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EVs and post 2020 CO₂ targets for passenger cars

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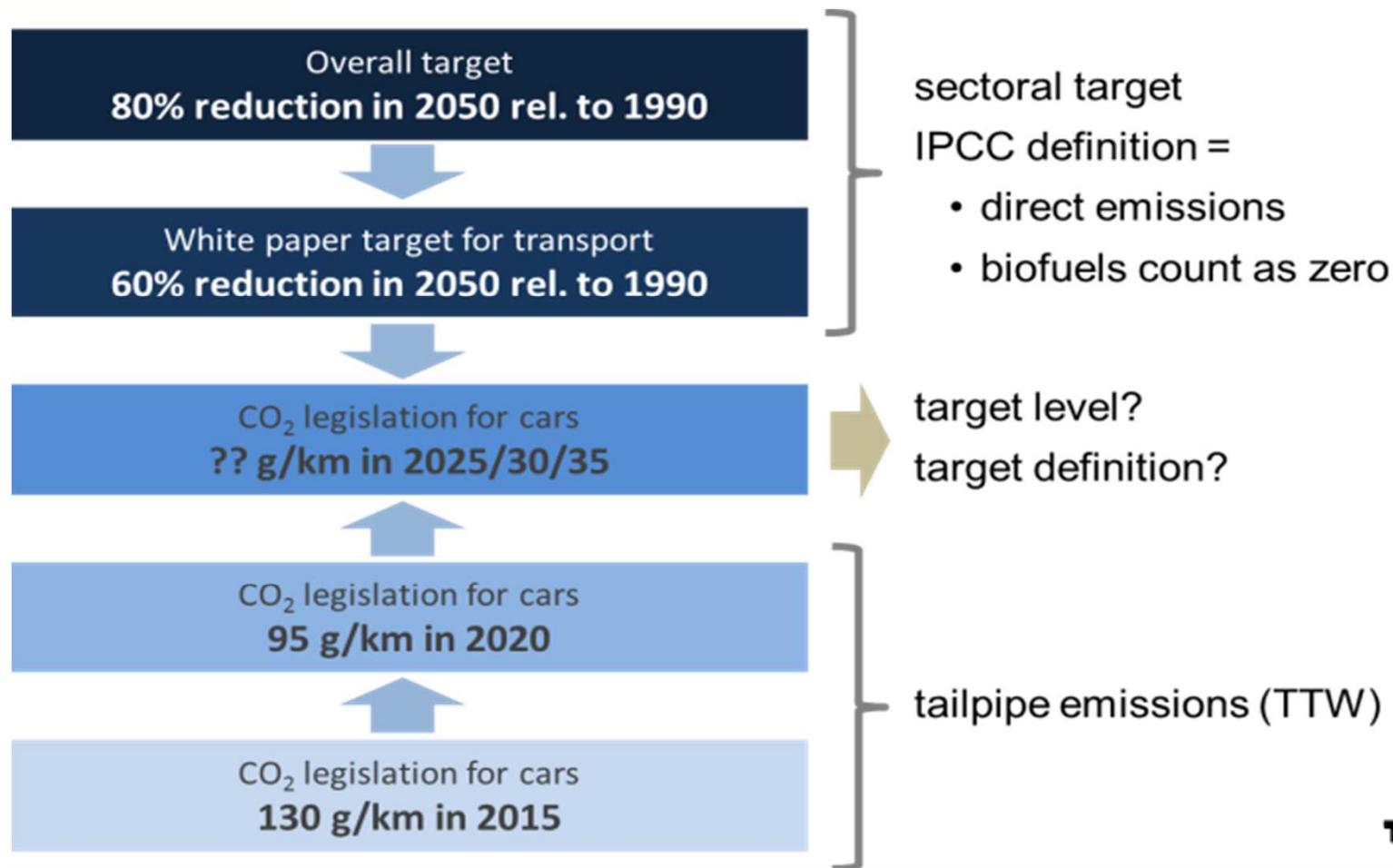


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CO₂ legislation for cars

A step towards meeting long term GHG emission targets



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Post 2020 targets

Important for momentum of the transition towards
large-scale application of (L)EVs

