UIRR
INTERNATIONAL UNION FOR ROAD-RAIL COMBINED TRANSPORT

EUROPEAN INTERMODAL SUMMIT #5

THE EFFICIENCIES OF COMBINED TRANSPORT

Akos ERSEK
Chief Policy Advisor

22 January 2025

Competitiveness and Resilience: the EU objectives for 2024-2029

How to achieve it with Combined Transport?

COMPETITIVENESS

RESILIENCE

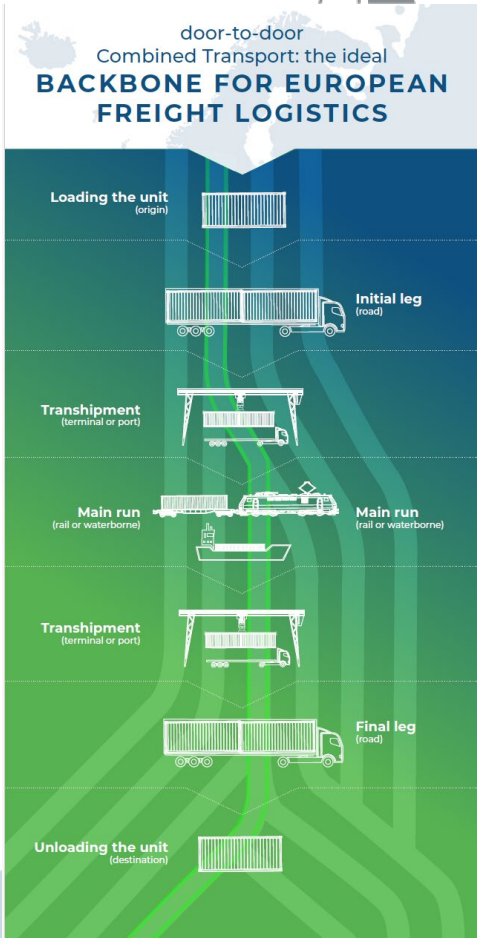
Baseline: **the "backbone of land freight transport over 300km"**

THREE QUESTIONS:

1. **How does Combined Transport compare to unimodal trucking if performing in the capacity of "backbone of land freight transport over distances of 300km"?**
   – efficiency + productivity performance

2. **How much modal shift would be needed until 2050 to qualify Combined Transport as "the backbone"?**
   – 1000 billion tonne kilometres

3. **Are the preconditions of Combined Transport to becoming "the backbone" realistic and affordable?**



The Efficiencies of Combined Transport: a study done for UIRR

ENERGY / IMPORTED FOSSIL FUEL DEPENDENCY

Door-to-door Combined Transport uses **70% fewer kilowatt-hours of energy to produce a tonne-kilometre of transport performance** compared to the unimodal long-distance trucking alternative.

The energy used by Combined Transport is dominantly grid-electric, which means **a direct supply from Europe's increasingly carbon-neutral power generation**, thereby reducing the continent's dependence on imported fossil fuels.

INFRASTRUCTURE

The infrastructure of non-road means of transport is more suited to accommodate the heavy axles required by efficient freight transport than road.

The **per tonne-kilometre infrastructure degradation of door-to-door Combined Transport is thus a fraction of that of its unimodal road alternative.** Slower road degradation means less frequent roadworks resulting in reduced disruptions and works-related congestion.

How does Combined Transport measure up?

EFFICIENCY AND COMPETITIVENESS

LABOUR PRODUCTIVITY, WORK/LIFE BALANCE

The number of **tonne-kilometres produced per worker employed in a door-to-door Combined Transport operation is multiple times higher** than that of workers active in the unimodal trucking alternative. At the same time, Combined Transport jobs offer a **superior work/life balance** to the workers, especially in comparison to truck drivers, promising to alleviate the looming truck driver shortage.

SAFETY: ACCIDENTS AND CONGESTION

More Combined Transport not only slows road degradation, but also contributes to a dramatic reduction in accidents due to the superior safety performance of non-road modes. This has a further **positive impact on the frequency and extent of road congestions** thus reducing the external costs of freight transport.

