

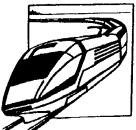


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Evaluation of intermodal transport chains

7th European Congress on ITS
Geneva
6 June 2008

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Royal Institute of Technology (KTH)
KTH Railway Group
Stockholm





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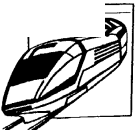
Evaluation of intermodal transport chains

Project of Swedish Intermodal Research Center (SiR-C)

Financed by the Swedish Road and Rail Administrations

Partners

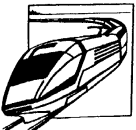
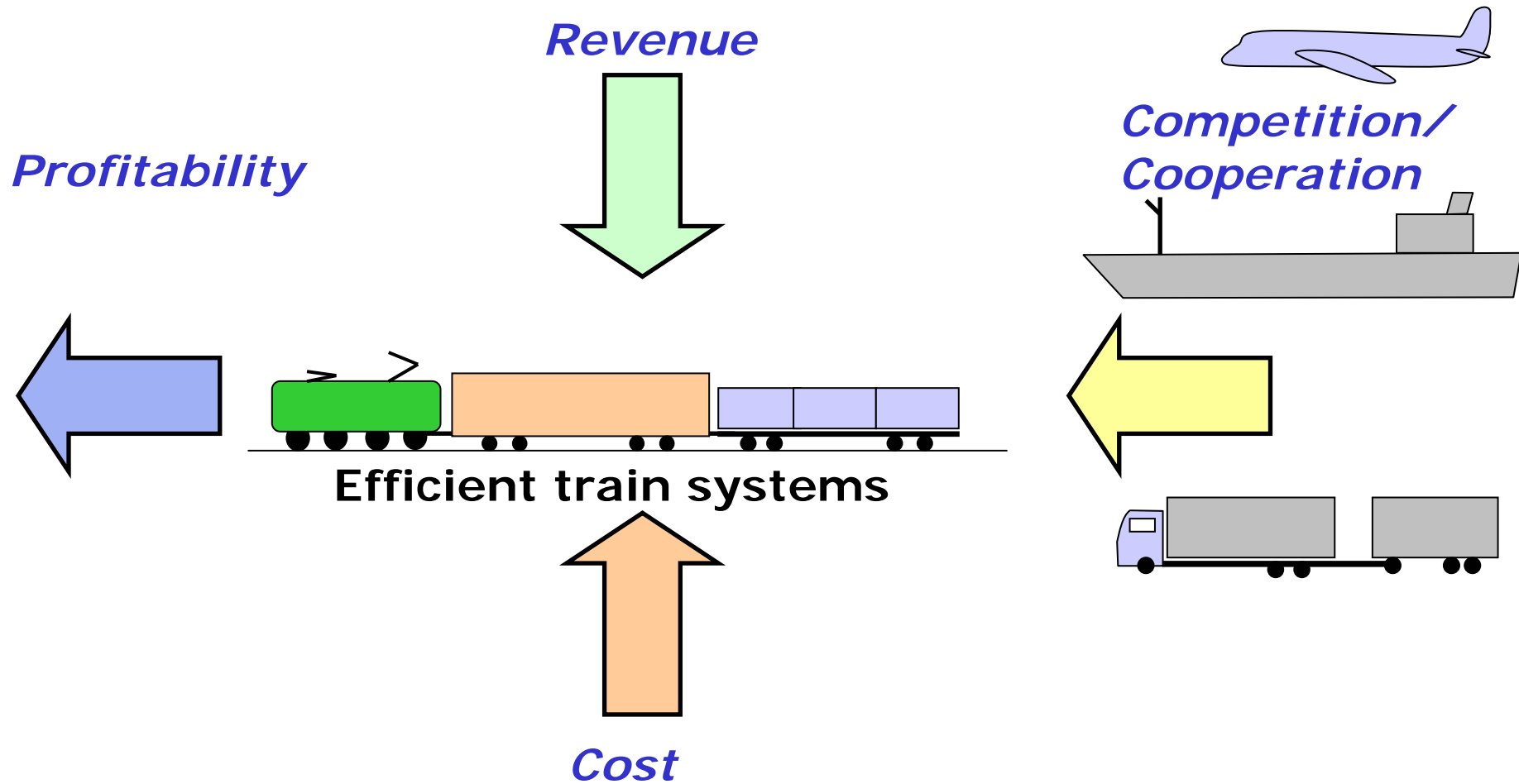
- **KTH Railway Group**
 - Project leader
 - Time- and cost model
 - Analysis and report
- **Mariterm**
 - Measurements of operations
 - Risk analysis
- **The Marcus Wallenberg Laboratory (MWL) for Sound and Vibration Research**
 - Shock and vibration tests in the laboratory
- **TfK Transport research**
 - Customers' preferences
 - Terminal cost model



