

Scenario simulations for ENV

Setup of the simulations

Caveats

Discussion on further development

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Overview of simulations

- Euro 5/6 : 24 scenarios
- Maritime : 21 scenarios
- CO2 car :
 - 19 draft and test scenarios
 - 13 final scenarios
- Infra. Charging : 1 scenario
- Fuel tax : 2 quick simulations
- Retrofit : 2 trial runs



Overview of simulations

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Euro 5/6 model version

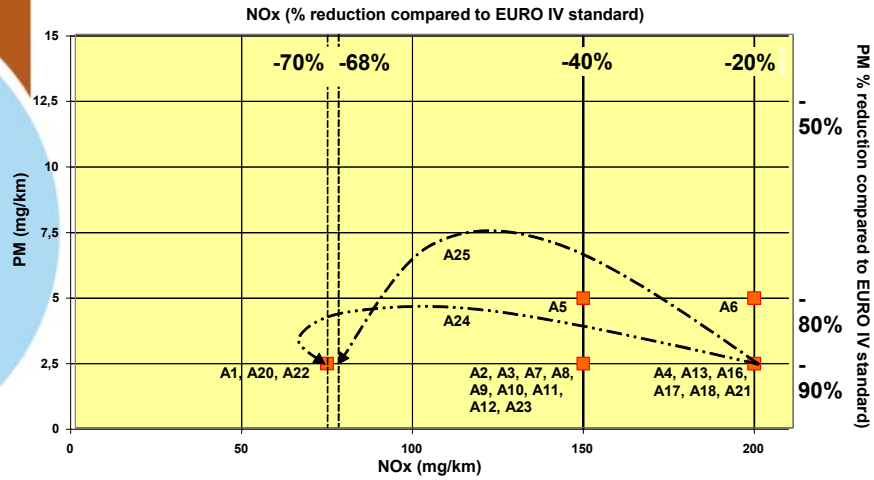
Performed with TREMOVE v2.32b (03/2005)

Changes since then for new v2.44/v2.50 :

- Partial A/B SCENES baseline
- Copert 4
- Update diesel car market share (ACEA public data)
- Further calibration to national data
- Biofuel blending policy
- ...

Euro 5/6 scenarios

Different limit values – diesel cars



TRANSPORT & MOBILITY
LEUVEN

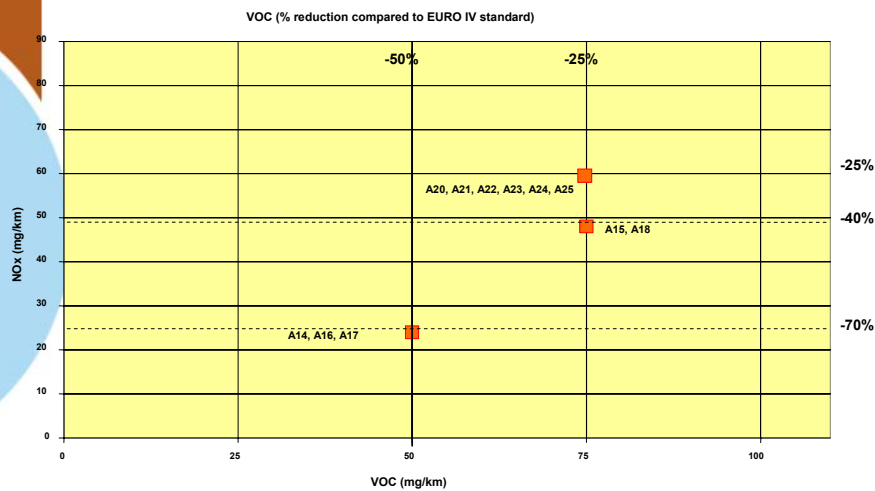
05-06/03/2007

TREMOVE : Final Meeting

5

Euro 5/6 scenarios

Different limit values – petrol cars



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TREMOVE : Final Meeting

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Euro 5/6 scenarios

- Limit values for
 - Diesel cars : A1 – A9
 - Diesel cars and N1 : A10 – A13
 - Petrol cars and N1 : A14 – A15
 - All cars and N1 : A16 – A23
 - All cars and N1 (+ Euro6) : A24 – A25
- Cost assumptions
 - Original Source : TNO, RICARDO, LAT expert panel
 - Economies of scale (0%, 33%; 45%, 67%)
 - Treatment double exhaust cars (2 approaches)
 - Effect on maintenance cost
 - Effect PM trap on fuel consumption

