



# External costs of transport in Flanders

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## Study for MIRA, 2010

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# Scope

- 2000-2008
- Transport modes
  - Road transport: 15 types + extra
  - Bicycles
  - Rail: passenger (3), freight (1 type)
  - Inland shipping: 3 types
  - Maritime shipping: 7 types
- Update of 2004 study



# Overview

- Prices (€/100 vkm)
- External costs (€/100 vkm)
- Internalisation



# Road transport prices

- Fuel prices
- Purchase price
- Yearly costs
- Company taxes
- Labour costs
- Subsidies



# Fuel price

- Fuel consumption from MIMOSA
- Fuel prices
  - Gasoline, diesel, LPG
    - FOD Economie: maximum price + VAT
    - BPF: excise duties and other taxes
  - Gas and electricity
    - Price for average use including power mix



# Purchase price

- Purchase price + VAT
  - Cars: Febiac
  - Light duty trucks: Febiac + website
  - Heavy duty trucks : Logghe ea 2006
  - Bus: De Lijn and Van Hool
- Purchase tax (Belasting op inverteersstelling)
- LPG subsidy: De Ceuster 2004
- License plate tax (up to 2002)
- Federale eco subsidy for cars
- Tax reduction for electric cars



# Yearly costs

- Circulation tax (Verkeersbelasting)
- Extra tax for diesel cars (Accijnscompenserende belasting)
- Eurovignet for trucks above 12 tonnes
- Radiotax (up to 2002)
- Maintenance + VAT
  - % of purchase price (TREMOVE and ANWB)
- Insurance + VAT
  - Household budget survey
- Technical inspection
  - Average number of checks/car/lifetime
- Permits for trucks (vervoervergunning)



# Company taxes

- Private labour taxes
  - Own car
  - Company car
- Company taxes
  - Private car
  - Professional car
- Not taken into account





# Labour costs & taxes

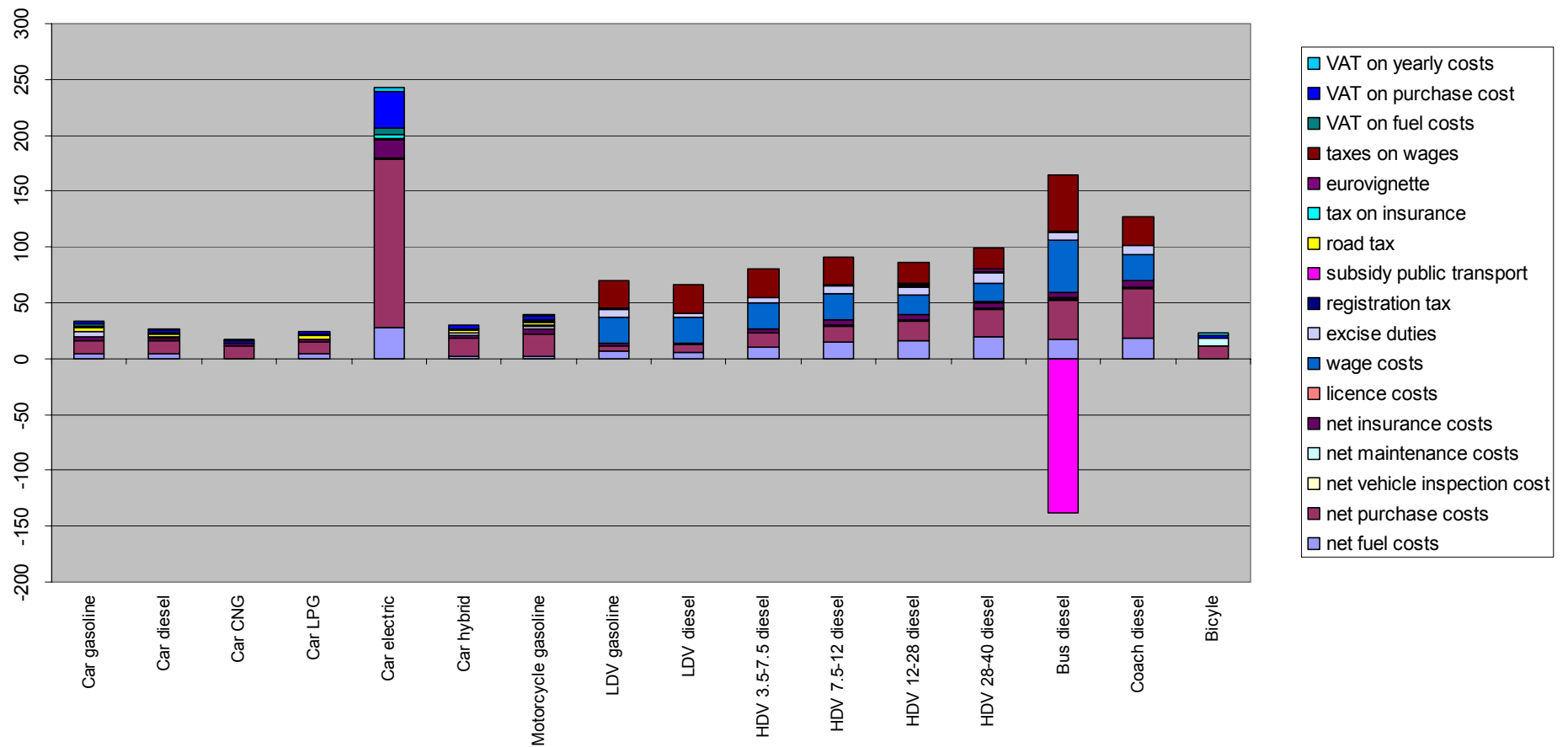
- Voor vrachtwagens en bussen (taxi niet)
- Personeelskosten
  - Bruto uurloon
  - ARAB vergoeding: extra vergoeding omdat kosten rijdend beroep hoger zijn dan als vaste standplaats (koffie, sanitair,...)
  - Verblijfsvergoeding
  - Nachtvergoeding
  - Bonussen



