

Effects of adapting the rules on weight and dimensions of heavy commercial vehicles as established within Directive 96/53/EC

TML (BE) - TNO (NL) - Sétra (FR) - LCPC (FR) - RWTH (DE)



Overview of the study

- Scenarios
- Stakeholder consultation
- Six effects
- Cost Benefit Analysis
- Conclusions and recommendations

Introduction

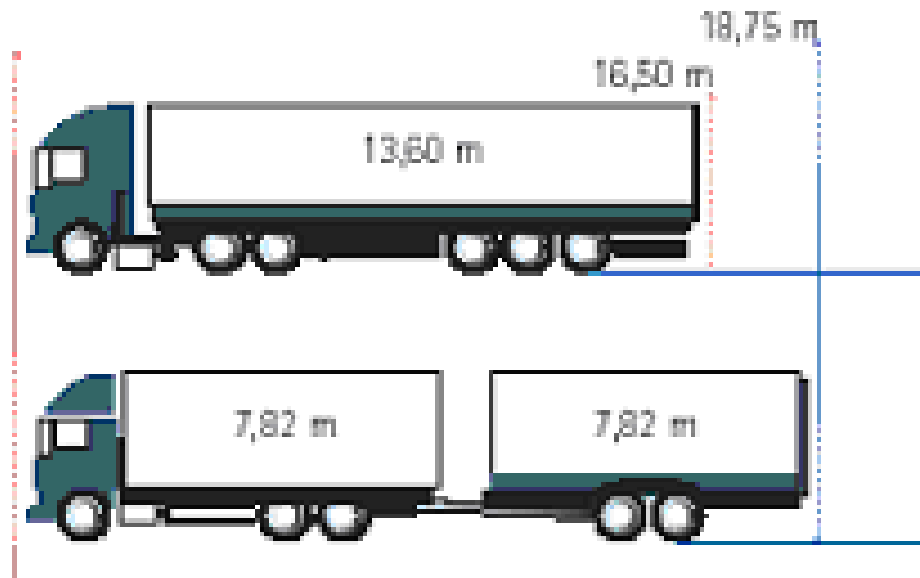
Current legislation: Directive 96/53/EC

Dimensions

- L: 16.50m/18.75m
- W: 2.55m
- H: 4,00m

Weight

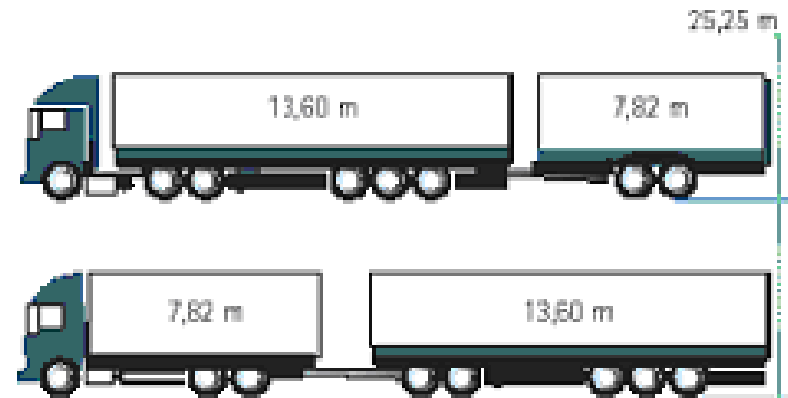
- 40t (44t)
- Limitation per axle



Introduction

Current legislation: Directive 96/53/EC

Exceptions: National traffic only



Combinations of existing modules: LHVs

- Max 25.25m, 60t
- Applied in Sweden, Finland
- Trials in Germany, Netherlands, Denmark



Scenarios

To assess impact of LHVs on transport demand and modal split, 4 scenarios for 2020 are defined:

