Zacharias Samos| 2023-04-18| TFEIP meeting

The Upcoming Euro 7 regulation

emisia
CONSCIOUS OF TRANSPORT'S IMPACT
European Environment Agency
European Topic Centre
Climate change mitigation

Euro 7 regulation objectives

- Reduce complexity of the current Euro emission standards
- Provide up-to-date limits for all relevant air pollutants.
- Improve control of real-world emissions

Introduction of Euro 7 vehicles

- COM proposal for Euro 7 introduction date:
  - from 1 July 2025 for M1, N1 vehicles
  - from 1 July 2027 for M2, M3, N2, N3 vehicles
- The Euro 7 legislation is still being shaped.
- The introduction of Euro 7 vehicles in Copert is expected to take place once the decisions are finalized.

Few introductory words

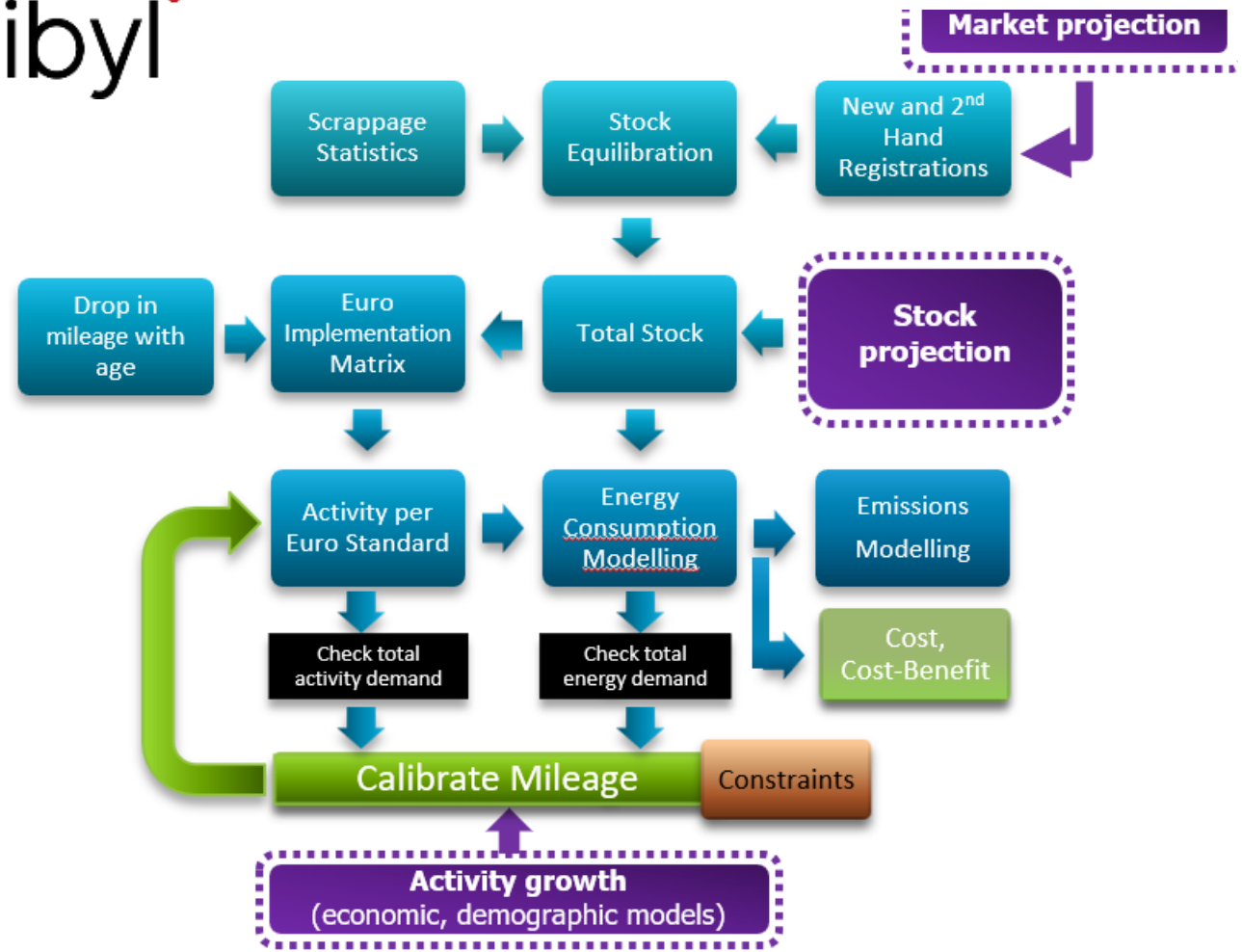
- The Euro 7 Impact Assessment report conducted by CLOVE partners was one of the inputs used in the Impact Assessment of COM
- It was conducted by Emisia and LAT based on the discussions and input within CLOVE, mostly in the 9.2020 –9.2021 period
- Policy options were specified by COM and were simulated as individual modelling scenarios by Emisia

- The proposal by COM does not match any of the original policy options proposed in the impact assessment but is a combination of elements from different ones

