports and land borders.

- Complementary services. These include both physical services, such as storage, consolidation and repackaging, and commercial services, such as trade finance and insurance, customs clearance, transfer of shipping documents, and interbusiness communications.

The analysis is supported by a detailed examination of the logistics components for the commodity-route combinations listed in Table 2.1. The routes were selected because they include strategic commodities, emphasize cross-border movements, and serve landlocked countries and isolated areas such as Northeast India. Using the logistics cost model developed by the Bank team in close consultation with private sector groups in the region, the study team conducted intensive interviews with freight forwarders, clearing and forwarding agents, shippers, and truckers to obtain data on charges for logistics services, time to complete different activities, and specific impediments on each of the routes for selected commodities.

The routes are divided into domestic routes that are restricted to a single country, regional routes that involve cross-border movements among the four countries, and third-country routes that involve ocean shipping to countries outside the region. The first group has an advantage because it does not face any cross-border delays.[3] The second group has problems associated with cross-

3. We have not included constraints in crossing state or province borders within countries.

border movements and transshipment between the vehicles of two countries. The third group has the additional problem of moving cargo through the seaports. Maps 1–5 at the end of this report present some of the routes and the border crossing points.

TRANSPORT COMPONENTS

Line-Haul Transport

Because most of these routes involve cross-border movements, and half involve shipments to countries outside the region, it is essential to look at the modal interface. This requires an understanding of the capacity and performance of individual modes within a country and their compatibility with bordering countries. India and Bangladesh have all four modes of transport, whereas Bhutan and Nepal have only road transport.

Road Transport

The primary mode for freight movements is road transport. Medium-size trucks (seven to ten ton payload) operate over two lane asphalt roads (5.5 meters wide in Bangladesh, 5.5 to 7 meters in India) at relatively low average speeds. Table 2.2 shows the characteristics of road transport. Only small portions of the major corridors are dual carriageways, and few of these are outside the large cities. Only recently has India begun to upgrade its four major intercity roads to dual carriage ways (Box 2.1). Many of the major roads are poorly maintained and congested. The result is relatively low average travel speeds, in the range of 200 to 400 kilometers per day. The movement of containers[4] on the Indian roadways is limited not only by the design and condition of the roads and traffic congestion but also by nonphysical barriers to moving containers out of the port. Tractor-trailers are also rare because of their cost, as well as road conditions, congestion, and weight limits. In Bangladesh, the weight limits on the bridges between Chittagong and Dhaka, the main corridor for containerizable goods, prevent the use of tractor-trailers.

Most of the trucks used in cross-border movements are two- to three-axle (six- or ten-wheel) trucks carrying payloads up to 18 tons. Trucks carrying bulk cargoes are generally overloaded,

TABLE 2.2 CHARACTERISTICS OF LINE-HAUL TRANSPORT

National roads	India	Bangladesh	Nepal
Max. axle load (ton)	10	8.2	n.a.
Typical truck GVW (ton)	15	11	12
Typical truck payload	10	7	9
Railroad	**E India**	**NE India**	**Bangladesh**
Rail gauge	**Broad**	**(BG/MG)[a]**	**(BG/MG)[a]**
Typical engine (BHP)	2,600	2,600/1,350	2,000–2,300/ 1,350–1,650
Max. axle load (ton)	20.3	20.3/ 12.7	22.5/13.0*
Car payload (ton)	58.8	58.8	40.0
Typical train length (feet)	2,200	2,200	1,800
Typical train length (car)	40 bogie	40/35 bogie	35 bogie
Avg. travel speed (kph)	23.7	23.7/18.1	11.0/12.3
Max.travel speed (kph)	100	100/65	80/72
Train control	Block telecom	Block telecom	Tokenless block

a. Broad gauge/meter gauge.
* Limit due to Jamuna Bridge 18.0.
n.a. = Not available.
Source: Consultant estimates.

4. These containers adhere to standards set by the International Organization for Standardization, which is based in Switzerland.

BOX 2.1 INDIA'S "GOLDEN QUADRILATERAL" ROAD NETWORK

The National Highways Authority of India has given priority to the development of a divided highway connecting the major cities of Mumbai, Delhi, Calcutta, and Chennai. The Golden Quadrilateral has a total length of almost 6,000 kilometers, of which about one-fifth is either completed or under construction, and another two-fifths is in the planning stage. Most of the project will consist of widening the existing two-lane roads. A recently negotiated World Bank loan will support the construction of the link between Delhi and Calcutta.

In addition to the quadrilateral, the authority is planning 7,300 kilometers of north-south and east-west dual carriage highways. About one-tenth is either completed or under contract. This project is scheduled for completion in 2009.

The estimated cost of Rs.54 billion for these projects will be financed through a variety of mechanisms, including fuel taxes, external borrowing, and tolls. About 10 percent will be funded through private concessions.

When completed, these roads are expected to reduce the travel times between the major cities and to allow for a dramatic increase in movement of containers by road. This assumes that the port regulations limiting full container loads movements are eliminated. These roads will greatly improve the access of Nepal, Northeast India, and Bhutan to the major ports of India.

causing additional damage to the road. Those carrying containers, garments, or other high-cube (low-density) cargoes have payloads of 10 tons or less.

The load limit for Indian roads is 10 tons per axle. Bhutan and Nepal have similar limits. Bangladesh currently applies a limit of 8.2 tons per axle, but this is expected to increase to 10 tons. The size of vehicles is limited by the capacity of the bridges, many of which are old, narrow, and in need of strengthening. The limits on total gross vehicle weight vary among the countries, but are below the level required for efficient operation of larger trucks and tractor-trailers. The combination of weight limits and road conditions make it expensive to move bulk commodities long distances by road unless the trucks are overloaded.

For-hire trucking services in all four countries are provided almost entirely by the private sector. Most of the trucking companies are relatively small, with fewer than 10 trucks. Strong competition produces relatively low freight rates. These rates and the lack of strict inspection standards discourage the use of new trucks. As a result, the average age of the fleet in Bangladesh is 15 years. The fleets in India and Nepal are slightly younger, with long-distance trucks less than five years old, on average. Most of the trucks are manufactured in India or Japan and have relatively low power-to-weight ratios. The combination of the age and condition of the vehicles, market conditions, slow travel speeds, and short travel distances creates relatively low average truck utilization—about 50 thousand loaded kilometers per year.

As Table 2.3 shows, the cost of road transport per kilometer is relatively low because of a combination of low labor costs and less expensive vehicles (in terms of capital rather than maintenance). However the lack of backhaul cargoes and the small payloads of the trucks increase operating costs. The capital costs for Indian trucking are significantly lower than for neighboring countries because the trucks are locally produced. However, as Table 2.3 indicates, the neighbor-

TABLE 2.3 ESTIMATED TRUCK OPERATING COSTS

Country	Per km	Per ton-km [a]
India – 15 ton	$.0.33	$0.044
India –12 ton	$0.33	$0.049
Bangladesh –11 ton	$0.27	$0.048
Nepal – 10 ton	$0.31	$0.046

a. Assuming 50 percent backhaul.
Source: Background Note 2.

ing countries are able to compete on routes within their own countries.

