The Time Cost Distance Model

Transit corridor performance

- The objective of the model is to propose a methodology to illustrate the cost and time components of door-to-door movement by available routes and modes as well as to illustrate the delays at borders or other inspection points up to the point of destination within a transit transport corridor.

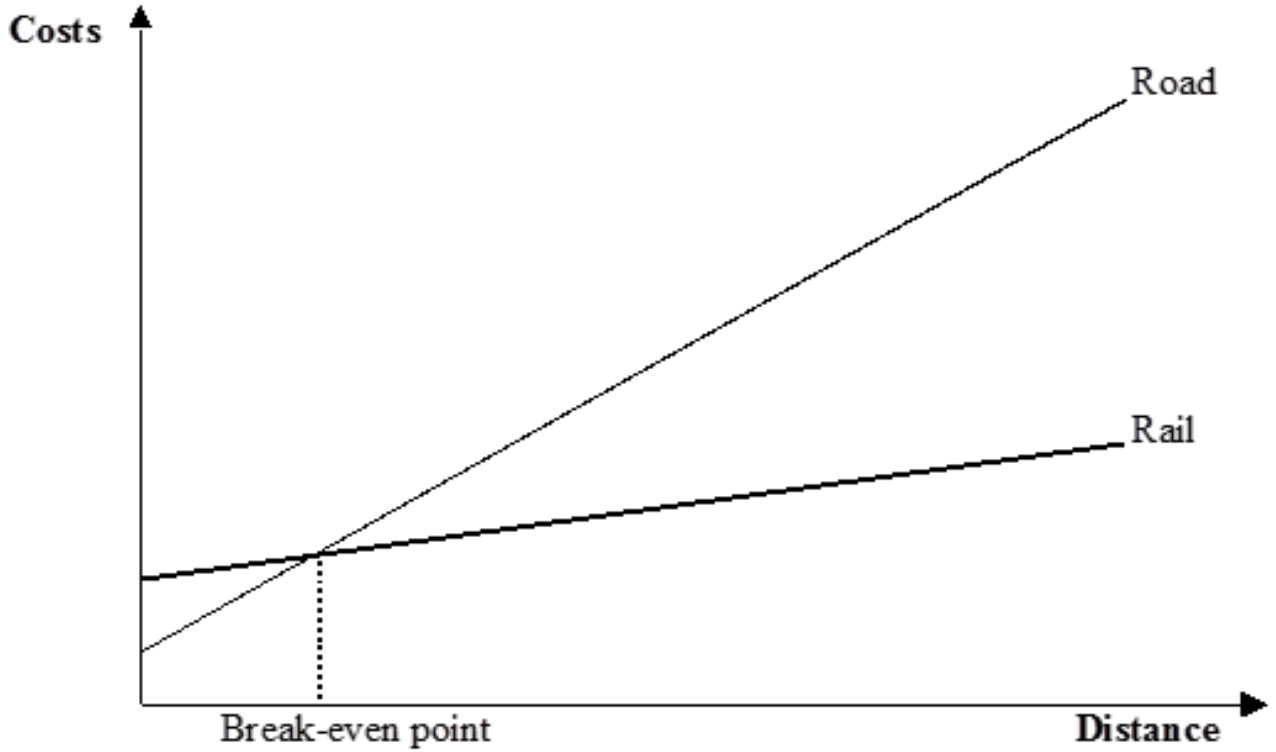
- The cost/time methodology has been adapted from Beresford and Dubey (1990), as improved by Banomyong (2000) and later disseminated by UNESCAP.