General methodology

Fleet, emission and energy consumption projections

sibyl

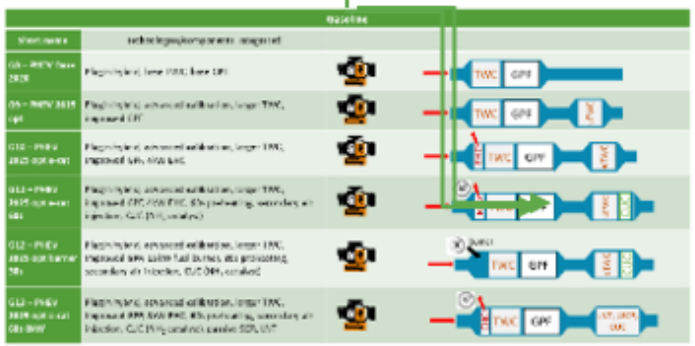


- **Main optional input (exogenous):**
  - Market or fleet growth
  - Operation patterns
  - Fuel specs
  - Requirement on technology penetration
  - Implementation costs
- **Baseline (endogenous):**
  - Detailed projection for each EU MS+ based on centralised assumptions
- **Main output per technology (2010-2050):**
  - Stock and activity projections
  - Energy consumption
  - Air pollutant emissions
  - WTW GHG emissions
  - Incremental costs for implementation

emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation

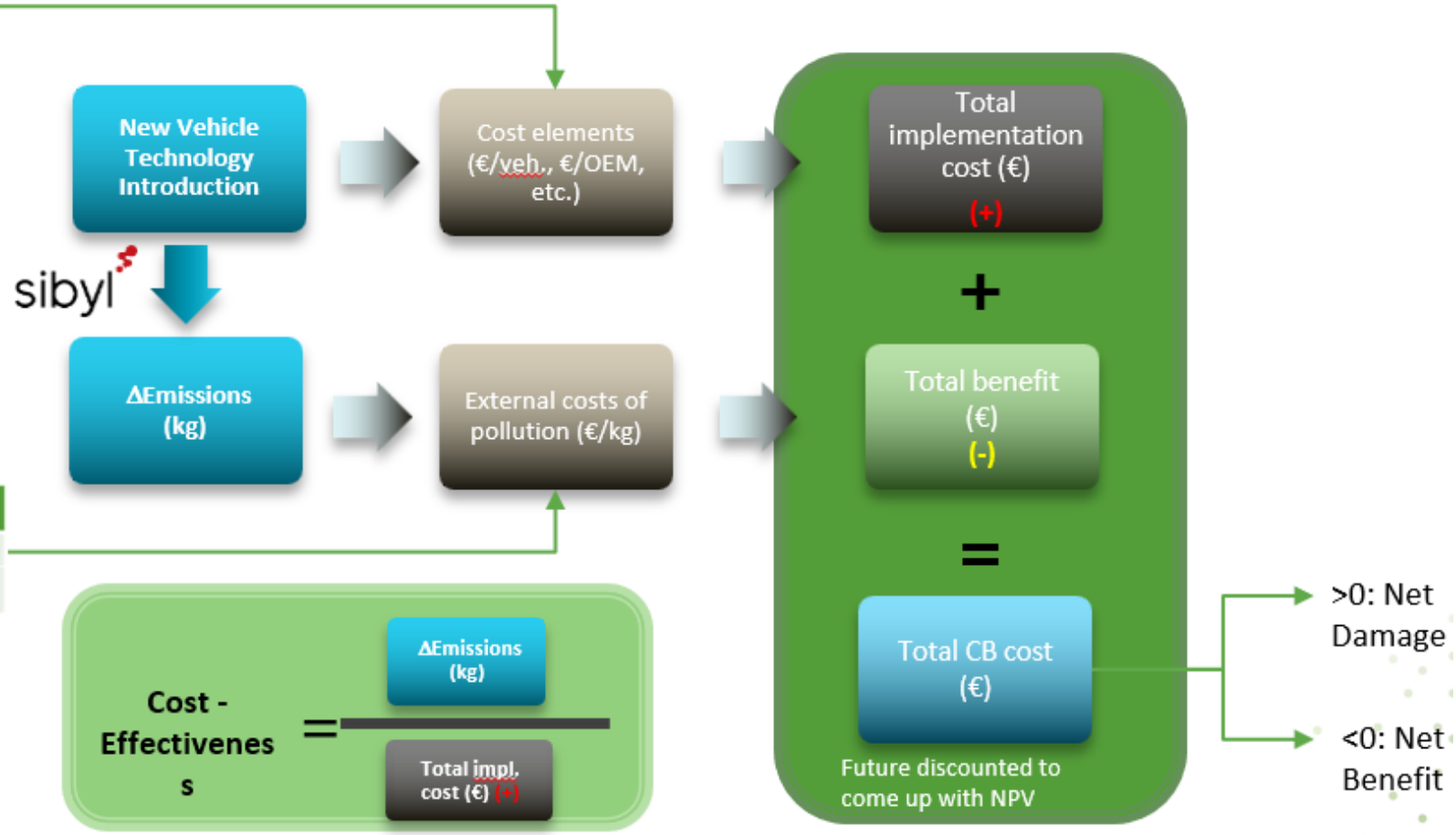
Cost-benefit of environmental measures and technologies



