Freight Transport

Modal shift potentials from road to rail per Member State

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Concept of the methodology

- No provision of savings achieved by a single action implemented, as impossible to define standardized values
- Instead: analysis of overall shift potential per Member State, to offer a first assessment of savings that can be achieved
- Option to enter the amount that will actually be shifted, either of total freight transport or a specific sector or distance class

Calculation of the modal shift potential
Transport volume

Basis:

Road freight transport volume (tv)

- Per Member State
- Per type of good
- Per distance class

Data was taken from EUROSTAT freight transport statistics.
Data quality varies among Member States.

Calculation of the modal shift potential
Theoretical potential

$$tv * f_g * f_{dc}$$

Transport volume multiplied by:

- Factor for the modal shift potential per type of good (f_{dg})
  - Depends on usual packaging, potential for quick transfer, packing density:

Modal shift potential per group of goods	f_g [dmnl]
Agricultural products and live animals	0,25
Foodstuff and animal fodder	0,35
Solid mineral fuels	0,00
Petroleum products	0,37
Ores and metal waste	0,10
Metal products	0,35
Crude and manuf. minerals, building materials	0,15
Fertilizers	0,30
Chemicals	0,63
Machinery, transport equipment, manufactured articles	0,68

Calculation of the modal shift potential
Theoretical potential

$$tv * f_g * f_{dc}$$

Transport volume multiplied by:

- Factor for the modal shift potential per distance class (f_{dc})
  - Longer transport distances are more reasonable to shift:

Modal shift potential per distance class	f_{dc} [dmnl]
0 - 50 km	0,00
50 - 149 km	0,05
150 - 499 km	0,40
> 500 km	1,00

Calculation of the modal shift potential
Technical potential

$$tv * f_g * f_{dc} * f_{nd}$$

Takes into account the rail network density (f_{nd})

- Approach: freight transport volume on rail will at a maximum be doubled until 2030
- Comparison of current rail freight transport with theoretical potential
- Calculation of a factor for maximum technical potential

Network density per Member State

Factor for network density	f_{nd} [dmnl]	Factor for network density	f_{nd} [dmnl]
Belgium	0,71	Latvia	1,00
Bulgaria	0,57	Lithuania	1,00
Czechia	1,00	Luxembourg	0,17
Denmark	1,00	Hungary	1,00
Germany	1,00	Netherlands	0,99
Estonia	1,00	Austria	1,00
Ireland	0,07	Poland	0,71
Greece	0,09	Portugal	0,33
Spain	0,18	Romania	1,00
France	1,00	Slovenia	0,56
Croatia	1,00	Slovakia	0,91
Italy	1,00	Finland	1,00
Cyprus	0,00	Sweden	1,00

Calculation of final energy savings

$$TFES = tv * (FEC_{road} - FEC_{rail}) * f_g * f_{dc} * f_{nd} * f_{nt} * share$$

- Technical shift potential * **difference in energy consumption per transport mode** (FEC_{road} – FEC_{rail})

Final energy consumption FEC [kWh/tkm]	0 – 500 km	> 500 km
Road Transport	0.833	0.194
Rail transport	0.061	
Lifetime of savings [a]		
Lifetime of savings	2 years	

- Inclusion of a factor f_{nt} for long distance transportation, to take into account international transport

International freight transport

- For international freight transport:
  - Only savings achieved on national territory can be accounted
  - Take into account substituted tank fillings on national territory
  - Hypothesis: first tank filling happens at start of the cargo transport
  - About 2.000 km can be travelled with one tank filling
  - All distances above 2.000 km are only accounted for partly

Total savings potential per MS

Member State	Final Energy Savings [GWh/a]	Member State	Final Energy Savings [GWh/a]
Austria	1.320	Italy	7.190
Belgium	2.118	Latvia	777
Bulgaria	655	Lithuania	2.408
Croatia	814	Luxembourg	75
Czechia	2.039	Netherlands	3.610
Denmark	653	Poland	14.538
Estonia	260	Portugal	448
Finland	1.581	Romania	2.477
France	7.862	Slovakia	1.835
Germany	16.330	Slovenia	915
Greece	108	Spain	2.466
Hungary	1.512	Sweden	2.088
Ireland	40	TOTAL	74.120

Effect on primary energy consumption

$$EPEC = FEC_{Baseline} \cdot \sum_{ec} (share_{ec,Road} \cdot f_{PE,ec}) - FEC_{Action} \cdot \sum_{ec} (share_{ec,Rail} \cdot f_{PE,ec})$$

EU averages:

$share_{ec}$ – Road freight transport	[%]
Diesel	100 %
$share_{ec}$ – Rail Freight Transport	[%]
Electricity	64 %
Diesel	36 %

CO_2 savings

$$GHGSAV = \left[FEC_{Baseline} \cdot \sum_{ec} \left(share_{ec,Road} \cdot f_{GHG,ec} \right) - FEC_{Action} \cdot \sum_{ec} \left(share_{ec,Rail} \cdot f_{GHG,ec} \right) \right] * 10^{-6}$$

EU averages:

$share_{ec}$ – Road freight transport	[%]
Diesel	100 %
$share_{ec}$ – Rail Freight Transport	[%]
Electricity	64 %
Diesel	36 %

Cost components

- Indicative values for:
  - Fixed costs (Asset leases, Insurance, Interest, Maintenance)
  - Variable costs (Fuel, Bunkering, Stores & supplies, Maintenance)
  - Staff costs (Wages, Social security and pension contributions, Accomodation)
  - Mode-specific costs (Usage of Infrastructure, supporting services, permits & certification)
  - General operating costs (Administration, Real estate & infrastructure, Wages for other personnel, IT & communications, Overhead)
- All values are presented in €/tkm
- Cost data from a study in the Netherlands was used, so adjustments to national circumstances might be necessary

Use & Limitations

- Member States can assess overall potential and enter a share to be shifted by actions implemented, either for:
  - The total shift potential
  - For a certain group of goods or distance class
- Economic feasibility is not considered in the methodology, but data on relevant cost components has been prepared

Thank you

Get in touch for more information!

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