- The model includes costs and time associated with transport by any mode and with transfers between modes. The methodology is based on the premise that the unit cost of transport varies between modes

Four developmental stages,

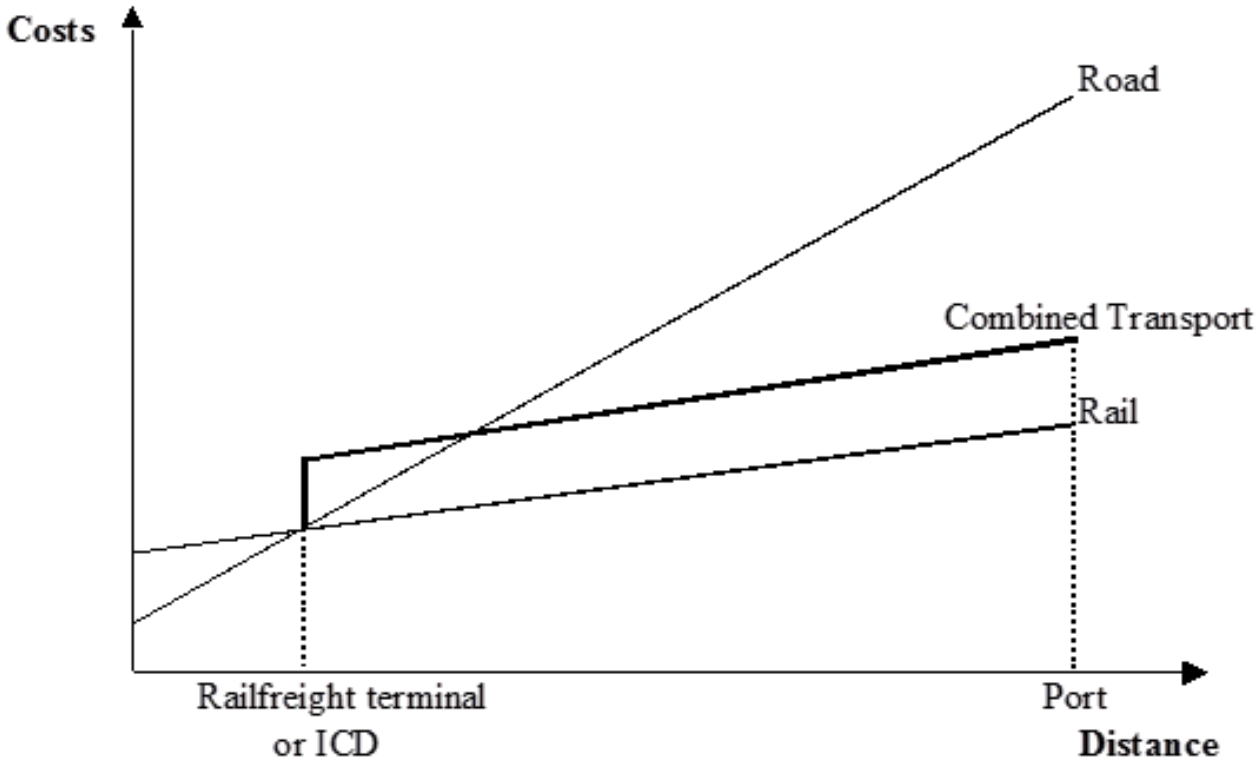
- Stage 1: Competition between two modes of transport.
- Stage 2: a combination of transport modes, where the cost of transport by combining both modes is less expensive than just road transport and slightly more expensive than rail transport.
- Stage 3: Combined transport, road-rail-sea.
- Stage 4: Multimodal transport, from origin to destination