Despite the differences in road dimensions and national limits on gross vehicle weight, there are no physical hindrances on the movement of trucks between the countries. Any constraints on cross-border movements are caused by insufficient capacity on the roads approaching the border, inadequate waiting area and customs checkpoints, and the lack of effective transit protocols. For example, Bangladesh does not allow trucks from other countries to travel on its roads. India reciprocates but does allow trucks from Nepal and Bhutan to operate on designated transit routes. Indian trucks are allowed into Nepal and are given a limit of 72 hours to carry cargo and return to India. Additional data on truck transport is provided in Background Note 2.

Rail Transport

The rail networks in India and Bangladesh are a mix of broad (1.68 meters) and meter gauge (Table 2.2). In India about one-third of the system is double tracked, whereas in Bangladesh the percentage is much smaller. India has made a concerted effort to convert its network to broad gauge and Bangladesh has undertaken some conversions to dual gauge. The network in Eastern India is mainly broad gauge. However, the connecting links with Nepal are meter-gauge rail with the exception of Birgunj (which is a broad-gauge link). The rail link between Radhikapur and Birol is also a meter-gauge line. The network in Northeast India is meter-gauge, except for a broad-gauge line extending to Lumding. The next section to Kumarghat is currently being converted to broad gauge. The section extending from Kumarghat to Agartala is being constructed as a broad-gauge alignment.

The network in eastern Bangladesh is meter gauge whereas the western part of the country has predominantly broad gauge. The construction of the rail link across the Jamuna Bridge and the extension of dual-gauge operations to Dhaka are expected to be completed next year, substantially improving the coverage of the broad-gauge system. Several other harmonizations are either underway or being planned which will provide additional linkages between the western and eastern parts of the country.[5] In addition, the planned introduction of dual-gauge track between Chittagong, Akhaura, and Tongi will provide a direct link between Chittagong and both Nepal and northeast India. Although the strength of the track and type of sleepers differs between the two countries, this does not prevent the movement of rail cars across the border.

The Indian and Bangladesh railways are publicly operated. Despite recent efforts to improve performance, they continue to suffer from overstaffing, poor maintenance, and old rolling stock. Bangladesh Railways also suffers from poor utilization of equipment (Table 2.4A and B). In Bangladesh there is also a significant problem with track maintenance, especially in areas prone to flooding. Although rail is the second most important mode of transport in both countries, it has suffered a declining market share due to operational problems. Rail traffic has been declining in both relative and absolute terms. In Bangladesh, the tonnage declined by about 40 percent over 25 years while market share decreased to 7 percent of total tonnage. The market share is continuing to decline but the traffic tonnage has flattened out. Rail share in India,

5. Two other projects under consideration are the linking of Akhaura and Agartala, which the Indian and Bangladesh Railways are undertaking, and a proposal to link Tongi and Akhaura utilizing German funds. A link between Dhaka and Joydepur is expected to be completed next year with dual-gauge connections between Joydepur and Parbatipur.

TABLE 2.4A RAILWAY PERFORMANCE INDICES, 1969–70 TO 1997–98

	Bangladesh railways		Indian railways	
	BG[a]	MG[b]	BG[a]	MG[b]
Car kms/day	20.9	16.6	169.1	38.2
Engine kms/day	149	170	396	331
Bangladesh	**1969–70**	**1996–97**	**1997–98**	**1998–99**
Route kms	2,858	2,706	2,733	2,733
No. of locomotives	486	284	275	279
Freight cars in FWUs	19,616	15,917	15,073	14,247
Tons carried (in millions)	4.88	2.94	3.04	3.42
Ton-kms (in millions)	1,265	782	804	896
India	**1970–71**	**1996–97**	**1997–98**	**1997–98**
Route kms	59,790	62,725	62,495	62,809
No. of locomotives	11,158	6,975	7,206	7,429
Freight cars in FWUs	383,990	272,144	263,981	253,186
Tons carried (in millions)	167.9	409.0	429.4	420.3
Ton-kms (in millions)	235,785	277,567	284,249	281,513

a. Broad gauge
b. Meter gauge
Source: Bangladesh Integrated Transport Sector Study, 1998; see also Background Note 3.

TABLE 2.4B MODAL SHARE OF TRAFFIC IN BANGLADESH

Bangladesh (modal share)	1974/75	1984/85	1996/97
Road	35	48	63
Rail	28	17	7
Water	37	35	30

after being above 50 percent in the early 1980s in terms of ton-kilometers, dropped below 40 percent by 1992 and continued to decline thereafter, although tonnage has recently increased.[6] The factors leading to the loss in market share include low operating speeds (15 kilometers per hour or less), shortages of equipment, especially locomotives, poor track conditions, and long and unpredictable delays. Rail transport is also relatively expensive because of the inefficiency of the operations. The principal rail cargoes are bulk cargoes, both liquid and dry.

In India, the movement of containers by railroad has increased substantially following the formation of Container Corporation of India and the procurement of a large fleet of cars for transporting standardized boxes. In Bangladesh, the transport of containers is limited by the lack of cars and the operating commitment of the railroad. There are some block train movements between Chittagong and the Dhaka ICD, but these account for a very small portion of the containers handled at Chittagong (Background Notes 3 and 4). Problems with rail services, charges, and port regulations limit the amount of boxes that are moved between the port of Chittagong and the Dhaka ICD to about 15 percent of the total volume moved through Chittagong. At least 40 percent of containers going from Dhaka to Chittagong are empty (see Box 2.2).

For a number of commodity routes, such as bulk cargoes between India and Bangladesh and transit cargo from Nepal, rail has a competitive advantage. The establishment of a dual-gauge rail link across the Jamuna Bridge is expected to provide a significant increase in containers once the broad-gauge connection is extended to Dhaka. The principal rail routes under consider-

6. *India Transport Sector Report 13192-N*, World Bank, 1995.

ation are the broad-gauge routes connecting East India with west Bangladesh (at the Benapole-Petrapole, Darshan-Gede, and Radhikapur-Birol border crossings) from Tripura through Maishassan to Shahbajpur and on to Sylhet. A more complete discussion of Bangladesh Railways and links with Indian Railways is provided in Background Note 3.

A protocol exists for the interchange of rail wagons across the India-Bangladesh border. It sets out the charges for the exchange of wagons and establishes a target wagon balance. Rail track does not appear to create a physical constraint for the movement of trains across the border, but Indian and Bangladeshi wagons have different coupling and braking systems that restrict operating speeds for Indian trains hauling Bangladeshi cars. The freight trains in India are typically 40 wagons in length, whereas those in Bangladesh are 35 wagons long. The Indian trains must be broken into two sections, with the second section waiting for up to a week for another locomotive. Since the rakes traveling from Bangladesh to India usually carry consignments for a variety of locations, the wagons must be reassigned to other trains shortly after passing into India. About 2,000 Indian wagons in transit through Bangladesh have been "lost" over the last decade.

