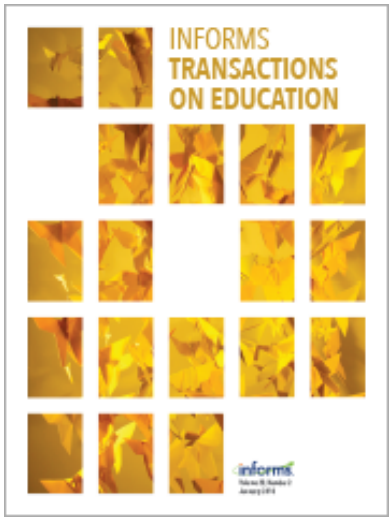

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Case

Coastal Shipping for Automobile Distribution

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1. Introduction

Over their evening coffee, managers at the Coastal and Automotive Logistics Corporation (CALC),[1] thinking about how their day went, felt uneasy about this entire new project that they had initiated. They were doubtful that the demand for coastal shipping was sufficient to offset the high fixed cost of operations. Furthermore, there was uncertainty in customer commitment—the assurance from them for a minimal consistent transportation demand. This had instilled a fear of cash flow problems in the short term and potential losses of running the business in the long term.

The existing supply chain of finished automobiles[2] in India follows a simple distribution strategy. Automobiles are packed into specially designed automobile carrier trucks, known as auto trailers, and are directly shipped from the factories to the auto dealers in different locations across the country. The existing distribution system offers certain advantages such as flexibility and transportation safety provided by this one-to-one delivery system. Furthermore, the auto manufacturers have long-term relationships with transportation service providers. In comparison, the coastal shipping of automobiles is a multimodal logistics activity. It involves first-mile delivery from the factory to the nearest seaport using auto trailers, storage in or near the seaport, the loading of automobiles onto coastal ships, shipment from the origin seaport to the destination seaport, discharge and storage at the destination seaport, and, finally, last-mile delivery from the seaport to the auto dealer. Because the current system has been in operation for decades now, and different parties have well-established standard operating procedures, there is a resistance to change to a new mode such as coastal logistics. The hassles involved in coastal shipping, and resistance to change, were deterrents for other such logistics companies that tried this mode in the past with limited success.

Coastal shipping refers to a domestic or interstate shipping operation that moves cargo and/or passengers between ports over a short distance (i.e., between ports of a nation or between a country's port and the ports of adjacent countries) (Arof 2017). There is a worldwide impetus to develop intermodal transportation by a shift to waterborne transportation.[3] The European Union has called for a significant modal shift to short sea shipping for medium- to long-distance trade (European Commission 2009). The U.S. Department of Transportation has undertaken similar initiatives in its "America's marine highways" initiative.[4] Coastal shipping is also an important element of port-led development, whereby industries are developed adjacent to ports, and the coastal shipping mode handles a major part of the domestic logistics.

The coastal shipping of automobiles is carried out by specially designed ships known as roll-on/roll-off (ro-ro) ships. The ro-ro ships consist of open garage spaces for securely parking thousands of automobiles and any other rolling stock or wheeled cargo. Ro-ro ships have ramp ways fitted on the sides, which can be lowered to a jetty, allowing for easy loading/discharging of wheeled cargo. This makes ro-ro ships very flexible in cargo handling, as they do not require any special cargo handling equipment at the ports. Coastal shipping

involves hiring the services of large ro-ro ships along with other associated costs of coastal multimodal logistics. These operations are capital intensive but result in economies of scale when operated on large shipments of automobiles. To make the coastal shipping business conducive, the management need some assurance of orders from the auto manufacturers and timely payment of dues. Additionally, they need support from the port authorities to overcome operational difficulties.

The government of India realizes the importance of coastal shipping as a mode of sustainable transportation. It is an environment friendly mode of transportation and has the potential to reduce the ever-increasing congestion of highways in the country. Thus, the government is trying to develop a favorable regulatory and business environment for the development of coastal transportation. Will this project be able to sustain itself or not was a big question. Furthermore, the feasibility reports and studies, despite being optimistic, were not unambiguously speaking of consistent demand. Because the government is bullish about the coastal shipping, they did promise support for the business. Still, there are multiple challenges in its inclusion in a profitable multimodal transportation system.

