

Health Effects of Traffic-Related Air Pollution in a Changing Transportation Landscape

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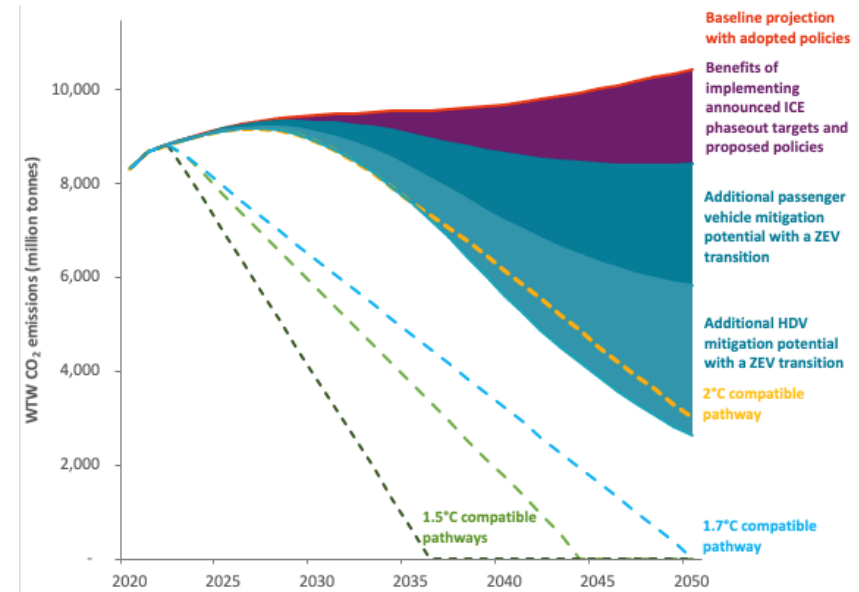
May 1, 2023

The pathway to keep global on-road transport “well below” a 2°C emissions trajectory is challenging but continues to strengthen.

- Implementing announced ICE phaseout targets and proposed policies could peak global road transport CO₂ emissions in 2030.
- If more countries align policies with 100% LDV and HDV EV sales by 2035 and 2040 – along with consistent interim targets – we can achieve a below 2°C emissions trajectory.
- Reducing the gap with a 1.5°C trajectory will require additional “avoid and shift” policies and other measures.

Reference: *Update on the global zero-emission vehicle transition in 2023*, ICCT, in press.

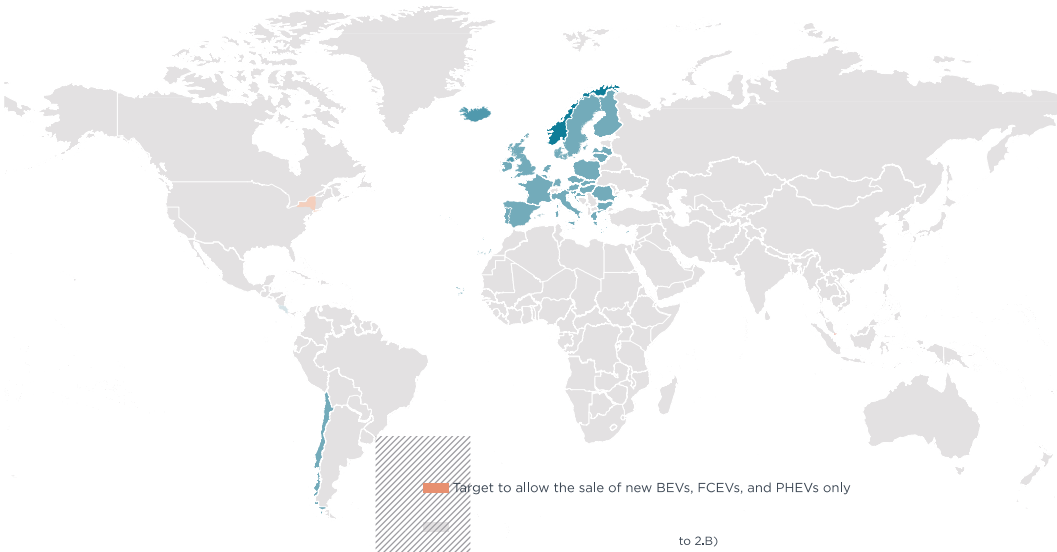
Global WTW CO₂ emissions from road transport



Global WTW CO₂ emissions from road transport compared to 1.5°C and 2°C compatible emissions pathways

Countries with ICE phaseout targets by 2035 now cover 1 in 4 new car and van sales worldwide

