

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

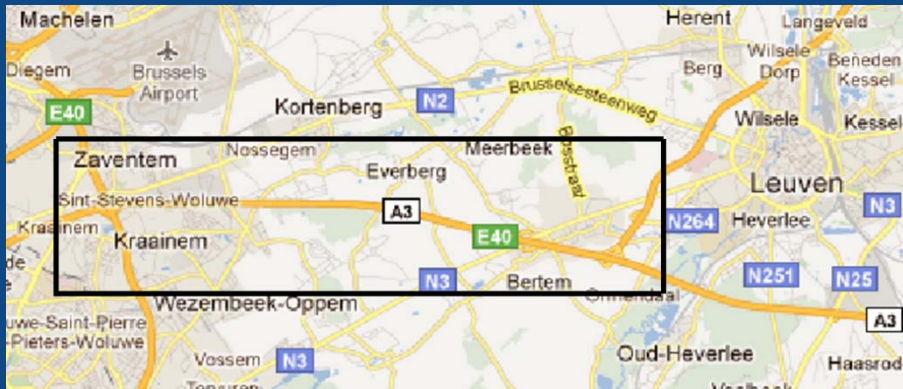
- Case study Leuven-Brussels
- Global impact on Belgian highway network

2. Impact modal shift on traffic emissions

- Emissions motorcycles vs. passenger cars
- Case study Leuven-Brussels

Impact on traffic congestion

Case study Leuven-Brussels



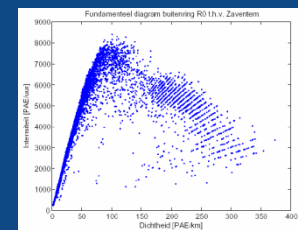
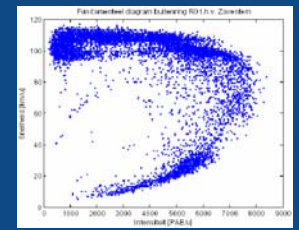
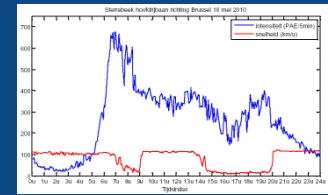
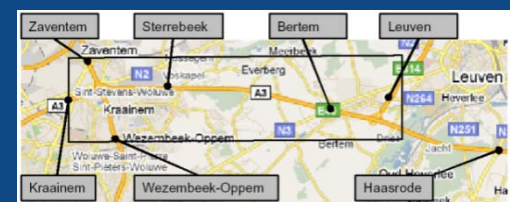
- 1) Reference scenario: current morning peak (2011)
- 2) Scenario 10% modal shift from car to motorcycle

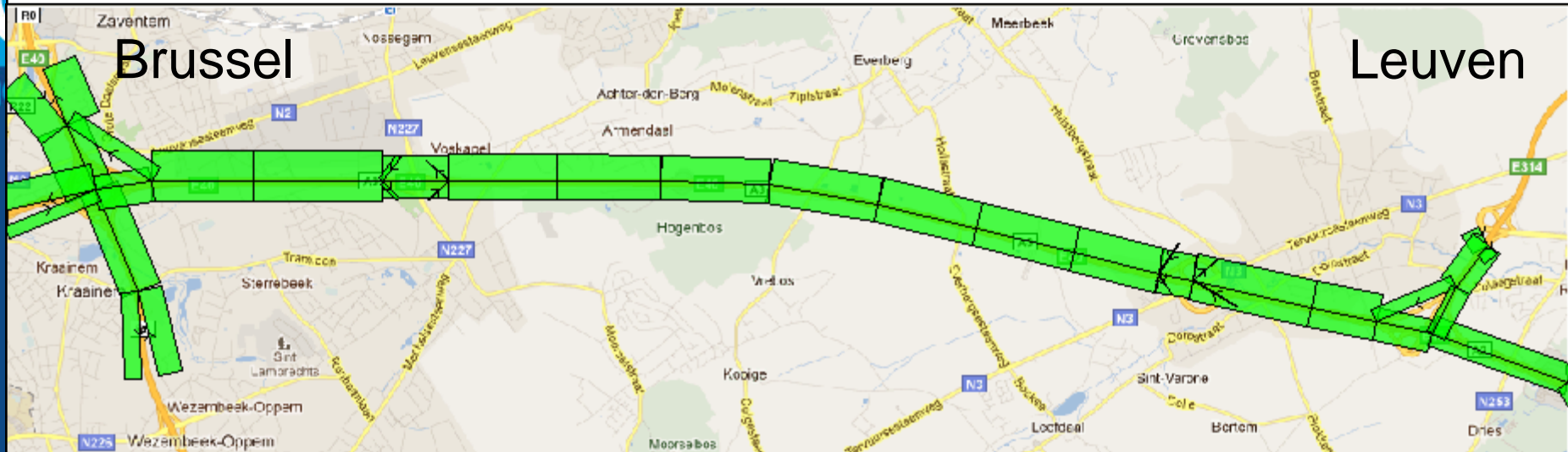
Reference scenario (morning peak 2011)