BOX 2.2 CONTAINER TRAFFIC MOVEMENT BETWEEN CHITTAGONG AND DHAKA

Chittagong port handles 95 percent of the total containers received in Bangladesh, and 85 to 90 percent of these are bound for Dhaka. However, only 10 to 12 percent (less than 40,000 ton equivalent units are moved by rail to an inland container depot (ICD). Dhaka has a capacity of 100,000 ton equivalent units. The remaining container traffic (90 percent) is unpacked at Chittagong and moved in break bulk by small trucks. There is no container movement by road due to axle load limitation on bridges. The reason for this anomaly is the rail charges and regulations between Chittagong and Dhaka. A shipper who books a container for delivery to Dhaka ICD has to pay the shipping line an extra US$350 for a 20-foot container or US$550 for a 40-foot container for Chittagong-Dhaka movement by rail. Of this, Bangladesh Railway charges only US$120 to US$180 for a 20-foot container, depending on the quantity of cargo, and US$200 for a 40-foot container. Bangladesh Railway does not guarantee the safety of goods on this route, and the shipping line justifies this extra charge as coverage for damage. The truckers, however, charge US$80 to US$100 for an amount of break-bulk cargo equivalent to a 20-foot container load. Since the difference is substantial, the shippers and exporters prefer to move goods in break bulk and unload or load at Chittagong port. This causes congestion at the port as well as on the Dhaka-Chittagong road. Also, this is not the safest way of handling the container cargo. If Bangladesh Railway were to provide cargo insurance as part of its tariff, substantial container traffic could get diverted to rail. This would benefit the shipper as well as the port and railway. The congestion at the port would be reduced, the turnaround would improve, and there would be better utilization of available space at Dhaka ICD.

Inland Water Transport

Bangladesh has an extensive inland water network that links with West Bengal on its west and Assam and Northeast India on the east. The Class I routes operate throughout the year with a minimum draft of 12 feet. However, shifting rivers, increasing levels of siltation, and a lowering of groundwater due to pumping have made it difficult to maintain the depths on the secondary routes. Furthermore, the old and inefficient dredging fleet and limited hydrographic survey prevent the routes from being properly maintained. So far, the government has not been able to dedicate the resources necessary to maintain either a complete network of primary and secondary routes or the navigational markers needed to allow nighttime operations on all the primary routes.

India and Bangladesh have well-developed private sector barge operations. The barge fleets include both self-propelled and dumb barges that are 10 to 15 years old. The capacity ranges from 150 tons for self-propelled and up to 1,200 tons for dumb barges (see Background Note 5). There is a significant overcapacity, which has led to

strong competition and low freight rates but limited consolidation. Most operators continue to own a single barge or a small fleet. The inland water transport has the lowest charges per ton-kilometer freight transport for cargoes with origins and destinations near the rivers. It loses cost advantage when trucks are required to move cargo to and from the rivers.

Bangladesh and India signed an Inland Water Transport transit protocol in 1980. The protocol allowed Indian barges to transit Bangladesh between West Bengal and Northeast India, but it prohibited transshipment of Bangladeshi cargo en route. In October 1999, a revised protocol was introduced that allows Indian barges to transport cargo between the two countries, provided that both countries share the transportation of cross-border trade and transit cargo on an equal tonnage basis. Despite low costs and the absence of cross-border transshipment requirements, inland waterway transport is at a competitive disadvantage because of its low travel speeds, which average less than 50 kilometers per day due to the limitations on night navigation and physical constraints on routes. Despite these limitations, the Bangladeshi private sector is seeking to capture additional regional traffic, including the petroleum products shipped from the Numaligarh refinery in Assam to markets in Bangladesh and West Bengal.

TABLE 2.5 SAMPLE OCEAN FREIGHT CHARACTERISTICS

Route	Cargo	Rate/TEU[a] (US$)	Days
New Zealand-Calcutta	Wool	1,200	24
Calcutta-WCUS	Garments	3,100	35
Chittagong/Calcutta-U.K.	Tea	1,250	23.5
Singapore-Chittagong/Calcutta	Polypropylene	975	10
Calcutta-Germany	Carpets	1,200	22

a. 20 foot equivalent unit.
Source: Logistics cost study team, World Bank.

International Shipping

The fourth mode of transport is ocean shipping through Calcutta and Chittagong ports. These ports are positioned well north of the main shipping lines and handle relatively small volumes of cargo. As a result they attract relatively old and inefficient vessels. The container vessels are feeder ships of up to 750 TEU (20 foot equivalent unit) and bulk vessels of 25,000 dead weight tonnage (dwt) or less.

Containers are transshipped via Singapore or Colombo. Feeder services are provided by independent operators that transport boxes for several large container lines. The time required for the feeder movement and transshipment is about eight days—three days of sailing time and five days in the transshipment port waiting for the mother vessel. Table 2.5 shows typical container freight rates and shipping times for the sample of routes under study.

The situation for noncontainerized general cargo is somewhat different. The amount and frequency of general cargo liner services has been declining steadily. These have been replaced by container liner services and by chartered vessels carrying neo-bulk cargo. For large shipments of neo-bulk cargoes, the cost of ocean transport is dependent on the size of the vessel. This is determined by the depth of the port as well as the size of typical consignments. The draft limitations at Calcutta, Haldia, Chittagong, and Mongla are 7.5, 8.4, 9, and 4 (7.5 at anchorage) meters, respectively. The routing of neo-bulk cargoes is generally determined by the availability of railroad and inland water access to the port having adequate depth.

The protocols for handling transit cargo from other countries appear to be well established for

these ports. The principal barriers to efficient transfer are the slow handling rates, restrictive labor practices, poor operational controls, and cumbersome customs procedures. Bangladesh is currently implementing a preshipment inspection and valuation for selected imports at their port of origin in order to reduce the time required for customs inspection. Although this should improve transparency and reduce informal payments, it will not significantly reduce the time required for customs clearance because many of the delays are associated with the preparation of customs documents and inspections.

Border Crossings

There are three types of border crossings: road, rail, and seaports (Table 2.6). The road crossings consist of a customs checkpoint for vehicles moving across the border, a truck waiting area, and an area for cargo inspection. Where cargo must be transshipped, additional space must be provided for storing cargo and for unloading and loading trucks. The rail crossings consist of sidings or rail yards where locomotives are exchanged from those of one country to those of the next. No storage is required because the cargo remains in the rail cars rather than being transferred. The seaports provide a full range of services, including loading and unloading facilities, vehicle fleeting areas, and cargo storage and consolidation, as well as transfer to and from ocean transport.