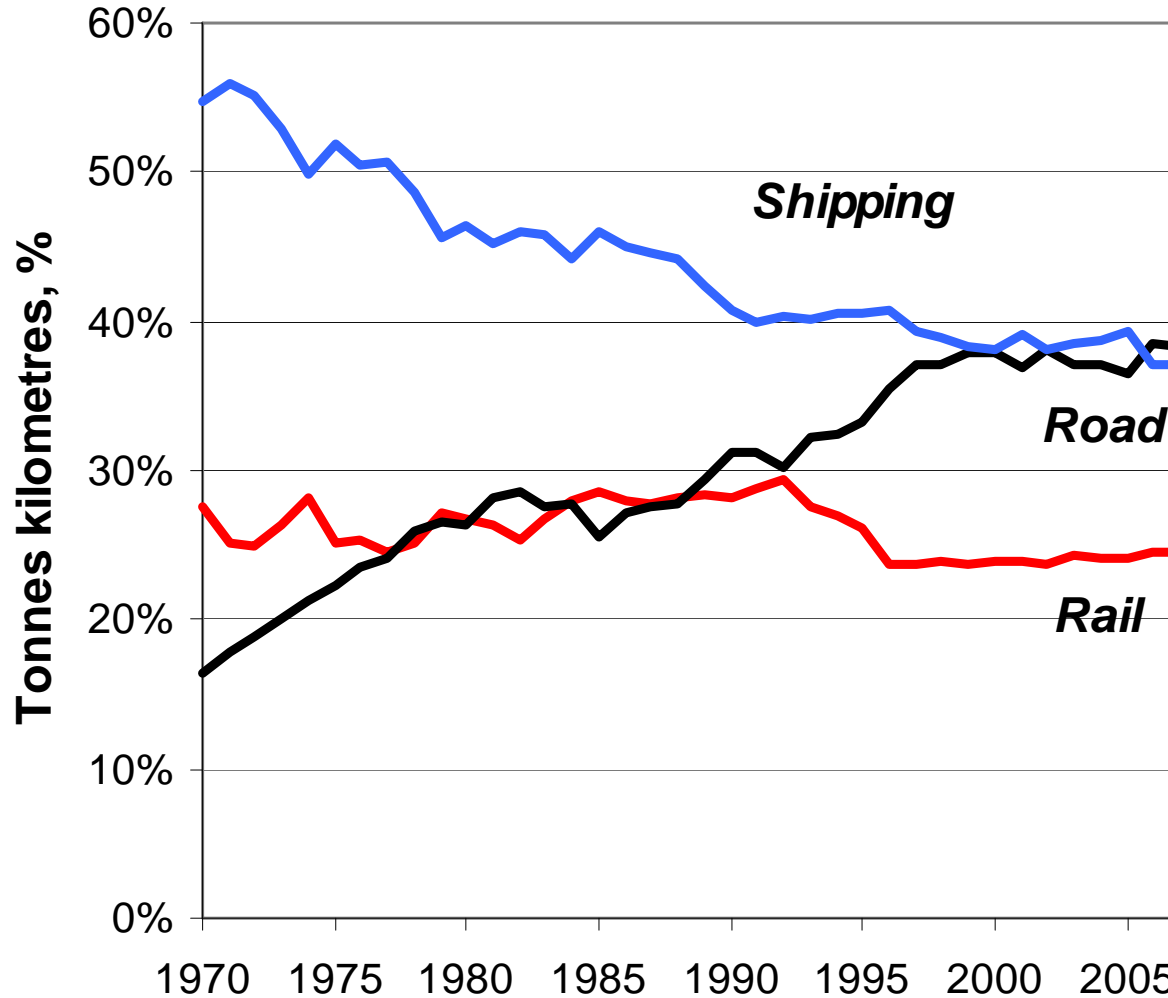


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KTH Railway Group - System approach



Long-distance freight transportation - market shares in Sweden



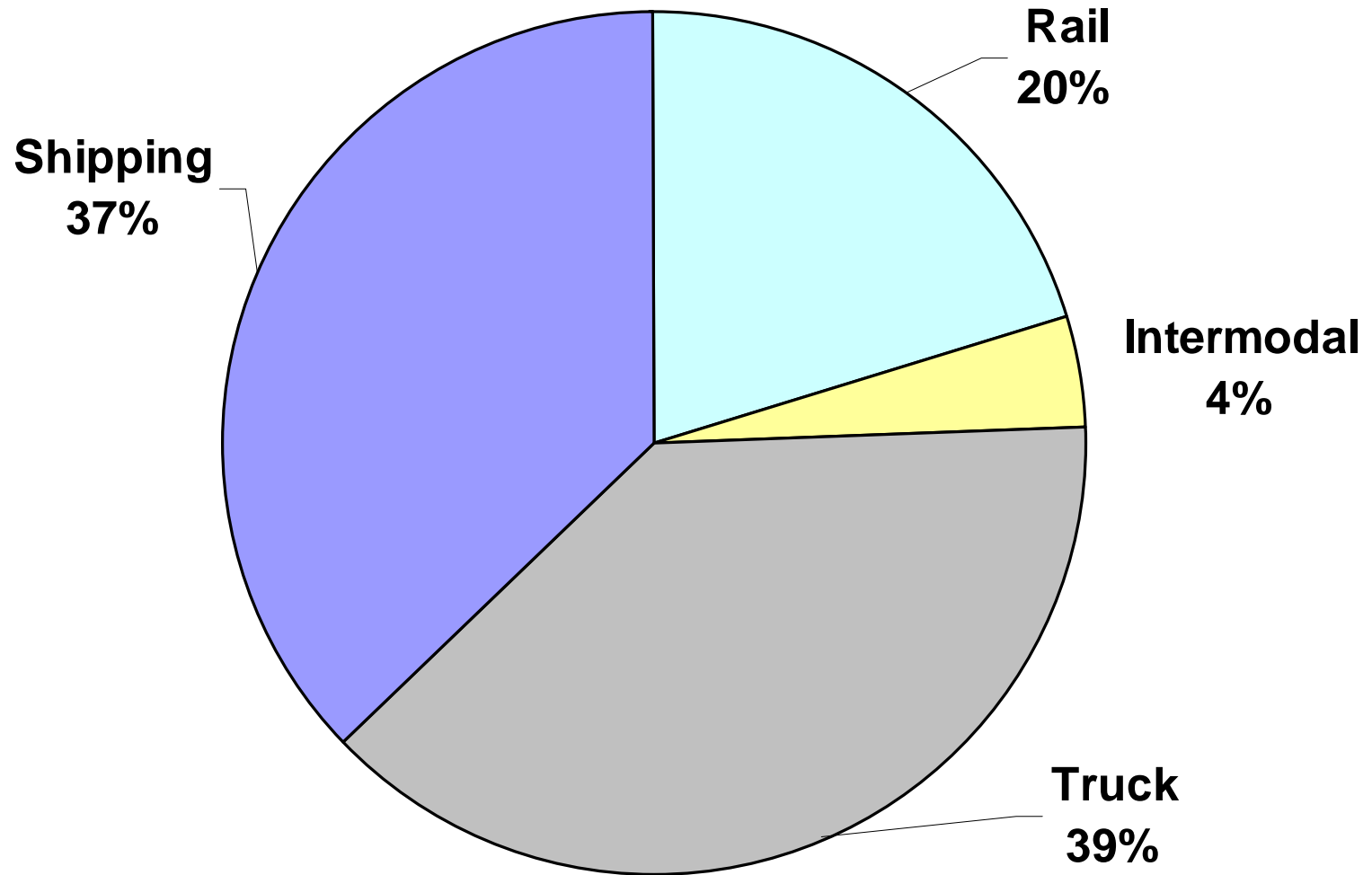
Source: Jakob Wajsmann, Banverket





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Long distance tonnes kilometres in Sweden 2007





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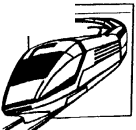
Evaluation of intermodal transport chain

Aim

- To identify the weakest link in an intermodal transport chain
- To analyse measures to eliminate the weakest link

Method

- To follow up a number of intermodal transport chains
- To investigate each link in the chain as regards
 - Time consumption
 - Costs
 - Administrative routines
 - Damage to cargo





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Evaluation of intermodal transport chain

What is typical for intermodal transport?