Technology assessment and cost potential

Pollutant	NO_x		NH_3	NMVOC	$PM_{2.5}$ exhaust			PM_{10} non-exhaust
Area	City	Rural	All areas	All areas	Metropolitan	City	Rural	All areas
Damage cost [€/kg]	21.3	12.6	17.5	1.2	381	123	70	22.3

Source: Handbook on the external costs of transport, EC, 2019



Details of the different steps follow in the presentation and can also be found in the Annex of the IA report

emisia
CONSCIOUS OF TRANSPORT'S IMPACT

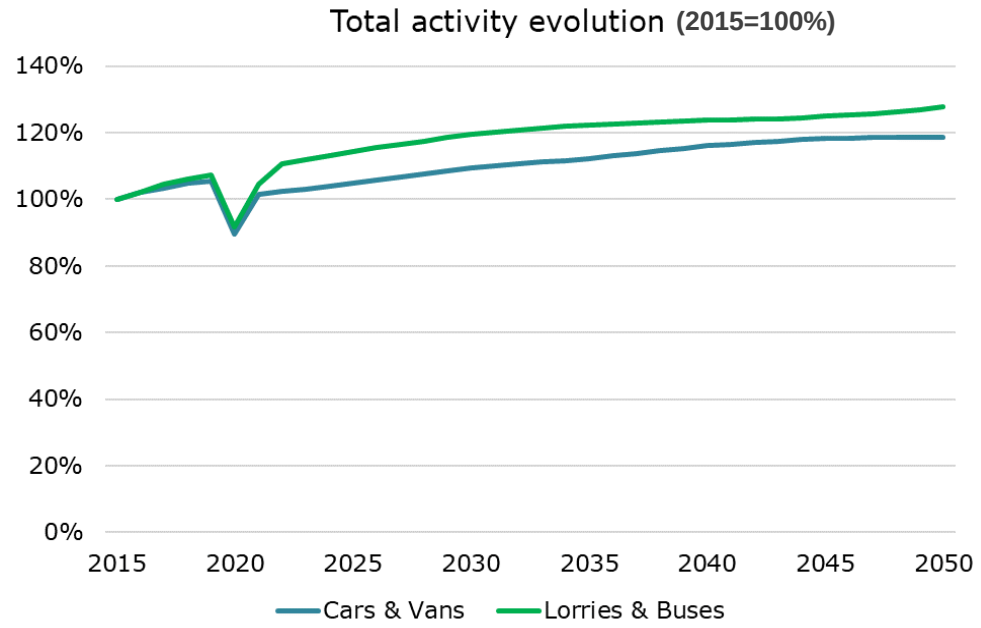
European Environment Agency
European Topic Centre
Climate change mitigation

Baseline and policy options

Activity evolution

Baseline in line with the policy objectives of Fit for 55 in terms of road transport activity projection

- Consistent with DG CLIMA baseline that has gone into the assessment in the revised 2020 climate and energy legislative framework (SWD(2021) 613)
- Impact of COVID-19 on total activity and sales of new vehicles has been considered