TABLE 2.6 MAJOR BORDER CROSSINGS

Border	Crossing Points	Modes
Nepal/India	Birgunj/Raxaul	Road, Rail[a]
	Biratnagar/Jogbani	Road
	Bhairahawa/Nautanwa	Road
	Kakarvitta/Phulbari	Road
	Nepalganj	Road
Bhutan/India	Phutsoling-Jaigaon	Road
Bangladesh/India	Benapole/Petrapole	Road, Rail[a]
	Darshana/Gede	Rail BG[b]
	Rohanpur/Singhebad	Rail BG[b]
	Birol/Radihkapur	Rail MG[c]
	Shahbajpur/Mahishasan	Rail MG[c]
	Banglbandha /Phulbari	Road
	Chilhati/Haldibari	Rail (potential)
	Burimari/Changra bandha	Road
	Hili/ Balurghat	Road
	Tamabil/Daukii	Road
	Karimganj/Zakiganj	Road
	Sonamasjid/	Road
	Akhaura/ Agartala	Road, Rail[d]
India/	Calcutta	Ocean
	Haldia	Ocean
Bangladesh	Chittagong	Ocean

a. Operational by 2001.
b. Broad gauge.
c. Meter gauge.
d. Planned.
Source: Background Notes 3 and 6.

Currently the transit protocols limit not only the border crossings but also the number of routes that can be used for transporting cargo. Some of the protocols require that the cargo be transshipped from the vehicles of one country to those of another, which increases not only the time and cost for transport but also the damage to the cargo and the variance in travel time. These problems could be reduced if cargo were allowed to move in-bond (meaning that the containerized cargoes could remain in the sealed container box even when the cargo has to be transshipped) with ICDs and other facilities established at the border to expedite movement across the border. The regional border crossings vary in their level of development. The crossing at Benapole is the most developed. It has warehousing, parking areas, and a well-developed market with logistics services. Despite all these facilities, Benapole

suffers from severe congestion, and cargo must be diverted to other crossings (see Box 2.3).

The facilities at the Birol, Hili, Sonamasjid Rohanpur, and Burimari border crossings are much simpler. The crossings have customs facilities and roadside parking, but they lack truck unloading ramps, warehouses, telecommunications, and other logistics services. Among the least-developed crossings is the Phulbari corridor linking Kakariatha, Nepal via India to Banglabandh, Bangladesh. The Banglabandh crossing lacks even basic customs facilities. Table 2.7 provides information on problems at major border crossings.

BOX 2.3 BENAPOLE: BOTTLENECK AT THE INDIAN-BANGLADESH BORDER

Benapole is the principal border crossing between India and Bangladesh. The facility is called a land port: its functions are limited to providing a customs checkpoint and bonded warehouses. It has a large number of clearing agents who maintain offices on the site, and there are adequate telecommunication services. Import traffic for Bangladesh is transferred from Indian trucks to bonded facilities within Bangladesh while export traffic is transshipped into warehouses 500 meters inside the Indian border. The average daily traffic exceeds 200 trucks loaded with cargo for Bangladesh and 50 trucks with cargo for India, as well as 2,000 passengers. Throughput is constrained by a single customs lane in each direction for clearing vehicles and emigrants. As a result, there is severe congestion with lines of up to 1,500 trucks and waiting times of one to five days. The area has a large complex of warehouses and markets, but it is constrained by a narrow road leading to the border and a lack of parking spaces. The area in Benapole for transshipping goods from Indian trucks to Bangladeshi trucks can accommodate only 250 to 300 trucks. Customs procedures are largely to blame for the delays, with normal customs working hours limited to 9 a.m. to 6 p.m. The congestion has reached such a level that traffic has been diverted to more remote border crossings where there is less rigorous enforcement of customs inspections.

The facility also has operational problems. The 30-plus warehouses provided by the Mongla Port Authority have adequate capacity (about 15,000 tons), but there is low utilization due to poor maintenance, difficult access, inadequate security, and no running water or sanitary facilities. The facility lacks adequate cargo handling equipment. Cranes are in poor condition. There are no inland container depots and no provision for receiving and delivering cargo to shipping lines.

In order to reduce congestion, a new truck terminal has been constructed in Benapole, in addition to a bypass road leading to the crossing. On the Indian side, a parking area for 400 to 500 trucks is being constructed, in addition to new private warehousing. However, the more important issues related to simplifying customs procedures, eliminating the need for transshipment, and increasing private sector involvement in operations have yet to be addressed.

For transit cargo between India and Nepal, three border point ICDs are being constructed to expedite handling and storage.[7] These are intended to provide efficient transfer of containers on trucks or, in the case of Birgunj, on rail cars. The Birgunj ICD will be equipped with reach stackers to allow efficient transshipment of cargo between trucks and between rail and truck.

As Table 2.8 shows, customs clearance procedures can add significant costs and delays even though they represent a relatively small part of the logistics chain. The existing procedures are both cumbersome and time-consuming, and they reflect the conservative trade policies that have characterized the region for decades. Poorly defined or complex procedures and documents reduce transparency, especially where a large number of people are required to give approvals.

Table 2.9 shows the documents that are submitted to customs at the border crossings. Many are the same as those commonly required at other international borders, such as invoices, packing lists, certificates of origin, letters of credit, and quarantine forms for plants and foods. Some of the documents, such as import licenses, export permits, and various certificates, are less common. These are intended to meet local requirements. They supply information that should already be available to the customs officials and

7. The World Bank assisted "Nepal Multimodal Transport and Trade Facilitation Project."

not submitted with each shipment. Other documents, such as equipment interchange certificates for containers and railway cars and registration forms for vehicles and drivers moving across the border, are required because simplified procedures for in-bond movements and modern regulations for the carriage of goods have yet to be developed.

The basic customs documents, such as transit, export, and import declarations, create problems because they vary from country to country and must be prepared separately for each side of the border and submitted in multiple copies. A standardized format would not only reduce the paperwork but also encourage more consistent procedures and greater coordination between customs officials on either side of the border. The problem of standardization has been hampered by India's decision to develop a separate trade classification system while its neighbors adopted the ASYCUDA automated systems format.

The document problem is not limited to the number of documents that must be submitted, but also includes the procedures used for verifying and approving documents. The number of copies that must be submitted and, more importantly, the number of signatures required, add considerably to the cost. Although the requirements for the Nepal–India movements have been reduced in the last few years, considerable improvements are still needed.