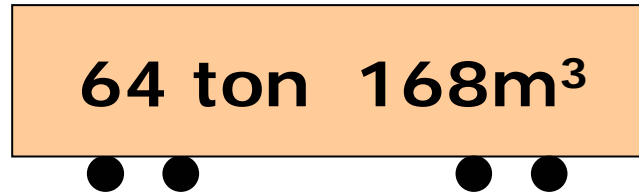
- An intermodal transport chain consists of:
 - Loading/Unloading
 - Feeder transport
 - Terminal handling
 - Long distance transport
- And compares with:
 - Direct trucking
 - Rail wagon loads
 - Shipping (not included)



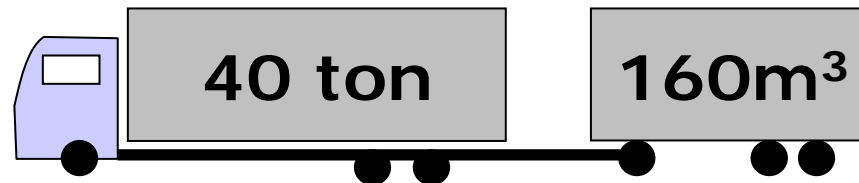
Intermodal "competes" with direct trucking and wagon load



Intermodal



Wagon load



Trucking



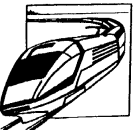


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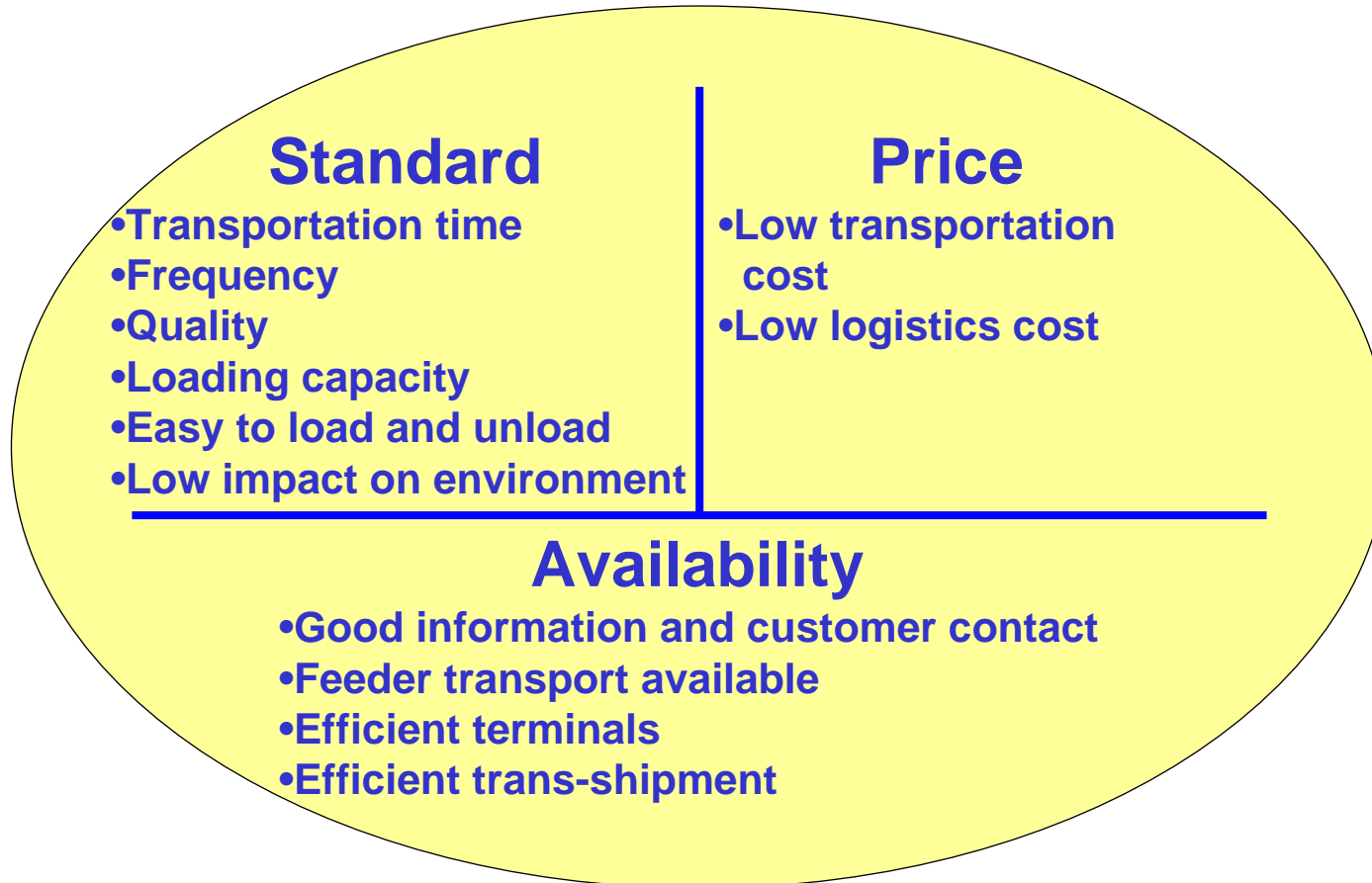
Evaluation of intermodal transport chains

Project plan

- Identification of different transport chains
- Measurements of operations
- Shock and vibration tests in the laboratory
- Frequency of events in transport chain
- Follow-ups of administrative routines
- Experience of customers
- Development of time and cost model
- Risk analysis
- Identification of the weakest link
- Conclusions and suggested solutions



