

SUMMARY

Current freight transport is mainly done by conventional transport systems. Innovative systems already exist however and are already in use for public transport. Conventional transport modes can also be used in a more innovative way. The research question of this report therefore is: What innovative freight transport concepts for inland transportation exist or are being researched and can they improve current freight transport network?

The research question is limited to the European market, because the current network here is getting overloaded and new transport systems are needed. The scope of this report is container transport, because most transport in Europe is done using containers. Furthermore, choosing one transport volume makes the comparison easier.

All systems and concepts must be compared using certain characteristics. The most important ones are performance, cost and sustainability. Performance is further divided in capacity, speed and loading time. Cost is divided in cost of vehicle, cost of infrastructure and operating cost. Sustainability consists of energy consumption and emissions. Furthermore, it could be important if a concept is still in a design stage or is already tested. A rating has therefore been given for the development stage. The final ratings are determined using a multi-criteria analysis in combination with a sensitivity analysis. Ratings are given for each criterion and they are multiplied with weight factors.

Nineteen innovative transport concepts or systems have been found in available literature. Sorted by their modality, they are:

- Road transport: *Automatic Highway System, Multi-Trailer system*
- Water transport: *Short Sea Shipping, Partial Air Cushion Support Catamaran*
- Rail transport: *Double Stack trains, Fast Loading System for trains, Automatic trains*
- Air transport: *Airship*
- Non-conventional transport: *Combi-Road, Hybrid Road-Rail vehicles, Maglev2000, Electric Cargo Conveyor, Pneumatic Capsule Pipeline, Automated Guided Vehicle in Tube, Automated Guided Rail Vehicle in Tube, Magtube, CargoRail, AutoGo, GRail*

For the comparison, the Automated Guided Vehicle in Tube, Automated Guided Rail Vehicle in Tube, Magtube, Maglev2000, the Auto-Go and the GRail concepts are excluded, as there were not sufficient details available.

Before the sensitivity analysis is done, the CargoRail concept has the highest overall score. This concept is however not fully designed yet. When a sensitivity analysis is done, with higher weight factors for operating cost, energy consumption and development stage, Short Sea Shipping gets the highest overall score, followed by Double Stack trains and Multi Trailer Systems. Short Sea Shipping focuses on fast loading Roll on Roll of vessels to reduce total transport time. This system already exists and is only applicable as inland freight transport system when sea transport can replace land transport. Therefore it is no alternative for conventional freight transport systems on all routes. With Double Stack Trains, containers are stacked two high on trains to enlarge the capacity of railways. The problem of this system is that these trains can't drive on most railways in Europe. Multi Trailer Systems are normal trucks with multiple trailers behind them. In Europe the

maximum length is 25,25 meter on most roads, so real MTS's aren't allowed yet. These systems are all existing innovative freight transport systems. Innovative freight transport systems that aren't fully designed yet need more development to be real alternatives for current freight transport systems.

It can be concluded that innovative freight transport system can improve current inland freight transport network. For all important characteristics innovative transport systems perform better than conventional systems. Innovative systems developed in the past are most likely to be implemented as new transport systems. Some newer innovations that are not fully designed yet also score better than conventional road transport. They need more research to become more likely to be implemented. Other new innovations need more development to allow comparison with other transport systems.

The comparison has some weak points. Results found for concepts that are in (early) design stage won't be fully reliable. This is compensated with the status rating. Furthermore, scores given for each criterion are based on borders drawn between values. It could therefore be that for example a small difference in operating cost means a whole point less.

Finally, this report only consists of innovative container transport systems. For bulk or pallet or other kinds of transport, a totally different conclusion could be found. This could be a topic for a follow-up study.