Innovating our mobility

L-category vehicles: smaller, lighter, more specialised

Brussels, 24.1.2012

Commuting by motorcycle impact analysis

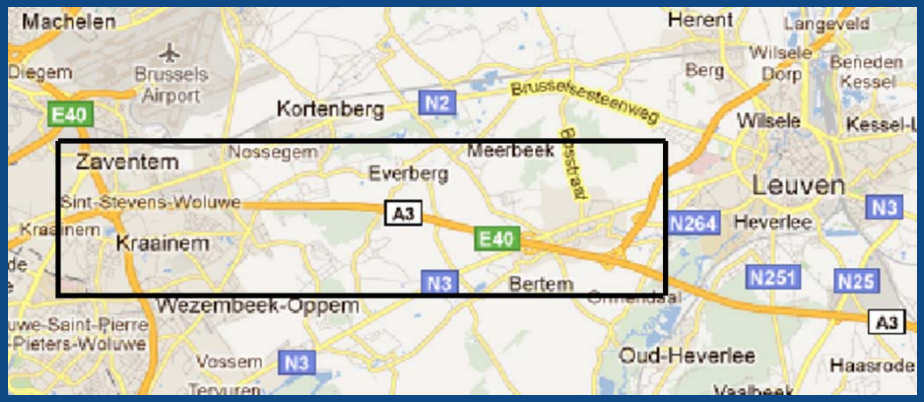
a study of Transport & Mobility Leuven for FEBIAC

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

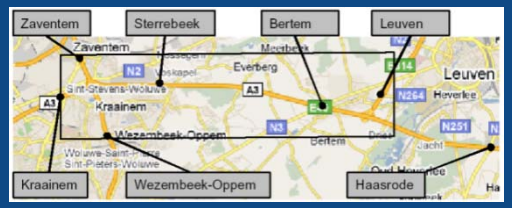
Case study Leuven-Brussels

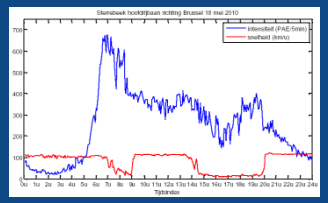


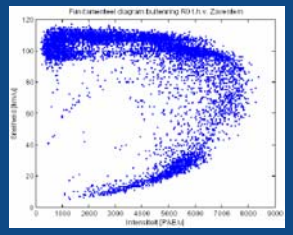
1) Reference scenario: current morning peak (2011)
2) Scenario 10% modal shift from car to motorcycle

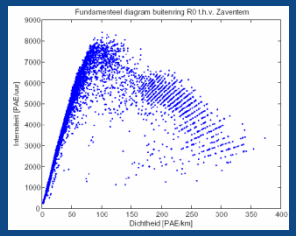
Reference scenario (morning peak 2011)

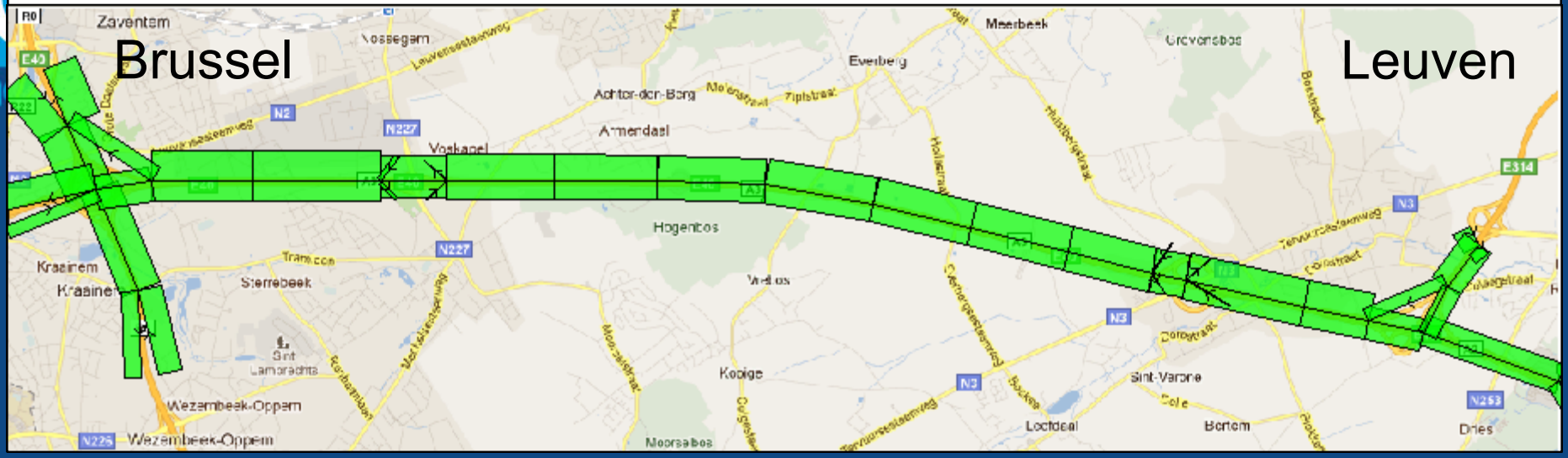
- Dynamic simulation of traffic flows by LTM
- Realistic representation
  in line with traffic counts
  - 42 detectors on 7 locations
  - May 2011, every 5 minutes:
    volumes, speeds, composition
  - Capacity network sections