Customer requirements

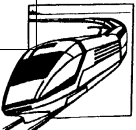
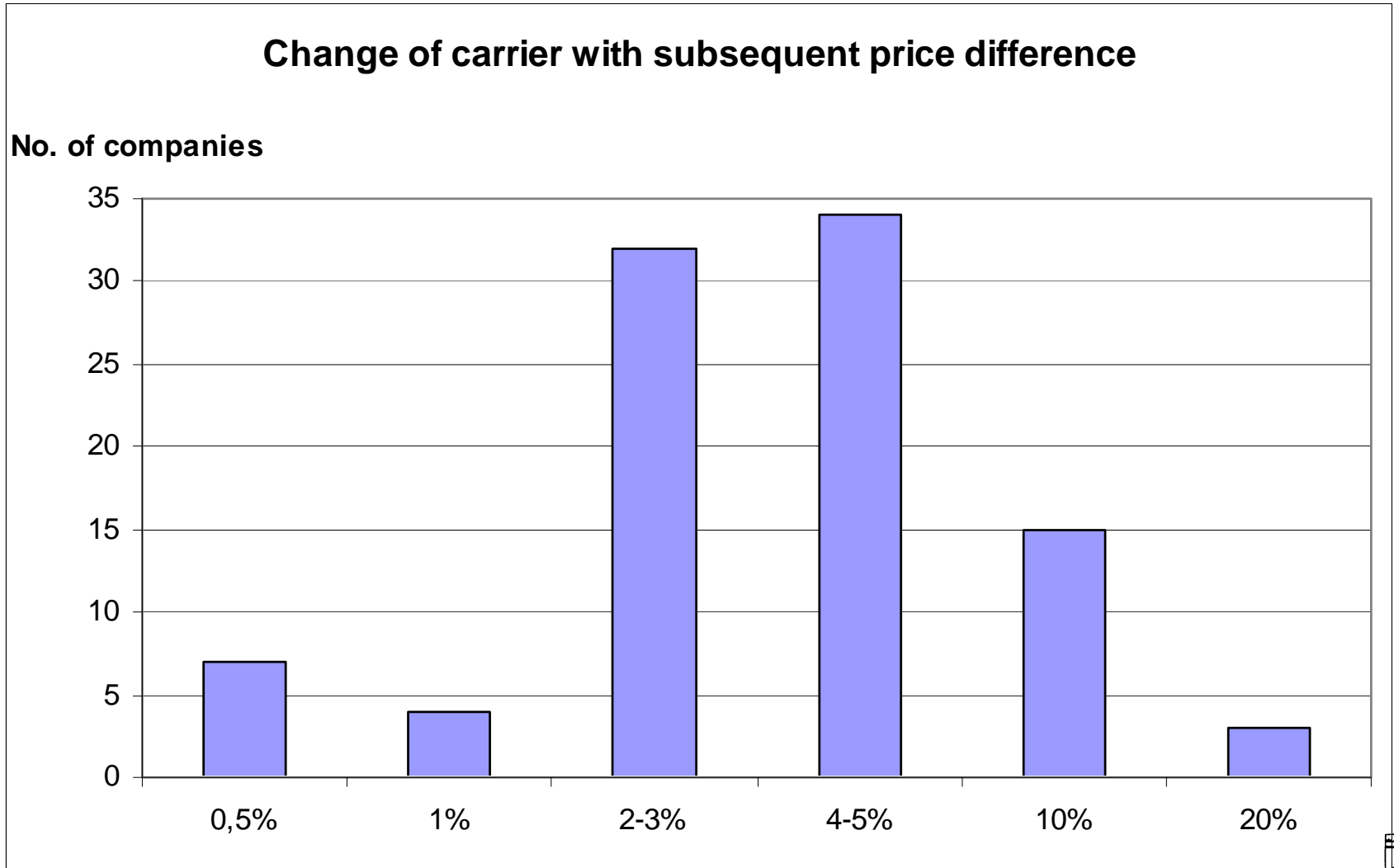




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At what price difference do the companies change carrier if there is an equivalent alternative?

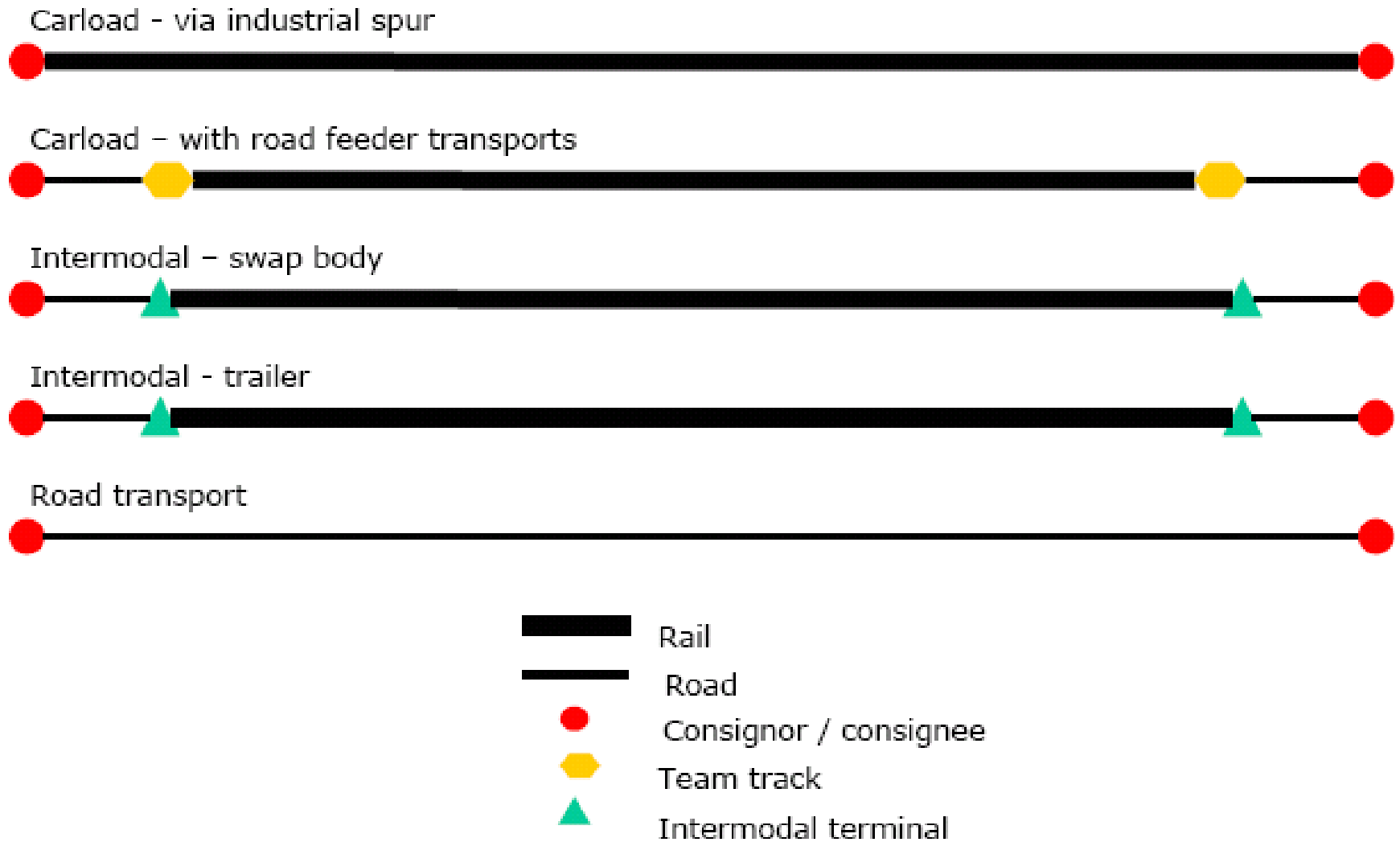
Interviews with 97 transport directors by Sofia Lundberg