- Scenario 1: “Business as usual”. This scenario assumes no changes to the equipment constraints that were valid in 2000.
- Scenario 2: “LHV Full Option”: Europe-wide permission of 25.25m 60t trucks.
- Scenario 3: “Corridor”: LHVs of 25.25m 60t are allowed in some countries, while Europe-wide only 18.75m 40t trucks are allowed. Countries:
 - ØBelgium, The Netherlands, Germany, Denmark, Sweden, Finland
- Scenario 4: “Compromise”: Europe-wide permission of trucks up to 20.75m 44t

Six effects

- Meeting demand (TNO, Sétra)
- Modal split (TNO, Sétra)
- Safety (RWTH Aachen)
- Infrastructure (Sétra)
- Energy and CO₂ (TML)
- Noxious emissions (TML)



Six effects

Meeting demand and modal split

- 3 approaches
 - First approximation
 - Manual calculation
 - Modelling (TRANS-TOOLS)
- Biggest issue: elasticities
 - Both direct price-• and cross-• with other modes
 - Literature shows great variety for both

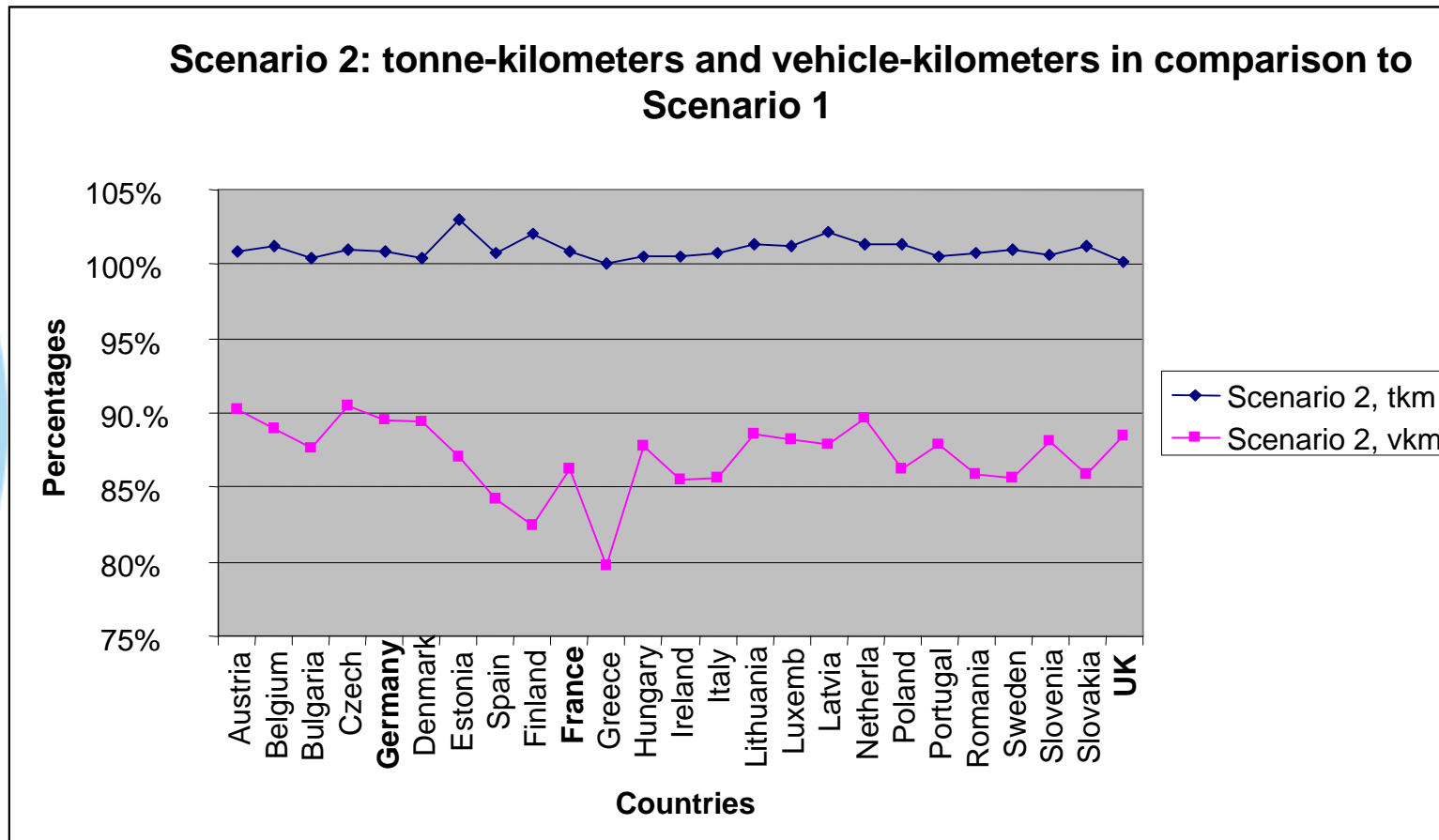
Six effects

Meeting demand and modal split: assumptions

- Road transport demand price elasticity. In the TRANS-TOOLS model it is set to -0,416 related to tonne volume (not tonne-kilometer volume!).
- LHV extra loading capacity (in comparison to HGV)
 - Scenarios 2 and 3 (25,25 meter & 60 ton): 50%
 - Scenario 4 (20,75 meter & 44 ton): 10%
- LHV road transport discount factor:
 - Scenarios 2 and 3: 20%. In other words, the cost of ton-kilometre of cargo transport is 80% of the one of HGV.
 - Scenario 4: 7% (93% of HGV ton-kilometer cost)
- Average vehicle load factors depend on commodity type and distance class

Six effects

Meeting demand and modal split: Results



Six effects

Meeting demand and modal split: Results
Scenario 2 vs. 1: Road

- TRANS-TOOLS modeling result: There is an aggregate growth of 1,0% in total EU road tonne-kilometer volume in 2020.
- There is a more substantial decrease of heavy goods cargo traffic (vkm) in 2020: 12,9%.
- There are differences in ton-km and vehicle-km changes per country, mostly depending on the size and transit function of the country.