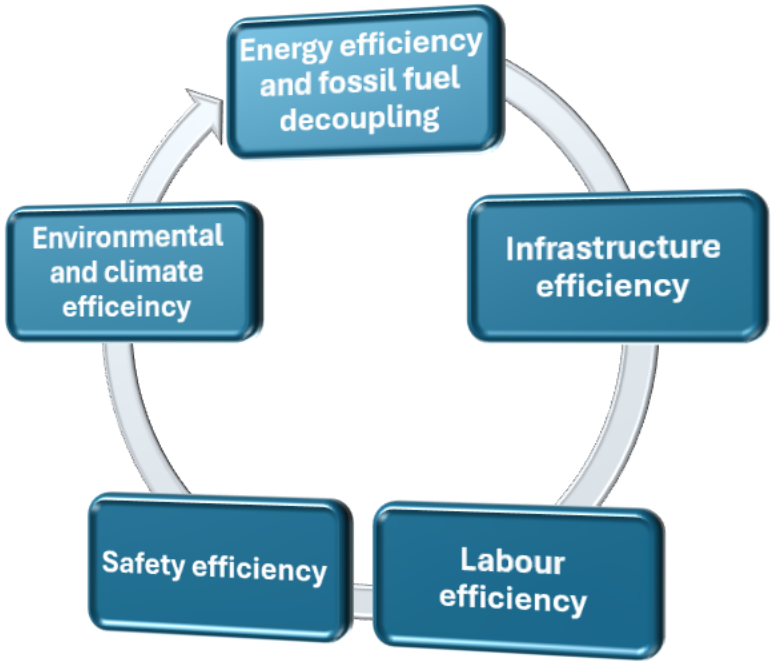
CLIMATE AND THE ENVIRONMENT

The harmful emissions of door-to-door Combined Transport, such as **PM10, PM2,5, NOx and ozone, are a fraction of those produced by unimodal trucking.** The greenhouse gas emissions of Combined Transport are up to **90% lower than that of the unimodal trucking alternative.** Zero-carbon door-to-door Combined Transport has been demonstrated to be viable with products and technologies already on the market today, making it **the most cost-effective solution for Europe.**

The results in numbers: **exceptional performance**

Combined transport – compared to unimodal truck transport – can deliver meaningful results in every examined dimension:

- **70%** better energy efficiency
- **Up to 50%** road infrastructure maintenance expense saving
- **60%** better labour productivity and improved work/life balance
- **95%** fewer accidents per tonne-kilometres
- **Up to 84%** fewer air pollutant and greenhoue gas emissions
- **50%** reduction of road congestion related to maintenance works and accidents



What does this mean for the European economy: **in monetary terms**

ANNUAL SAVINGS FROM 2050

- ✓ 70% better energy efficiency = **€70 billion**
- ✓ 50% road infrastructure maintenance expense reduction = **€20 billion**
- ✓ 60% better labour productivity + improved work/life balance = **€47 billion**
- ✓ 95% fewer accidents per tonne-kilometres = **€70 billion**
- ✓ Up to 84% fewer air pollutant and greenhoue gas emissions = **€17 billion**
- ✓ 50% estimated reduction of road congestion related = **€90 billion**

The annual contribution to the public budgets and to European economic actors would amount to €314 billion, which is equal to **€222 billion net of internalisation charges** paid through taxes and charges.

Energy efficiency: **70% less energy needed per tonne-kilometre**

- ✓ **SOURCE OF PRESENT DAY EFFICIENCY** :
  - low friction of steel-on-steel or steel-in-water (compared to rubber-on-asphalt)
  - large sizes (trains: a 'platoon' of 40-50 truckloads, waterway vessels: 50-2000 truckloads)
  - high degree of electrification of railways (grid power, regenerative braking)
  - dedicated infrastructure (reduced need to brake, reduced need for start-and-stop)

- ✓ **OUTLOOK for Combined Transport** :
  - Uniform 740m train length and electrification (TEN-T)
  - Better traffic controlling (further reduction of graking action)
  - Further electrification of transhipment and road last mile (BEV trucks)
  - Increased share of locally generated renewable electricity (reduced transmission loss)