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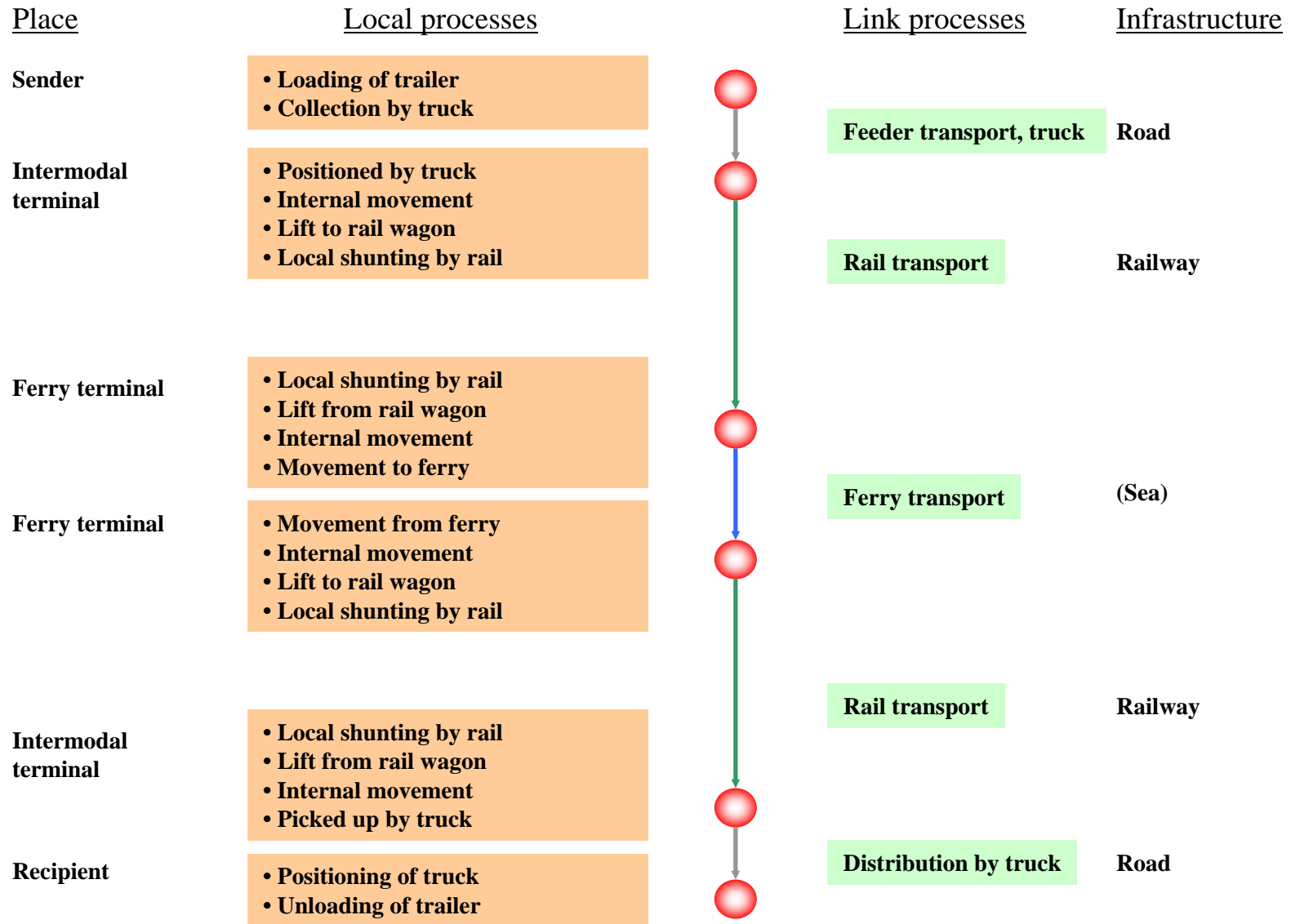
Different kinds of intermodal transport chains compared with direct rail (carload) and road transport.