All scenarios and assumptions defined by DG ENV

Scenario input : Available

1. Emission limit values (test-cycle g/km)
 - Source : Commission
 - Cars absolute values for diesel and petrol
 - N1 assumed same reduc. % compared to Euro 4
2. PM trap fuel consumption increase (1 – 2%)
 - Source : Panel report
3. Technology Cost
 - Source : Panel report
 - 8 car types (double exhaust cars as separate types)
 - Min. and Max. values
 - Not all limit values (e.g. diesel 150 mg, but not 200 mg)
4. No other information (e.g. effect on maintenance cost, effect on other pollutants, ...)

Scenario input : model input

1. Emission limit values (test-cycle g/km)
 - % test-cycle reduction Euro 4 – Euro 5/6 applied to real-world (Copert) Euro 4 emission factor
2. PM trap fuel consumption increase (1 – 2%)
 - 1.5% decrease applied to real-world fuel consumption
 - Same impact on CO2 and SO2
3. Technology cost
 - Absolute avg. cost used in most cases
 - Equal absolute cost increase in all countries
 - 200 mg NOx diesel ~ used 150 mg min. cost, ...
 - 2 approaches for averaging single and double exhaust
 - Economies of scale : 0%, 33%, 45%, 67 %
 - N1 : Subclass I (small cars); Subclass II & III (double exhaust cars)

Scenario input : Caveats

- Emission limit values (test-cycle g/km)
 - Equal % reduction test-cycle vs real-world ?
 - Equal for cold and hot emissions ?
 - Impact on other pollutants ?
- Technology cost
 - Equal absolute cost increase in all countries ?
 - In car CO2 scenarios used equal % increase
 - Technology cost vs cost to consumer
 - 16% difference revealed in car CO2 study (dealer mark-up etc.)
- Other cost components : Maintenance ?
 - Standard assumption : maint cost ~ purchase cost

Scenario output : formats

1. Output .mdb : 650 MB
 - Fleets, Vkm, Emissions by vehicle type, age, ...
2. Excel pivot tables
3. Tables for report
4. Graphs for report

Tool to join .mdb's available (but limited #)

Requested tables and graphs are different for each type of scenario

Road charging <-> Emission standard



Scenario output : formats

Wish list :

- Enable analysis at most detailed level
 - By country, vehicle type, age, road type, period, year, ...
- Customised summary output tables
- Comparison scenarios in joined output tables

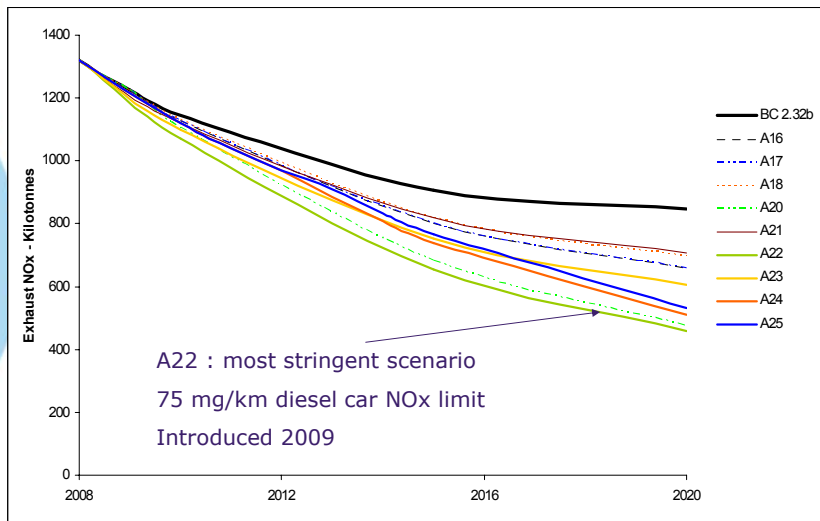
Solution ?