Ports

The ports represent the critical border crossing in terms of costs and time. The time the cargo spends in port is determined by four factors: the complexity of the customs clearance procedures, the frequency of vessel arrivals, the efficiency of the cargo handling and storage operations, and the efficiency of the shippers and consignees. The latter depends on the level of coordination

TABLE 2.7 CHARACTERISTICS OF MAJOR BORDER CROSSINGS

Border crossing	Mode	Problems
Chittagong	Water	Inefficient management and operations, lack of equipment, excessive delays and costs
Calcutta	Water	Inefficient management and operations, lack of equipment, excessive delays and costs
Benapole/Petrapol	Road	Congestion
Birgunj/Rauxal	Rail	ICD not yet operational
Bhairahwa/Notanawa	Road	ICD not yet operational
Biratnagar/ Jogbani	Road	ICD not yet operational
Darsana/Gede	Rail	Long processing times
Kakarbhitta-Panitanki	Road	Poor facilities on both borders, no customs office at Banglaband
Burimari-Changrabaandh	Road	Insufficient infrastructure, lack of customs office, bad road access

Source: Background Notes 6, 7, 8, and 9.

TABLE 2.8 COSTS AND TIME FOR CUSTOMS INSPECTION AND CLEARANCE

Mode	Commodity	US$/ton	Time (hrs)
Regional			
Barge	Cement	0.07	24
Truck	Agricultural produce	16.24	30
Truck	Limestone	6.05	32.5
Truck/ferry	Yarn	6.55	205
International			
Truck	Wool	8.94	63
Truck	Tea	14.29	12
Truck	Carpet	27.00	20
Truck	Polypropylene	6.54	55
Truck	Cotton garment	5.94	36

Source: Logistics cost study, World Bank.

TABLE 2.9 BORDER CROSSING DOCUMENTATION

Cargo routes	Documents required
India to Bangladesh Import Cargo	For Indian customs—Customs export declaration, bill of lading, invoice, packing list, letter of credit. For Bangladeshi customs—Import permit, bill of lading, packing list, letter of credit, consignment insurance cover, certificate of registration (value-added tax), importer pass book. For goods entering the export-process zone—Bonded warehouse licenses, value-bonded form, risk and duty bond.
Nepal to India Transit Cargo	For Nepali customs —Customs transit declaration, customs export declaration, duty insurance certificate, invoice, packing list, certificate of origin, certificates of registration (income tax, value-added tax, company), letter of credit. For Indian customs—Customs transit document, duty insurance, invoice, packing list, letter of credit, certificate of origin.
Bangladesh to Nepal	For Bangladeshi customs—Export registration certificate, invoice, letter of credit, packing list, certificate of origin, truck receipt. For Nepali customs—Customs import declaration, invoice, packing list, certificate of origin, import license, letter of credit, health/quarantine certificate, equipment interchange receipt, and duty insurance coverage for containers.
Bangladesh Ports	Exports—Export bill of entry, invoice, packing list, export permit, undertaking by export company, outpass statement, export permit, risk bond.
India Ports	Imports—Customs transit declaration, bill of lading, invoice, packing list, certificate of origin , import license, letter of credit, health/quarantine certificate , equipment interchange receipt and duty insurance coverage for containers.

Source: Background Notes 8 and 9.

in processing shipping documents and the ability of the shipper and consignee to time shipments so as not to use the port for storing inventory to be sold. There are significant problems with all four components that cause the relatively long time delays for cargo in port.

For import and export cargoes, the effectiveness of a route is very much dependent on the port services. The time and cost for oceanborne transport generally exceeds the time for land transport even where the latter involves a long distance. In many situations the longer land route is preferable because it provides access to a larger, more efficient port that has better connections to foreign origins and destinations. The South Asia ports can be grouped into three levels of service. At the highest level are major trans-

shipment hubs that have frequent sailings by large shipping lines offering scheduled services to different regions of the world. These services typically operate on a day-of-the-week schedule so that importers and exporters can time their shipments to minimize the time in port. The only major transshipment hub in the immediate region is Colombo. It has obtained this status by virtue of its proximity to the major markets of South Asia, its location along the equatorial routing of the larger liner services, and its efficiency relative to the ports in southern India. The other transshipment ports serving the region are Singapore, which handles most of the feeder services to Chittagong and Calcutta, and Dubai/Aden, which serves the west coast of India.

The second level of ports are regional hub ports such as Nhava Sheva and Port Kelang. Although located away from the major shipping routes, they have day-of-the-week calls by major shipping lines that have a portion of their voyages call at these ports.[8] The number of regional hubs will increase with the growth in traffic. The Thai port of Laem Chabang is approaching hub status, and there is likely to be a regional hub on the east coast of India during this decade.

The third category of ports are regional seaports such as Calcutta, Chittagong, and Haldia. These attract feeder services from the major transshipment hubs that operate on a flexible schedule, so it is difficult to schedule cargo movements to connect with major shipping lines. This introduces delays at both the feeder port and the transshipment port. It also creates an additional cost for a second handling. The smaller feeder vessels have higher operating costs per unit of cargo, but this additional cost is lower than the cost of the larger vessels calling at the port to transfer relatively small cargo loads. Economically, they are able to provide more frequent service to the transshipment hubs.

The status of Chittagong, Calcutta, and Haldia as feeder ports is unlikely to change because of limitations on the volume of cargoes, their distance from the main shipping routes, and their low cargo handling productivity. Chittagong has no container gantry cranes. This, together with labor problems, reduces the handling productivity below five containers per vessel-hour. In addition, vessels are forced to wait for berths for two to seven days. Total turnaround time can range from five to thirteen days for an activity that would require less than one day in most ports. The performance in Calcutta and Haldia is not much better.[9] If a new, privately operated port were developed in Patenga, Bangladesh, or along the east coast of India, it should be able to divert substantial traffic from existing public ports and generate some additional traffic—which has happened at the Jawaharlal Nehru Port Trust on the west coast of India.[10] However, it would be unlikely to achieve regional port status because of the limited import-export traffic generated by the region.

Improvements in port performance through faster, more reliable equipment and better management of labor will increase berth productivity and reduce delays to vessels. If this were combined with guaranteed availability of berth space, day-of-the-week sailings could be introduced. At

8. Large container shipping lines and alliances serving major routes increasingly operate with variations of their main route called strings. Each voyage or string will call at a certain number of secondary ports as well as the main ports.

9. For additional discussion of impediments to port efficiency, see Background Notes 8 and 9.

10. The success of private port operations in improving productivity, diverting traffic from public ports, and attracting new traffic is well documented. Examples include Laem Chabang in Thailand, Giao Tauro in Italy, Manzanillo in Panama, and Nhava Sheva in India.

present, any attempt to introduce a fixed schedule would require excessive slack time in the sailing schedule because of the uncertainties in port performance and would result in inefficient use of vessels. This is a common problem in regions with underdeveloped ports, such as Southeast Asia and the east coast of South America, but there are attempts to overcome this problem through investments in modern cargo-handling equipment and privatization of port operations. The results have been a significant reduction in port costs, freight rates, and times for ocean shipment.