- 60% reduction of transport CO₂ emissions is expected to require significant share of (L)EVs
- 95 g/km in 2020 feasible without (L)EVs
- 70 g/km is lowest average that can be achieved with ICEVs on the basis of current market division and vehicle models
- What is necessary from the overall perspective of the European CO₂ emission reduction strategy?
 - What would help to realize ambitions w.r.t. role of (L)EVs?
 - Target level + definition

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Discussion about post 2020 targets For CO₂ regulation of passenger cars

- Target levels
 - informal proposal: 68 – 78 g/km for 2025
- Metric
 - TTW or WTW CO₂ (g/km)
 - TTW or WTW energy (MJ/km)
- Modalities
 - utility parameter: from mass to footprint?
 - shape of target function
 - mileage weighting
 - etc.

For this assessment a **TTW-based metric** is assumed, similar to current legislation.

Other modalities not relevant for this assessment

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How to motivate post-2020 target levels?

- Different approaches possible:
 - Extrapolation of annual reduction levels that are considered feasible, e.g. 3 or 5% p.a.
 - Bottom-up assessment of what is technically feasible in target year at acceptable costs
 - Will be done in the coming year
 - Top-down back-casting of the path along which vehicle target should develop in order to reach overall 60% target for 2050
 - Subject of this paper

Composition of new vehicle sales in 2035 must be similar to the overall fleet composition in 2050 required for meeting the target

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Top-down back-casting

The path along which vehicle target should develop in order to reach overall 60% target for 2050

- White Paper target of 60% is a sectoral target (IPCC rules)
 - EVs and FCEVs count as zero emission
 - biofuels count as zero emission
 - but have no effect under a TTW CO₂ target
 - WTT emissions are attributed to energy sector and agriculture
- Take into account that:
 - passenger cars may have to do more than 60%
 - volume of transport grows between 1990 and 2050
 - share of biofuels will change over time

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Back-of-the-envelope calculation Assumptions

- Average TA CO₂ value of fleet in 1990 is 180 g/km
- New cars in 2035 must have same average CO₂ emission as entire fleet must reach in 2050
 - linear interpolation between 2020 target and required 2035 value
- TTW targets under 70 g/km can only be reached with a finite share of (L)EVs
 - for simplicity calculation for EVs only

Back-of-the-envelope calculation Scenario variants

- Scenario variants:
 - Overall CO₂ reduction target passenger cars: 60%, 70%, 80%
 - Passenger cars may need to do more than 60% to compensate for smaller potential in other subsectors
 - Share of biofuels in 2050: 0%, 40%
 - Note: consumption of fuels in 2050 is very low, so high share of biofuels may still not be (much) more than present use
 - Mobility growth up to 2050
 - Reference scenario on basis of data from White Paper scenario
 - Scenario variants based on literature

Example calculation

- Average fleet emissions to be reached in 2050 in function of the reduction target and the assumed growth in traffic volume