Stage 1: Road versus rail alternative



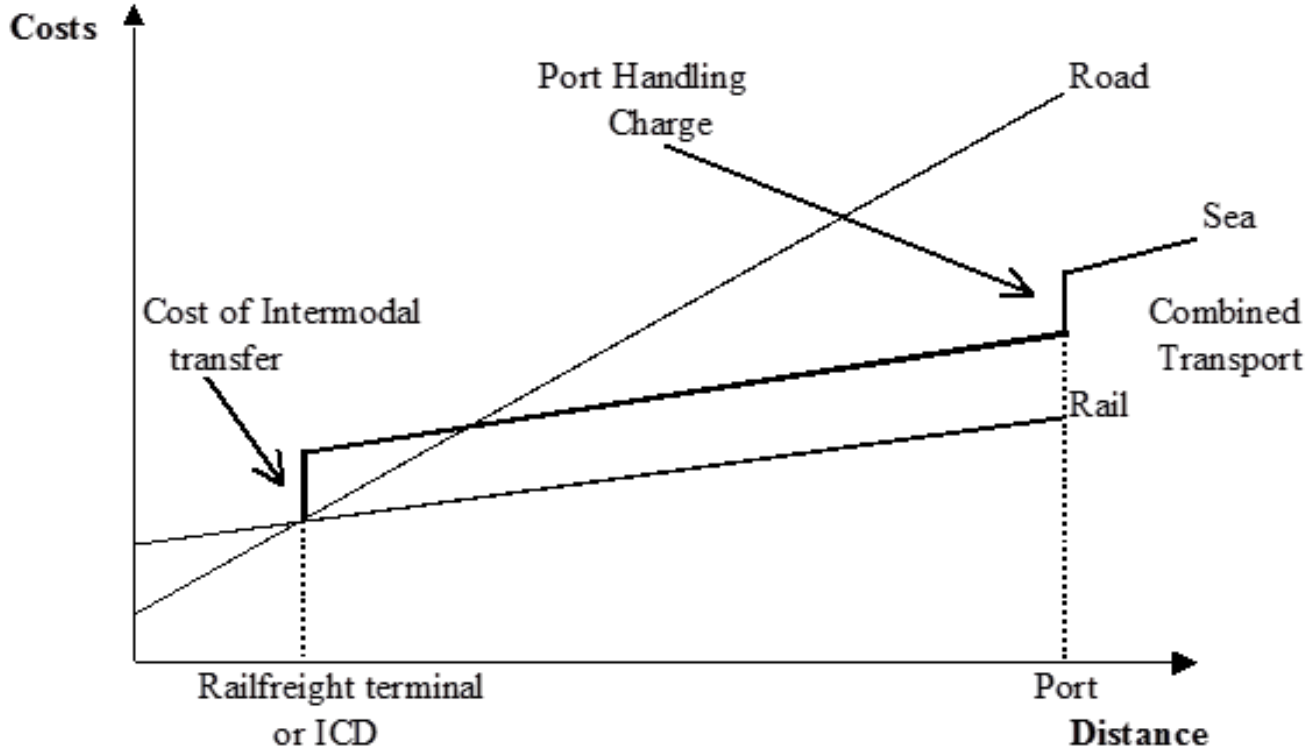
The distance and cost/time data are plotted on the x-axis and y-axis, respectively. Initially road transport may be cheaper than rail transport over shorter distances, due to the initial costs (or time) required to transport the goods to the railway station. However, as the distance increases, the two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