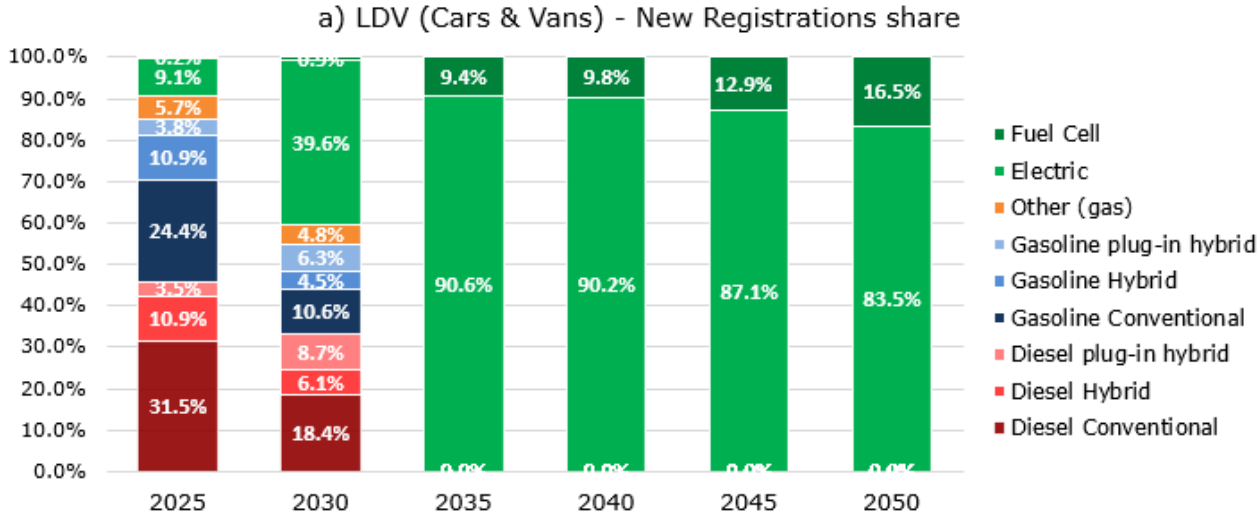


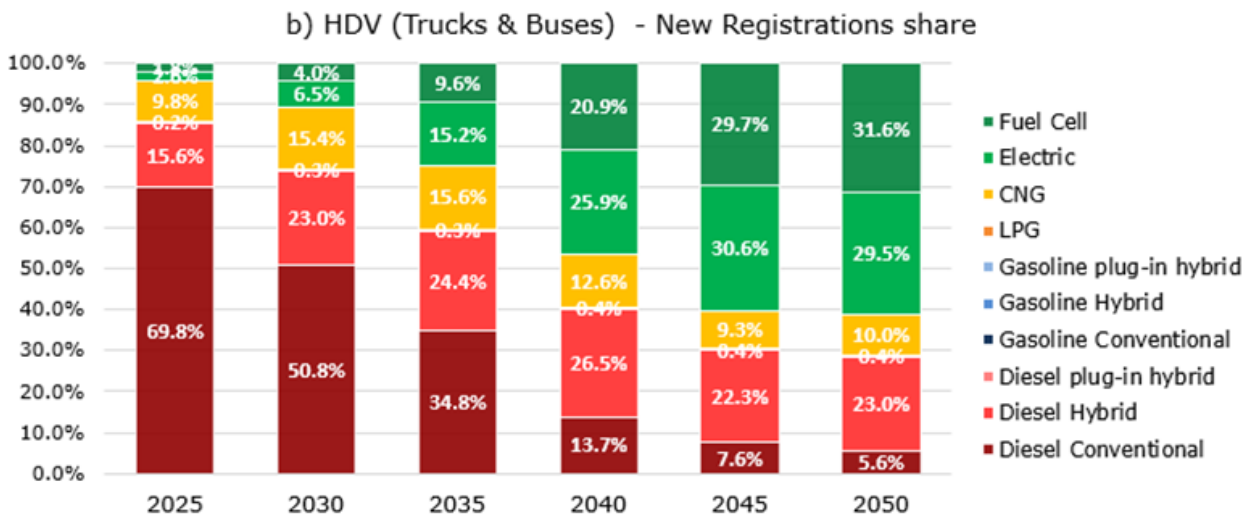
"EU fit-for-55" package:
- 55% reduction in overall transport emissions by 2030 (vs1990)
- 90% reduction by 2050

emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation

Technology/fuel mix





In line with Fit for 55's policy objectives for the projected technology/fuel mix by 2050 (new registrations)

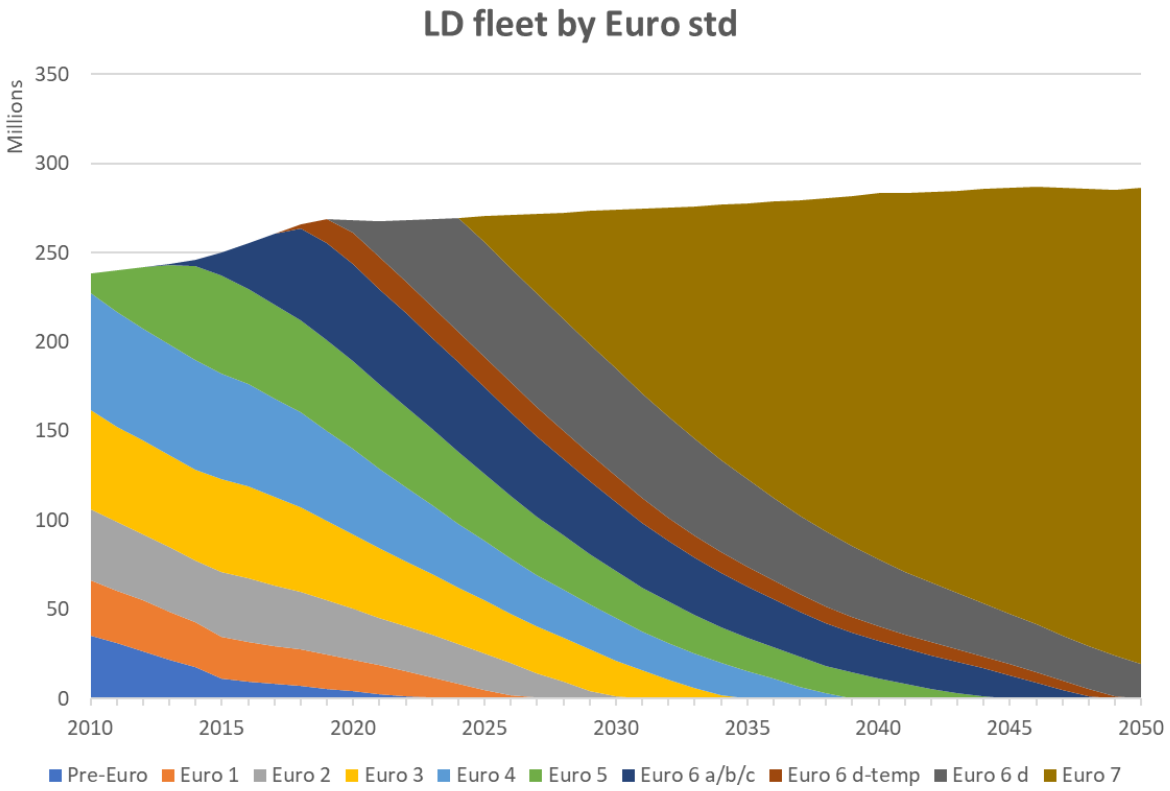
Based on the EU fit-for-55 MIX Scenario 2021. The available data was not very detailed, so we also used:

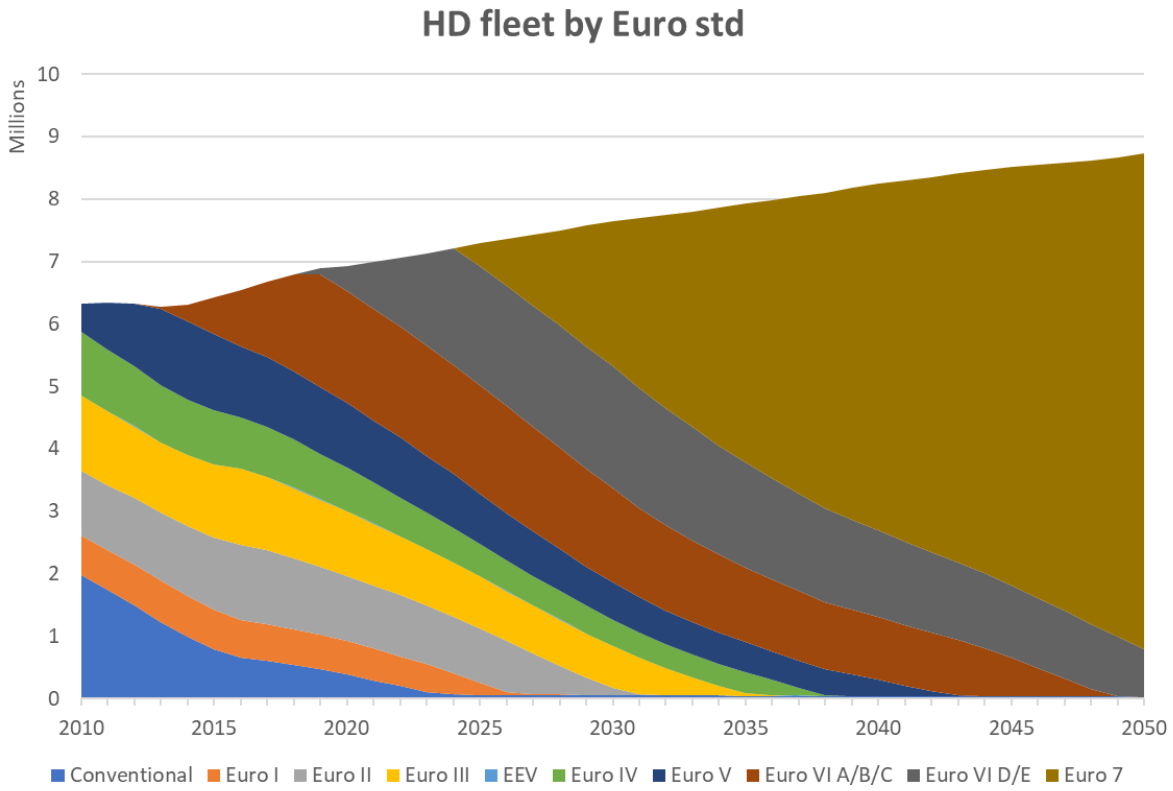
- Industry expectations on future technology mix
- CLOVE's engineering judgment
- CO2 emission standards for HDVs have been reviewed recently by COM. Any changes will be reflected in a new scenario

emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation

Fleet evolution by Euro std





emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation

Policy options

Policy Option 0:
No change over current standards = 'baseline'

Policy Option 1:
Refined architecture of vehicle emission standards

- Make the current limits consistent for different technologies
- Simplifies the existing emission tests

One scenario

Policy Option 2:
Improved air pollutant limits and advanced tests for cars, vans, lorries and buses in addition to PO1

Three scenarios

Policy Option 3:
Advanced measures and lifetime compliance of cars, vans, lorries and buses in addition to PO2

Two scenarios

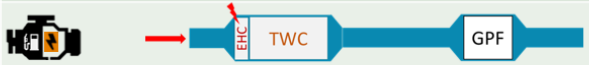
The same method but with different parameterizations was used for each policy options

emisia
CONSCIOUS OF TRANSPORT'S IMPACT

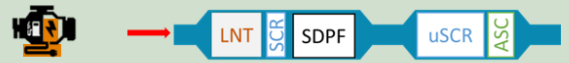
European Environment Agency
European Topic Centre
Climate change mitigation