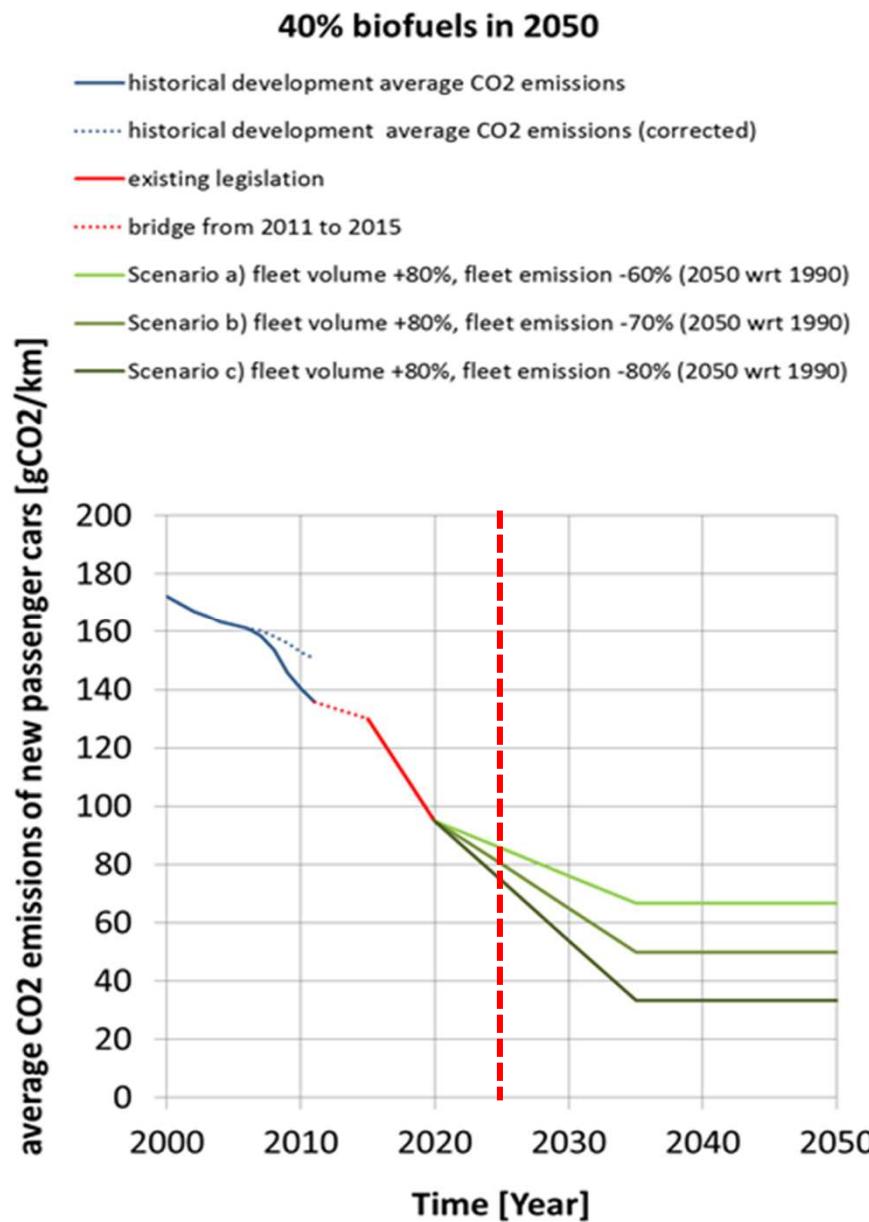
Fleet average CO ₂ emissions (IPCC)	Volume of pass. car transport	Fleet average CO ₂ emissions (IPCC)
[g/km]	[vkm]	[g/km]
1990	180	1
change	-60%	+80%
2050	72	1.8

Example calculation

- Required share of EVs to meet the target for 2050 in the scenario assessed in previous slide, for two different assumed shares of biofuels

Fleet average CO ₂ emission in 2050 (IPCC)	ICEVs TA CO ₂ (TTW)	Biofuels share	ICEVs IPCC CO ₂	ICEVs share	EVs share
[g/km]	[g/km]	[%]	[g/km]	[%]	[%]
40	70	0%	70	57%	43%
40	70	40%	42	95%	5%