- High-level Guided User Interface for output table generation
- ...



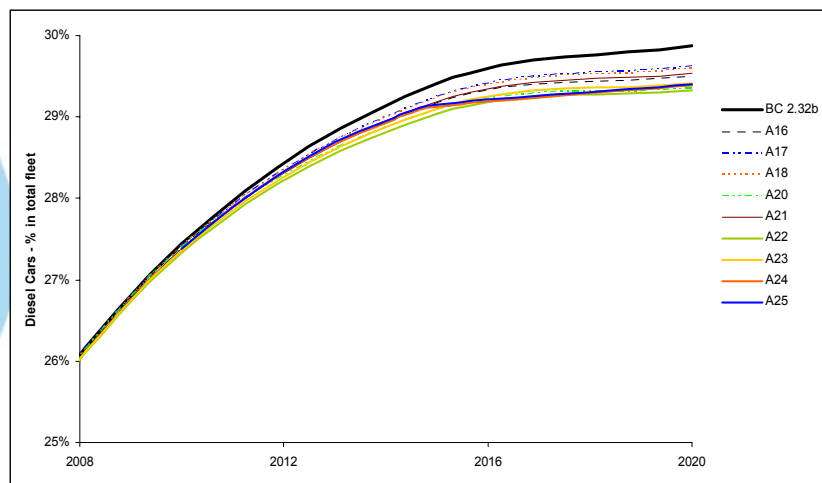
Scenario results : Emissions

NOx emissions – EU 15 + 4 NMS – Car and N1 - Kton



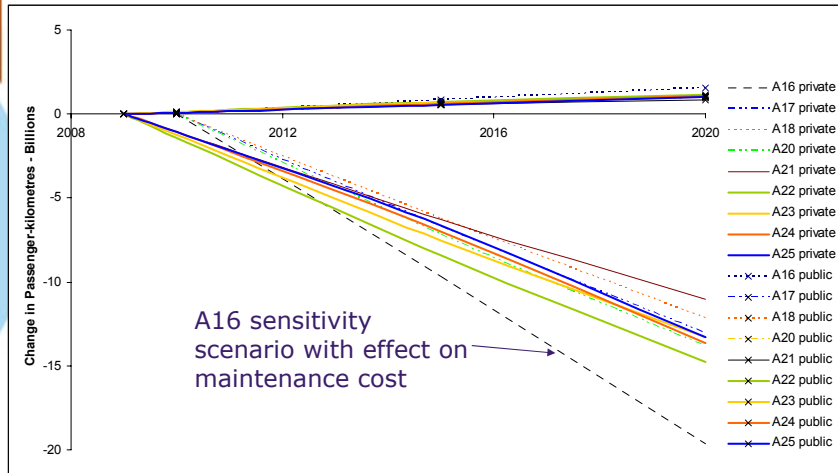
Scenario results : Fleet

Fleet share of diesel cars – EU 15 + 4 NMS – Car and N1 - %



Scenario results : Demand

Change in pass.km – EU 15 + 4 NMS – Billions



Scenario results : Welfare effect

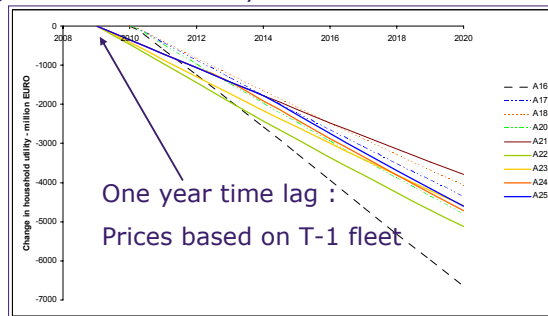
Welfare effect in TREMOVE =

- Change in household utility
- + (Change in production costs)
- + Change in government tax revenue * (1+ mcpf)
- + (Change in external cost)