ANALYSIS OF LOGISTICS COSTS AND TIMES

The times and costs for moving cargo along the 11 routes listed in Table 2.1 were estimated from information provided by cargo owners and forwarders based on typical shipments. We analyzed the information to determine the relative contributions of the various logistics activities as follows:

- Loading at the origin and unloading at the destination,
- Line-haul movements,
- Intermediate handling at the border crossings and ports, and
- Customs inspections.

The analysis included the land movement and the transfer across the border through the seaport, but it did not include ocean transport.

Table 2.10 summarizes the costs for the individual activities. The costs for initial loading and final unloading and the intermediate cargo handling were computed per ton of cargo handled, and the line-haul transport was computed per ton-kilometer to take account of differences in vehicle size and mode. For truck transport, an additional calculation was made for the charges per kilometer. For loading the cargo at its origin and unloading at its destination, the costs differ from less than US$1 per ton to over US$25.[11] The higher costs were due to the packaging requirements of higher value cargoes, specifically textiles, tea, and freight of all kinds (FAK). Since wool and polypropylene are imports, the packaging was performed at foreign origins (New Zealand and Singapore), and these charges are not included in the table.

The cost for the line-haul movement depends on the mode. The rates for rail and barge transport were lower than for trucking when calculated on a per ton-kilometer basis. For trucking, the rates range from US$0.029–US$0.058 per ton-kilometer, depending on the size of the shipments and whether the trip is short distance or long distance. Limestone, tea, and FAK were carried in eight-ton loads, whereas the other cargoes have consignments about twice that size. The rate per truck-kilometer was relatively consistent, between US$0.45 and US$0.50, except for agricultural products, which had an exceptionally low rate for movement to the border crossing at Kakarbhitta. These rates are significantly higher than the estimated trucking costs presented in Table 2.3. This is because of fewer-than-expected backhauls, increased delays en route, and the informal costs paid at various police checkpoints.

Intermediate handling occurs where there is transshipment between vehicles, a change in cargo form, or a transfer of cargo to and from storage and from one mode to another. The amounts paid ranged from US$1.6 per ton to over US$31.

11. These costs do not include the cost of time.

TABLE 2.10 UNIT COSTS FOR MOVEMENT OF CARGO BY ROUTE AND COMMODITY

	Origin/destination	Mode	Cargo	Initial load and final unload (US$/ton)	Line haul[a] (US$/ ton-km)	Line haul[a] (US$/km)	Intermediate handling[b] (US$/ton)	Customs procedures[c] (% value)
Domestic								
1	Calcutta-Argatala	Rail	Cement	0.46	0.016	n.a.	n.a.	n.a.
2	Calcutta-Siliguri-Argatala	Truck	Freight, all kinds	34.75	0.059	0.47	n.a.	n.a.
Regional								
3	Calcutta-Sheikhbaria-Argatala	Barge	Cement	0.46	0.022	n.a.	1.60	0.11
4	Kathmandu-Kakarbhitta-Dhaka	Truck	Ag. produce	3.88	0.033	0.28	4.24	4.60
5	Thimpu-Jaigon-Burimari-Dhaka	Truck	Limestone	3.33	0.058	0.43	4.80	12.11
6	Calcutta-Benapole-Dhaka	Truck/ferry	Yarn	35.47	0.097	n.a.	5.41	0.26
International								
7	NewZealand -Calcutta-Raxaul-Kathmandu	Truck	Wool	2.35	0.044	0.37[b]	25.82	0.45
8	Karimganj-Siliguri-Calcutta-Liverpool	Truck	Tea	28.57	0.053	0.45	27.38	0.60
9	Kathmandu-Raxaul-Calcutta-Bremen	Truck/rail	Carpet	18.33	0.031	0.47	16.40	0.45
10	Singapore-Calcutta-Jaigon-Thimpu	Truck	Polypropylene	1.56	0.031	0.50	31.31	1.28
11	Dhaka-Chittagong-west coast of the United States	Truck	Cotton garments	20.56	0.029	0.46	10.38	0.20

a. Charges for movements by truck, rail, or barge.
b. Transshipment of cargo at border crossings, packing and unpacking of containers, and other handling of cargo in port.
c. Formal and informal charges for cargo clearance and inspection.
d. Assumes that two trucks are required for 17 tons because of high volume.
n.a. = Not available.
Source: Logistics costs study, World Bank.

These amounts were less a function of the value of the cargo and more a function of the number and type of border crossings involved.

Customs clearance procedures, exclusive of duties, accounted for less than 0.5 percent of the cargo value for most of the routes. The percentages varied inversely with the value of the cargo, indicating that a significant part of these costs are related less to the value of the cargo than to the volume of cargo. The major exceptions are the agricultural products, which incur an extremely high cost for the customs procedures at Phulbari (Map 3).

The costs for these different components were compared as a proportion of the total costs for the different logistics activities (see Figures 2.1 and 2.2). This comparison does not include the charges for handling at the origin and destination because these are imputed costs based on the time spent by regular employees in the production process.[13] When this cost is excluded, the line-haul costs should account for at least 85 percent of the total for regional shipments and at least 75 percent for foreign shipments with the exception of short distances. For the first three routes (regional routes 3 to 5), the cost for line-haul transport was dominant. However, for the shipment of agricultural products, the other costs were more than one-third of the total because of the relatively high costs for customs clearance in crossing from the Nepali and Bangladeshi borders.[12]

For the international routes, (Routes 7 to 11 in Table 2.10), the costs other than line haul account for 40 to 60 percent. Customs procedures were significant in both Calcutta and Chittagong ports because of inefficiencies and informal payments. The costs for intermediate handling were about 20 to 25 percent of total costs because they included all handling costs in port other than loading and unloading the vessel. These numbers are reasonable except in the case of polypropylene offloaded in Calcutta, which incurred exceptionally high costs for handling and storage.

Customs clearance procedures add a relatively small amount to the logistics costs with the exception of agricultural products, which incurred high costs at Phulbari customs, and carpets, which experienced high formal and informal fees at Raxaul and Calcutta. The costs for customs procedures are not significant when compared to the value of the cargo, as shown in Table 2.10. The exceptions are agricultural produce, as mentioned above, and limestone, which has a very low product value. Overall the customs procedures had a greater impact on delays than on costs.

The time spent on individual components of the logistics chain is influenced by a number of factors. For example, the time spent loading at the point of production is more dependent on production schedules than on the productivity of the physical handling. Figure 2.1, which excludes this component, shows the relative importance of the remaining logistics activities. With reasonably efficient operations, it should be expected that line-haul movements would account for 80 to 90 percent of the time for regional movements and 75 to 80 percent of the total time for international movements for all but the shortest routes. In fact the percentages are much lower due to inefficiencies at the border crossings.

For the regional routes, the line haul accounts for 57 to 65 percent of the logistics time, exclusive of loading and unloading at the origin and destination. Customs procedures account for most of the additional time on the routes from Bhutan and Nepal to Dhaka. These routes require two border crossings and one transshipment, with the majority of the time lost in clearing the cargo through customs. The movement of cement by barge does not involve significant border checks, but it does require transfers to trucks at both ends, which adds a significant amount of time.