40% biofuels for ICEVs



40% biofuels in 2050

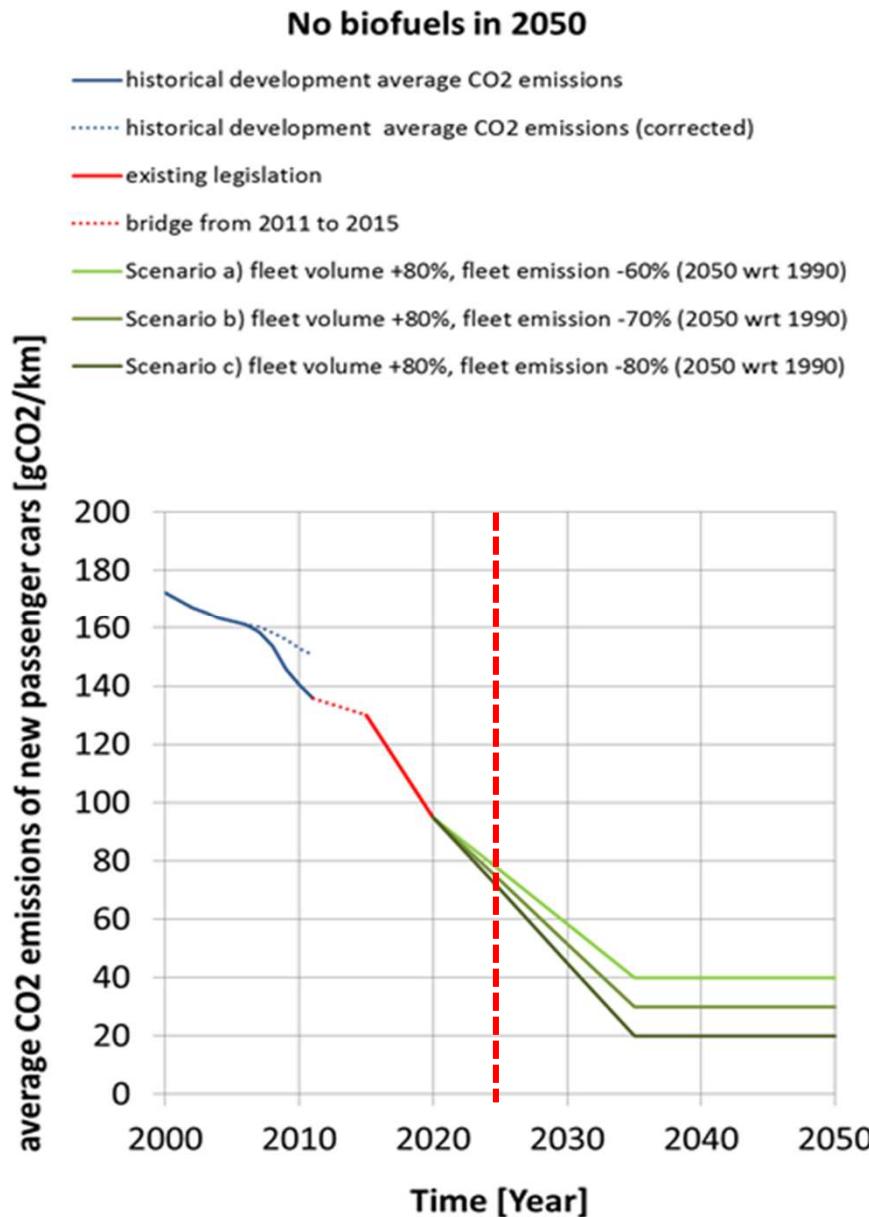
Scenario	Fleet average IPCC CO ₂ emission 1990	reduction of pass. car CO ₂ emissions 2050 - 1990	Pass. car traffic volume growth 2050 - 1990	Fleet average TTW CO ₂ emission 2050
[#]	[g/km]	[%]	[%]	[g/km]
a)	180	-60%	+80%	66.7
b)	180	-70%	+80%	50.0
c)	180	-80%	+80%	33.3

40% biofuels in 2050

Scenario	EVs share 2050	TA CO ₂ target (TTW)			
		2025	2030	2035	
[#]	[%]	[g/km]	[g/km]	[g/km]	
a)	5%	86	76	67	
b)	29%	80	65	50	
c)	52%	74	54	33	

- Combination of 60% target and 40% biofuels share leads to negligible required EV share in 2050

No biofuels for ICEVs



0% biofuels in 2050

Scenario	Fleet average IPCC CO ₂ emission	reduction of pass. car CO ₂ emissions	Pass. car traffic volume growth	Fleet average TTW CO ₂ emission
	1990	2050 - 1990	2050 - 1990	2050
[#]	[g/km]	[%]	[%]	[g/km]
a)	180	-60%	+80%	40
b)	180	-70%	+80%	30
c)	180	-80%	+80%	20

