Foresight on future fleet developments and impacts on CO_2 emissions

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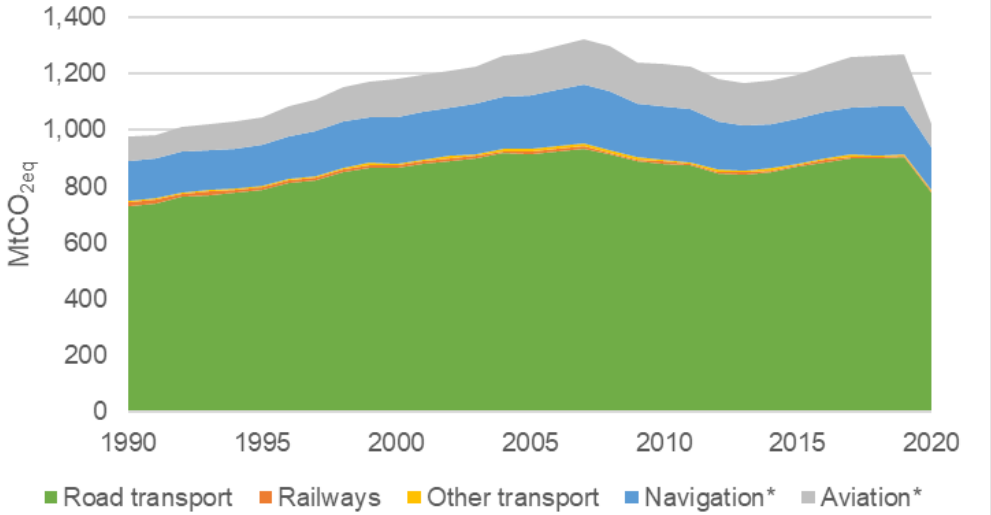
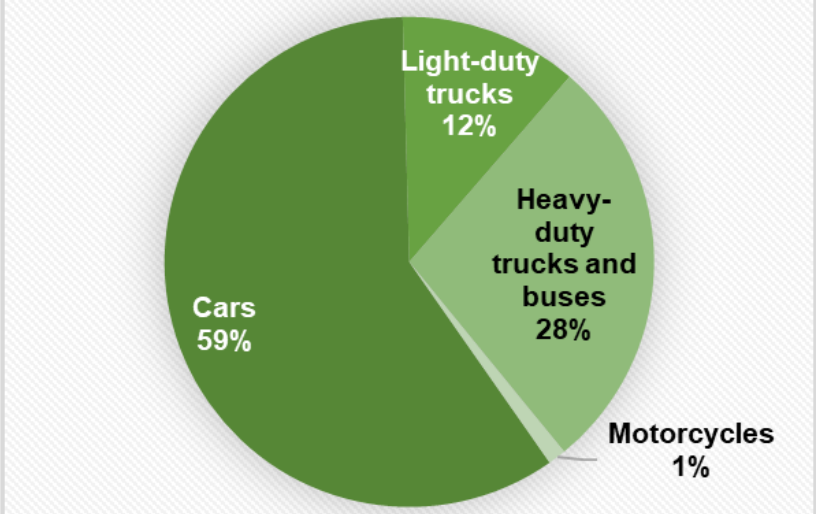
Disclaimer

“The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission”

Historical transport emissions





*Domestic+International. Source: adapted from UNFCCC (2022)

Objective:
"*The transformation of the entire transport sector towards zero emissions needs to be accelerated*" (EU, 2019)

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Previous work

- Conclusions and recommendations from ‘Fleet and Fuel Scenarios for 2050 Carbon Neutral Road Transport in the EU’ (ERMES, 2021):
  - “The complete and robust carbon-neutrality of road transport could be achieved with a mix of technologies”
  - “Enable fleet mix change by:
    - Improving powertrain technology: cost, range, functionality, …
    - Adapting infrastructure technology and concepts”
- “Resources will not be able to sustain simultaneous mass electrification of both the LDV and HDV segments” (Hao *et al.* (2019), p. 4)