- 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



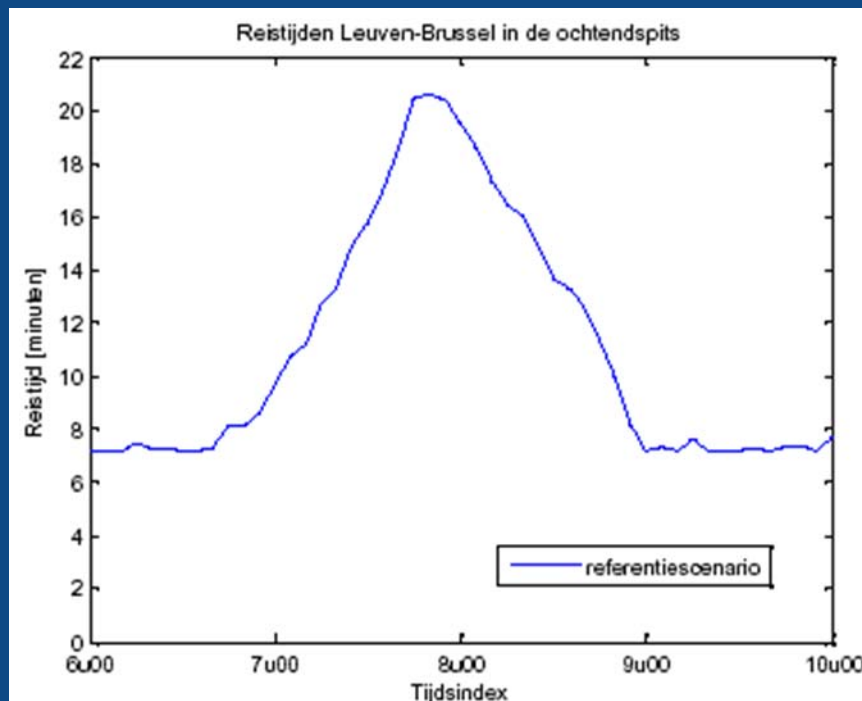


Reference scenario - simulation results (6.30 – 9.30)