Technology Mix

Euro 7 technology packages LDV

Gasoline		
Short name	Technologies/components integrated	Configuration
G1 – Base Euro 6	Base TWC, base GPF	
G2 – Base Euro 7 opt	Advanced calibration, larger TWC, improved GPF	
G3 – MHEV Base Euro 6	Mild hybrid, base TWC, base GPF	
G4 – MHEV Euro 7 opt	Mild hybrid, advanced calibration, larger TWC, improved GPF	
G5 – MHEV Euro 7 opt e-cat	Mild hybrid, advanced calibration, larger TWC, improved GPF, 4kW EHC	
G6 – MHEV Euro 7 opt e-cat 10s	Mild hybrid, advanced calibration, larger TWC, improved GPF, 4kW EHC, 10s preheating, secondary air injection, CUC (NH_3 catalyst)	
G7 – MHEV Euro 7 opt burner 10s	Mild hybrid, advanced calibration, larger TWC, improved GPF, 15kW fuel burner, 10s preheating, secondary air injection, CUC (NH_3 catalyst)	

Gasoline		
Short name	Technologies/components integrated	Configuration
G8 – PHEV Base Euro 6	Plugin hybrid, base TWC, base GPF	
G9 – PHEV Euro 7 opt	Plugin hybrid, advanced calibration, larger TWC, improved GPF	
G10 – PHEV Euro 7 opt e-cat	Plugin hybrid, advanced calibration, larger TWC, improved GPF, 4kW EHC	
G11 – PHEV Euro 7 opt e-cat 60s	Plugin hybrid, advanced calibration, larger TWC, improved GPF, 4kW EHC, 60s preheating, secondary air injection, CUC (NH_3 catalyst)	
G12 – PHEV Euro 7 opt burner 30s	Plugin hybrid, advanced calibration, larger TWC, improved GPF, 15kW fuel burner, 30s preheating, secondary air injection, CUC (NH_3 catalyst)	
G13 – PHEV Euro 7 opt e-cat 60s 8kW	Plugin hybrid, advanced calibration, larger TWC, improved GPF, 8kW EHC, 60s preheating, secondary air injection, CUC (NH_3 catalyst), passive SCR, LNT	

Diesel		
Short name	Technologies integrated	Configuration
D1 – MHEV P0 Euro 7 opt	Mild hybrid, advanced heating calibration, larger EATS	
D2 – MHEV P0 Euro 7 opt e-cat	Mild hybrid, advanced heating calibration, larger EATS, EHC	
D3 – MHEV P0 Euro 7 opt e-cat preheating	Mild hybrid, advanced heating calibration, larger EATS, EHC, preheating, secondary air injection	
D4 – PHEV P2 Euro 7 opt	Plugin hybrid, advanced heating calibration, larger EATS	
D5 – PHEV P2 Euro 7 opt e-cat	Plugin hybrid, advanced heating calibration, larger EATS, EHC, turbine bypass	

emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation

Exhaust Emission factors

EFs calculation overview

$$Ep,j,x = Nj,x \times Mj,x \times EFp,j,x$$

- E = Total annual emissions
- N = No of vehicles in operation
- M = Annual mileage per vehicle
- EF = Estimated emission factor in g/km
- p= Pollutant (AP & GHG)
- j= Vehicle category
- x = Year of calculation