On foresight

Foresight on future CO_2 impacts from vehicle fleets involves the exploration of changes over time in powertrain technology, policy, economic and other behavioural aspects

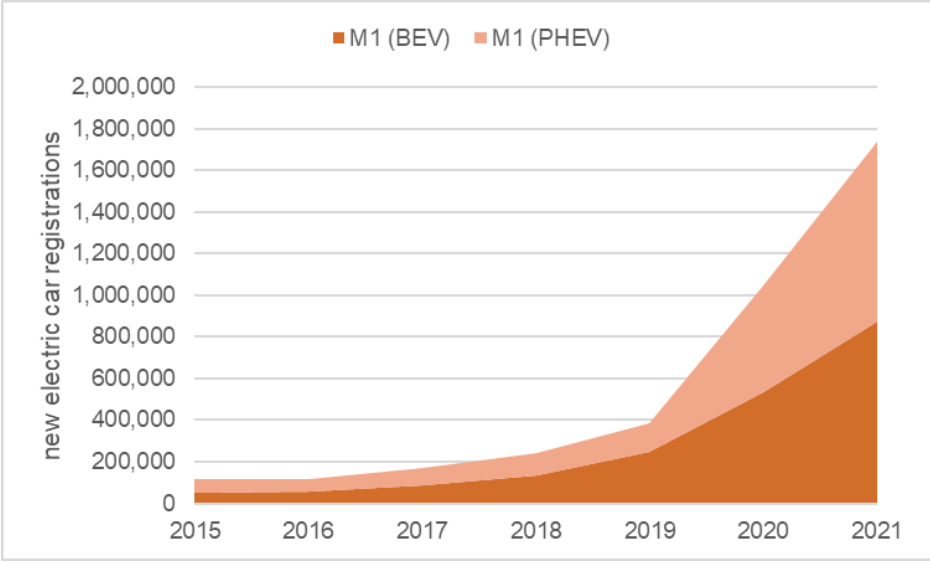
Since transport is a complex system, modelling this is a challenge

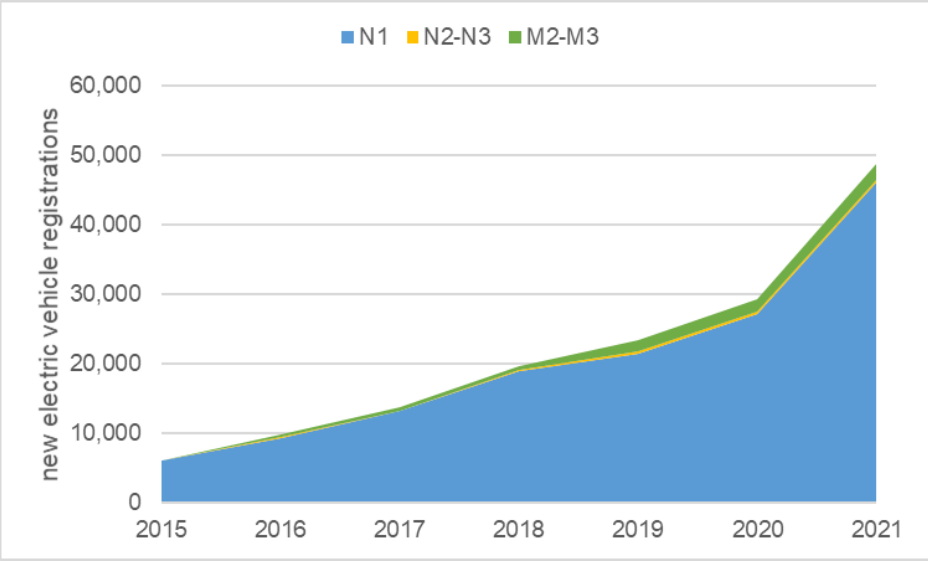
Reliance on simulation and scenario-based approach

Bearing in mind:

- Unknown future → Focus on anticipatory knowledge
- Role of agents' expectations and the possibility of self-fulfilling prophecies in social systems