Stage 2: Combined transport, road-rail



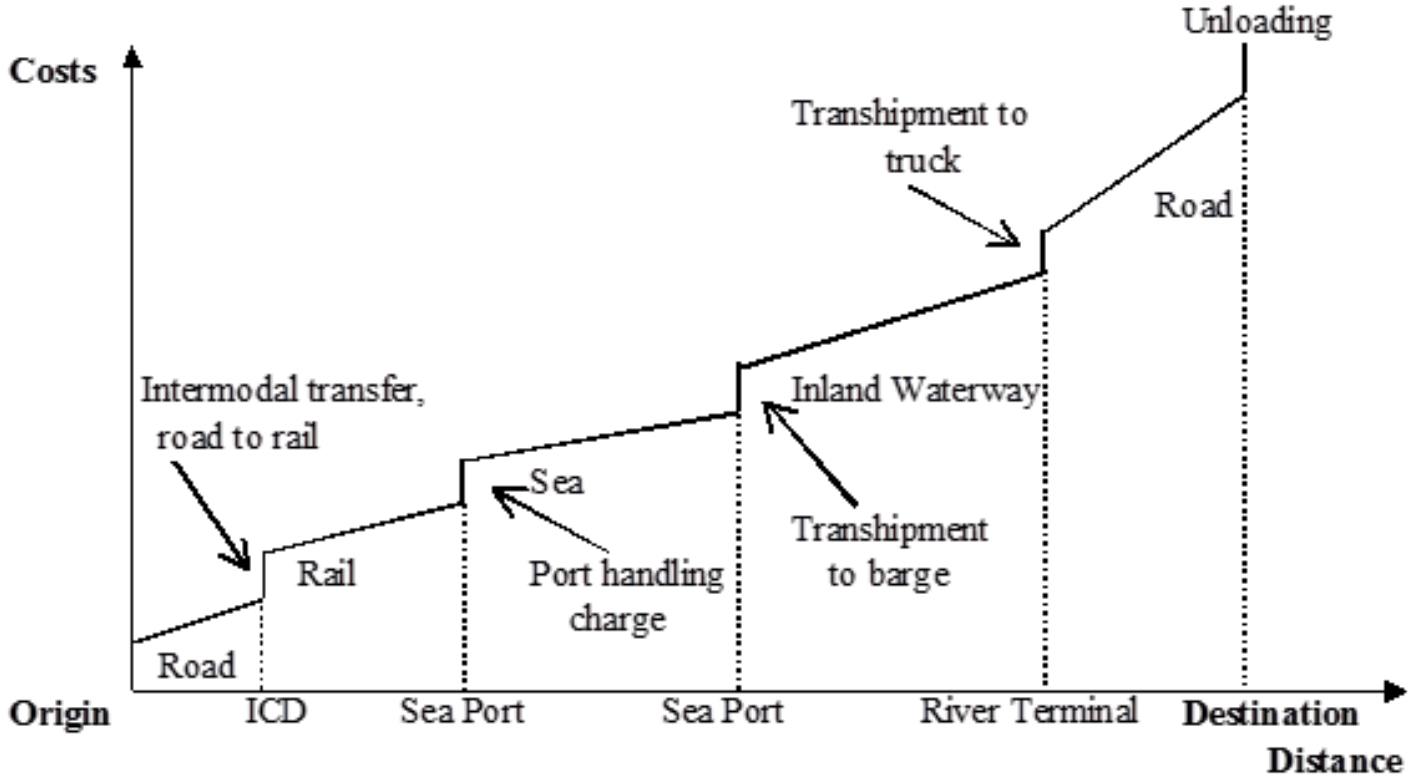
In the first part of the journey, it is cheaper to transport the goods by road rather than by rail. However, if the distance to be travelled is further than the break-even distance, transport by rail becomes more economical. An intermodal transfer can be arranged at the closest rail freight terminal or inland clearance depot (ICD). The vertical step in figure 3 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.

Stage 3: Combined transport, road-rail-sea



Since the overwhelming majority of traded goods are transported by sea, the most likely destination for the freight in transit will be a seaport, where the goods will be transferred onto seagoing vessels. 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.

Stage 4: Multimodal transport, from origin to destination



The final stage 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. 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.