The international routes require a lot of time in port. This includes time spent clearing customs, but it is primarily the time spent waiting to enter the port, loading and unloading the vessel, and in storage waiting for the vessel. The proportion is greatest for Route 11 because of the

12. There are also significant costs for damages that have not been included.

short travel time between Chittagong and Dhaka. Although the movement of polypropylene is much longer, the exceptionally long delay in the port of Calcutta accounts for a large part of the logistics costs.

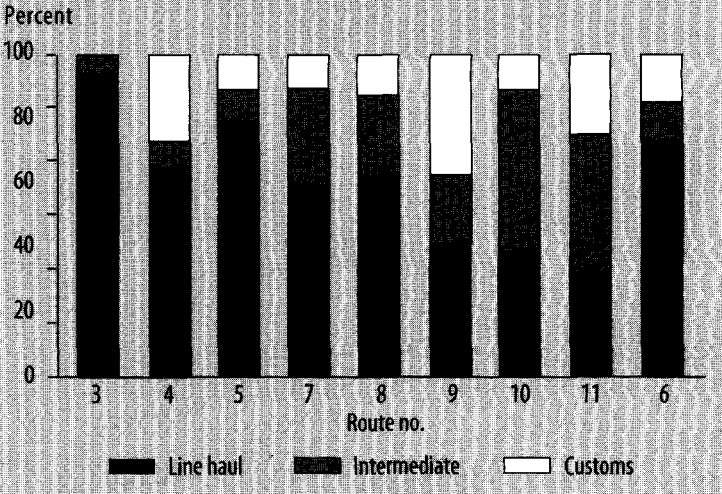
The last route, the domestic shipment of yarn from Calcutta to Dhaka, highlights the extremely long waiting times for customs at Benapole. Table 2.7 shows the times associated with customs processing on both sides of the border. The delays at crossings other than Benapole appear to be, if not justifiable, at least manageable.

As Table 2.11 shows, overall route performance can be compared using two performance measures: average speed and unit cost. The average speed of the journey compares the land route distance and travel time for the line-haul movement. The unit cost for the journey is equal to the logistics costs for the land movement divided by the product of the route distance and consignment size (for example, $/ton-kilometer).

The average speed was less than 400 kilometers per day because of the congestion on the roads and the delays en route for the railway. The speeds are higher in Bangladesh because there is less traffic congestion. The cost per ton-kilometer is lowest for all-rail and all-barge shipments and highest for short-distance truck movements.

Four general conclusions can be drawn from this route comparison. The first is that the overall logistics costs, although significant for some commodities, is not all that great when measured as a percentage of cargo value. The inefficiencies of the transport services are offset by low labor costs and older, fully depreciated transport equipment. As a result these percentages are comparable with those experienced elsewhere. The problem is not the cost but rather the time, reliability, and safety of the logistics services.

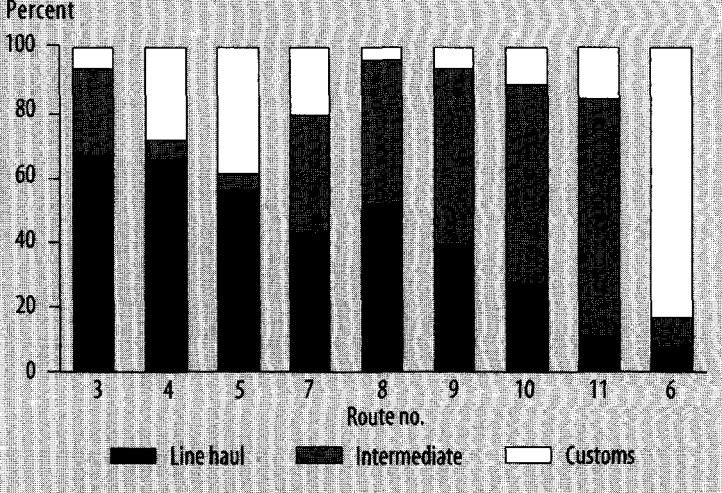
FIGURE 2.1 COMPARISON OF LOGISTICS COSTS BY ROUTE



Source: Logistics cost study, World Bank.

3 Cement Calcutta-Argatala
4 Agricultural produce Kathmandu-Dhaka
5 Limestone Thimpu-Dhaka
6 Yarn Calcutta-Dhaka
7 Wool New Zealand-Calcutta-Kathmandu
8 Tea Karimganj-Calcutta-Liverpool
9 Carpet Kathmandu-Calcutta-Bremen
10 Polypropelene Singapore-Calcutta-Thimpu
11 Garment Dhaka-Chittagong-United States

FIGURE 2.2 COMPARISON OF LOGISTICS TIME BY ROUTE



Source: Logistics cost study, World Bank.

TABLE 2.11 BASIC COMPARATIVE PERFORMANCE MEASURES

Route	Mode	Cargo	Km/day	US$/ton-km
Calcutta-Agartala	Rail	Cement	818	0.02
Calcutta-Agartala	Truck	Freight, all kinds	216	0.08
Calcutta-Agartala	Barge	Cement	154	0.02
Kathmandu-Dhaka	Truck	Agricultural produce	415	0.05
Thimpu-Dhaka	Truck	Limestone	401	0.08
New Zealand-Calcutta-Kathmandu	Truck	Wool	228	0.07
Karimganj-Calcutta-Liverpool	Truck	Tea	197	0.10
Kathmandu-Calcutta-Bremen	Truck/rail	Carpet	211	0.09
Singapore-Calcutta-Thimpu	Truck	Polypropylene	158	0.08
Dhaka-Chittagong-United States	Truck	Cotton garments	281	0.16
Calcutta-Dhaka	Truck	Yarn	506	0.23

Source: Consultant study team estimates.

The second conclusion is that the border crossings are a major cause of higher costs and longer delivery times. The critical bottlenecks are the seaports, the Benapole crossing, and the Nepal border crossings. The problems at the crossings are being addressed through the provision of additional infrastructure. They are also being addressed through changes at procedures at the Nepal border crossings.

The third is that the customs clearance procedures are a problem in terms of unnecessary delays and unofficial costs. However, they do not have as great an impact as other procedures at the border crossings and ports. Customs can and should be more efficient, but the protocols are the major source of inefficiency. Customs limitation on working hours, supply of officials at the crossing, the number of gates for receiving cargo, and the transparency of procedures for inspection and valuation not only reduce efficiency but also generate animosity. More importantly, they create uncertainty concerning the delivery time for and condition of the cargo.

The fourth conclusion is that the priority should be given to improving procedures in the short term and infrastructure in the medium term.

