CHAPTER III. CASE STUDY METHODOLOGY

A number of models have been developed to aid transport decision makers in choosing the most effective transport mode or combination of modes that not only minimize costs and risk, but also satisfy various on-time service requirements within the transit corridor. The cost/time methodology presented below and utilized in this study has been adapted from Beresford and Dubey[4], as improved by Banomyong.[5] It includes costs and time associated with transport by any mode (road, rail, inland waterway and sea) and with transfers between modes (at ports, rail freight terminals and inland clearance depots) as components. The methodology is based on the premise that the unit cost of transport varies between modes and this will be reflected in the cost curves. For volume movements, sea transport is generally cheapest per tonne per kilometre and road transport is normally the most expensive, with transport by waterway and rail in an intermediate position.

This model may also be used as a useful tool in the debate over the value of time in freight transport operations by analyzing transit times by mode and route. The longer freight takes to reach its destination (including dwell times at terminals), the greater will be the implicit interest costs of working capital. Total implicit costs may, however, be a good deal higher, since some goods may be needed urgently and business may be lost if goods arrive too late. The value of time will ultimately depend on the nature of the commodities being transported and the cost of delays must also be taken into account when appraising the risks attached to specific routes and transport modes. As part of the analysis of the transit routing decision, it is important to examine the trade-off between the monetary outlays for transport and the implicit costs of time.

Points of transshipment, at border crossings or between modes, are incorporated into the cost curves as vertical steps. For example, at ports and inland terminals, a freight handling charge is levied without any material progress being made along the supply chain; therefore, the costs incurred here are represented by a shift upwards in the cost curve at these points. The height of the step is proportionate to the amount of the charge. These vertical steps can also be broken down to reflect different types of charges or processes involving time, such as document fees, transit charges and cargo clearance costs. In this regard, bottlenecks at points of transshipment can be analyzed in themselves and as part of the overall route.

A. Four stages in the methodology

The methodology may be considered in four developmental stages, from its basic form (figure III.1) through two intermediate stages (figures III.2 and III.3) to its final form (figure III.4).[6] These are presented in more detail below.

Figure III.1 shows the distance and cost/time data plotted on the x-axis and y-axis, respectively. As can be seen, initially road transport may be cheaper than rail transport over shorter distances, due to the initial costs (or time) required to transport the goods to the railway station. However, as the distance increases, the two lines cross and beyond this point, rail transport has a lower per kilometre cost than road transport, as indicated by the flatter slope.

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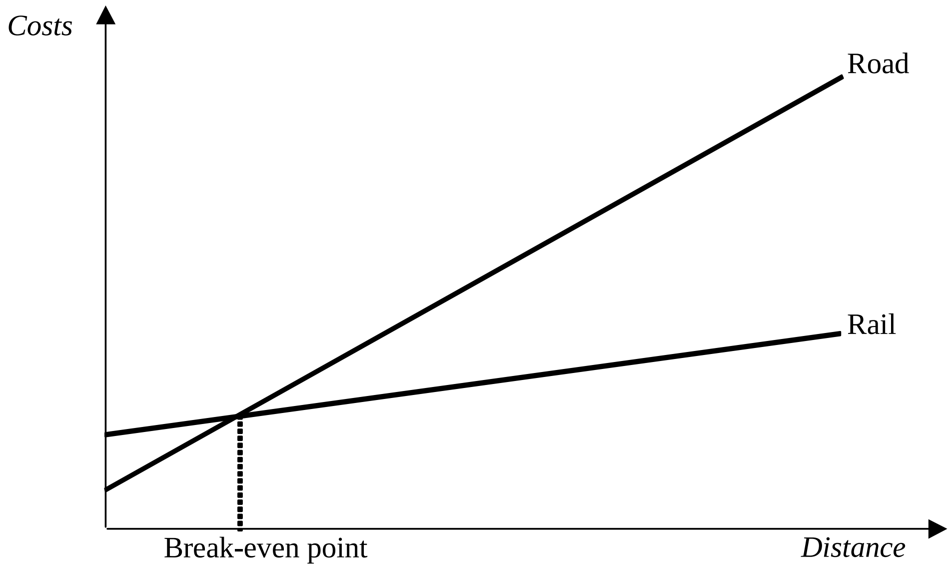
[4] Beresford, A.K.C. and R. C. Dubey, *Handbook on the Management and Operation of Dry Ports* (UNCTAD/ RDP/LDC/7).
[5] Banomyong, R, "Multimodal Transport Corridors in South East Asia: A Case Study Approach", unpublished doctoral dissertation, University of Cardiff, Cardiff Business School, 2000.
[6] These figures are adapted from Banomyong, op.cit.