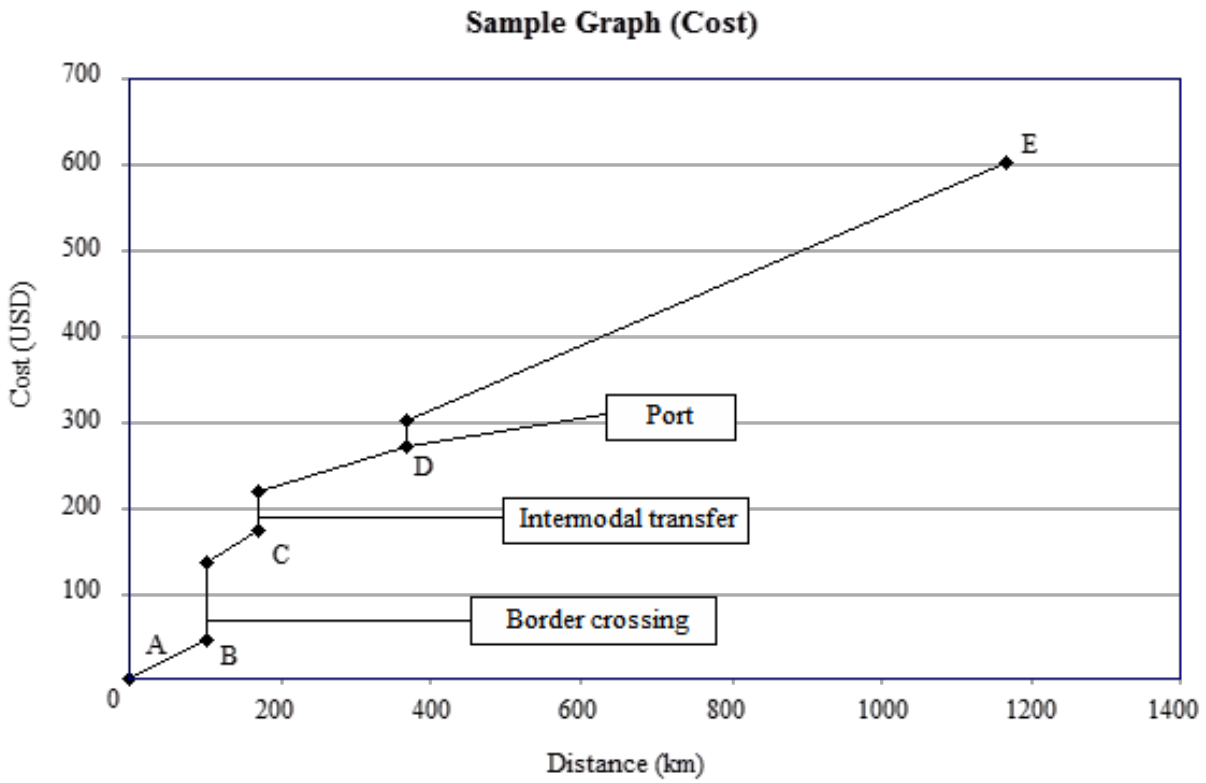
Source and Units of Information

- **Source:** The data utilised are obtained during interviews with transit and transport service providers, traders and governmental officials.
- **Units:** A unit of analysis must be agreed upon. Data such as cost or quotes should concern the shipment of one TEU on a freight-all-kind basis or for a shipment of a particular product.
- **Information needed:**
  - Origin and destination of the cargo;
  - Full route details including border crossings and modal transfers;
  - Mode of transport for each leg;
  - Distance for each leg;
  - Transit time for each leg (in hours or days); and
  - Cost or quotes for each leg.