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Example of process chain in international trailer transport

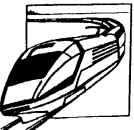




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Selection of transport chains for evaluation of intermodal transport

	Origin-destination	Mode	Company	Product
1	Gävle-Milan	Intermodal	Sandvik	Steel
2	Fors-Göteborg-Great Britain	Intermodal	Stora-Enso	Paper
3	Helsingborg-Stockholm	Intermodal	ICA	Foodstuffs
4	Skåne-Bro	Wagon load	Coop	Grocery
5	Torsvik-Stockholm	Intermodal	IKEA	Porcelain
6	Göteborg-Södertälje	Intermodal	Maersk	
7	Malmö-Stockholm	Trucking	Schenker	Less than carload
8	Göteborg-Insjön	Intermodal	Claes Ohlsson	Manufactured goods
9	Uddevalla-Göteborg	Intermodal	Green Cargo	
10	Norrköping-Trelleborg-Duisburg	Intermodal	Hector Rail	

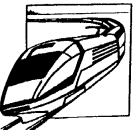




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Selection of transport mode and handling equipment for measurements of shock and vibration

	Place	Mode/ Transport Equipment	Loading unit
1	Malmö	Intermodal-Railway wagon	Trailer Swap body
2	Helsingborg	Intermodal Trailer-distribution	Trailer 25 ton Trailer 12 ton
3	Trelleborg port	Tugmaster-rolltrailer Tugmaster-chassis Tugmaster-chassis+Reach Stacker	Swap body
4	Helsingborg port	Port crane Reach-stacker Vehicle Mower	
5	Malmö intermodal terminal	Valvport crane Reach-stacker	Trailer Container Swap body





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Selection of products for test of shaker in laboratory

	Commodity	Product	Company	The test includes
1	Paper	Bale of fine paper	Stora-Enso	Shock and vibration test
2	Porcelain	Plates	IKEA	Shock and vibration test
3	Glass	Glass	IKEA	Shock and vibration test
4	Grocery goods	Glass jars of cucumbers	ICA	Shock and vibration test

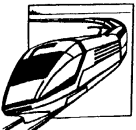
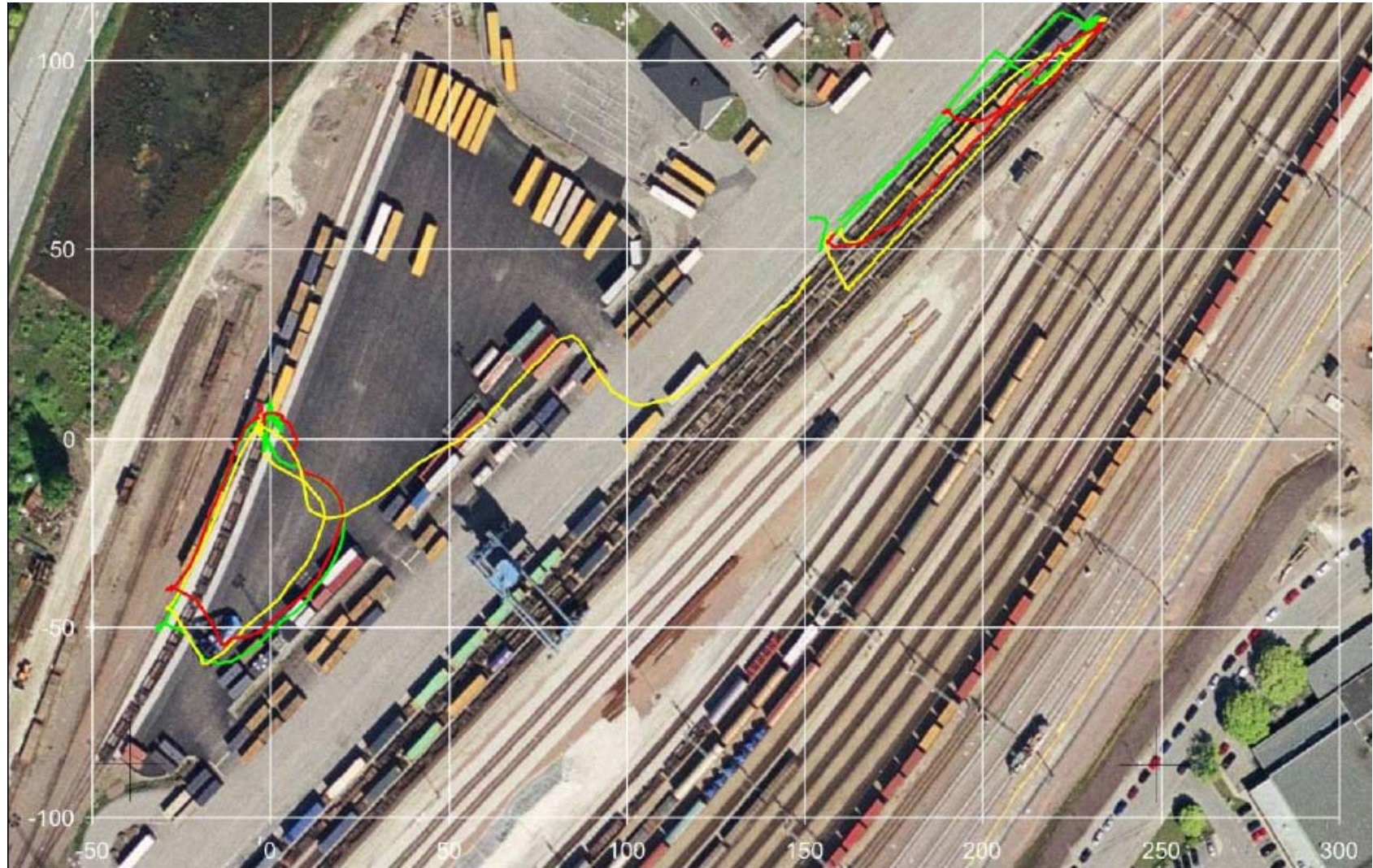