Figure III.1. Unimodal alternative, road versus rail



Competition between just two modes of transport is somewhat simplistic. In reality, a combination of transport modes can also provide a competitive solution, where the cost of transport by combining both modes is less expensive than just road transport and slightly more expensive than rail transport. In the first part of the journey, it is cheaper to transport the goods by road rather than by rail. However, if the distance to be travelled is further than the break-even distance, transport by rail becomes more economical. Therefore, an intermodal transfer can be arranged at the closest rail freight terminal or ICD. The vertical step in figure III.2 represents the costs (or time) involved when goods are transshipped from road to rail at the rail freight terminal or ICD. The cost of rail transport, in reality, has not increased but the cost of the intermodal transfer is reflected in the combined transport cost from that point on.

Figure III.2. Combined transport, road-rail

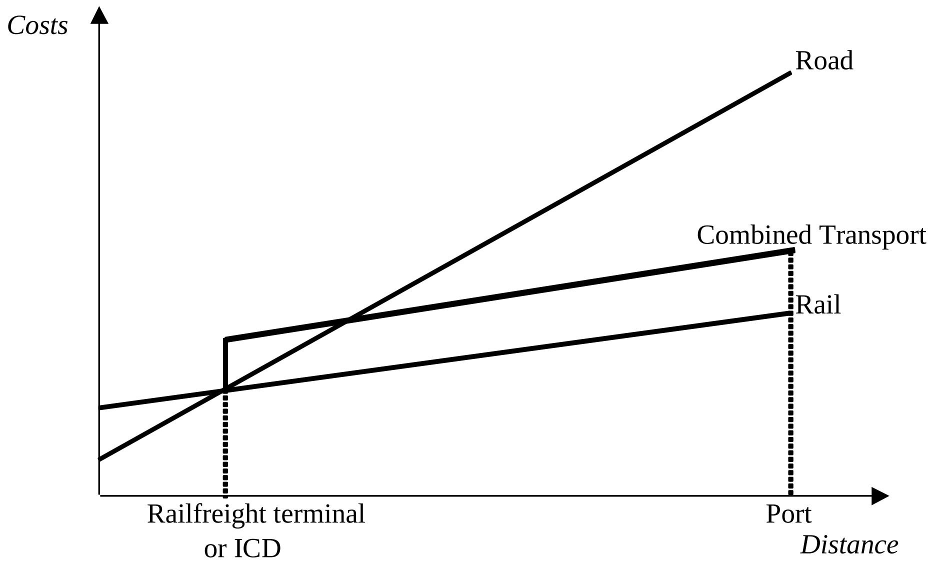
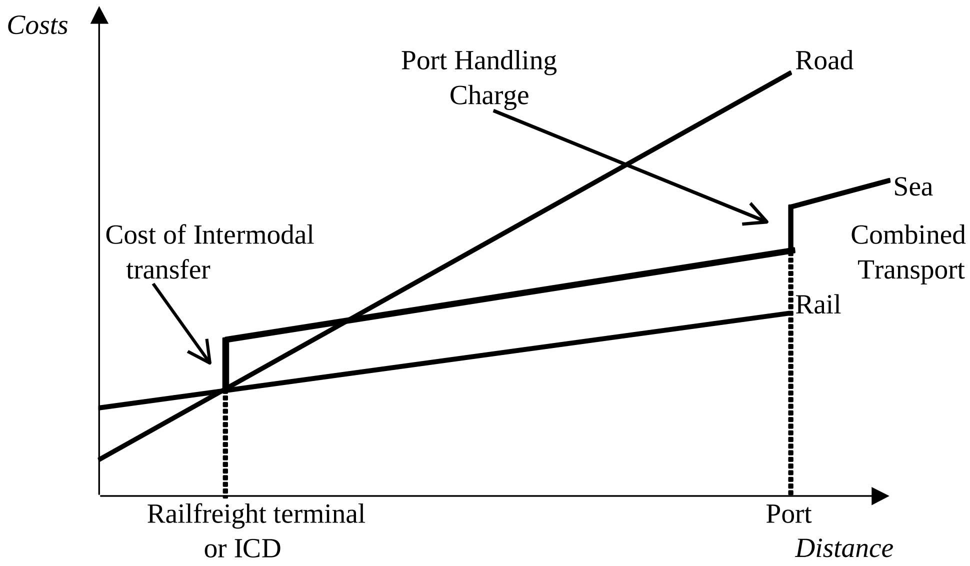
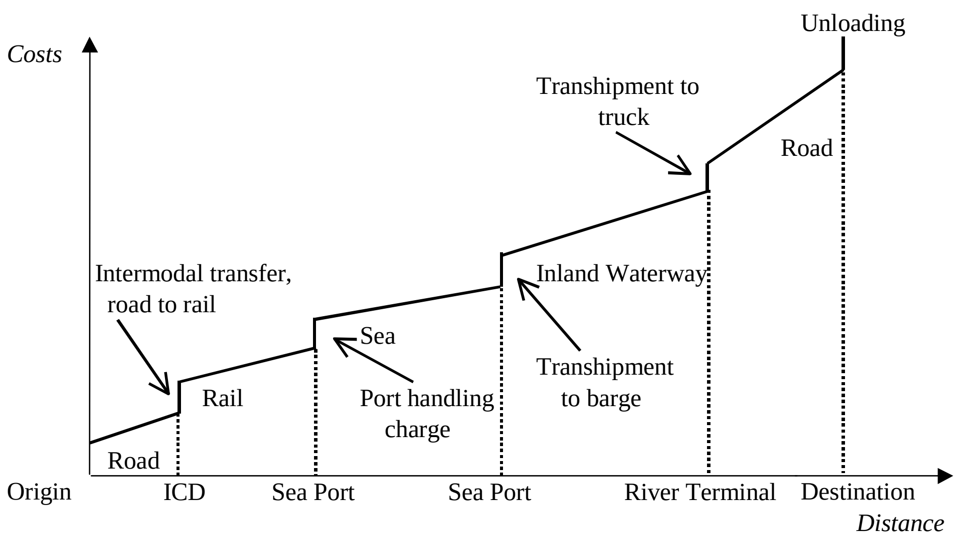


Figure III.3. Combined transport, road-rail-sea



Since the overwhelming majority of traded goods is transported by sea, the most likely destination for the freight in transit will be a seaport, where the goods will be transferred onto sea-going vessels. In figure III.3, the additional costs (or time) incurred at the port are represented by the second vertical step. Thus, cumulative costs from the origin to the port are the sum of the cost of rail transport to the ICD plus the cost of intermodal transfer at the ICD plus the cost of rail transport from the ICD to the port plus the handling charge at the port.

Figure III.4. Multimodal transport from origin to destination



The final stage of the methodology, illustrated in figure III.4, shows that numerous modes of transport may be involved for goods to be moved door-to-door. At each intermodal transfer point there will be a cost (or time) increase represented by a vertical step, which will be cumulated with the transport and other costs that have been incurred up to that point. Should a border crossing occur along the route, the border crossing charges (and time spent) can be represented by another vertical shift upwards in the cost curve at that point, which can then be cumulated with other costs.