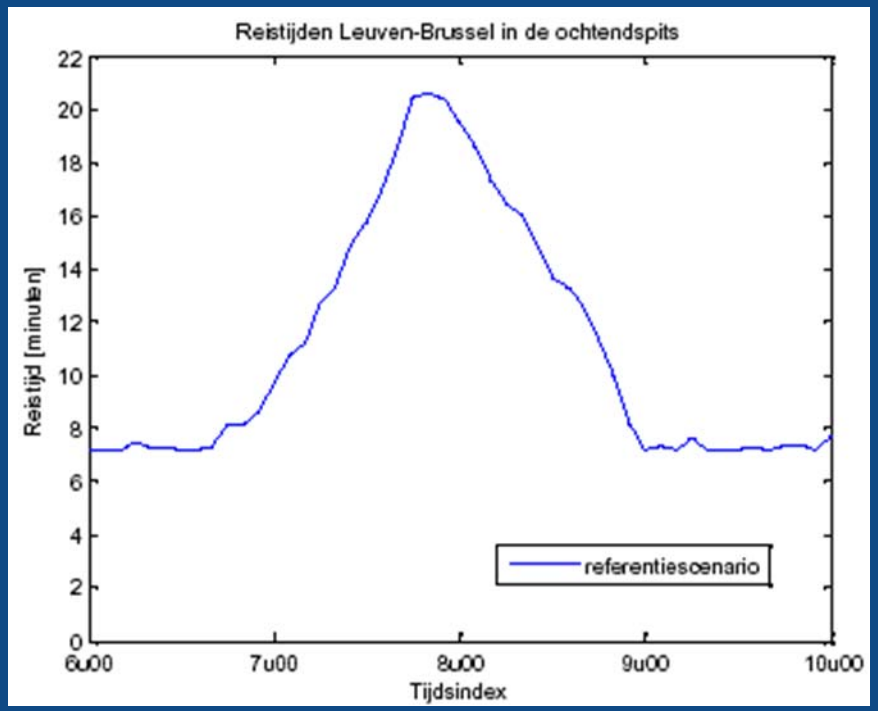


Reference scenario - simulation results (6.30 – 9.30)