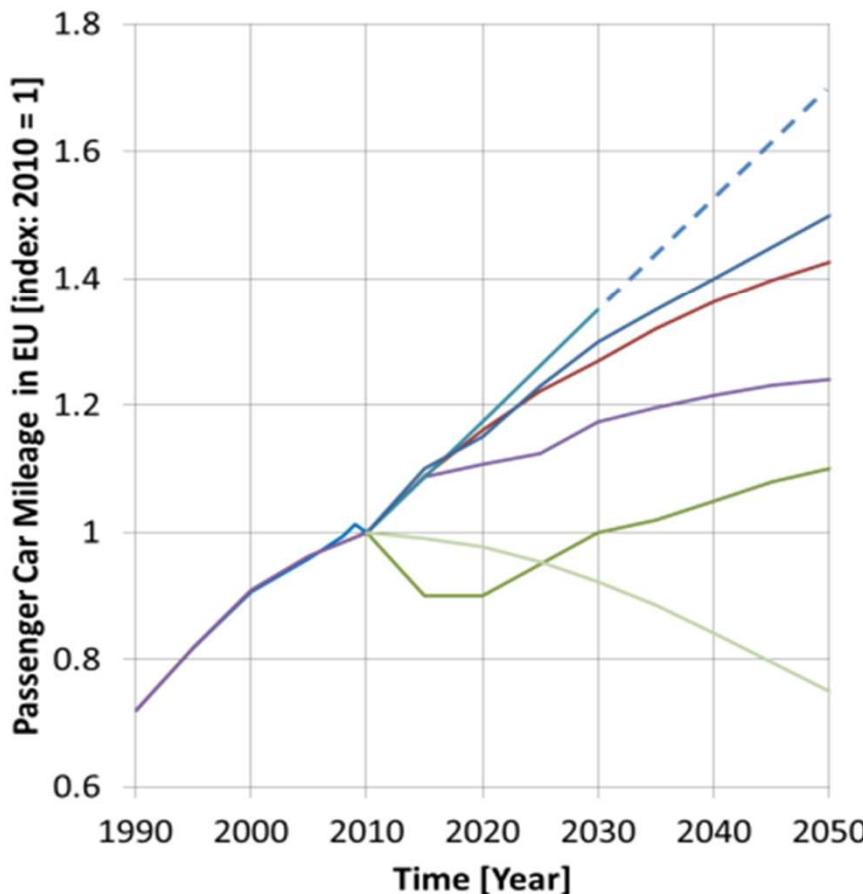
0% biofuels in 2050

Scenario	EVs share	TA CO ₂ target (TTW)			
		2050	2025	2030	2035
[#]	[%]	[g/km]	[g/km]	[g/km]	[g/km]
a)	43%	77	58	40	
b)	57%	73	52	30	
c)	71%	70	45	20	

- Without biofuels a large EV share is needed to meet 2050 target

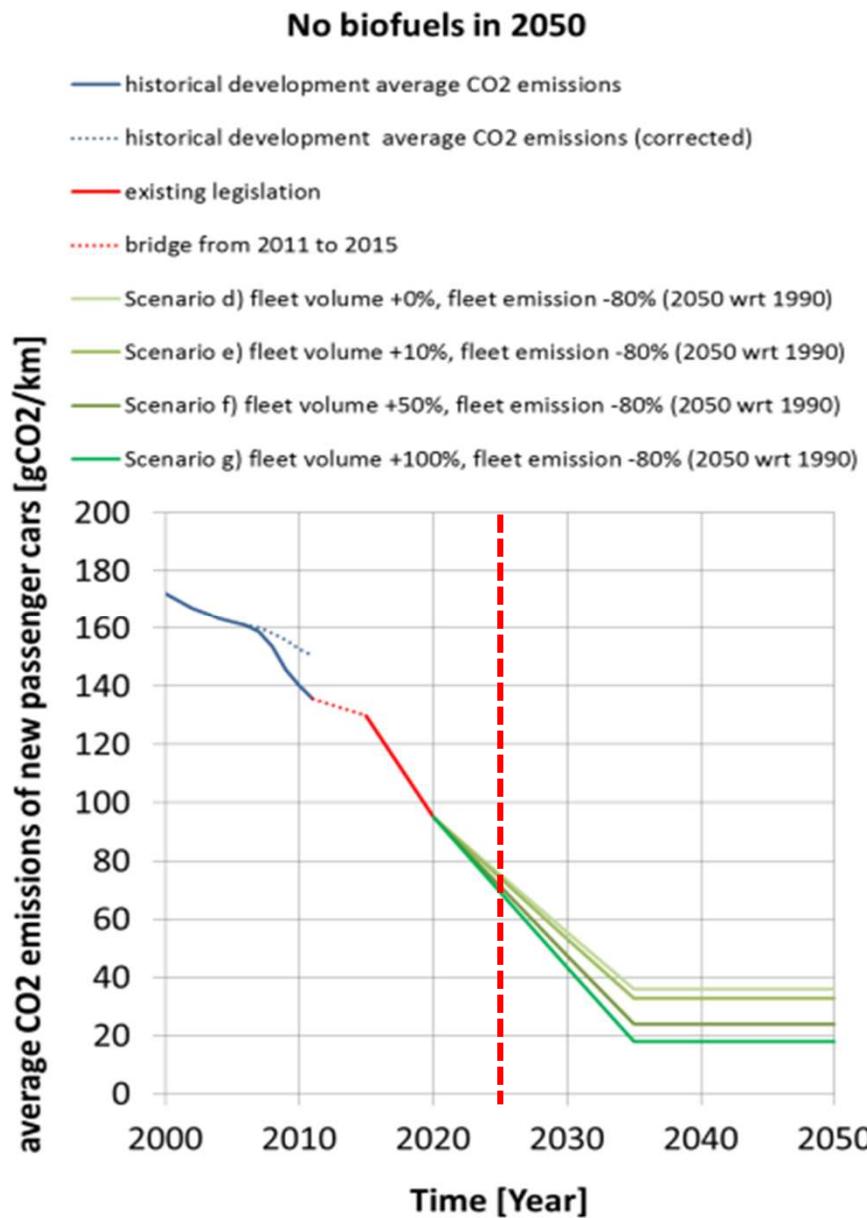
Growth scenarios: passenger car mileage EU