The border crossings can add considerable uncertainty to the time involved and damage incurred in transporting the cargo; especially where border-crossing procedures are complex or require frequent inspections. Manufactured products are increasingly sensitive to this problem because tighter logistics are required in modern commerce. The inability to guarantee delivery schedules requires the recipient of the cargo to maintain extra inventory to prevent a shortfall due to late deliveries. The inability to guarantee the condition of the cargo adds to the cost for insurance and makes it more difficult to sell the product. Variances in the costs for crossing the border place the profitability of shipments in jeop-

ardy. The product price must be increased to take into account the upper range of costs.

IMPLICATIONS OF LOGISTICS CONSTRAINTS AND CHARACTERISTICS OF GOODS

The efficiency and effectiveness of different routes depend on both the characteristics of the route and the nature of the cargo being moved. Cargo is typically characterized as break bulk, unitized, neo-bulk, or bulk. Each requires specialized handling systems if the goods have to compete effectively for market share. The type of cargo and the markets in which it is sold determine the type of logistics services required to compete effectively for market share. The important cargo characteristics include:

- The value of the cargo per unit volume or weight,
- The susceptibility of the cargo to damage while in transit and when handled, and
- The physical and commercial life of the cargo.

The third item has both physical and commercial dimensions, as Chapter 1 discussed. Some commodities—most notably, fruits and vegetables—have a relatively short physical life. Others have a short commercial life. For example, garments and footwear are affected by changes in season and fashion.

The competitiveness of the markets in which the cargo is sold also affects the logistics requirements. Market sensitivity to the delivery times and variations in those delivery times, as well as to delivery costs and variations in those costs, are particularly important.

These sets of characteristics are linked. The first item is linked to the delivered cost where that cost is measured relative to value of the cargo. The second item is also linked to the delivered cost because damages or losses during transit increase the delivered that cost. The third item is linked to the delivery time because it limits the acceptable time for delivery. Table 2.12 shows the relationship between the physical and commercial characteristics of the cargo and the type of logistics required.

Commodities can be categorized according to the level of logistics services required. The first category is high-value, time-sensitive cargoes that are vulnerable to damage. These must be moved quickly, generally in unitized form, with a minimum amount of transfers. Typical reorder times are 1.5 to 2 months, implying a maximum travel time of 25 to 35 days. The price of transport is less important than the time and reliability of deliveries. Higher-value cargo can afford a higher cost of transport. Among the cargoes in this category are fruits and vegetables, meat, fish (both fresh and frozen), and other food products. The shipper chooses the fastest mode of transport with a preference for the route that has the least number of handlings. Road transport is generally preferred unless transshipment can be avoided through the use of rail transport. For high-valued perishables, air freight is preferred.

Four other commodities—consumer goods, wood products, seasonal garments, and textiles—are often included in the first group. These can be divided between upscale products such as electronics, fashion garments, and designer furniture that have a shorter shelf life and tight delivery schedules, and low-cost products such as appliances, basic clothes, and general furniture that tend to have a longer shelf life and much looser delivery schedules.

These low-cost goods are part of the second category: medium-value commodities with

TABLE 2.12 COMMODITY CHARACTERISTICS

Commodity	Value US$/ton	Density[a]	Shelf life		Susceptibility damage and loss[d]	Market sensitivity	
			Physical[b]	Commercial[c]		Delivered cost[e]	Delivery time[e]
Fruits and vegetables	1,500	M	S	S	V	M	V
Fresh meat and fish	2,000	M	S	S	V	V	V
Frozen meat and fish	3,000	M	M	S	V	M	V
Tea	2,400	L	M	M	M	M	M
Grain	200	M	L	L	M	V	M
Jute, cotton		L	L	L	M	V	M
Textiles, fabric, yarn	2,500	L	L	M	M	V	V
Carpets	6,000	L	L	L	M	M	M
Garments	3,000	L	L	M	M	V	V
Wood products	1,500	L	L	M	M	V	M
Food products	1,500	M	M	M	M	M	V
Consumer goods	2,500	L	M	M	M	V	M
Cement	60	H	M	L	M	V	M
Clinker	< 50	H	L	L	N	V	M
Timber	500	M	L	M	M	M	M
Steel products	350	H	L	L	N	V	M
Petroleum and oil products	200	H	L	M	N	V	M
Petrochemicals	500	H	L	M	N	M	V

Notes:
a. L = low (< 0.7), M = medium, H = high (≥ 1.0).
b. S = short (< 1 month), M = moderate, L = long (> 1 year).
c. S = short (< 3 months), M = moderate, L = long (> 9 months)
d. V = very susceptible, M = moderately susceptible, N = relatively impervious.
e. V = very sensitive, M = moderately sensitive, N = relatively insensitive.
Source: Consultant study team estimates.

moderate shelf lives and limited susceptibility to damage. Carpets are included in this group despite their high value. They are only moderately susceptible to damage and, most important, have a long shelf life. Other commodities in this group are jute, cotton and other fibers, tea, timber, and petrochemicals. Delivery times are longer, about forty to sixty days. Reorder times are two to three months. These commodities are more price sensitive, so it is necessary to select logistics services that balance between cost and time. Trucking is preferred, but the shipper may choose rail or inland water if it provides a lower cost and fewer handlings.

The remaining category includes low-value commodities with long shelf lives that are relatively impervious to loss or damage. These are typically bulk cargoes such as grains, cement, and limestone. Their logistics emphasize low-cost, reliable transport. Because these commodities tend to be handled in large volumes, the logistics are less concerned with minimizing delivery time and more with maintaining a reliable delivery schedule. The greater the variance in delivery times, the larger the inventories that must be maintained to avoid outages. The shipper will prefer the mode that handles large consignments but minimizes the number of handlings. Rail is the most popular mode, followed by inland water transport. Where these are not readily available, road transport will be used, especially for petroleum products.

For all three groups, there will be a preference for routes that do not require border crossings with significant delays or transshipments. Table 2.13 shows the impact of the logistics costs on the delivered cost of the cargo. These logistics costs, including the ocean freight for imports and exports, are divided by the delivered cost of the cargo. Not surprisingly, the percentage is greatest for the low-value cargoes, such as cement and limestone, and least for the high-value cargoes, such as carpets, garments, yarn, and consumer goods. The cargo value has a greater impact than the distance shipped, as can be seen by comparing the local shipment of agricultural products with the export of cotton garments to the west coast of the United States.

TABLE 2.13 LOGISTICS COSTS AS % OF CARGO VALUE

Mode	Commodity	Land distance (km)	Percent cargo value
High value, short life			
Truck	Cotton garments	280	8
Truck	Agricultural produce	1,194	18
Truck	Freight, all kinds	1,615	4
Truck	Yarn	359	3
Medium value			
Truck	Tea	1,380	12
Truck	Wool	1,215	8
Truck	Polypropylene	820	25
Truck	Carpet	1,026	3
Low value			
Truck	Limestone	786	119
Rail	Cement	1,535	44

Source: Logistics cost study, World Bank.