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	

Sample graph



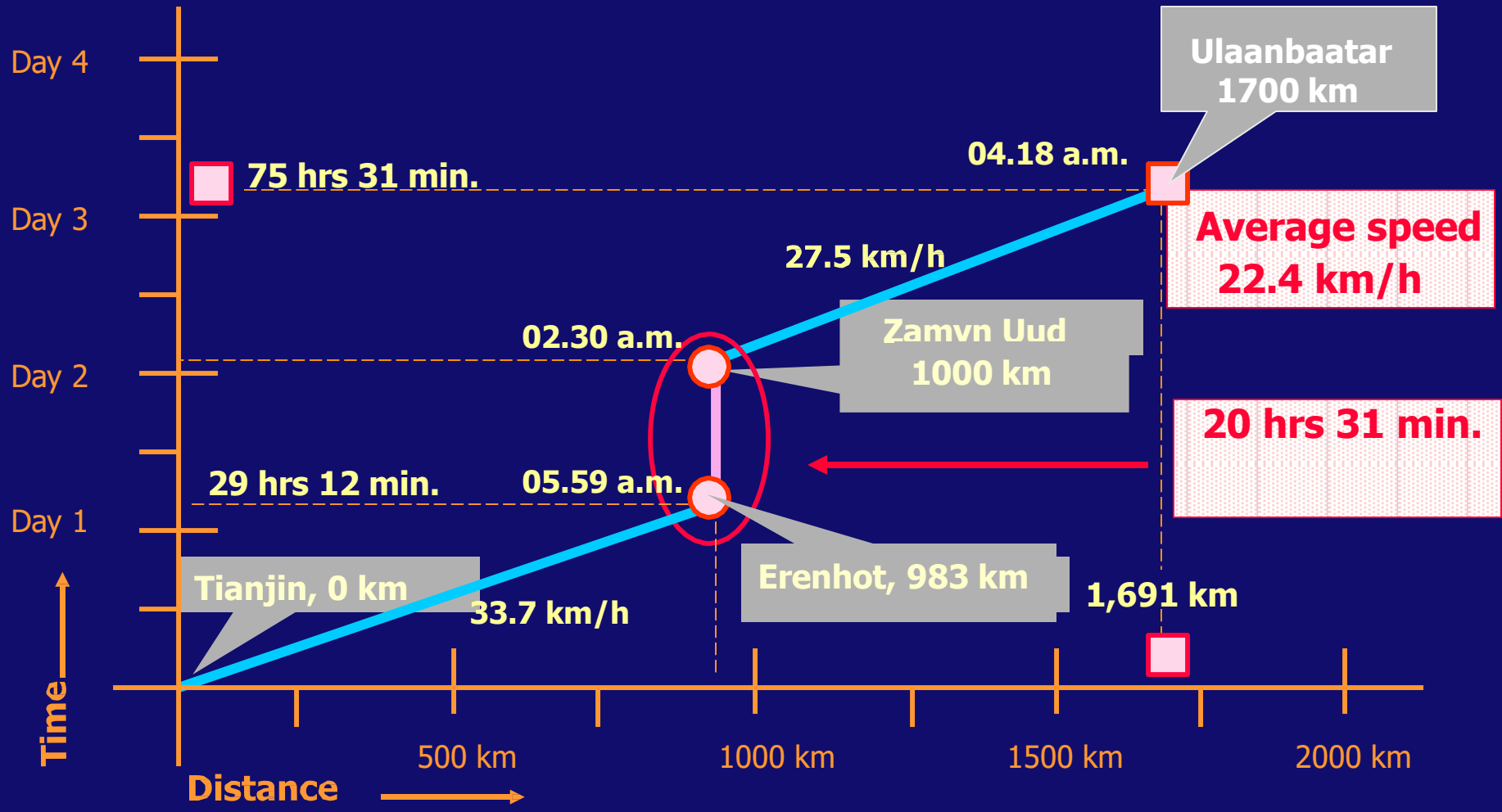
For costs or quotes, the figure shows the relative cost of each leg (or mode, where applicable), and the approximate proportion of non-transport costs in relation to transport costs.

A breakdown of costs at border crossings or ports, can highlight areas for action.

By plotting time against distance, the relative speed of transit transport for each leg (or mode) can be compared, and bottlenecks at transshipment points can be identified.