# Subsidies

- De Lijn price/cost
  - 2000: 30%
  - 2008: 15%
- NMBS passenger transport

# Price per vehicle-km for road transport in 2008





# Bicycles

- Purchase: 400€ (excl VAT) – 8 years
- Accessories: 100 euro – 5 years
- Maintenance: 50 euro/year
- Bicycle company bonus: 0.20 €/km



# Trains

- Costs are derived from the NMBS accounts.



# Inland ships

- Ship types: Spits, European ship, Large cargo ship
- Fixed costs
  - Personnel, maintenance, repair, depreciation, insurances
- Variable costs
  - Fuel, permits (vaarrechten), fuel taxes (energiebelasting)



# Maritime ships

- LoLo, RoRo, large and small RoPax, container, bulk and tanker
- Personnel, insurance, maintenance, repair, oil, administratie, afbetalingen, depreciation, taxes (havengelden), fuel
- € per day to €/km with hours on sea, very variable







# External costs

- Types
  - Congestion
  - Emissions
    - Climate change
    - Air pollution (PM, SO<sub>x</sub>, NO<sub>x</sub>,..)
  - Accidents
  - Infrastructure
  - Health
- Not: nature, smell

# Congestion Road transport

- = VOT \* time losses \* volume
- VOT: TREMOVE & SCENES
- Time losses: speed-flow functions for Flanders based on real data
- Much lower values than literature

Voertuigtype	hoofdwegennet Vlaamse ruit		Hoofdwegennet buiten VR		Regionaal wegennet		Stedelijk Wegennet		Alle wegen
	piek	dal	piek	dal	piek	dal	piek	dal	
Personenwagen	4.397	3.643	0.038	0.034	5.161	2.563	7.904	3.845	3.973
Motorfiets	2.198	1.822	0.019	0.017	2.581	1.281	3.952	1.923	1.987
Lichte vrachtwagen	4.397	3.643	0.038	0.034	5.161	2.563	7.904	3.845	3.973
Zware vrachtwagen	8.794	7.286	0.077	0.067	10.323	5.125	15.808	7.691	7.946
Bus	8.794	7.286	0.077	0.067	10.323	5.125	15.808	7.691	7.946



# Congestion

## Other modes

- Rail
  - Not calculated
- Inland shipping
  - Depending on route: locks and bridges
  - Not calculated
- Maritime shipping
  - In ports
  - Not calculated



# Air pollution Climate change

- Emissions in kg per vkm \* cost  
emissions in € per kg
- Cost: VITO project
- Emissions:
  - Road: MIMOSA model
  - Rail and shipping: EMMOSS



# Accidents

Depends on

- Accident risk
- Accident costs
- Risk elasticity: change in risk when volume changes
- Share of accident cost of vehicle type in total



# Noise

- Threshold: hindrance above 65 dB(A)
- Calculation of number of hindered persons
- Valuation: 10 euro/person
- Marginal cost: increasing traffic volumes gives increasing noise hindrance minus mitigation measures



# Infrastructure

- Includes: higher operating costs, maintenance cost, repair costs by the road/rail/canal/port operator due to extra vehicles.
- Road and rail: marginal cost approach from the GRACE project
- Inland and maritime shipping: average cost.