The intermodal terminal in Malmö

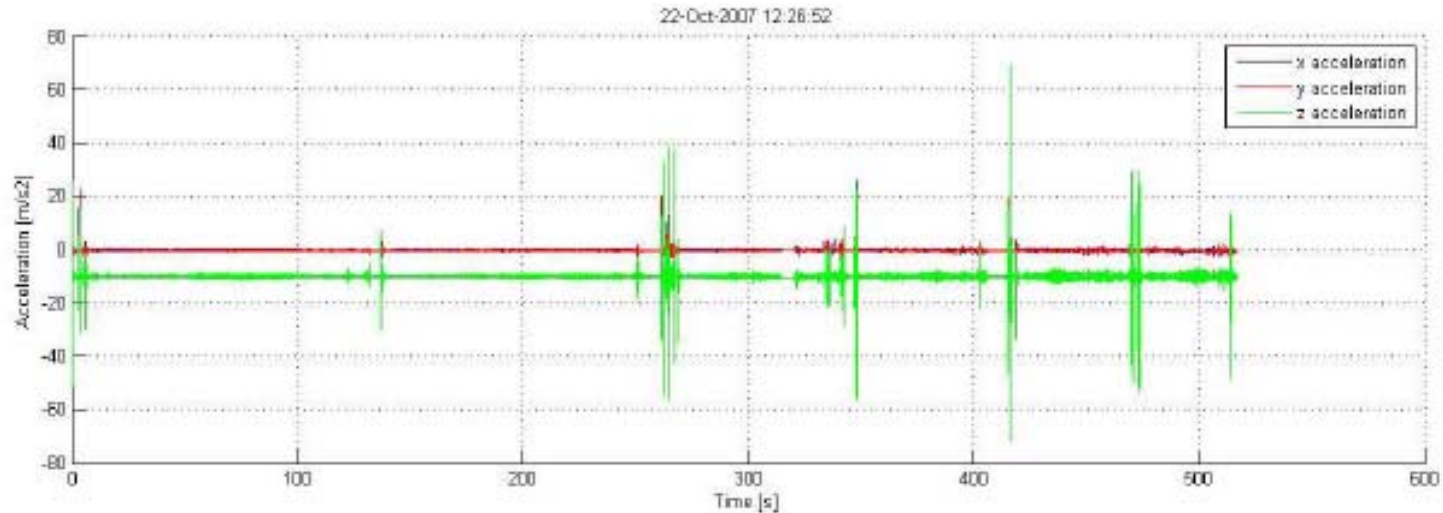
Movements registered by GPS

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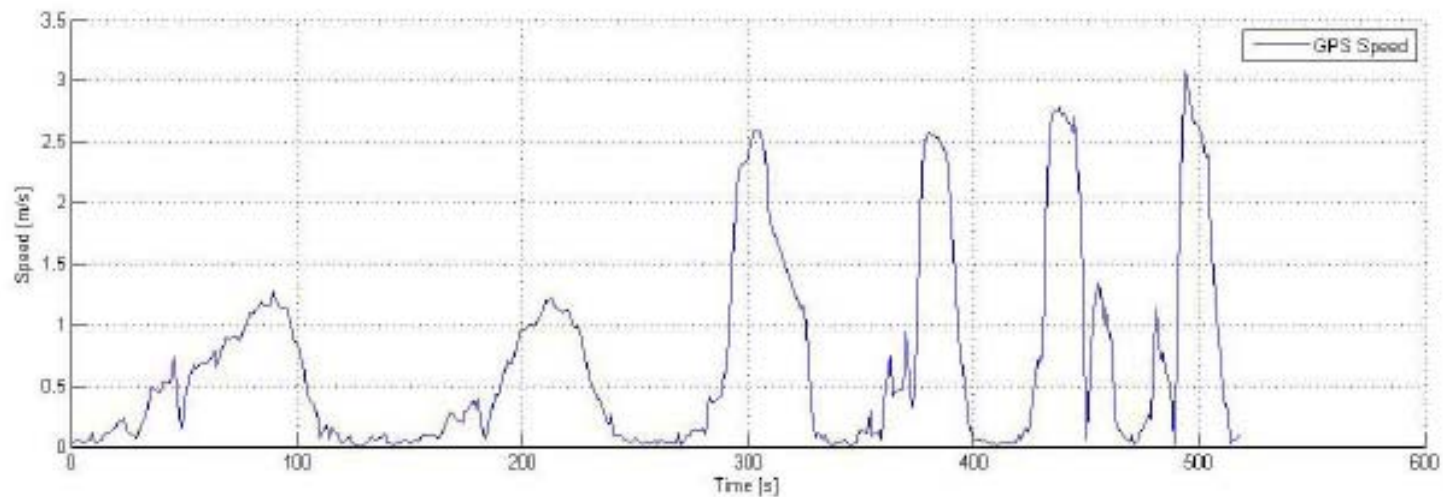


Handling of swap-bodies in Malmö intermodal terminal

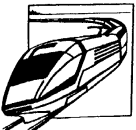
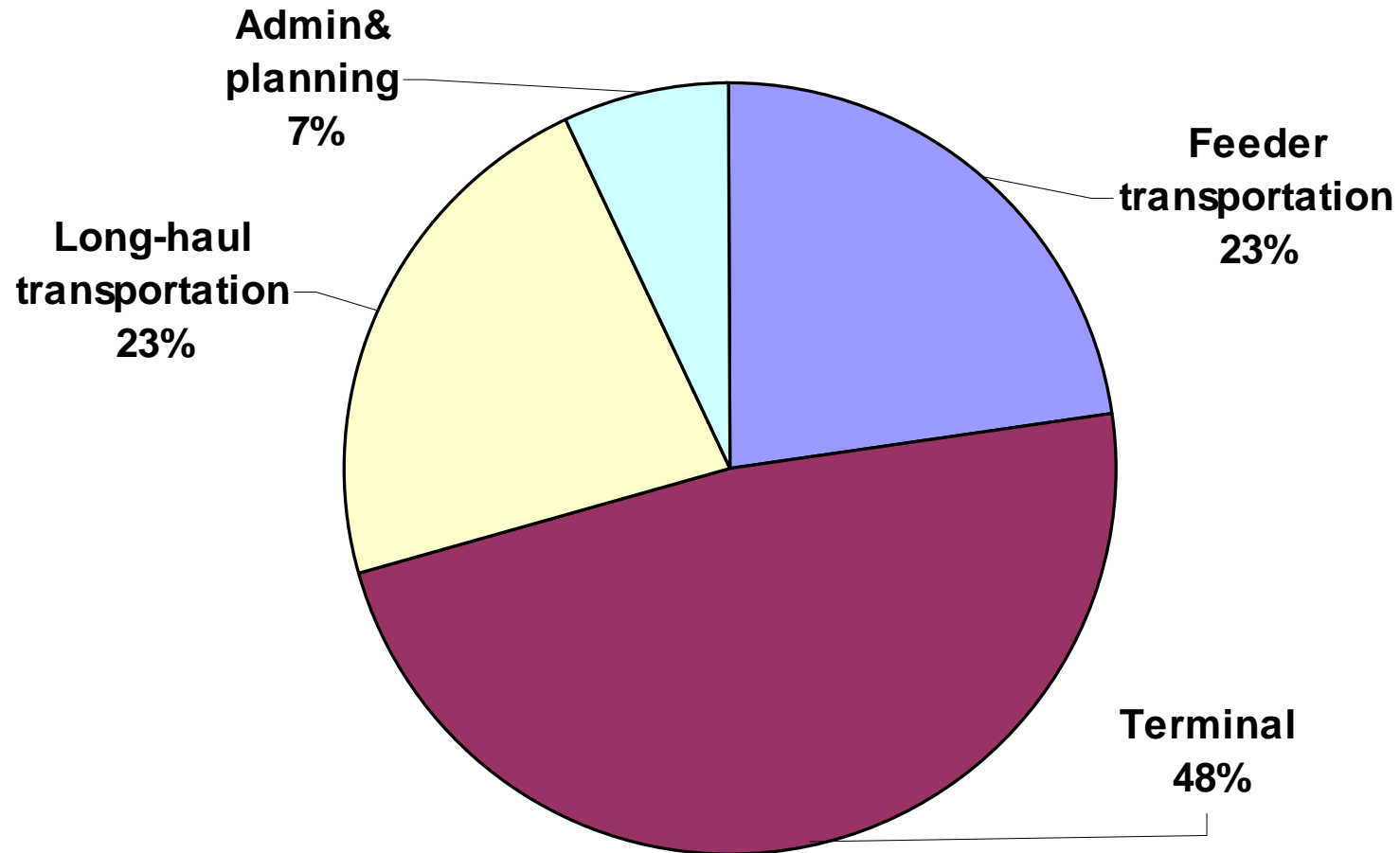
Measurements of accelerations