- Free-Flow
- Capacity
- Congestion

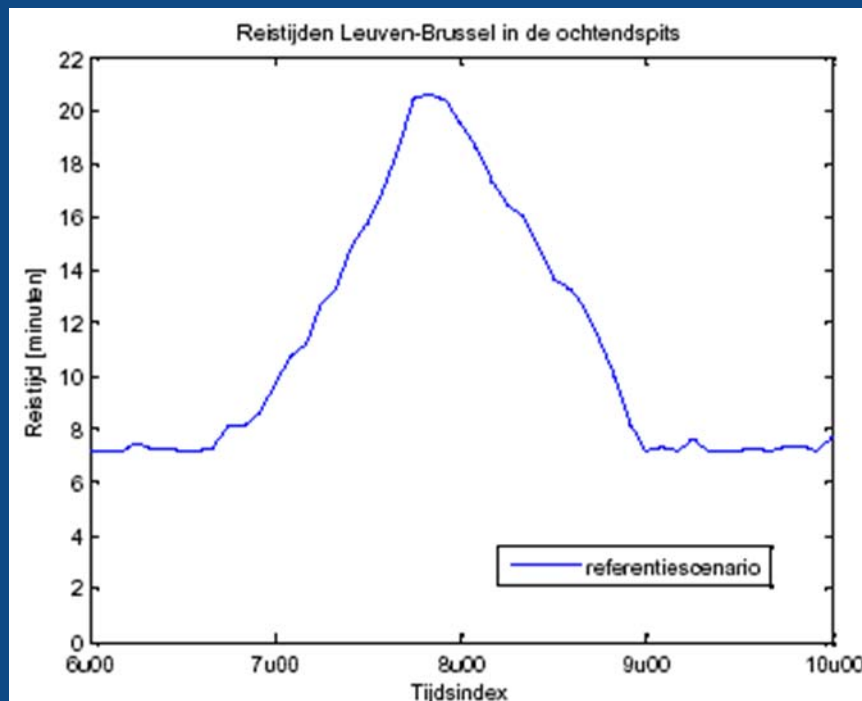
Reference scenario (morning peak 2011)

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)

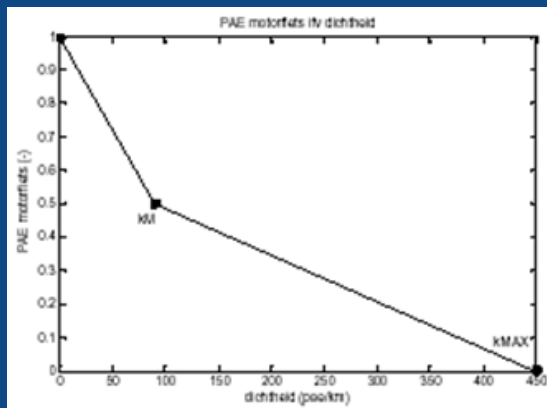
Assumptions:

- 10% passenger cars replaced by motorcycles
- Occupancy passenger car (commute) = 1.1
- Occupancy motorcycle (commute) = 1.0