Scenario results : Welfare effect

- Increased costs and taxes for car and N1 (private trips)
- Constant income assumption
- Decreased consumption and substitution => Utility loss

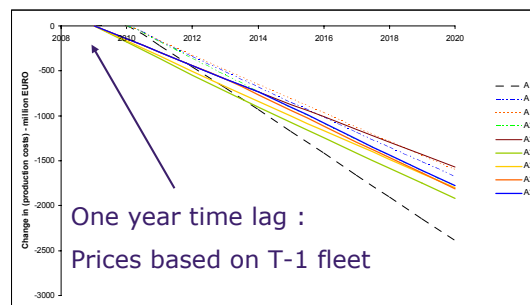
Change in household utility - EU15 + 4 NMS - million EURO



Scenario results : Welfare effect

- Increased costs and taxes for car and N1 (business trips, freight)
- Constant production level assumption
- Increased production costs and substitution => Welfare loss

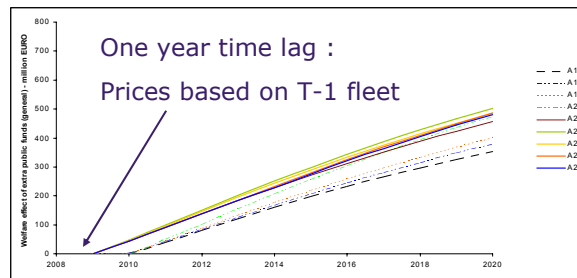
(Change in production costs) - EU15 + 4 NMS - million EURO



Scenario results : Welfare effect

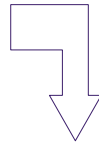
- Government : Increased (fuel, purchase) tax income,
- Allows to lower general taxes or labour taxes or ...
- Thus extra tax payments Households / Firms are no welfare loss
- Additional benefits from e.g. reducing distortionary taxes on labour market (mcpf)

Change in tax revenue * (1+mcpf) - EU15 + 4 NMS - million EURO



Scenario results : Welfare effect

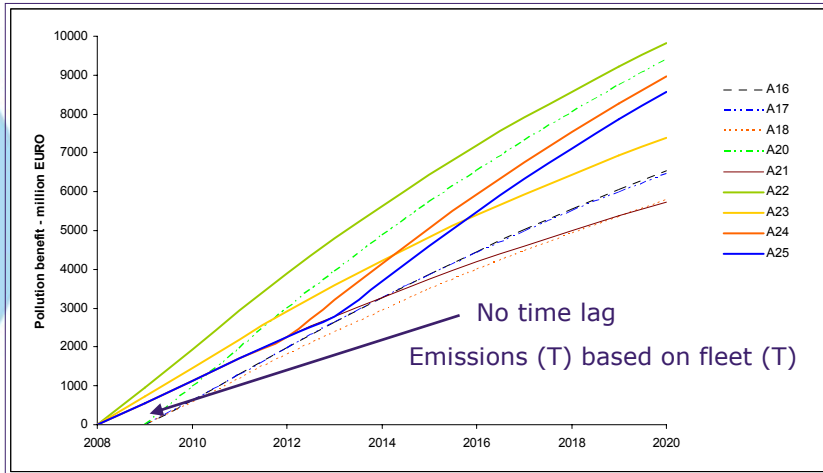
- Change in external cost
 - Emissions
 - Congestion : included in generalised price
 - ~~Accidents~~
 - ~~Noise~~
 - ~~Road damage~~