2. The Firm

CALC is a third-party logistics provider, based in the Indian city of Chennai. Chennai is sometimes referred to as the "Detroit of India" because of its significant automotive industry (Dekho 2014). CALC has made significant investments in logistics-related infrastructure and operates mechanized port terminals (container and bulk), container freight stations, container rakes, and rail and road terminals. CALC has developed its capabilities in offering sustainable logistics solutions such as coastal shipping–based multimodal logistics services to various shippers. Being in Chennai, it started offering coastal shipping–based integrated logistics services to the automotive industry in Chennai. It offers end-to-end distribution services of finished automobiles. CALC currently operates coastal shipping services for finished automobiles along a fixed coastal sea route of Chennai–Pipavav–Chennai (refer to Exhibit 1). Other sea routes are under consideration by CALC and can be used depending on feasibility test reports and client requirements.

3. Industry Background

Coastal shipping in India is gaining importance with positive government intervention. The Sagarmala project spearheaded by the Sagarmala Development Company talks about some 415 projects identified for port modernization and new port development, port connectivity enhancement, port-linked industrialization, and coastal community development. It has a projected cost of USD 123 billion to be expended over 10 years, starting in 2015 and ending 2025 (Make in India 2018). It gives impetus to logistics organizations to recognize the high importance of waterways as a transport medium. Rabindra Kumar Agarwal, joint secretary (Sagarmala), said that there is potential for the transportation of coal, steel, cement, fertilizers, and automobiles through coastal shipping (Behera 2018). On October 28, 2017, a consignment of 185 trucks was shipped from Chennai Port on the ro-ro ship *MV IDM Doodle* to Bangladesh, a key market for the Indian firm Ashok Leyland, a major manufacturer of commercial automobiles. The level of interest shown by the Government of India (GOI) is evident from the fact that the maiden voyage of this ro-ro service was flagged off by Union Minister for Shipping Nitin Gadkari through a video conference (Press Information Bureau 2017).

Despite all the initiatives, the advantages of coastal shipping are still not convincing enough for the automotive industry to develop sustainable logistics solutions. Link Shipping, a shipping company, tried coastal voyage way back in 2016 when 800 Hyundai cars were shipped on ro-ro vessels from Chennai to Port Pipavav in Gujarat for distribution in northern India. But the coastal movement could not be sustained because there was no return cargo from Gujarat ports to southern India. The ship operator tried its best to rope in Maruti and other auto manufacturers based in northern India but did not succeed. Besides this, the high port fees also turned out to be a demotivating factor for the shipping lines (Cross 2016). Then in September 2016, another logistics firm tried by pooling the cars manufactured by Hyundai, Nissan, Daimler, and Ford from Chennai. The company chartered a foreign flagged vessel to carry these cars from Kamarajar Port Limited in Ennore, close to Chennai, to the ports in Gujarat. After five or six voyages, this firm also gave up the attempt, saying that it was not a paying proposition. The company, however, indicated that it would soon resume such services (Hindu Business Line 2018).

4. Business Sustainability of the Coastal Shipping Service

CALC hires a ro-ro vessel from another shipping company for a voyage charter[5] to operate on a fixed route. In one instance, CALC operated a ro-ro ship between the southern Indian port of Chennai and the western Indian port of Pipavav (refer to Exhibit 1). CALC offers coastal shipping–based multimodal delivery services to auto manufacturers, involveing end-to-end delivery services. This means that CALC hires an auto trailer operator to provide first-mile transportation from an auto manufacturer's factory to the loading seaport, then loads the automobiles on the ro-ro ship, and ships

the automobiles to the final discharge port of Pipavav. Then, again, an auto trailer is hired to deliver the automobiles from the port to the final dealer points. CALC incurs various transportation-related costs in these operations.

On the client's part, there is no volume guarantee from auto manufacturers. Low cargo volume coupled with the high cost of operations renders coastal shipping unprofitable and creates cash flow problems for CALC. Furthermore, the cycle time of the coastal shipping may not be in sync with the manufacturing and delivery schedule of auto manufacturers committed to delivering cars to dealers on specific dates. Most auto manufacturers have formed strategic relationships with the transportation service providers operating auto trailers, who generally view the shift to coastal shipping as a loss of their business. Because of the lack of enthusiasm transport service providers have for coastal shipping, on most occasions, there is a shortage of auto trailers for delivery from the discharge ports to the dealer points. It results in frequent buildups of uncleared cargo and congestion at the ports. Consequently, the uncertainty in delivery time increases, which leads to a perception that coastal shipping is not reliable. Another major problem is the vessel loading or unloading delay as a result of variations in tide at some western Indian ports such as Kandla. The ramp position changes because of tide variation, resulting in stoppages in operations, which could be handy at times.