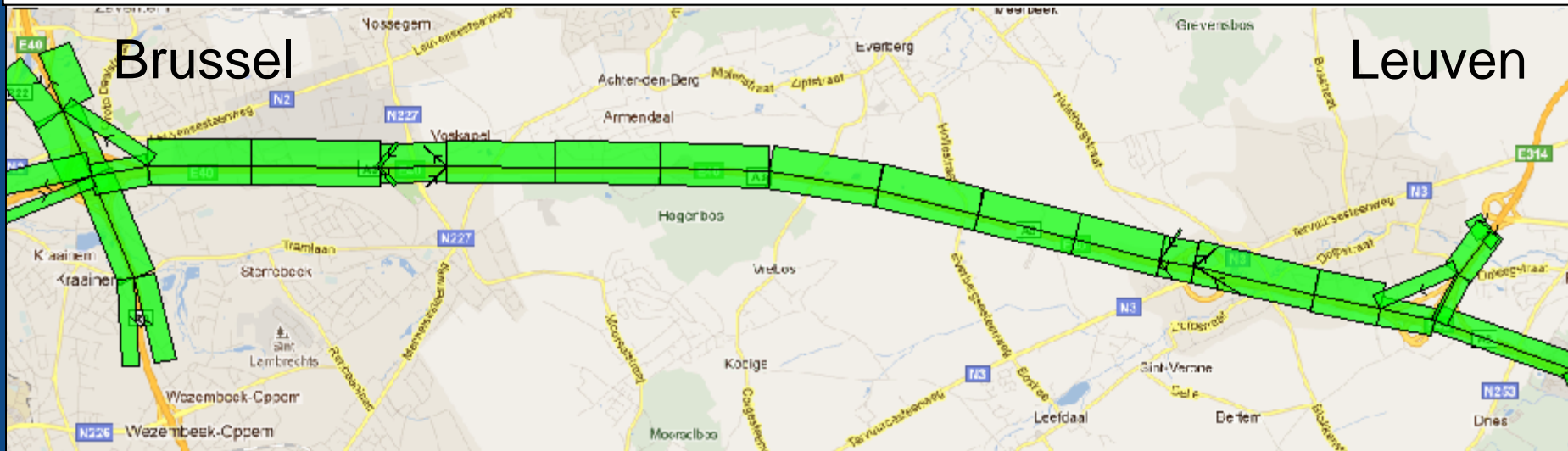
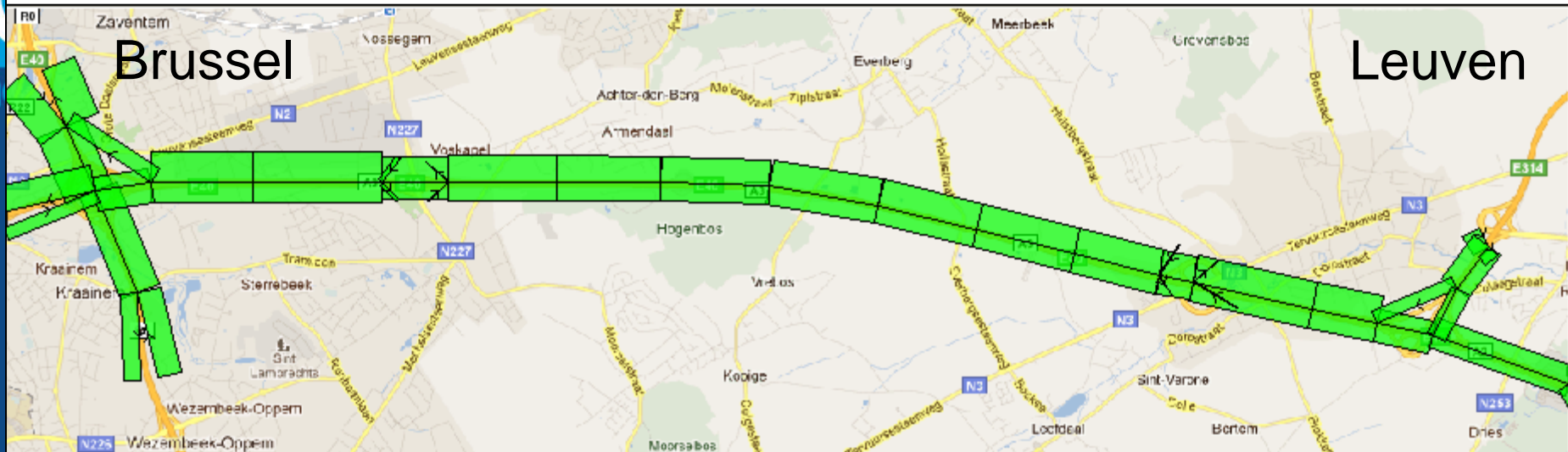
Modal shift scenario (morning peak 2011)

Assumptions:

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

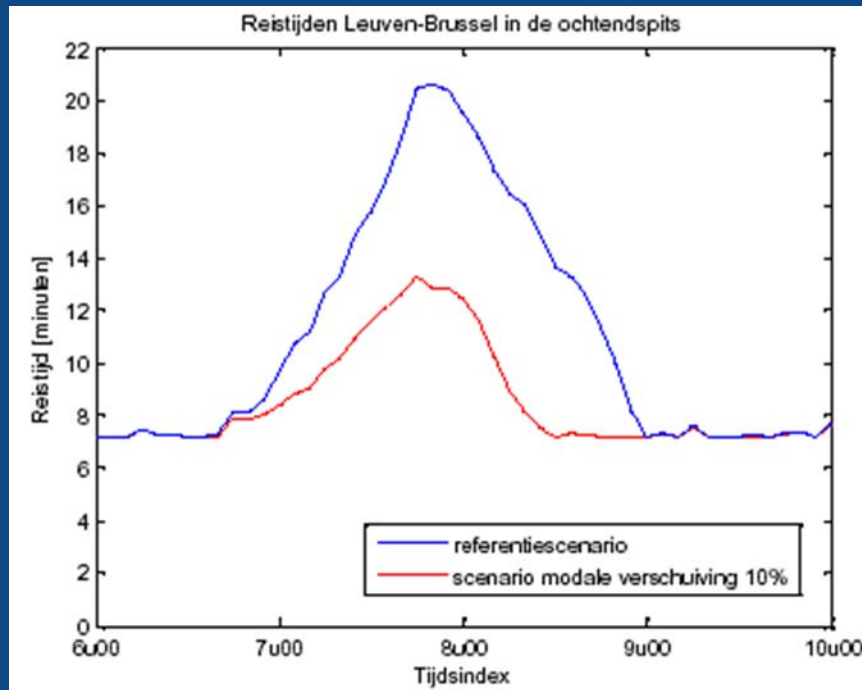


- $PCE = 1$ for min. density
- $PCE = 0.5$ at capacity
- $PCE = 0$ for max. density



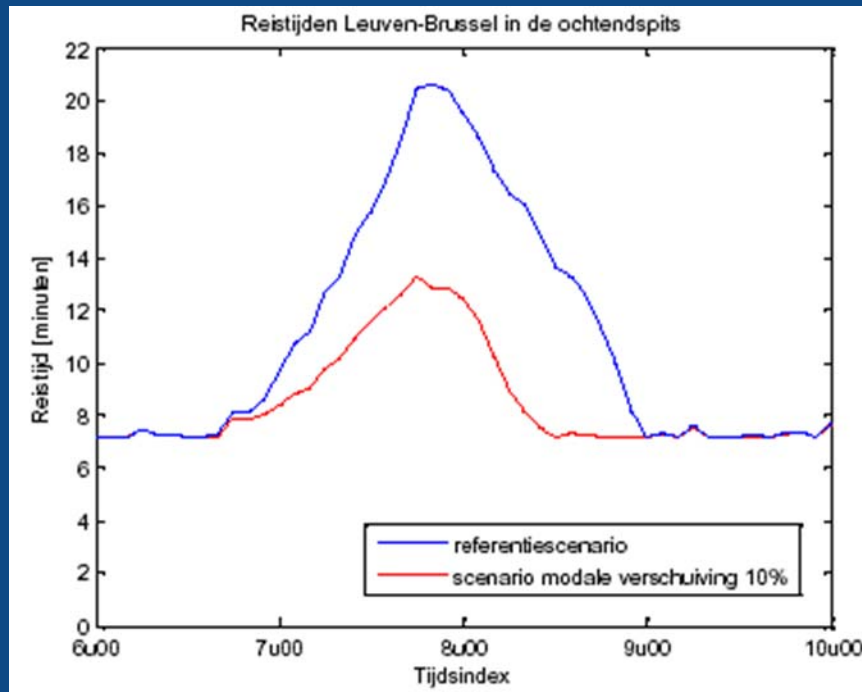
Modal shift scenario (morning peak 2011)

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

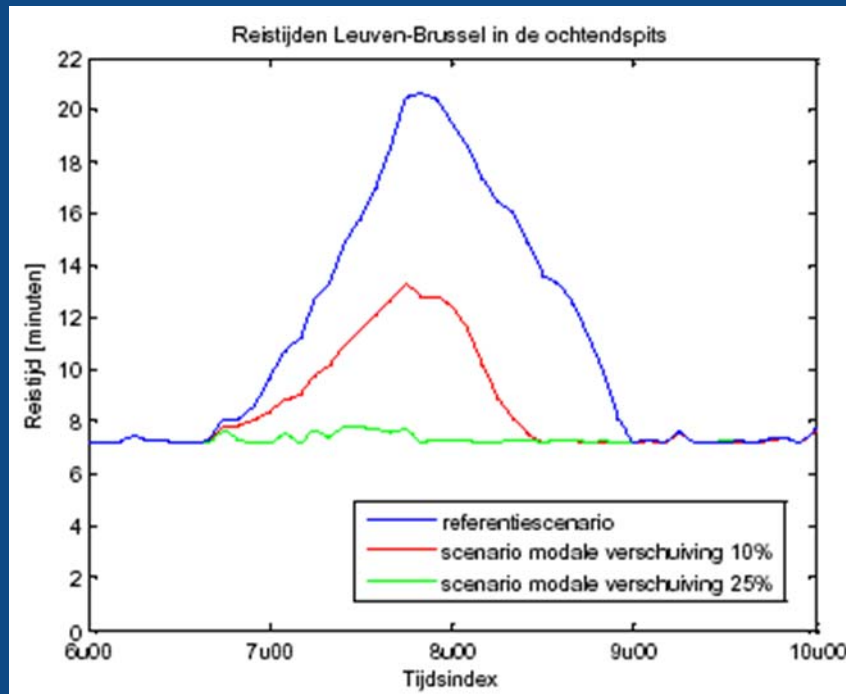
on highway due to improved traffic conditions