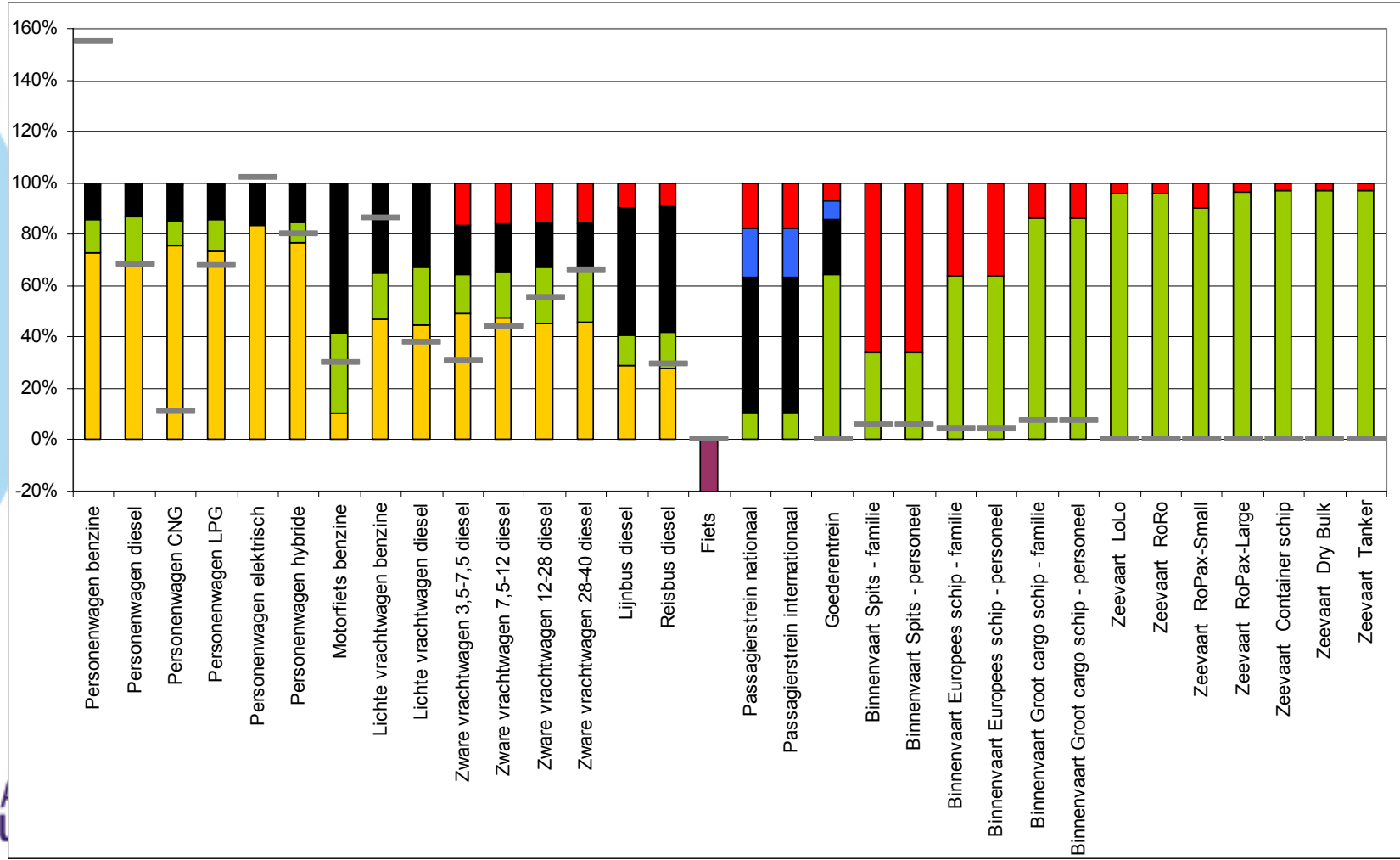


# External benefits cycling

- Reduction in health care cost when people cycle more
- Reduction in obesity when people cycle more
- Better labour productivity when people cycle more
- Valuation
- 193.76 euro/year or 9371 euro/100 vkm