- historical development passenger car mileage in EU [9]
- EU-Roadmap: Reference scenario with low world energy prices [9]
- EU-Roadmap: Energy efficiency scenario [9]
- TREMOVE: Reference scenario [10]
- ITF Transport Outlook: high car ownership, high GDP [11]
- ITF Transport Outlook: low car ownership, low GDP [11]
- Peak car scenario [12]



- Various scenarios from literature
 - incl. a “peak car” scenario
- Sensitivity assessed under assumption that passenger cars need to reduce 80% in 2050 relative to 1990

Scenario variation: volume



0% biofuels in 2050

Scenario	Fleet average IPCC CO ₂ emission	reduction of pass. car CO ₂ emissions	Pass. car traffic volume growth	Fleet average TTW CO ₂ emission
[#]	[g/km]	[%]	[%]	[g/km]
1990	2050 - 1990	2050 - 1990	2050	
d)	180	-80%	0%	36
e)	180	-80%	+10%	33
f)	180	-80%	+50%	24
g)	180	-80%	+100%	18

0% biofuels in 2050

Scenario	EVs share	TA CO ₂ target (TTW)			
		2050	2025	2030	2035
[#]	[%]	[g/km]	[g/km]	[g/km]	[g/km]
d)	49%	75	56	36	
e)	53%	74	53	33	
f)	66%	71	48	24	
g)	74%	69	44	18	

- Even with 40% biofuels the “peak car” scenario would still require 14% EVs to achieve 80% reduction

Conclusions

- EVs and other LEVs such as PHEVs and FCEVs can be expected to play a prominent role in achieving the long term CO₂ reduction goal for transport
 - **0% biofuels:** LEV share of 40 to 70% necessary in 2050 to reduce the direct emissions of passenger car fleet by 60 to 80% compared to 1990
 - **40% biofuels:** 60% reduction in 2050 feasible with a **limited share of LEVs** and a 2030 target of 70 g/km
- Required intermediate target levels strongly depend on:
 - assumed growth in vehicle kilometres between 1990 and 2050
 - extent to which >60% reduction in passenger cars is necessary
- 60% target for transport sector does not automatically put sufficient pressure on the system to reach other goals of White Paper wrt phasing out of conventional vehicles in cities
 - E.g. “Halve the use of ‘conventionally-fuelled’ cars in urban transport by 2030; phase them out in cities by 2050”

Conclusions

- Proper choice of post-2020 targets under the CO₂ regulation for passenger cars can be a powerful instrument to:
 - motivate manufacturers to continue their efforts in marketing and further development of (L)EVs in the coming decade
 - pull EVs through the “valley of death”
 - support the transition towards longer term sustainable mobility system
- A 2025 CO₂ target of at most 70 g/km, and a significantly lower target for 2030 should be announced as early as possible

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