New vehicle registrations (EU27)





Source: adapted from EAFO (2022)

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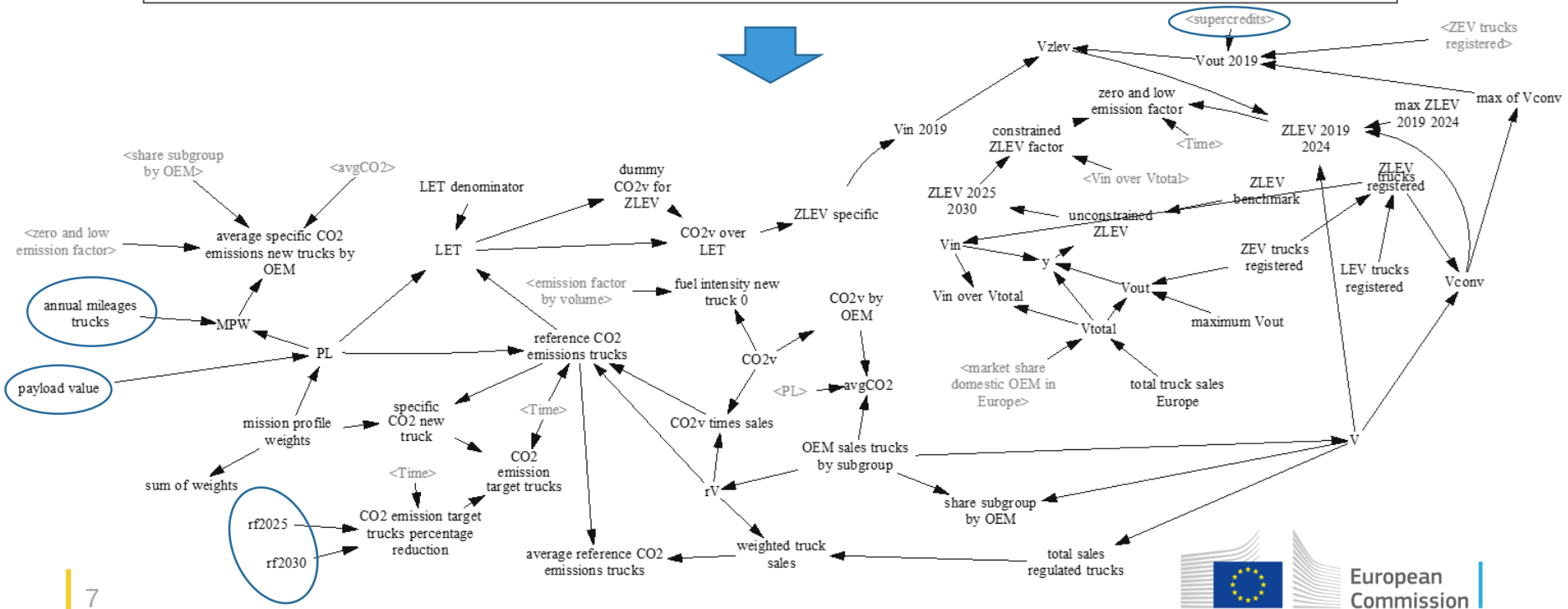
Model-based policy analysis

L 198/202 EN Official Journal of the European Union 25.7.2019

REGULATION (EU) 2019/1242 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 20 June 2019

setting CO_2 emission performance standards for new heavy-duty vehicles and amending Regulations (EC) No 595/2009 and (EU) 2018/956 of the European Parliament and of the Council and Council Directive 96/53/EC



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Zero emission (tailpipe) trucks

26 t
185 kWh

27 t
200-265 kWh

27 t
82 kWh

40 t (?)
70 kWh

19 t
336 kWh

19 t
282 kWh

29-37 t
350 kWh

27 t
56 kWh

27 t
448 kWh

29 t
300 kWh

40-44 t
540 kWh

18-34 t
120 kWh

19-36 t
73.2 kWh

37 t (?)
753 kWh

Source: adapted from OEM websites. See also EC (2020)