B. Data needed to build the model

The costs presented in this study are based on quotes that were obtained during interviews with logistics and transport service providers, traders and governmental officials during study visits undertaken by the Secretariat. These data are not usually publicly available. Prices quoted concerned the shipment of one standard container (twenty-foot equivalent unit or TEU) on a freight-all-kind basis. However, depending on the quantity of goods transported, lower quotes may be possible. Data on transit times offered for each transit route and the variation in delays at critical nodal links were also obtained from the same group of respondents. The information needed to build the model includes:

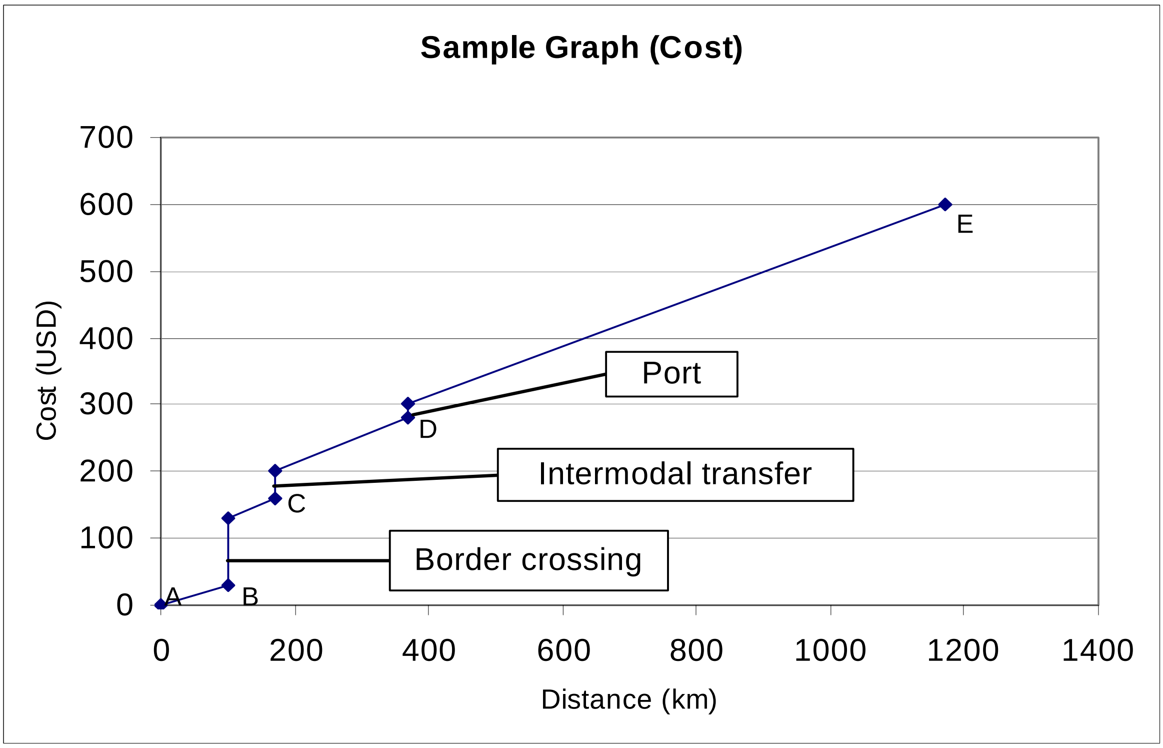
- The origin and destination of the cargo;
- The full routing from origin to destination, with an indication of the places where the cargo is essentially stationary (such as border crossings and points of intermodal transfer);
- Mode of transport for each leg;
- Distance for each leg;
- Transit time for each leg (in hours or days); and
- Cost for each leg.

A sample data table, showing the transit of goods from point A (origin) to point E (destination) is given in table III.1. This data is plotted against distance for each leg of the journey. In the case of costs, the figure will graphically show the relative cost of each leg (or mode, where applicable), as well as indicate the approximate proportion of non-transport costs in relation to transport costs. Further information, for example, a breakdown of costs at border crossings or ports, can highlight areas for action by policy makers. Similarly, by plotting time against distance, the relative speed of transit transport for each leg (or mode) can be compared, and the bottlenecks at transshipment points can be identified. Figure III.5 below is a sample graph using the cumulative cost data from the table.