Infrastructure efficiency: **50% reduction of road maintenance expenses**

- ✓ **SOURCE OF PRESENT DAY EFFICIENCY** :
  - railway infrastructure is built for 22,5t axles – the axle range on railways is 18-22,5 tonnes (there are no „light" and „heavy" axles on rail)
  - heavy axles on roads cause exponentially greater wear-and-tear: 98% of road vehicles roll on axles of 5 tonnes or less (passenger cars: 1t axle), only 2% of road vehicles have 10t or heavier axles (presently 11,5t)
  - roads and bridges have historically not been built for 11,5 tonne axles, but much lower – the legislation increased maximum permissible axle load over the years
  - the ratio of overloaded heavy trucks was estimated at 10% -- these cause even greater degradation

- ✓ **OUTLOOK for Combined Transport** :
  - 22,5-tonne axles are adequate for Combined Transport – no increase is sought
  - alternative fuelled road vehicle drive axles need to be 12,5 tonnes

Labour productivity: **60% fewer manhours per tonne-kilometre**

- ✓ **SOURCE OF PRESENT DAY EFFICIENCY** :
  - rail: 40-50 truckloads per driver, waterborne: 50+ truckloads per crew member
  - trucks: 1 driver per truckload
  - resting time: enforcement gaps in road haulage; no issues in rail or waterborne

- ✓ **OUTLOOK for Combined Transport** :
  - average speed of freight trains and trucks performing Combined Transport road legs can increase considerably
  - self-drive technologies in all modes and in transhipment are under development

- ✓ **OUTLOOK for trucking**:
  - longer and heavier trucks can improve labour productivity (potentially higher salaries for EMS drivers?, enforcement of resting time?)

Safety efficiency: **95% fewer accidents, fatalities and injuries**

- ✓ **SOURCE OF PRESENT DAY EFFICIENCY** :
  - rail and waterborne: accidents/fatalities/injuries per tonne-kilometre are very low due to built-in safety systems (active train control systems)
  - trucks: the role of the human factor in accidents is very high + severity of accidents by heavy goods vehicles is exponentially higher

- ✓ **OUTLOOK for Combined Transport** :
  - ERTMS deployment will further boost safety performance

- ✓ **OUTLOOK for trucking**:
  - introduction of further active safety systems (driver assist) + self drive capabilities
  - traction dilemma presented by rubber-on-asphalt will persist
  - ever increasing traffic density and ageing of drivers overshadows
  - rebuilding of road infrastructure and increased use of passive safety elements

Pollution: **90% lower emissions per tonne-kilometre**

- ✓ **SOURCE OF PRESENT DAY EFFICIENCY**:
  - rail and waterborne: energy efficiency + use of electric propulsion in rail freight
  - trucks: internal combustion and rubber-on-asphalt causes most harmful emissions

- ✓ **OUTLOOK for Combined Transport**:
  - longer trains
  - regenerative braking – electric brakes to replace pressure air braking

- ✓ **OUTLOOK for trucking**:
  - battery electric or fuel cell electric powertrains offer lower pollution characteristics
  - regenerative braking with limited potential due to the rubber-on-asphalt friction