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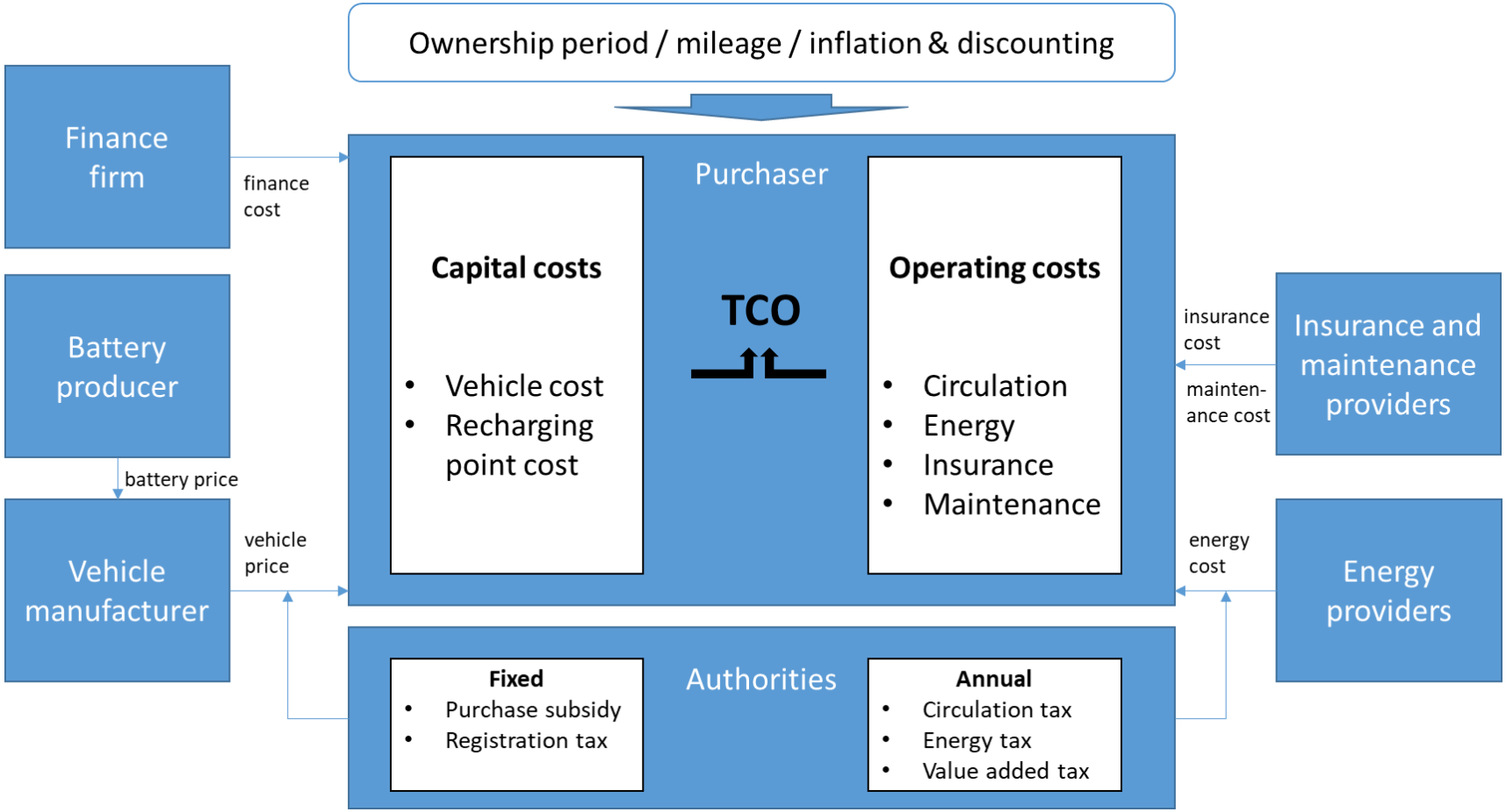
Total cost of ownership (TCO) module