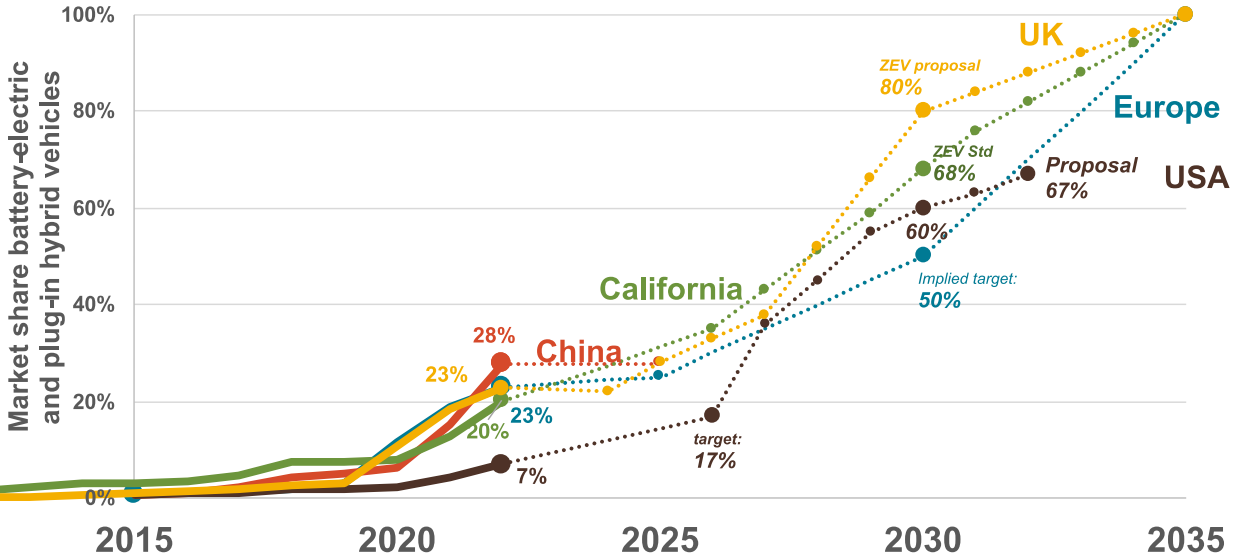
Governments with official targets to 100% phase out sales of new internal combustion engine cars and vans/light trucks by a certain date* (Status: Through November 2022)



- Not represented on the map are countries with ZEV targets at less than 100%, including US and China that together account for more than 40% of the global car market.
- Only official government targets are included in this map: unofficial targets (including some COP26 announcements) are not included here
- On the HDV side: 9 governments have official targets for ICE bus phase out dates and 5 for ICE truck phase out dates

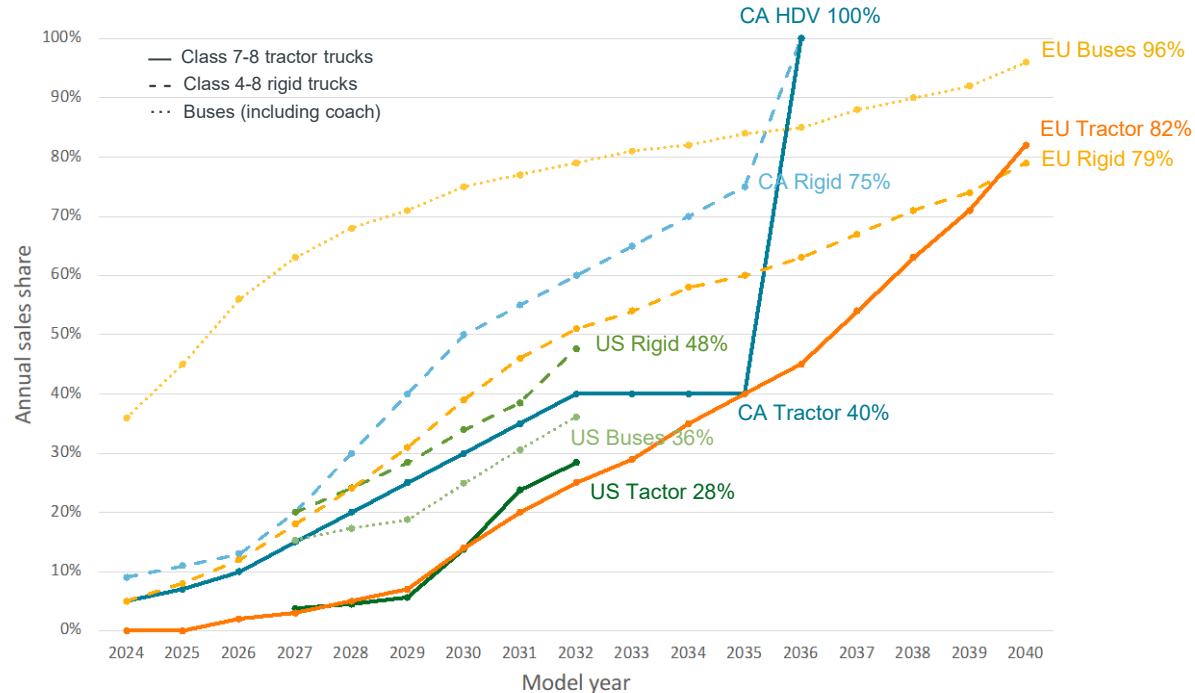
Major markets are adopting policies to require 100% electrification for passenger cars in 2035 with a range of interim targets

National policies include internal combustion vehicle phase out targets, fiscal incentives, fuel economy / CO2 standards, ZEV sales requirements.