Coastal shipping was plagued by policy and regulatory bottlenecks, but with the government's recent initiatives, logistics firms face much fewer issues. The coastal shipping faces similar challenges worldwide with some common policy and business issues (refer to Exhibit 2). Some of the initiatives taken by the Ministry of Shipping to promote coastal shipping include a 40% discount on vessel- and cargo-related charges (levied at the Indian ports), taxes on bunkering fuel reduced from 18% to 5%, business development teams constituted at ports for promoting coastal shipping, and cabotage relaxations for specialized vessels such as ro-ro ships, for example.[6] The customs procedure at the ports can be cumbersome at times. One of the challenges faced at Indian ports is competition with foreign-going vessels. Because the foreign-going vessels are given priority in berthing, it may cause delays in berthing for coastal ships. Another challenge is that the nonmajor ports are underdeveloped in terms of infrastructure and hinterland connectivity.

None of the Indian ship owners owns ro-ro ships. One of the reasons is the difficulty in concessional loans for purchasing ships. Coastal shipping has a high operational cost also because of high import duties on bunker fuels, lubricating oils, and spares, along with high wage rates. Related issues emerge from stringent specifications related to the construction of vessels, leading to higher capital costs, a greater incidence of corporate taxation for coastal vessels (as opposed to the usual tonnage taxation for ocean-going vessels), and personal income taxation, which discourages quality officers from joining Indian coastal vessels. Furthermore, there is a lack of separate berthing facilities at major ports and inadequate cargo handling facilities at minor ports, which needs to be improved to make coastal shipping attractive.

CALC management had shown to the world that the coastal shipping of automobiles is a feasible business and was urged by the Ministry of Shipping to continue its coastal shipping operations. The GOI has been implementing favorable policies for making coastal shipping a success and has shown willingness for further reforms. The challenge was to operationalize the sudden changes in shipping and port policies resulting from the differences in practices of different authorities under whom the coastal shipping operations fall. A firm such as CALC cannot help changing the regulatory environment so fast, although appropriate recommendations need to be passed on.

So far, CALC has operated voyages for automobile delivery on a trial basis. However, these operations were at a smaller scale and did not prove profitable. Because these operations required economy of scale, CALC management thought that a suitable logistics distribution design may help to achieve the target profitability. Planning problems related to logistics distribution need to be addressed. Which ships should be selected for operations? How many voyages should be served with the chartered ships? What volume of automobiles is required on all links of the route to make these operations profitable, and how can this volume be ensured from the auto manufacturers? Another related question is how to collaborate with the auto trailer operators for streamlining first-mile and last-mile transportation services.

CALC top management constituted a research team to develop logical solutions to these problems. The team compiled comprehensive data related to major automobile manufacturing clusters in India, ships available in the international market for coastal ro-ro operations, important ports, trucking rates, and customer locations in India. Three leading automobile manufacturing clusters (referred to as AMs) are considered (see Exhibit 3). The ports of Chennai and Pipavav are considered for coastal shipping, allowing a single shipping route from the southeastern part of the Indian coast to extend to the western part and back (refer to Exhibit 4). Although the port charges levied on cargo handling varied across the ports, standard rates were considered for the variable cost of cargo handling.[7] Each port stay was assumed to last for one day on every port visit (see Exhibit 5). Furthermore, the

road distances between the three automobile manufacturing clusters and seaports were estimated from mapping applications (see Exhibit 6).

There are no ro-ro ships currently owned by Indian shipping companies. To enable a foreign flagged vessel for the Indian coastal operations, special permission is required. Consequently, only two ro-ro ships are available for coastal shipping operations. These two ships vary in characteristics (refer to Exhibit 7). The fixed and operating costs of these two ship types are made up of various components depending on ship characteristics and other factors. The road transportation cost, which is the cost of hiring auto trailers for delivery, is estimated as a two-part tariff derived from running a simple regression on tariff rates between multiple origin-destination pairs from historical data (see Exhibit 8). The transportation capacity of an automobile carrier is defined in number of units of a standard vehicle, and all the vehicles carried by a transporter are measured as a multiple of the standard unit. Finally, important auto dealer locations were identified across India, and data related to monthly demand (from June 2019 to August 2019) and road distances between various locations were estimated from known sources (refer to Exhibit 9). Now, the research team was facing the challenging task of deriving useful results from these data and presenting insights to the CALC's top management to make the coastal shipping of automobiles a viable business for the company.