- Free-Flow
- Capacity
- Congestion

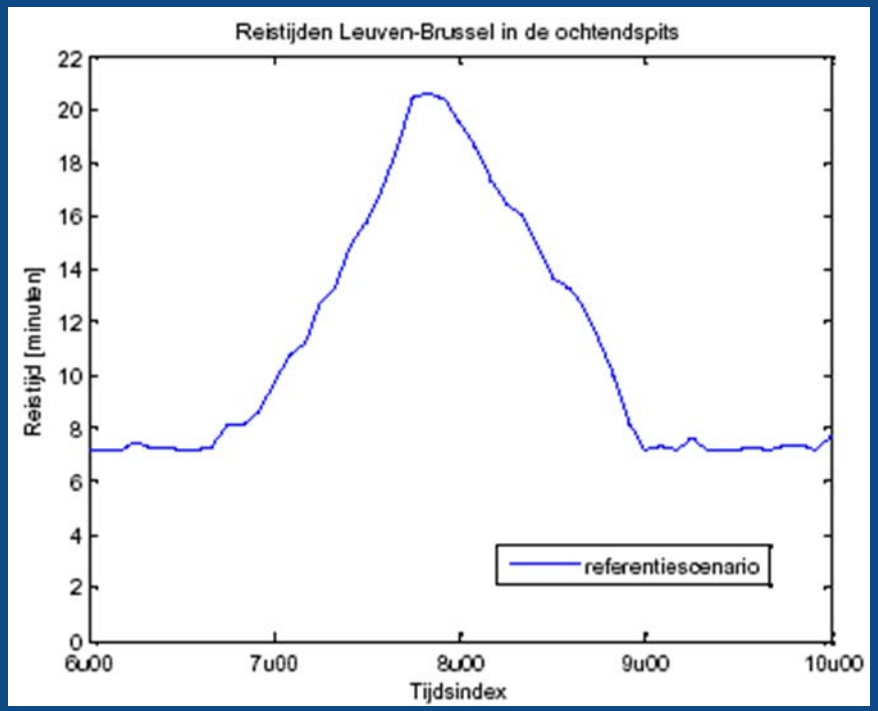
Reference scenario (morning peak 2011)

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:

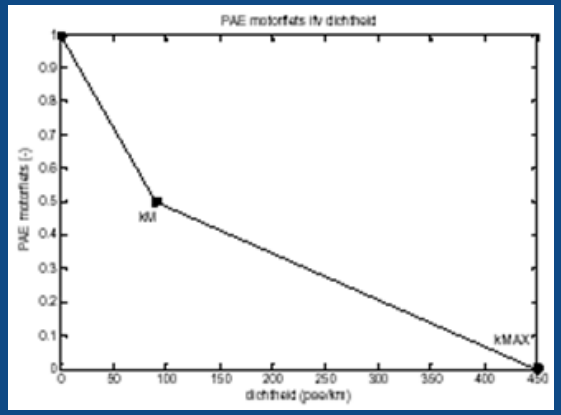
- 10% passenger cars replaced by motorcycles
- Occupancy passenger car (commute) = 1.1
- Occupancy motorcycle (commute) = 1.0

Modal shift scenario (morning peak 2011)

Assumptions:

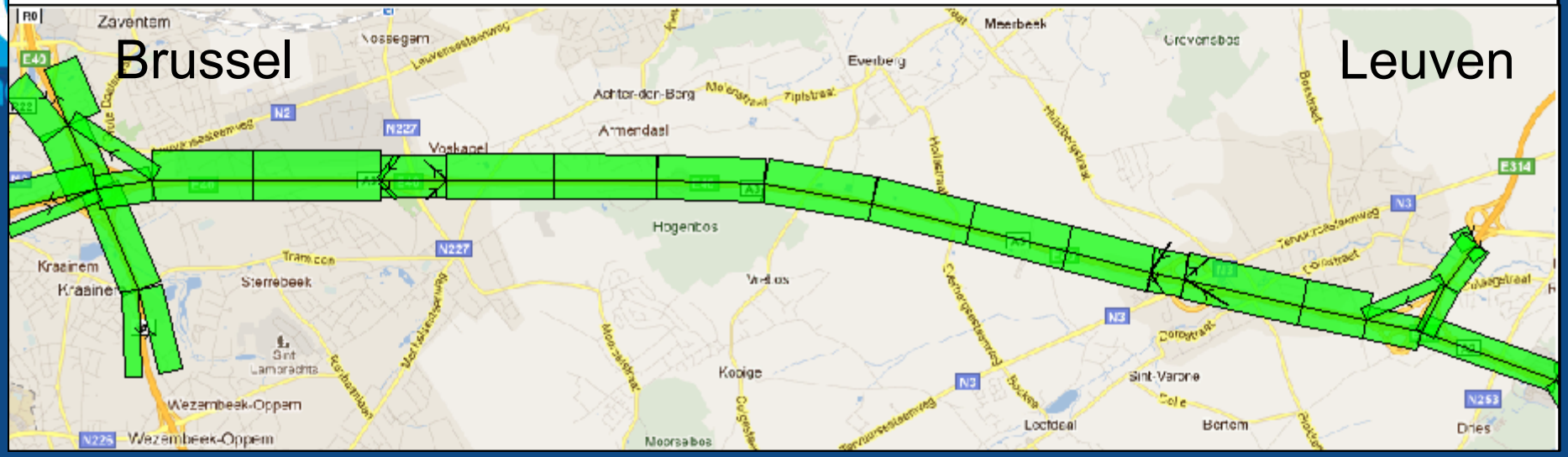
- Passenger-Car-Equivalent (PCE) motorcycle

  (How many cars would have same effect on traffic flows?)