Regulations promoting HD ZEV adoption are in early stages, but gaining some momentum

- CA 2020 Advanced Clean Truck rule requires phase-in of HD ZEV sales across all market segments, and the Advanced Clean Fleets rule includes 100% ZEV sales target for 2036 for HDVs over 85,000 lbs.
- EU proposed HDV CO₂ standard has a 100% zero-emission sales target for city buses by 2030 and 90% CO₂ reduction target for trucks by 2040.
- US proposed GHG emission standards for HDVs Phase 3 indicates projected ZEV adoption rates for MYs 2027-2032 technology packages



Reference: *Europe's new heavy-duty CO₂ standards, explained*, ICCT, Feb 2023,

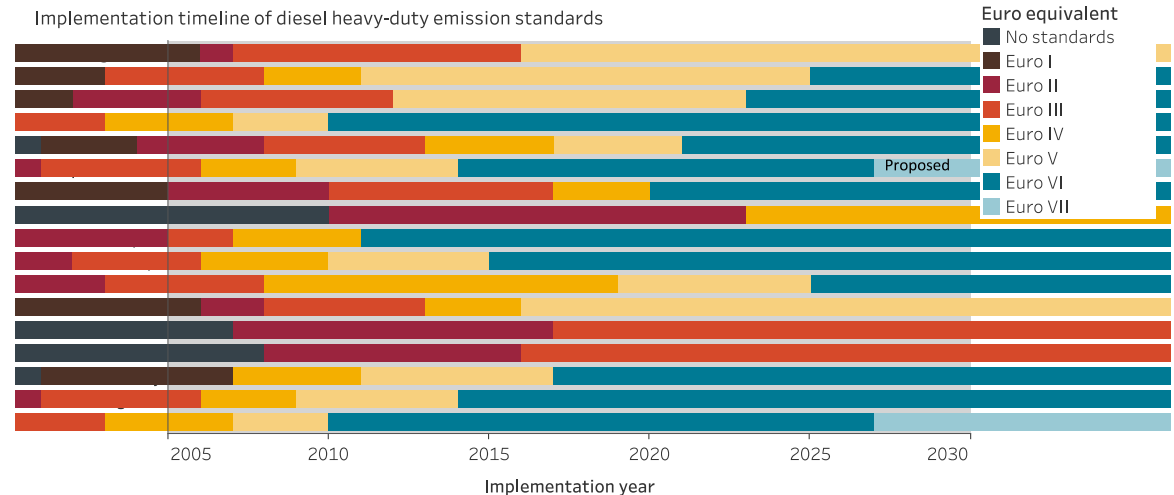
California's Advanced Clean Trucks regulation: Sales requirements for zero-emission heavy-duty trucks, ICCT, Jul 2020

EU numbers estimated based on a constant energy efficiency improvement of 3% every year for all fossil fueled ICE vehicles until the max technical efficiency was reached. Estimates include unregulated vehicles but most have a negligible impact on emissions.

Emission standards for new diesel HDVs continue to develop

- Most major economies have implemented or adopted Euro VI.
- US and Europe are implementing Euro VII or ultra-low standards
- Fuel quality can still be a major barrier in some countries.

Implementation year (all sales and registration) of heavy-duty diesel engine emission standards in major economies (only G20 shown here).



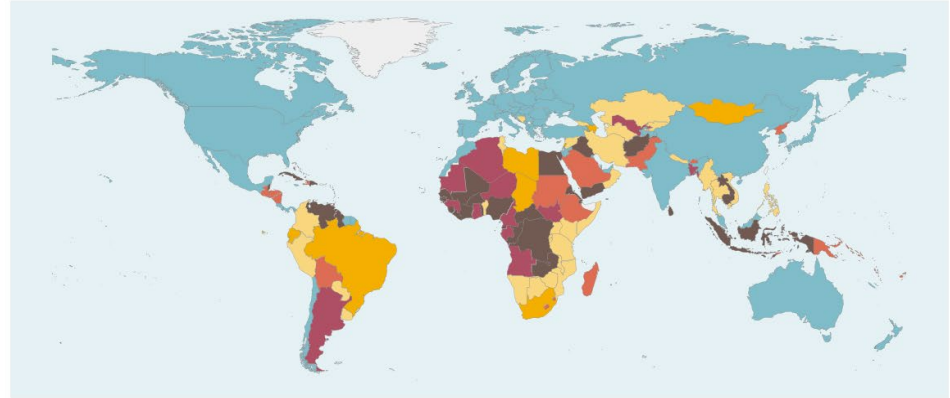
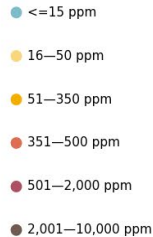
- Reference: https://theicct.org/wp-content/uploads/2021/12/g20-hdv-impacts-jul2021_0.pdf
- South Africa is at Euro II, but performance of new vehicles is estimated to be closer to Euro III for trucks and Euro IV for buses. Source: [Xie et al](#) (2022).