Six effects

Meeting demand and modal split: Results
Scenario 2 vs. 1: other modes

- Maximum average decrease of rail ton volumes due to LHV introduction is 3,8%
- Maximum average decrease of IWW ton volumes due to LHV introduction is 2,9%
- This decrease should rather be seen as “slower growth”, which was on average 1,1% annually the last 10 years. Between 2005 and 2020, total transport volume is expected to grow by between 30% and 60%

Six effects

Safety

- Road safety assessed on Vehicle, Human and (vehicle-) Environment

- Field of view
- Acceleration – Braking
- Handling characteristics
- Counterpart protection

- LHVs have the potential to decrease number of vehicles on the road

Ø Road safety not necessarily negatively affected

Ø Modified vehicle dimensions may change the accident frequency (-) and accident severity (+)

Six effects

Safety: Conclusions

- No inherent increase of safety risks in general
- Increased risk for some combinations regarding handling characteristics and for some accident configuration
- In general: slight increase of mass up to 44 t or length only would not lead to a decrease of road safety
- Calculated reduction of vkm due to LHVs can outweigh the higher risks induced by individual LHVs
- Counter Measures still recommended:
 - Vehicle equipment (electronic safety systems)
 - Driver selection and training








Six effects

Infrastructure

- Bridges
 - § Extreme load capacity
 - § Fatigue
 - § Span
- Pavements
 - § Different construction materials (flexibility)
- A number of combinations of length and weight were evaluated

Six effects

Infrastructure

Code	Shape	Pavement	Bridges	
			Extreme loads	Fatigue
G50		0.42		
F50		0.53		
E50		0.55		
C40		1.02		
D46		1.04		
B40		1.22		
C44		1.42		



No consequences









Moderate consequences



Important consequences

Six effects

Infrastructure

Code	Shape	Pavement	Bridges	
			Extreme loads	Fatigue
G60		1.46		
C48		1.85		
B44		1.92		
E60		2.05		
F60		2.07		
A44		2.39		