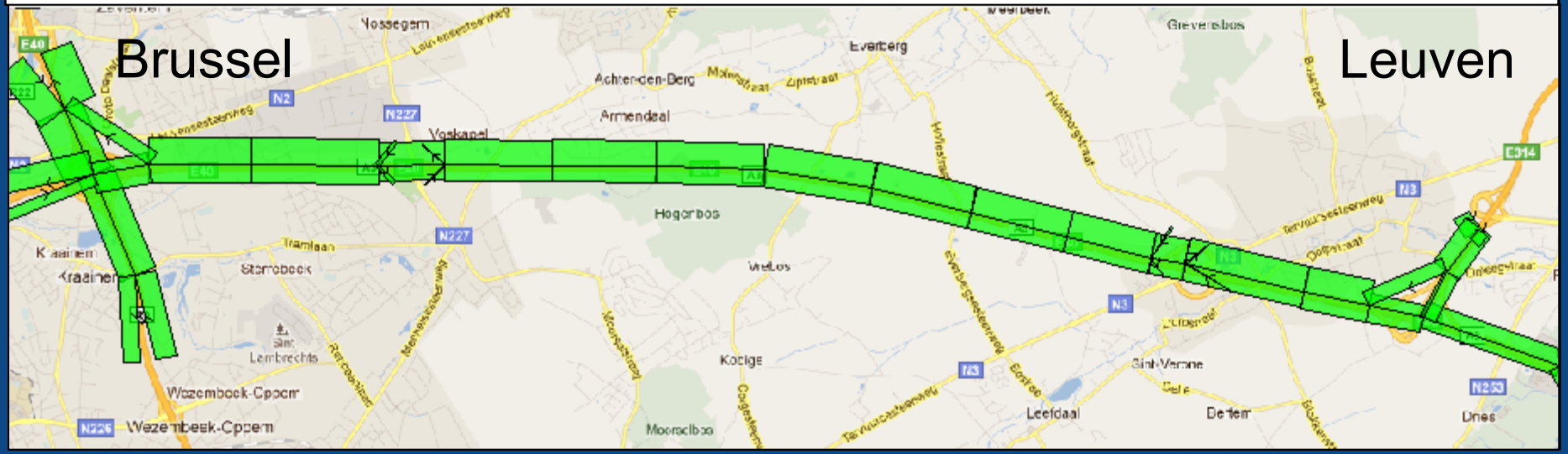


- PCE = 1 for min. density
- PCE = 0.5 at capacity
- PCE = 0 for max. density

Referentiescenario 9u30

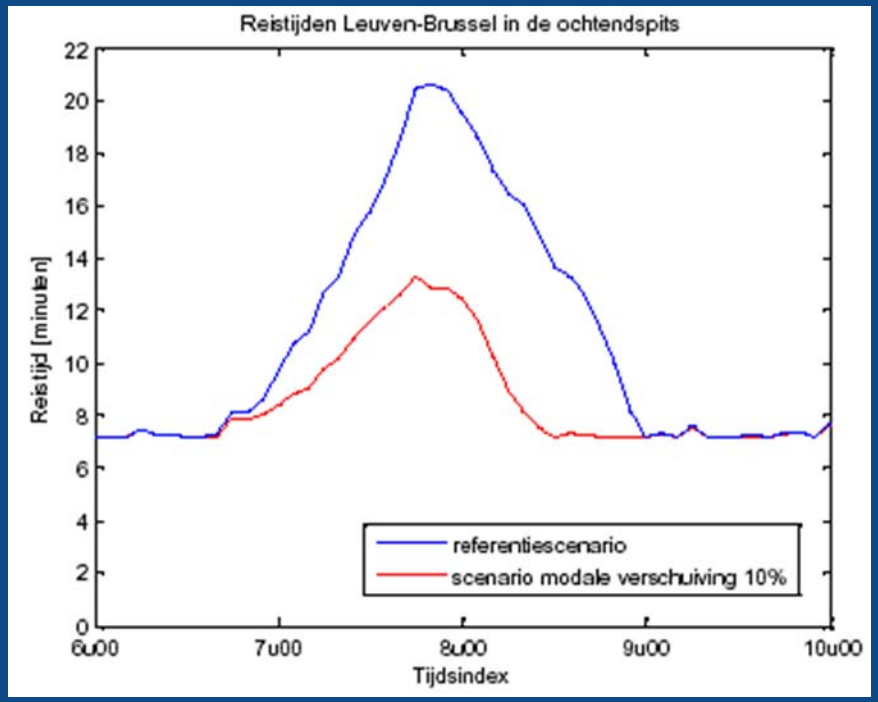


Scenario 10% modal shift 9u30