Measurements of movements and speed



Cost structure - intermodal





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Conclusions

- so far

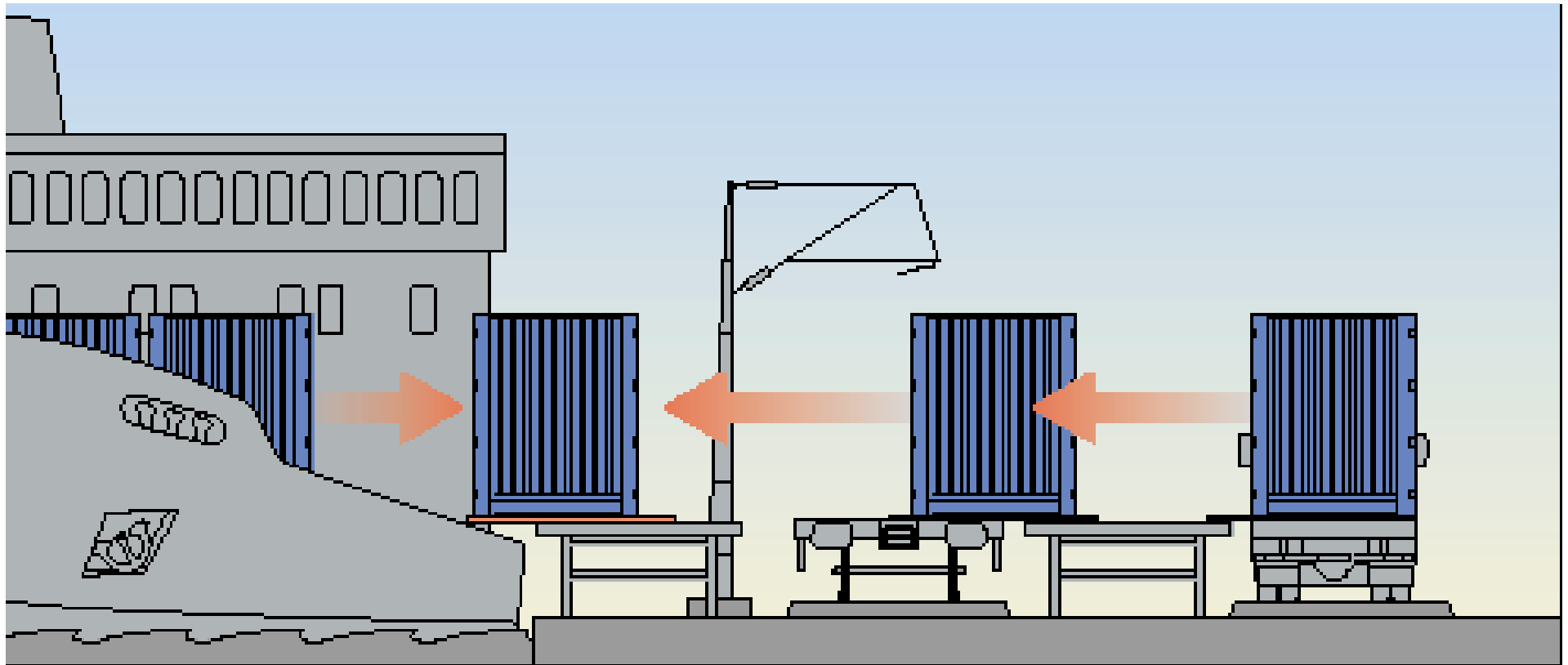
What distinguishes combined transport from direct transport with truck or wagon load?

- Terminal handling
 - An intermodal transport assignment always has to be handled in an terminal along the way
- More involved parties
 - More modes, transport companies and operators involved even if a forwarder is responsible to the customer
- The loading unit is unbroken from origin to destination
 - The loading unit has the function of packaging the goods and protecting it from origin to destination

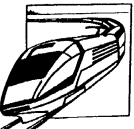
Focus on terminal handling and complexity in the process?



Efficient intermodal technology



Example of a horizontal transfer system, the Swedish CarConTrain system (CCT). The system can transfer containers and swap-bodies of different widths and lengths between different modes of transport and to and from storage positions. The system can be fully automated.



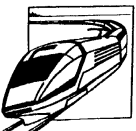
Port of Gothenburg Rail shuttles

Dedicated Rail shuttles to 22 places most of them daily
 Connections with 18 other places in Sweden and Norway



—●—
 Port of Göteborg Rail Shuttle

■
 Daily trains besides the Port of Göteborg Rail Shuttle System





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