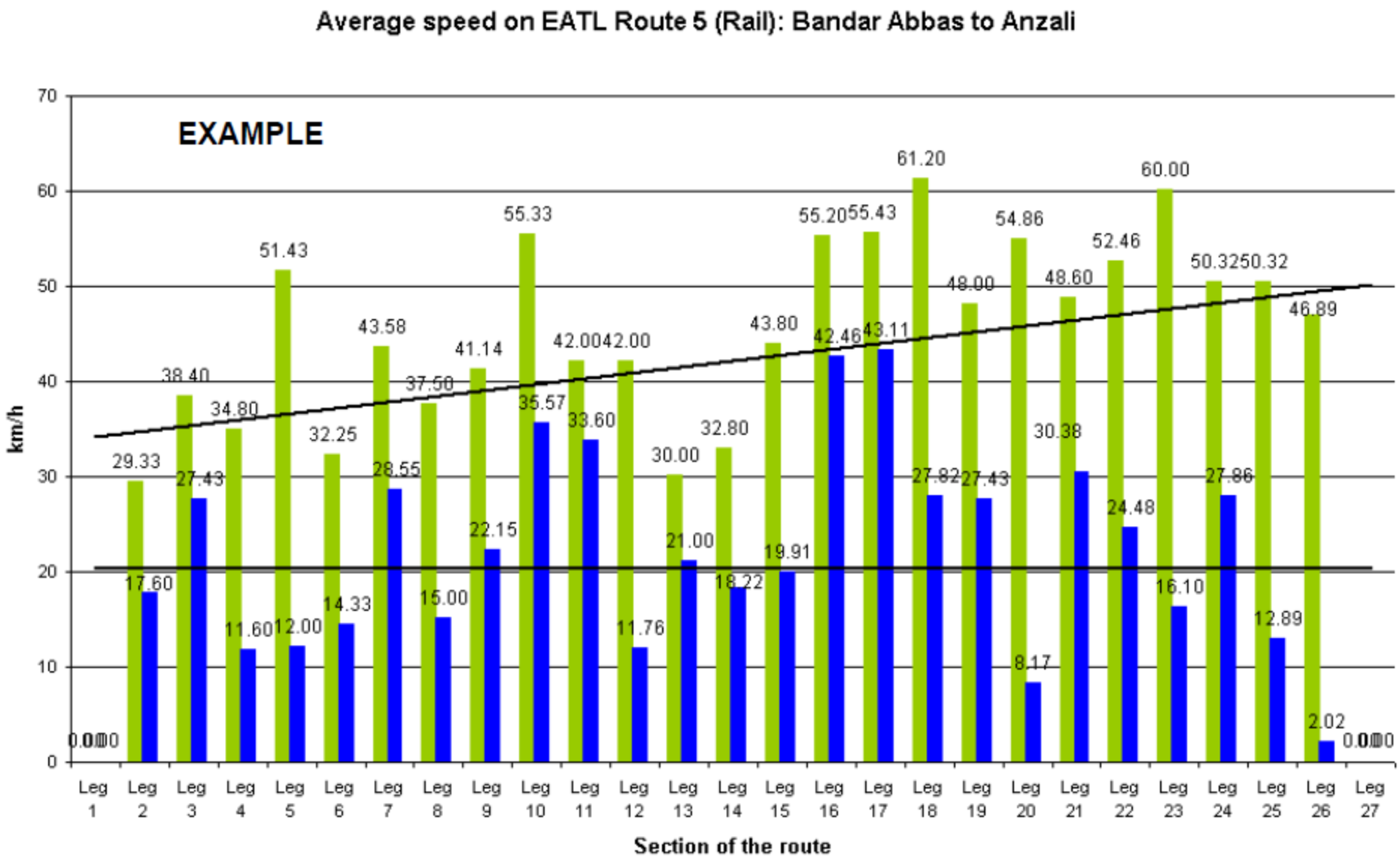
As a rule of thumb, the higher the vertical step the more likely that the border crossing or the nodal link is a bottleneck.

Results of Demo Run Tianjin - Ulaanbaatar



- Transshipment: 3 hrs. 20 min. (3.5 min. per box)
  Shunting + train formation: 3 hrs. 35 min.
- Customs: China, 3 hrs. 00 min.
  Mongolia, 4 hrs. 50 min.

Comparison of average speed per section of the route



Dimensions not included

- In addition to transportation time and costs, traders and transit service operators must also take into consideration the reliability of the transit corridor, in terms of:
  - All year consistency of transit times;
  - Frequency and quality of services;
  - Competition between service providers
  - Balance of freight volumes; (empty returns)
  - Predictability of costs;
  - Informal controls and check points;
  - Transport safety and security, etc.

Thank you for your attention

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