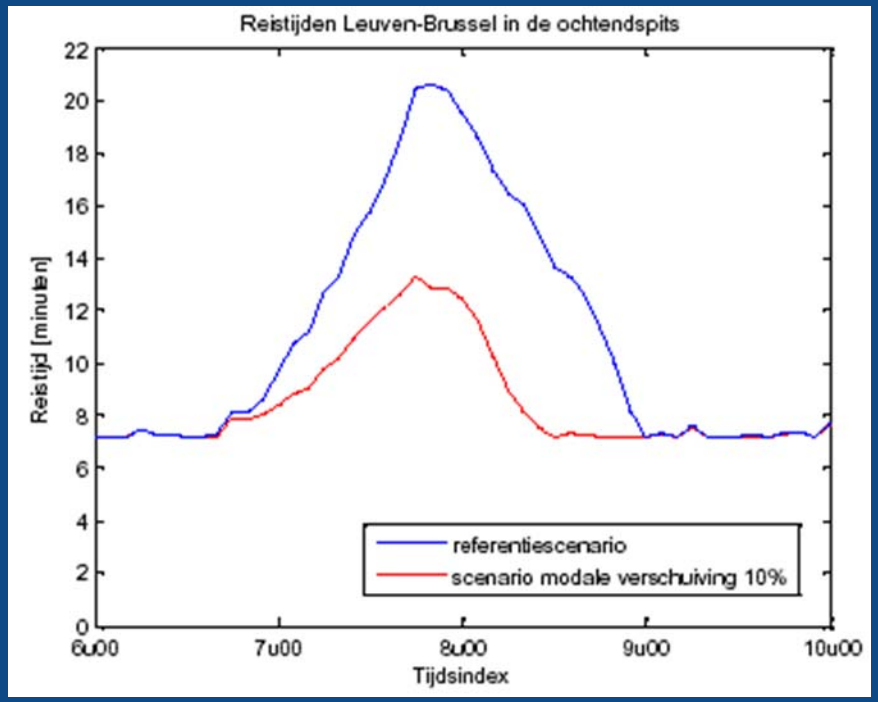
Modal shift scenario (morning peak 2011)

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

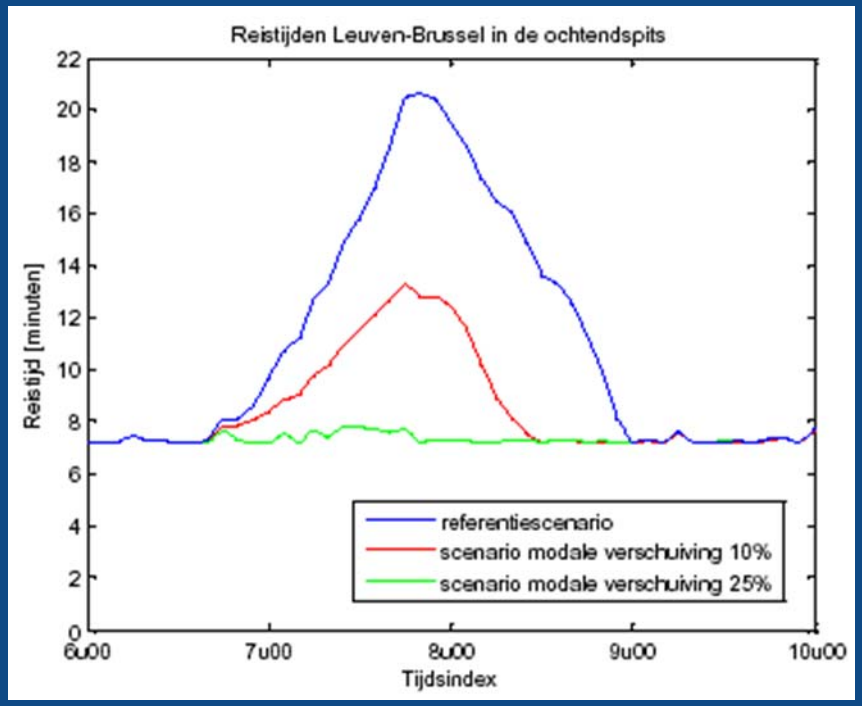
on highway due to improved traffic conditions