Congestion: **50% reduction of road congestion**

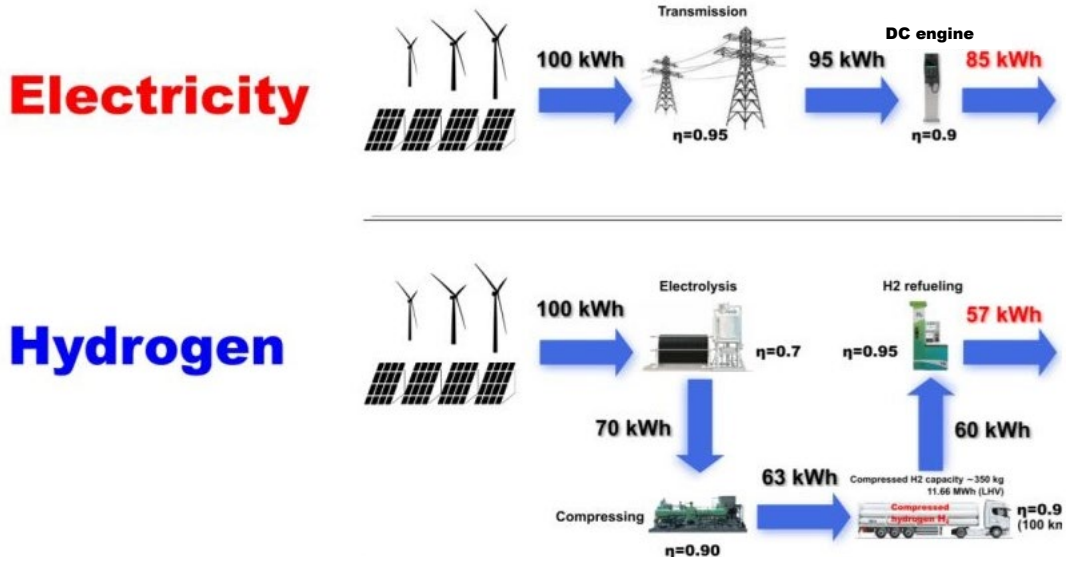
- ✓ **SOURCE OF PRESENT DAY EFFICIENCY** :
  - rail and waterborne: active route- and traffic management
  - trucks: free driving on motorways causes traffic overloads + frequent accidents and infrastructure works cause congestion

- ✓ **OUTLOOK for Combined Transport** :
  - improved rail traffic management – better bypass planning for infrastructure works

- ✓ **OUTLOOK for trucking**:
  - active infrastructure capacity management: not in planning
  - fewer road works: only if either heavy axle circulation is limited or if infrastructure is reinforced
  - fewer accidents: reduced truck circulation and/or more active safety systems, including self driving, and stricter, more effective enforcement

CT vs hydrogen fuel: **energy-efficiency, distribution, fuel production**

- ✓ **Energy efficiency**: of H2 powertrains is 34% while direct grid-powered electricity is 85%
- ✓ **Distribution**: TEN-E infrastructure requirements are modest compared to the challenges of developing a continent-wide hydrogen distribution network
- ✓ **Fuel production**: the production of hydrogen is costly and energy intensive, long distance transportation of hydrogen is also a big challenge



Comparison of an electric powertrain driven by electricity from the grid and a hydrogen-powered fuel-cell powertrain

MEGA TRUCK

CT vs EMS trucks: **50% reduction of road maintenance expenses**

EMS truck 25m/32m[1]	Efficiency category	combined transport
10-15% / 15-20%[2]	energy efficiency	**45-72%**
0%	infrasructure (road maintenance)	**50%**
50-100%	labour productvity[3]	**42-80%**[4]
n/a[5]	safety / accidents	**95%** (fewer)
10-20%	environment/climate	**65-91%**
0%	road congestion	**50%**

Combined Transport remains much more efficient in every category, especially if factoring the significant investments needed to maintain safety and limits on road degradation.

Combined Transport benefits can emerge much faster and with reduced collateral damages.

Prerequisites: **how can Combined Transport become the backbone?**

No need for unaffordable public or private investments into the infrastructure.

→ The estimated annual public investment need into the TEN-T transport infrastructure is about **€15 billion**.

→ The estimated annual private investment into various intermodal assets like terminals, rolling stock and digitalisation amounts to **€1,5 billion**.

Organisational actions based on legislative and regulatory steps can deliver the results.

→ The European and Member State legislators will have to make adjustments to the regulatory framework primarily to ensure that cross-border intermodal freight trains are granted **more and better quality train paths**, as well as that the **hierarchy of these trains is elevated** in the eye of rail traffic managers. The correct and timely implementation of the TEN-T and Railway Infrastructure Capacity Management regulations are needed.

→ **Standardisation and digitalisation** in the field of railway transport would need to be advanced throughout Europe. The correct and timely implementation of the Electronic Freight Transport Information Regulation and the TSI Telematics are needed.

UIRR
INTERNATIONAL UNION
FOR ROAD-RAIL
COMBINED TRANSPORT

THANK YOU

For your attention