Innovating our mobility
L-category vehicles: smaller, lighter, more specialised

Commuting by motorcycle impact analysis

a study of Transport & Mobility Leuven for FEBIAC
Commuting by motorcycle

1. Impact modal shift on traffic congestion
   - Case study Leuven-Brussels
   - Global impact on Belgian highway network

2. Impact modal shift on traffic emissions
   - Emissions motorcycles vs. passenger cars
   - Case study Leuven-Brussels
Impact on traffic congestion

Case study Leuven-Brussels

1) Reference scenario: current morning peak (2011)
2) Scenario 10% modal shift from car to motorcycle

Reference scenario (morning peak 2011)

• Dynamic simulation of traffic flows by LTM

• Realistic representation in line with traffic counts

- 42 detectors on 7 locations
- May 2011, every 5 minutes: volumes, speeds, composition
- Capacity network sections

Reference scenario - simulation results (6.30 – 9.30)

Free-Flow
Capacity
Congestion
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Reference scenario (morning peak 2011)

Travel Times
Reference scenario (morning peak 2011)

Travel Times

Total time loss
(all vehicles Leuven-Brussels 6.30 – 9.30)

= 1925 hours
Modal shift scenario (morning peak 2011)

Assumptions:

• 10% passenger cars replaced by motorcycles
• Occupancy passenger car (commute) = 1.1
• Occupancy motorcycle (commute) = 1.0
Modal shift scenario (morning peak 2011)

Assumptions:

• Passenger-Car-Equivalent (PCE) motorcycle  
  (How many cars would have same effect on traffic flows?)

- **PCE = 1** for min. density
- **PCE = 0.5** at capacity
- **PCE = 0** for max. density
Modal shift scenario (morning peak 2011)

Travel Times

Modal shift scenario (morning peak 2011)

Travel Times

Total time loss
(all vehicles Leuven-Brussels 6.30 – 9.30)

= 706 hours
(- 60% to reference)
Modal shift scenario (morning peak 2011)

Total time loss
(all vehicles Leuven-Brussels 6.30 – 9.30)
taking into account newly attracted traffic
on highway due to improved traffic conditions

= 1158 hours

(- 40% to reference)
Modal shift scenario (morning peak 2011)

Travel Times

25% modal shift needed to avoid congestion
Global impact on traffic congestion

Extrapolate impact to Belgian highway network

Reference: **37,000 hours** lost per day

- 40% time lost in modal shift scenario

**Time savings:** **15,000 hours** per day

Value of time commuter **13.96 €/h**

**Time benefits:** **210,000 €** per day

**50 Million €** per year (indicative figure)

Global impact on traffic congestion

Impact on underlying road network:

- less (rat-run) traffic, shift to highway network
- if also modal shift on underlying road network: similar time benefits
Impact on emissions

- Emission factor ‘mean’ car (mean Belgian vehicle fleet)
- Emission factor ‘recent’ motorcycle (250cc, Euro 3)

(source: COPERT IV emission functions 2010)

Emissions CO$_2$, NO$_x$, PM$_{2.5}$ lower for recent motorcycles
Impact on emissions

Total Emission costs (€/100 km)

(monetization based on environmental damage: NO\textsubscript{X}: 0.58 €/kg
PM\textsubscript{2.5}: 135.5 €/kg
HC: 7.5 €/kg
CO\textsubscript{2}: 20 €/ton

'Emission costs 20% lower for recent motorcycles'

Impact on emissions

Total Emission costs in case study Leuven-Brussels:

(all vehicles Leuven-Brussels 6.30 – 9.30)

6% lower in modal shift scenario c.t. reference

1% due to shift in traffic composition

5% due to avoided traffic congestion
Conclusions

Impact modal shift (10%) on traffic congestion:

- Queues are shorter and disappear more quickly
- Travel times are shorter
- Total time losses reduced by 40%
- Time benefits on Belgian highway network: 50 M€/year

Impact modal shift (10%) on traffic emissions:

- Recent motorcycles emit less CO$_2$, NO$_x$, PM$_{2.5}$, but more HC
- Total emission costs 20% lower for recent motorcycles
- Total case study emission costs 6% lower, 5% due to avoided congestion
Additional information

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