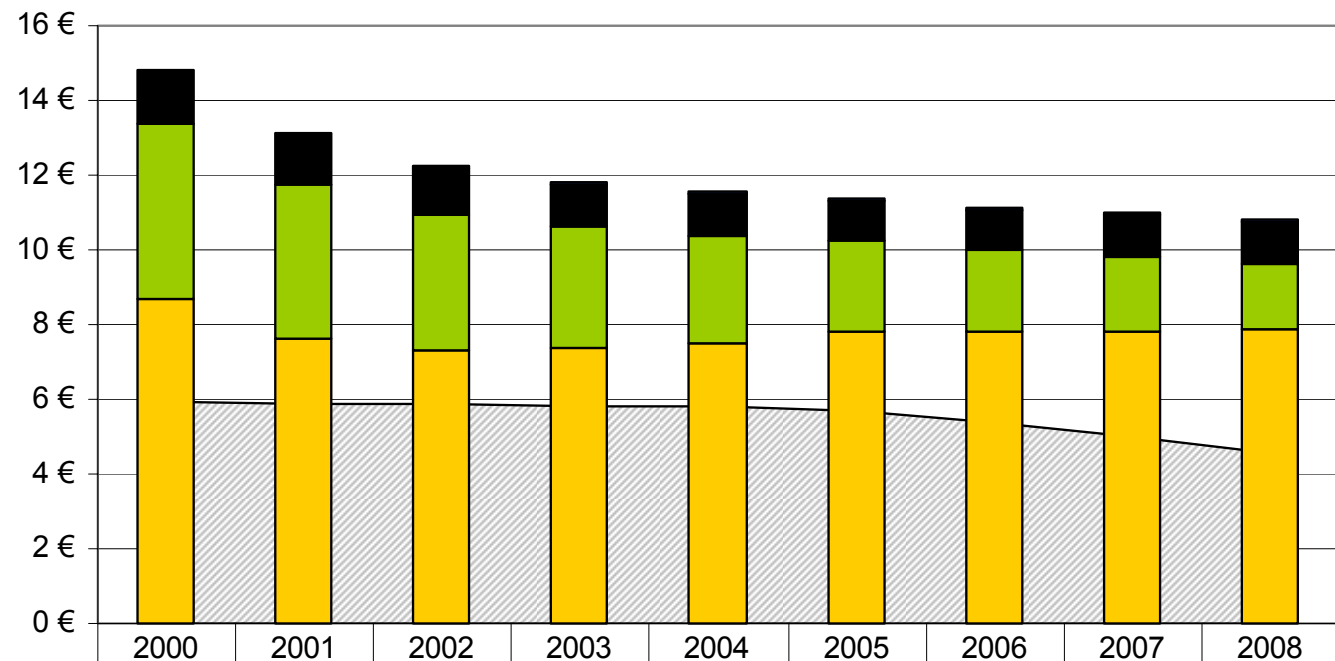


# Internalisation Overview for 2008



# Internalisation

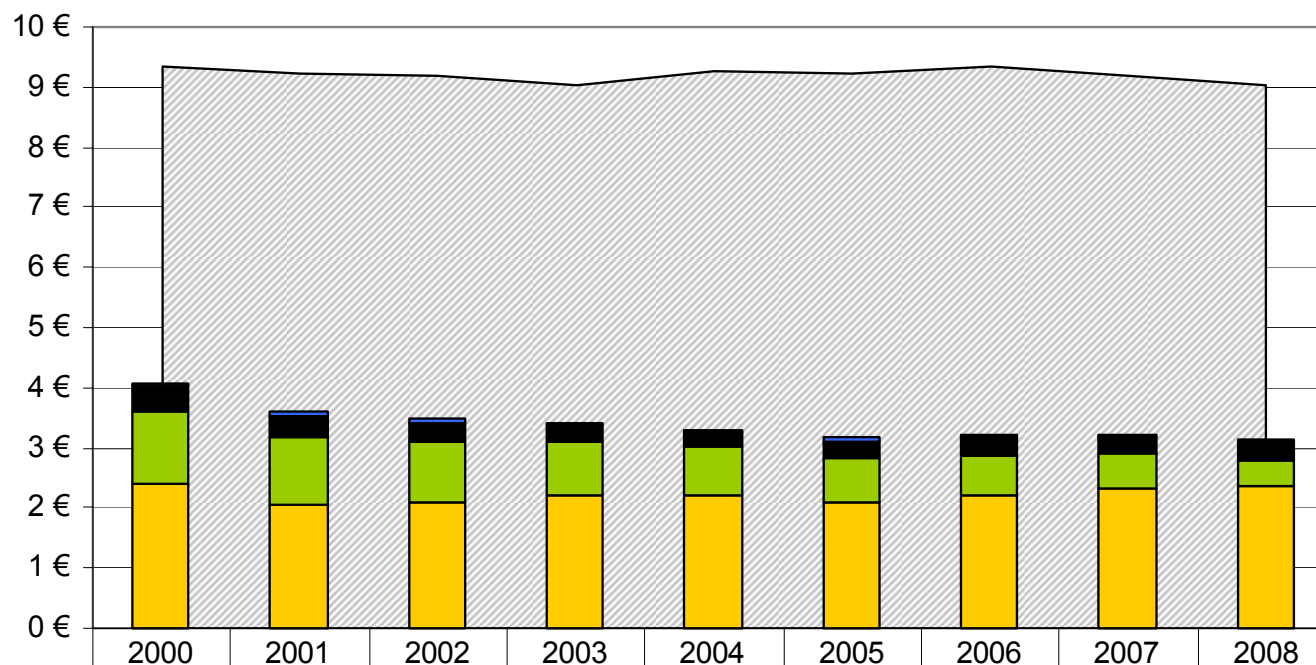
## Diesel car, urban road, peak



	2000	2001	2002	2003	2004	2005	2006	2007	2008
▣ Transportbelastingen	5,950	5,883	5,863	5,788	5,818	5,683	5,397	5,023	4,585
▣ MEK congestie	8,661	7,640	7,316	7,379	7,473	7,836	7,789	7,791	7,904
▣ MEK directe emissies	4,726	4,131	3,627	3,24	2,917	2,413	2,205	2,021	1,751
▣ MEK ongevallen	1,403	1,331	1,237	1,160	1,090	1,094	1,099	1,117	1,080
▣ MEK geluid	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052
▣ MEK infrastructuur	0	0	0	0	0	0	0	0	0
▣ MEB gezondheid	0	0	0	0	0	0	0	0	0