The research team needs to work on the following questions to address the above-mentioned requirements.

1. Estimate the overall cost of outbound automotive distribution under the current scenario, where truck trailers are being used to ship the automobiles directly from the factory to the different customer locations.

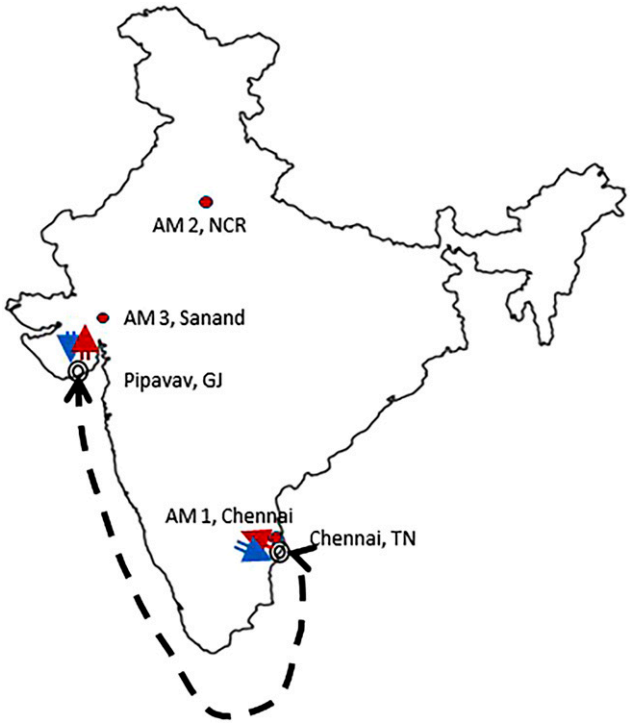
2. Identify the customer locations which are suitable for a modal shift to the coastal shipping. Given that coastal shipping is an intermodal activity, it involves truck trailers for the first and the last mile delivery. Thus, depending on the road distance required in coastal shipping, a location would make sense as a candidate for coastal modal shift.

3. Develop an optimal coastal shipping system design and shipment planning for the overall outbound automotive distribution network for the given scenario, including appropriate vessel sizes, number of voyages required in a year, and the amount of freight to be shipped using the coastal mode. Overall assessment of the total cost needs to be made for comparison with the cost of complete direct trucking option.

4. Identify the supply chain challenges associated with a modal shift to coastal shipping.

Exhibit 1

Figure E1. Major Auto Manufacturer Locations and Coastal Shipping Route Served by CALC



Note. GJ, Gujarat; NCR, National Capital Region; TN, Tamil Nadu.

Exhibit 2

Table E1. Regulatory and Business Environment Concerning Coastal Shipping Worldwide

Regulation	Description
Cabotage policy	Cabotage restrictions refer to the policy of allowing foreign ships to serve coastal shipping service in the domestic geography of a country. The cabotage policies vary from country to country. Some examples include the following: • The United States has a strict cabotage policy and restricts domestic shipping to only nationally registered vessels. • The European Union (EU) has a favorable policy in terms of relaxed cabotage laws across the member states through community regulations supporting pan-European logistics. • India recently relaxed its cabotage laws to allow foreign ships to serve the Indian coast, if the ship type is unavailable in India. • In Southeast Asia, Indonesia, Malaysia, and Thailand have cabotage restrictions mandating a percentage share of country ownership/management in the shipping operations.
Financial and tax incentives	Countries give financial incentives to promote shipping activities such as low interest loans for shipbuilding and incentives in port charges and crewing costs. Some examples include the following: • The federal government provides operating subsidies to most U.S. flag international vessels, although not to the domestic ones. • There are loan guarantees at lower interest rates for ships built in U.S. shipyards. • EU member states give incentives in infrastructure development supporting short sea shipping. • Southeast Asian countries facilitate fiscal incentives for national registered ships operating domestically.
Manning policy	Countries have rules related to the employment of national crew onboard domestic vessels. Some examples include the following: • Indian laws mandate coastal ships to have domestic crew; for foreign ships converted to Indian coastal trade, 50% of the crew must be Indian. • The United States mandates all crew to be U.S. nationals for all U.S.-registered ships. • Southeast Asian countries such as Indonesia, Thailand, and the Philippines have laws related to compulsory national crewing.
Operational challenges	Coastal shipping faces several operational challenges, which are common across the world, although the level of difficulty may vary across the geographies. Some of the challenges include the following: • Slow, inefficient, and inflexible modes of transportation in comparison with land-based modes • Traditional business practices prevalent in shipping operations, making it difficult to integrate with overall national logistics • Inefficiencies in cargo handling at ports because of a low level of automation and complex customs processes