Only effects on emissions covered for
assessment of emission policies – on
demand of DG ENV

Scenario results : Welfare effect

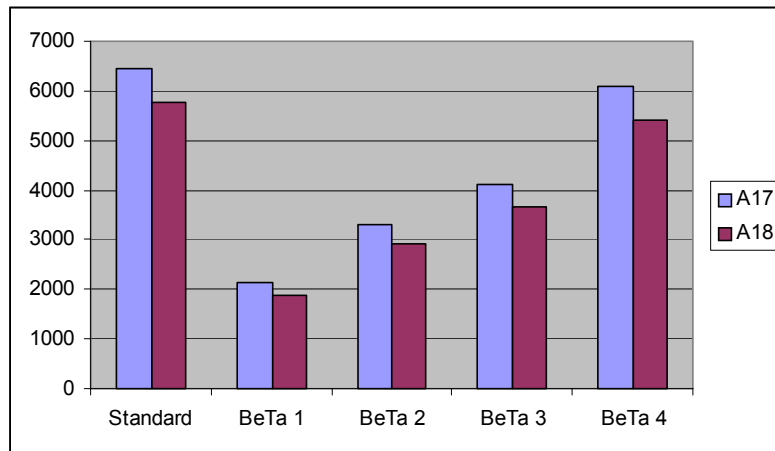
Change in emissions external cost – EU 15 + 4 NMS – million EURO



Scenario results : Welfare effect

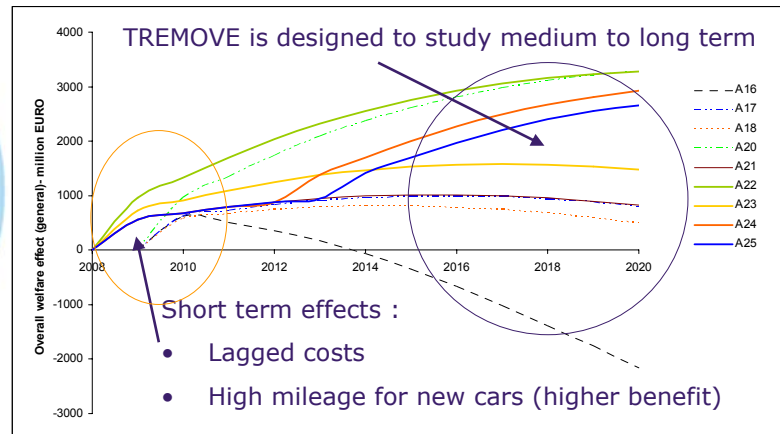
Sensitivity analysis on Pollution damage estimates :

Change in emissions external - cost million EURO



Scenario results : Welfare effect

Change in welfare – EU 15 + 4 NMS – million EURO
(general tax – standard external cost set)



Scenario results : Cost-effectiveness

Cost-effectiveness (EURO/ton abated)=

$$\frac{\text{Change in household utility} + \text{(Change in production costs)} + \text{Change in government tax revenue} * (1 + \text{mcpf})}{\text{Emission reduction}}$$

Applied in car CO₂ runs :

- Only CO₂ to be abated
- Fix abatement objective to be reached at least cost

Caveats

- Scenario input data
 - Real – world effects ?
 - Maintenance costs ?
 - Technology cost vs cost to consumer ?
 - Marginal cost of public funds
- Uncertainties
 - External costs
- Mid- to long-term results

Key Questions

- Many runs or few runs to analyse in detail ?
- Independent baseline or baseline adapted to studied policy ?
Car CO2 : weight increase, LRRT, TPMS, airco, ...
- Output data
 - Details versus Overview // Different for each policy
- Sensitivity analysis
 - With current demand module : in principle new SCENES run needed for analysing scenarios with e.g. other crude oil price evolution, other infrastructure investments, ...
 - Solution :
 - Autonomous forecasting module ?
 - Plug into TRANSTOOLS ?