Six effects

CO₂ and noxious emissions

- COPERT IV
- Average calculated fuel consumption for vehicles 16.5-18.75m/40t
 - Ø 30.28l/100 vkm
 - Ø 25.7l/1000tkm
- LHV of 25.25m/60t, average calculated consumption:
 - Ø 40l/100 vkm
 - Ø 22.75l/1000 tkm (-12%)
- LHV of 20.75m/44t, average calculated consumption
 - Ø 33.8l/100 vkm
 - Ø 25.7l/1000 tkm (+0%)

Six effects

CO₂ and noxious emissions

CO ₂	Scenario 2 vs. 1	Scenario 3 vs. 1	Scenario 4 vs. 1
Road (transport)	-3.6 %	-0.6 %	0.6 %
Road (well-to-tank)	-3.6 %	-0.6 %	0.6 %
Rail (electric)	-4.7 %	-1.7 %	-2.1 %
Rail (diesel)	-3.9 %	-1.1 %	-1.7 %
Inland waterways	-2.8 %	-2.3 %	-1.2 %
Total emissions	-3.6 %	-0.7 %	0.3 %

- Individual LHV is 12% more energy efficient per tonne-km than other large trucks, 9% less efficient per vehicle-km
- NO_x: -3.8%
- PM: -5.0%



Cost Benefit analysis

Freight transport with LHV allowed will be:

- cheaper
- slightly better for environment
- better for safety
- worse for infrastructure

CBA summary

		Scenario 2 vs. 1	Scenario 3 vs. 1	Scenario 4 vs. 1
Benefits of operating costs	Total road expenditures	23 991 million €	5 117 million €	6 560 million €
	Total rail expenditures	2 676 million €	1 075 million €	1 201 million €
	Total inland waterway expenditures	51 million €	41 million €	22 million €
Road Safety	Low cost/standard risk	415 million €	43 million €	559 million €
	Low cost/reduced risk	1 492 million €	192 million €	1 668 million €
	High cost/standard risk	1 491 million €	207 million €	814 million €
	High cost/reduced risk	2 180 million €	307 million €	1 777 million €
Infrastructure – maintenance	Low value	-785 million €	-163 million €	-733 million €
	High value	-785 million €	-163 million €	-1 729 million €
Infrastructure – bridges	Low value	-572 million €	-119 million €	-534 million €
	High value	-2 288 million €	-475 million €	-5 041 million €
CO2 emissions	Low cost	104 million €	21 million €	-10 million €
	Medium cost	469 million €	95 million €	-44 million €
	High cost	1 041 million €	211 million €	-98 million €
Noxious emissions: NOx	Low cost	169 million €	57 million €	11 million €
	Medium cost	460 million €	155 million €	30 million €
Noxious emissions: PM	Low cost	64 million €	22 million €	13 million €
	Medium cost	186 million €	63 million €	39 million €
CBA total	LOW value	24 397 million €	5 737 million €	1 587 million €
	HIGH value	29 228 million €	6 687 million €	8 265 million €



Benefits/costs to society

Freight transport with LHV allowed will be:

- cheaper
- slightly better for environment
- better for safety
- worse for infrastructure

⇒ Generally better for society



Conclusions

- Introducing LHVs is overall beneficial for the European society
- However:
 - rail and iww will grow slower than expected
 - the safety of the individual LHV is worse than of a “normal” truck
 - infrastructure costs to be paid



Recommendations

If the EC would implement LHV:

1. Introduce counter measures for:

- Modal choice
- Safety
- Infrastructure damage



Recommendations

- Modal choice, e.g.
 - § Internalisation of external costs
 - § Restrictions on routes and times
- Safety, e.g.
 - § Automated WIM systems
 - § Improved brakes
- Infrastructure damage, e.g.
 - § No 44 tons on 5 axles
 - § Restrictions on certain bridges
 - § Investment in old road networks



Recommendations

If the EC would implement LHV:

2. Implement in steps (weight)
3. Harmonise minimum standards for EU, let countries go above

!Additional research required on

- Demand and modal split
- Safety