Source: own work (under review)

Financial incentives

- Annual circulation/road tax/toll exemption: BE (Flanders), DE (exemptions for HCVs powered by electricity, hydrogen or natural gas in the toll scheme), HU, NL.
- Annual circulation/road tax/toll incentive or reduction: IE (in the process of adoption for HCVs powered by electricity, CNG, LNG or hydrogen), SK (50% reduction for hybrid, CNG, LNG and hydrogen vehicles).
- Free parking or discounts: FR (green disk for AFVs), RO (12 of the 41 administrative territorial units).
- Purchase grant/incentive/premium/subsidy for AFVs: ES (for LPG and natural gas (CNG, LNG) vehicles), IE (≤30% of the cost differential; in the process of adoption for HCVs powered by CNG or LNG), MT, PL (≤30% of the purchase cost for CNG/LNG M1, M2, N1-N3, L), RO (under consideration for CNG, LNG), SI (€4,500 for N1).
- Purchase grant/incentive/premium/subsidy for ZEVs: BE (Flanders), DE, ES, IE (≤30% of the cost differential; in the process of adoption for HCVs), LU (EVs and FCEVs), PL (≤30% of the purchase cost for M1, M2, N1-N3, L), RO (besides in place for EVs, under consideration also for hydrogen), UK (for vans and trucks).
- Bonus/malus or feebate system: FR, SE (covering also LCVs; HCVs included as procurement aid).
- Other tax reductions or exemptions: MT, PL, PT (depending on vehicle/fuel), FI (depending on fuel).
- Replacement of old/polluting vehicle: BE (for N1 in Brussels-Capital), IT (for old HCVs being replaced by new ones powered by electricity, CNG or LNG).
- Scrappage scheme (with or without replacement): FR, FI, MT, RO.
- Tax allowance scheme/concession/incentives/relief (including accelerated depreciation): AT (for CNG and hydrogen), FR (accelerated depreciation for HCVs powered by electricity, ethanol, hydrogen or natural gas), HU, IE (accelerated capital allowance support scheme regarding corporate tax when purchasing electric and CNG vehicles and related infrastructure; under consideration for hydrogen), LU, NL (environmental investment deduction allowance applicable also to LCVs and lower income tax liability for business users), SE (benefit in kind tax reduction).
- Vehicle registration tax reduction or exemption: DK, LT, NL, PL, SK (50% reduction for hybrid, CNG, LNG and hydrogen vehicles), FI (depending on vehicle/fuel).

 See Gómez Vilchez *et al.* (2022)

Alternative fuels infrastructure

DIRECTIVE 2014/94/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 22 October 2014
on the deployment of alternative fuels infrastructure

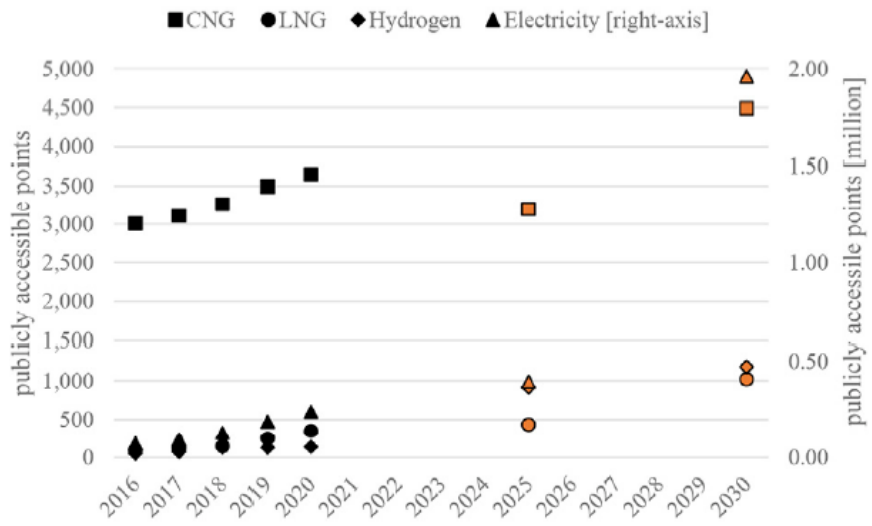


FIGURE 4
AFI deployment in EU27 + UK: historical data (2016–2020) and NIR targets (2025, 2030). Note: targets shown in orange, resulting from the sum of the available targets. Source: adapted from EC (2022), based on NIR and EAFO (2021) data.