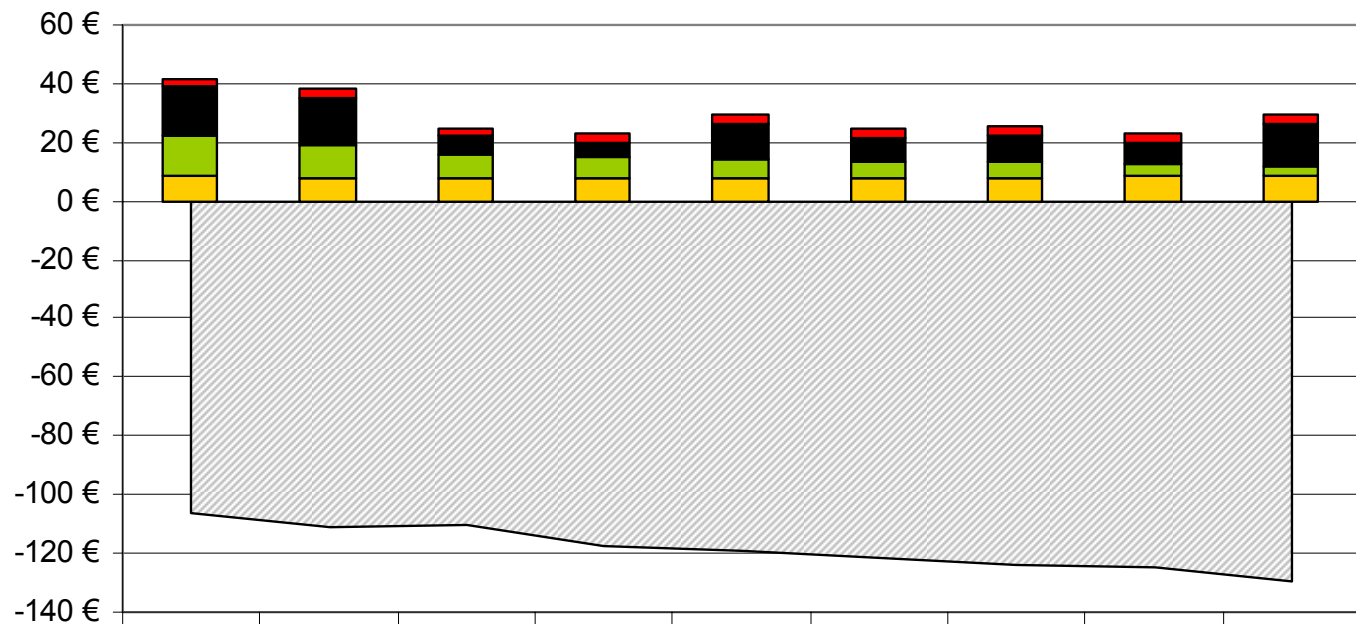
# Internalisation

Gasoline car, motorway excl. 'Vlaamse Ruit', off-peak



	2000	2001	2002	2003	2004	2005	2006	2007	2008
Transportbelastingen	9,330	9,206	9,183	9,035	9,250	9,227	9,324	9,201	9,045
MEK congestie	2,391	2,056	2,110	2,201	2,203	2,107	2,216	2,326	2,379
MEK directe emissies	1,223	1,110	1,003	0,911	0,817	0,725	0,652	0,562	0,428
MEK ongevallen	0,400	0,368	0,305	0,249	0,234	0,276	0,299	0,282	0,294
MEK geluid	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052
MEK infrastructuur	0	0	0	0	0	0	0	0	0
MEB gezondheid	0	0	0	0	0	0	0	0	0

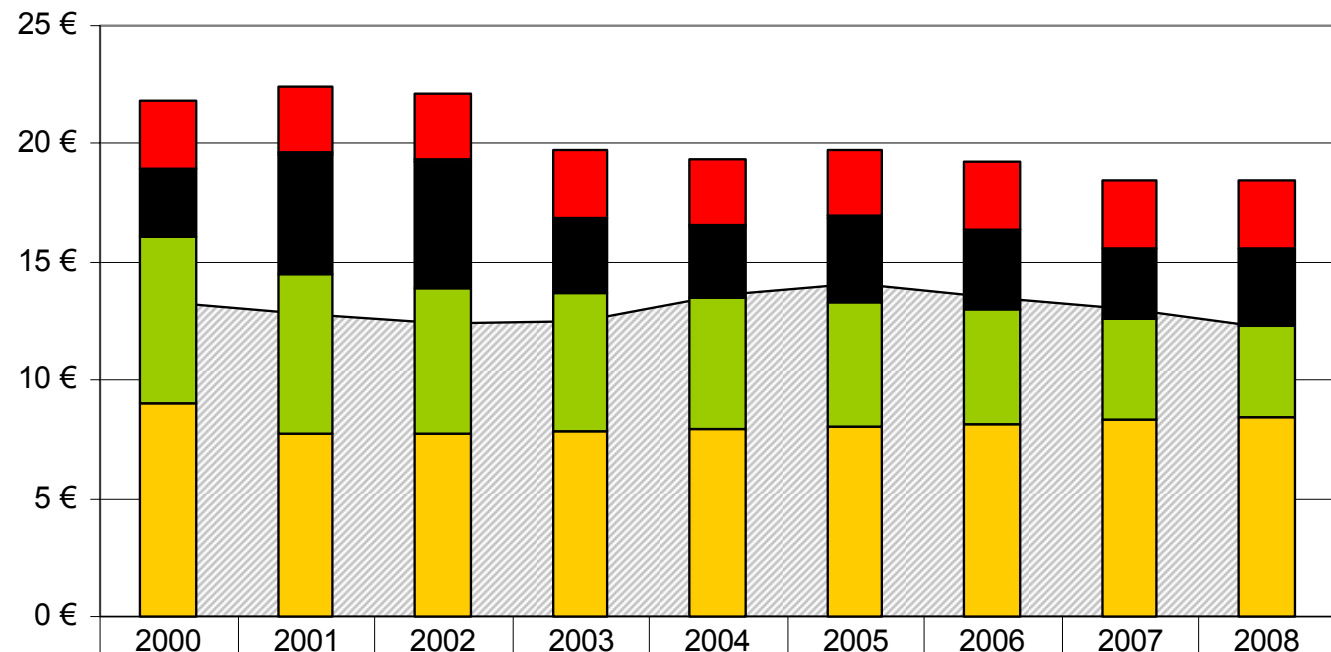
# Internalisation Diesel bus 'De Lijn'