= 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)

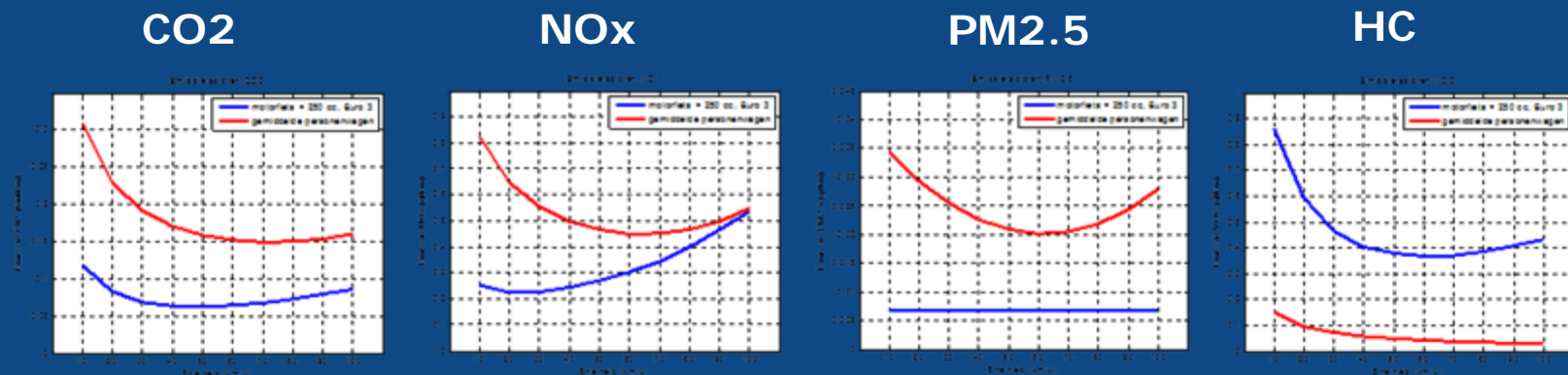
Global impact on traffic congestion

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 CO₂, NO_x, PM_{2.5} lower for recent motorcycles

Impact on emissions

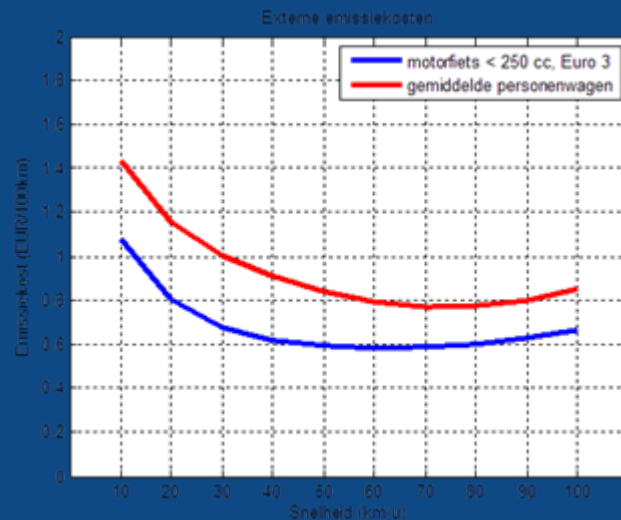
Total Emission costs (€/100 km)

(monetization based on environmental damage: NO_x: 0.58 €/kg

PM_{2.5}: 135.5 €/kg

HC: 7.5 €/kg

CO₂: 20 €/ton



— 'mean' car

— 'recent' motorcycle

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 CO₂, 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



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Additional information

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