= **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:

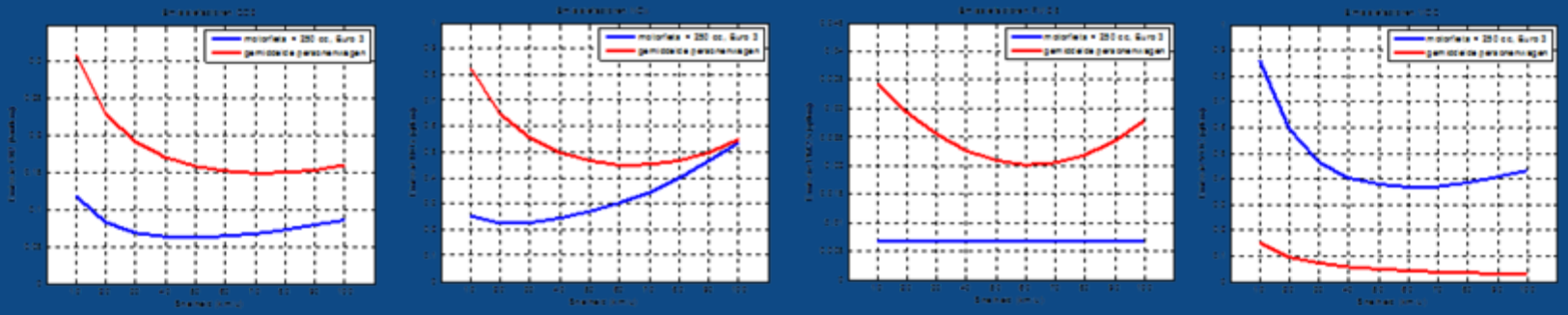
- less (rat-run) traffic, shift to highway network
- if also modal shift on underlying road network: similar time benefits

Impact on emissions

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

(source: COPERT IV emission functions 2010)

CO2 **NOx** **PM2.5** **HC**



Emissions CO_2, NO_X, $PM_{2.5}$ lower for recent motorcycles

Impact on emissions

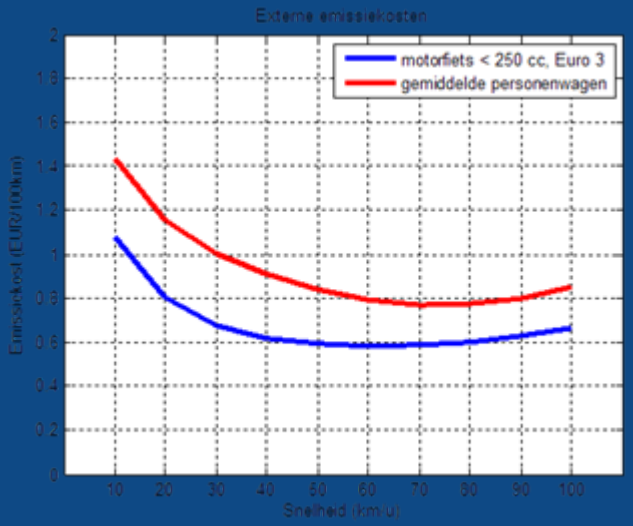
Total Emission costs (€/100 km)

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

$PM_{2.5}$: 135.5 €/kg

HC: 7.5 €/kg

CO_2: 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 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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