	2000	2001	2002	2003	2004	2005	2006	2007	2008
□ Transportbelastingen	-106,068	-110,946	-110,348	-117,500	-119,104	-121,887	-123,765	-124,380	-129,519
■ MEK congestie	8,994	7,724	7,710	7,868	7,962	8,018	8,110	8,326	8,449
■ MEK directe emissies	13,412	11,491	8,364	7,284	6,249	5,635	5,124	4,356	3,498
■ MEK ongevallen	16,340	16,093	5,841	4,634	12,006	7,986	9,087	7,266	14,606
■ MEK geluid	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052
■ MEK infrastructuur	2,832	2,832	2,832	2,832	2,832	2,832	2,832	2,832	2,832
■ MEB gezondheid	0	0	0	0	0	0	0	0	0

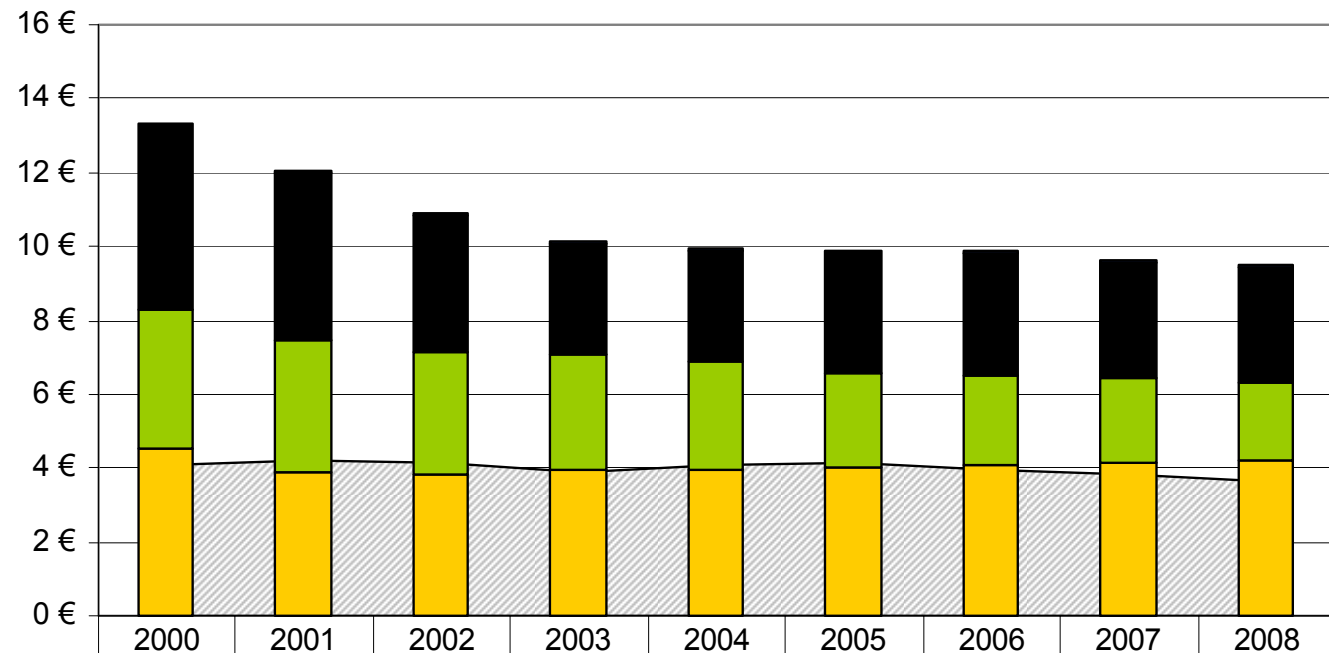
# Internalisation

## Diesel truck 28-40 tonnes



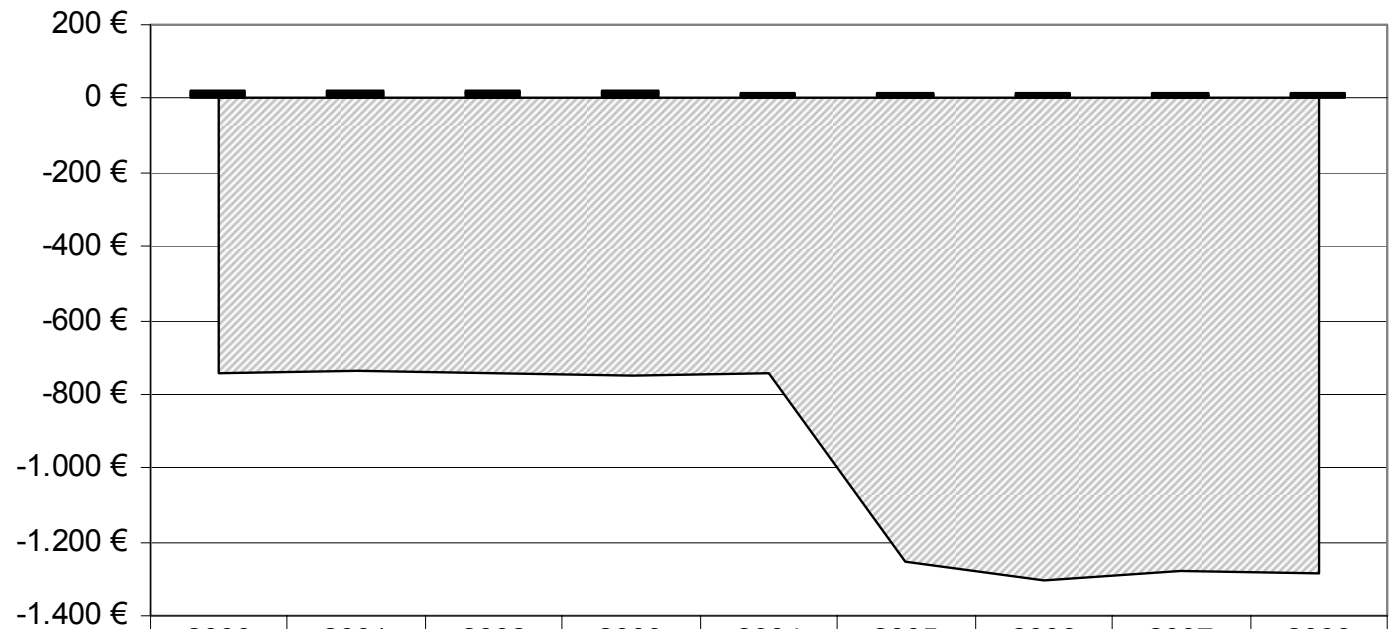
	2000	2001	2002	2003	2004	2005	2006	2007	2008
□ Transportbelastingen	13,244	12,755	12,389	12,489	13,608	14,038	13,526	12,978	12,212
■ MEK congestie	8,994	7,724	7,710	7,868	7,962	8,018	8,110	8,326	8,449