Table III.1. Sample data table

Leg	*Mode*	*Distance (km)*	*Cum. distance (km)*	*Cost (US$)*	*Cum. cost (US$)*	*Transit time (hours)*	*Cum. Time (hours)*
A to B	Road	100	*100*	50	*50*	4	*4*
Border crossing	-	-		100	*150*	6	*10*
B to C	Road	70	*170*	30	*180*	3	*13*
Intermodal transfer	-	-		40	*220*	3	*16*
C to D	Rail	200	*370*	60	*280*	18	*34*
Port	-	-		20	*300*	6	*40*
D to E	Sea	800	*1 170*	300	*600*	72	*112*
Total		1 170		600		112	

Figure III.5. Sample graph



C. Further applications and considerations of the methodology

1. Issue of reliability

When selecting transport routes, multimodal operators also take into consideration a number of other factors in addition to transportation time and costs, such as the reliability of the route. Reliability can be understood in terms of consistent transit times; regular schedules; predictability of costs; informal charges, such as 'tea-money', which are sometimes required to facilitate transport; damage during the journey; pilferage and overall security concerns.[7]

If it were possible to insure against such risks, the insurance costs could be used to assess reliability for comparable routes. One technique which can be employed as part of the application of the cost/time methodology to assess reliability along different routes is to use a confidence index. This index captures the subjective assessment of risk by the respondents who use each transit corridor.[8] The respondents intuitively assign a rating for each transport mode, intermodal transfer charge and other nodal activities, with uncertainty measured in terms of subjective probabilities assigned to each event. Measurement can be done on a scale from 1 to 5, where the lowest score indicates almost no confidence and the highest, a great deal of confidence. Alternatively, respondents can be asked to assign a plus sign (+) for

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[7] Other factors include the nature of the freight, value, marketing strategy, stockholding policy, and packing requirements.
[8] The confidence index is derived from the field of political science, especially political instability methodology.

confidence and a minus sign (-) for lack of confidence. A general assessment of confidence can then be obtained by examining the distribution of the individual responses.

A confidence assessment is useful in explaining cases where multimodal operators appear consistently to be choosing routes that are not the most time- or cost-effective. In terms of regularity of schedules and transit times, it also provides an indication of performance of transport operators. Since it is based on a subjective interpretation of operations, such an assessment requires that the persons interviewed be knowledgeable about international trade transactions, transport operations, documentary procedures, and rules and regulations in their respective countries or region. Due to time and resource constraints, the confidence index was not explored for the case studies presented in Part B.

2. Influence of direction of trade flows on corridor costing structure

In the case of landlocked developing countries, the number of containers being imported tends to exceed the number of containers being exported. This is partly owing to the fact that most, if not all, landlocked developing countries have substantial trade deficits. In addition, the majority of goods exported from landlocked countries are primary commodities, which have traditionally been moved in bulk, while their imports (excluding energy resources) are intermediate manufacturing inputs and capital and consumer goods that are more suited to containerization.

The data utilized in the cost/time model are collected from a variety of sources, most importantly transport operators and freight forwarders on the ground. Given the nature of their business, such operators will usually quote the cost for the total journey from origin to destination, without revealing the cost components of the various legs and transshipment points. It is therefore assumed that the quotations received include the cost of returning an empty container to the point of origin (of the imported goods).

Ideally, therefore, data should be collected for both inbound and outbound transport costs, as the latter should be lower than the former. However, another factor influencing the costing structure of transit corridors is the degree of competition between transit transport service providers along the route in question. In many of the countries studied, transit transport operations are run by a restricted number of operators. This means that they are less subject to market forces and can therefore establish similar transit rates for both exports and imports, without reference to the true costs involved.

3. Issue of comparability

In the application of the methodology, the unit of analysis should be a standard container so that comparisons can be made in terms of TEU or FEU (40-foot equivalent unit). Furthermore, as most costs are quoted in TEU, using containers as the unit of analysis allows for a more detailed analysis of the breakdown of costs, for example, at border crossings. The methodology can be adapted for use with other types of unit load but some adjustment will need to be made in order to represent increases in costs and time along a particular transit corridor.