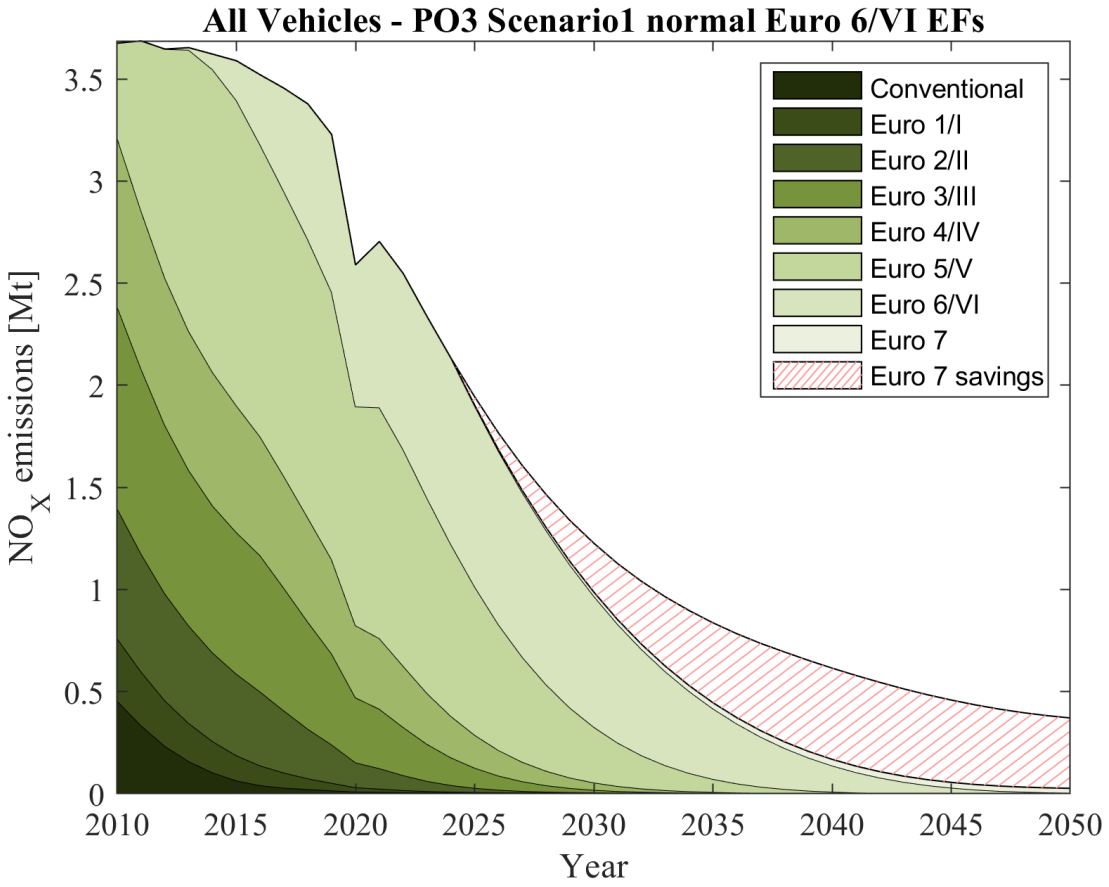
$$EF = \left[(w_1 \cdot EF_{hot\ RDE} + w_2 \cdot EF_{hot\ nonRDE}) \cdot DF(M) + w_1 \cdot EF_{cold\ RDE} + w_2 \cdot EF_{cold\ nonRDE)}\right] \cdot (1 - Tamp.share) + (w_1 \cdot EF_{hot\ RDE} + w_2 \cdot EF_{hot\ nonRDE}) \cdot (Tamp.share) \cdot (Tamp.rate)$$

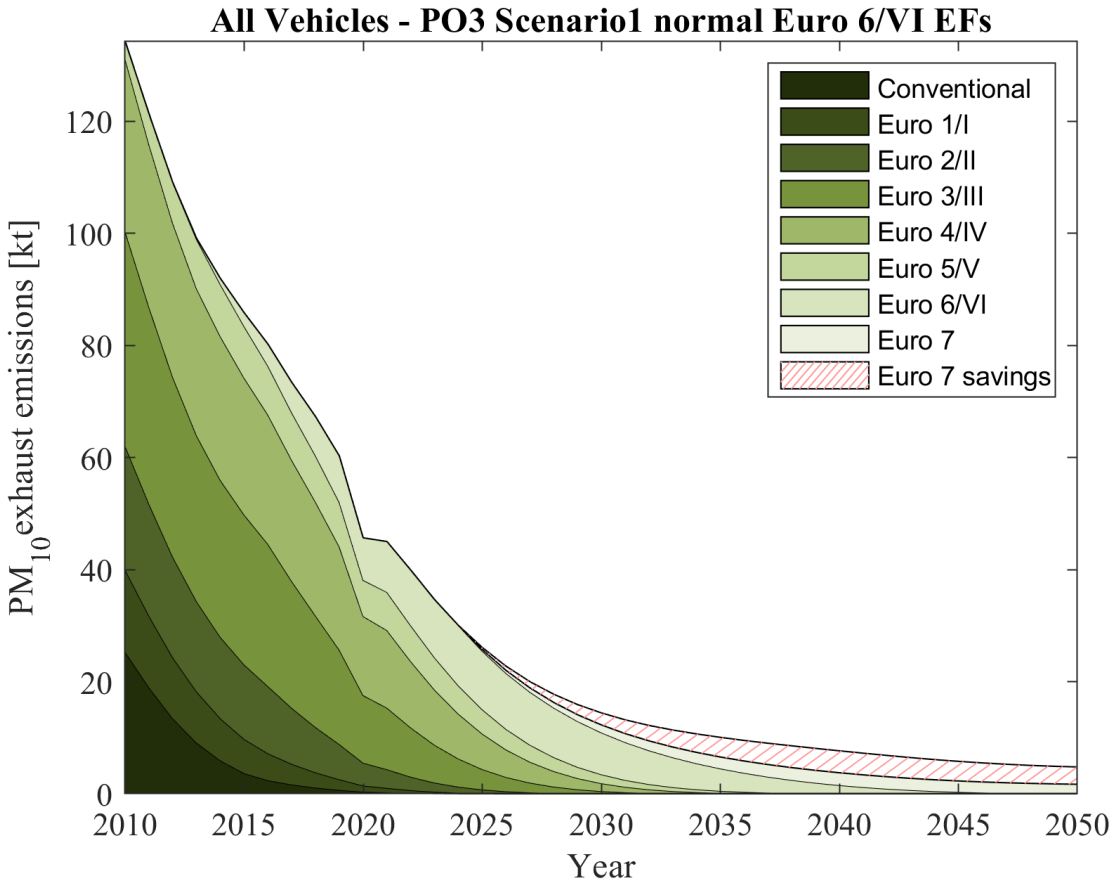
- $\mathbf{w_1}$: fraction of mileage to RDE conditions
- $\mathbf{w_2}$: fraction of mileage to non RDE conditions (w_1+w_2=1)
- $\mathbf{EF_{hot\ RDE}}$: hot mean emission level over RDE driving
- $\mathbf{EF_{hotnonRDE}}$: hot mean emission level outside of RDE (incl. AES)
- $\mathbf{EF_{coldRDE}}$: cold mean **excess** emission level over RDE driving
- $\mathbf{EF_{coldnonRDE}}$: cold mean **excess** emission level outside of RDE (incl. AES)
- $\mathbf{DF(M)}$: deterioration factor of emissions at mean fleet mileage (M) RDE
- $\mathbf{Tamp.share}$: % of tampered vehicles
- $\mathbf{Tamp.rate}$: tampering emission rate (increase of emissions on tampered compared to not-tampered vehicles)

emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation

Euro 7 environmental benefits





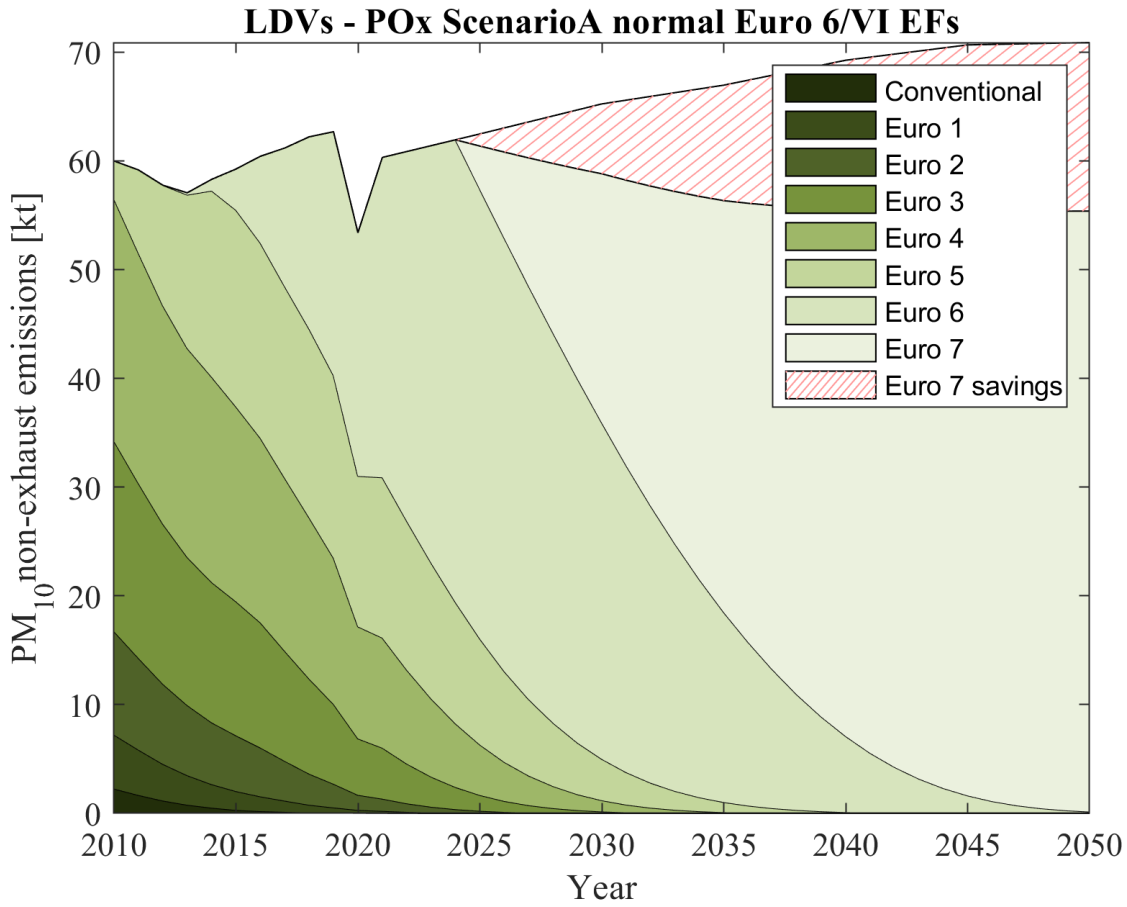
emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation

Non-Exhaust Emission factors

Technologies for non-exhaust emission controls

- Break wear for LDVs:
  - NAO pads instead of LS
  - NAO pads instead of LS & collection devices of brake wear particles
- Better control of fuel evaporation emissions
  - Increased canister capacity



emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation

Thank you!

emisia
CONSCIOUS OF TRANSPORT'S IMPACT

European Environment Agency
European Topic Centre
Climate change mitigation