■ MEK directe emissies	7,123	6,774	6,187	5,816	5,524	5,254	4,884	4,297	3,845
■ MEK ongevallen	2,789	5,080	5,391	3,141	2,993	3,628	3,342	2,935	3,232
■ MEK geluid	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052
■ MEK infrastructuur	2,832	2,832	2,832	2,832	2,832	2,832	2,832	2,832	2,832
■ MEB gezondheid	0	0	0	0	0	0	0	0	0

# Internalisation Diesel truck 1-3.5 tonnes



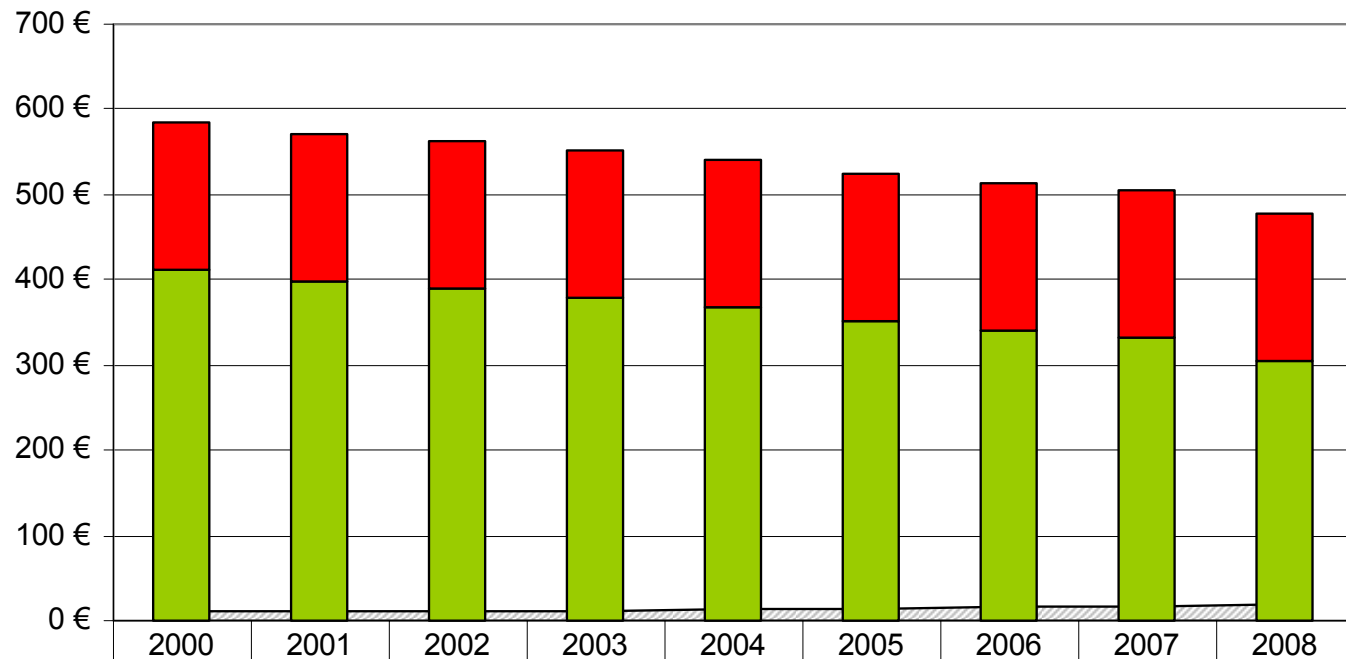
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Transportbelastingen	4,095	4,223	4,138	3,886	4,108	4,126	3,982	3,856	3,609
MEK congestie	4,497	3,862	3,855	3,934	3,981	4,009	4,055	4,163	4,224
MEK directe emissies	3,808	3,582	3,315	3,112	2,916	2,572	2,436	2,264	2,117
MEK ongevallen	4,988	4,557	3,669	3,011	2,969	3,269	3,344	3,151	3,073
MEK geluid	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052	0,052
MEK infrastructuur	0	0	0	0	0	0	0	0	0
MEB gezondheid	0	0	0	0	0	0	0	0	0