11 See Gómez Vilchez *et al.* (2022)

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Model

https://ec.europa.eu/jrc/en/pttmam

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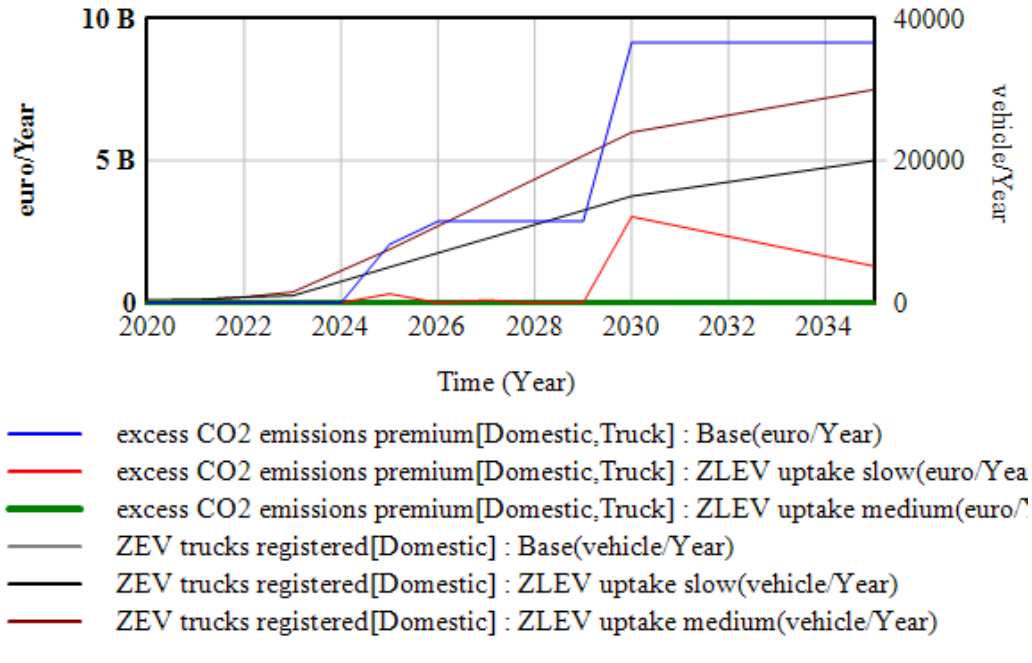
Selected results: registrations & CO_2



Source: own simulations using Vensim®

CO_2 emissions from new cars in first year of operation

CHART TO BE SHOWN DURING THE PRESENTATION (AS IT IS UNDER REVIEW)

PAX = Passenger occupancy. SUV = Sport utility vehicle.
Source: own work (under review)

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Selected results: fleet estimates

CHART TO BE SHOWN DURING THE PRESENTATION (AS IT IS UNDER REVIEW)

GD = Green Deal. NIR = National Implementation Report. SSMS = Sustainable and Smart Mobility Strategy.
Source: adapted from Chiara *et al.* (work under view)

Conclusions and outlook

- Two speeds of zero-emission vehicle uptake
- Regulations in place provide strong incentives but their future impact remain uncertain
- Relatively strong economic support offered in many countries
- TCO calculation useful but not always relevant for decision-makers
- More effort needed to understand key drivers of change and their interlinkages
- Greater focus should be placed on supply-side constraints
- Use PTTMAM for analysing policies and their impacts

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Thank you

Slide 18: photos, source: OEM websites

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