Note. Data obtained at https://www.itf-oecd.org/sites/default/files/docs/01shortsea.pdf (accessed December 10, 2020), https://fas.org/sgp/crs/misc/R44831.pdf (accessed December 10, 2020), and https://www.unescap.org/sites/default/files/Study%20on%20strengthening%20capacity%20to%20plan%20and%20develop%20efficient%20coastal%20shipping%20in%20SEA_0.pdf (accessed December 10, 2020).

Exhibit 3

Table E2. Plant Locations and Capacities

Auto manufacturing cluster	Plant location	Capacity	Supply
AM 1	Chennai	1,240,000	832,352
AM 2	National Capital Region	1,830,000	1,341,523
AM 3	Sanand	1,300,000	730,214

Exhibit 4

Table E3. Sea Distance Between Ports in the Coastal Shipping Route in Nautical Miles

Port	Chennai	Pipavav
Chennai	—	1,394
Pipavav	1,394	—

Notes. Based on data from http://ports.com/sea-route/ (accessed July 5, 2020). Note that 1 nautical mile = 1.852 km.

Exhibit 5

Table E4. Port-Related Data

Port cargo handling charges (in $/unit)	2
Port stay duration per visit of a ship (in days)	1

Exhibit 6

Table E5. Distances from the Auto Manufacturing Clusters to the Ports (in Kilometers)

Auto manufacturing cluster	Chennai port	Pipavav port
AM 1	38	2,043
AM 2	2,169	1,198
AM 3	1,869	292

Exhibit 7

Table E6. Ro-Ro Ship Characteristics

Characteristic	Ship 1	Ship 2
Capacity (in number of automobiles)	800	3,518
Average speed (knots[a])	13	17
Operating cost at sea (in $/day)	3,218	6,568
Operating cost at port (in $/day)	3,467	15,925
Fixed cost of shipping (in $ for three months)	268,366	536,778

[a]Note that 1 knot = 1 nautical mile per hour = 1.852 km per hour.

Exhibit 8

Table E7. Auto Trailer Charges

Charge	$
Fixed cost of hiring for a trip	185.69
Variable cost per km	1.46
Truck capacity (in units)	8

Exhibit 9

Table E8. Data Provided in the Spreadsheet Supplement (CACL.xlsx)

Description	Sheet name
List of customer locations	Customer Locations
Monthwise demand at each customer location of products from each manufacturing cluster	Customer Locations
Distance of each customer location from each automotive cluster	Customer Locations
Distance of each customer location from both the ports	PortCustDist

Endnotes

[1] This case is inspired by coastal shipping operations conducted by a third-party logistics firm in India, which offers coastal shipping service for automobiles using the sea route from/to Chennai to the Gujarat state. We have used a fictional name to demonstrate the issues faced by this firm in the financial sustainability of this business.

[2] A *finished automobile* refers to a fully manufactured new vehicle produced in a factory for sale to a final customer.

[3] See https://www.unescap.org/sites/default/files/Study%20on%20strengthening%20capacity%20to%20plan%20and%20develop%20efficient%20coastal%20shipping%20in%20SEA_0.pdf (accessed July 5, 2020).

[4] See https://www.transportation.gov/testimony/development-short-sea-shipping (accessed on June 30, 2020).

[5] A voyage charter is an arrangement where the charterer hires a ship for a voyage between a fixed route for an agreed-upon payment. The running costs of the ship are borne by the shipping company.

[6] See http://ris.org.in/pdf/aiib/03_April2018/Inaugural/Mr.KailashKumar_Aggarwal.pdf (accessed July 3, 2020).

[7] These are processes involved in the loading and discharging of cargo at the seaport.

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