# Internalisation National passenger train



	2000	2001	2002	2003	2004	2005	2006	2007	2008
□ Transportbelastingen	-745,754	-738,639	-741,575	-747,485	-743,082	-1252,395	-1303,403	-1281,579	-1285,846
■ MEK congestie	0	0	0	0	0	0	0	0	0
■ MEK directe emissies	6,549	5,603	4,347	3,386	2,753	2,003	1,914	1,880	1,839
■ MEK ongevallen	9,043	9,189	9,120	9,110	9,042	9,278	9,037	8,771	9,310
■ MEK geluid	3,303	3,303	3,303	3,303	3,303	3,303	3,303	3,303	3,303
■ MEK infrastructuur	3,133	3,133	3,133	3,133	3,133	3,133	3,133	3,133	3,133
■ MEB gezondheid	0	0	0	0	0	0	0	0	0

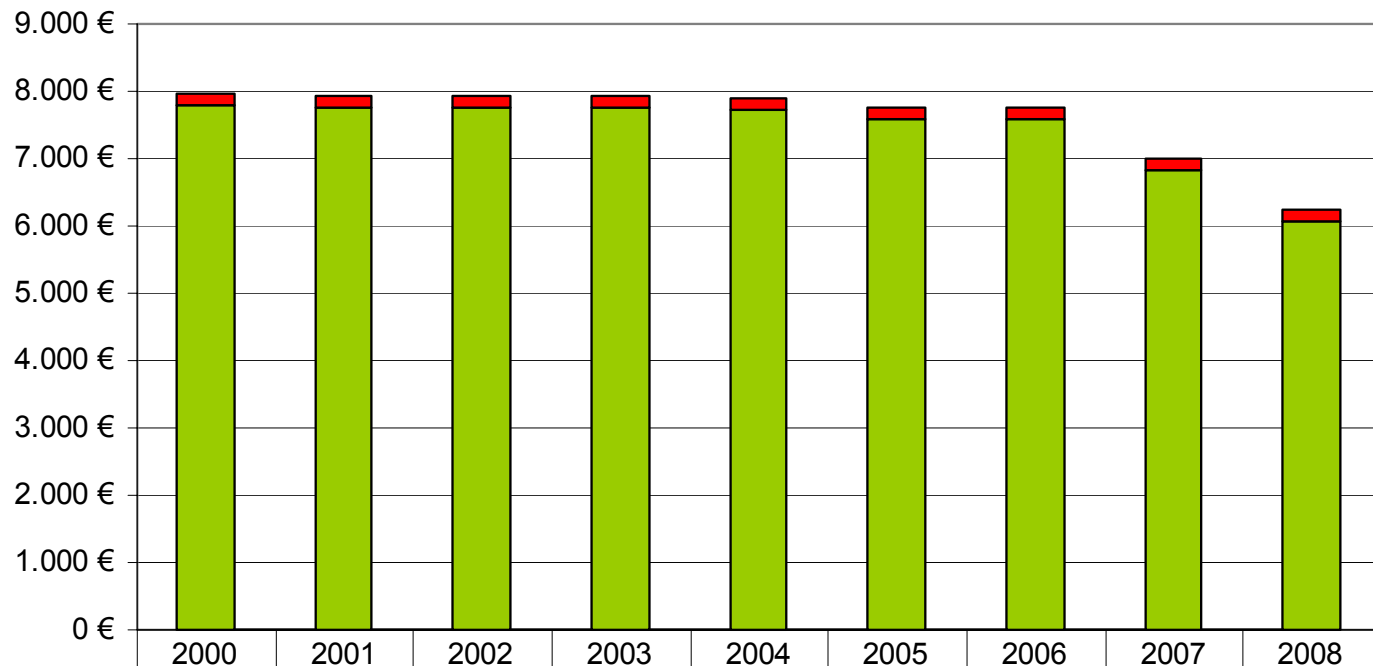
# Internalisation Inland European ship



■ Transportbelastingen	11,840	11,840	11,840	11,840	12,500	13,626	15,791	17,811	18,789
■ MEK congestie	0	0	0	0	0	0	0	0	0
■ MEK directe emissies	410,711	398,966	389,884	379,306	369,165	350,440	339,351	331,335	304,781
■ MEK ongevallen	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
■ MEK geluid	0	0	0	0	0	0	0	0	0
■ MEK infrastructuur	172,935	172,935	172,935	172,935	172,935	172,935	172,935	172,935	172,935
■ MEB gezondheid	0	0	0	0	0	0	0	0	0



# Internalisation Maritime container ship



	2000	2001	2002	2003	2004	2005	2006	2007	2008
Transportbelastingen	0	0	0	0	0	0	0	0	0
MEK congestie	0	0	0	0	0	0	0	0	0
MEK directe emissies	7797,449	7774,76	7759,368	7743,956	7725,045	7592,672	7575,402	6817,37	6059,79
MEK ongevallen	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
MEK geluid	0	0	0	0	0	0	0	0	0
MEK infrastructuur	172,935	172,935	172,935	172,935	172,935	172,935	172,935	172,935	172,935
MEB gezondheid	0	0	0	0	0	0	0	0	0



# Thank you!