Low sulfur fuel and cleaner emission standards are yet to be adopted in some countries

- Regions with highest fuel sulfur levels:
 - North, West, and Central Africa
 - West, Central, and Southeast Asia
 - Central and South America
- ≤ 15 ppm is needed for Euro 6/VI and above, 10ppm for optimal performance

Estimated average diesel sulfur content in 2022, in parts per million
Source: ICCT internal database and Stratas Advisors (2022)

Estimated average diesel sulfur content in 2022

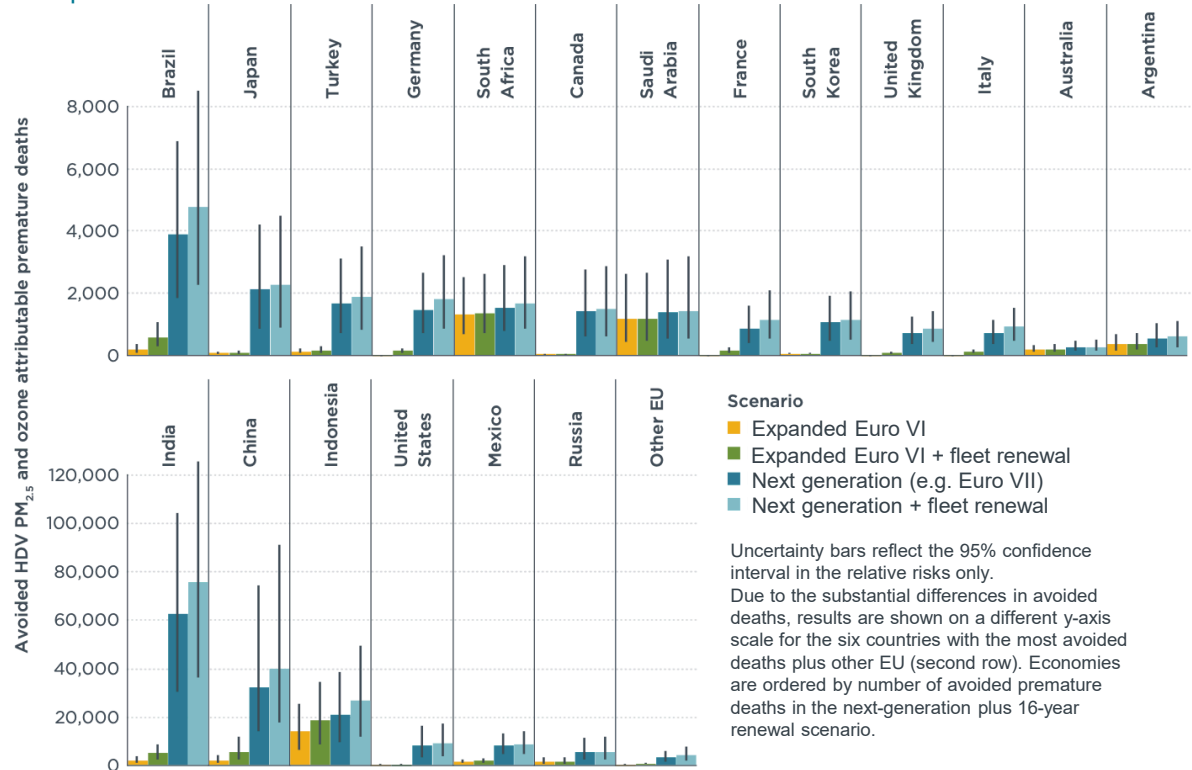


Cleaner emission standards for new and in-use diesel HDVs would achieve major health benefits

- Implementing Euro VI in all G20 countries by 2025, coupled with accelerated fleet renewal, is expected to avoid 37,000 premature deaths in 2040.
- Implementing Euro VII equivalents by 2030 combined with accelerated fleet renewal is expected to avoid 189,000 premature deaths in 2040.
- Cumulatively avoided premature deaths from 2020 to 2050 would total more than 1 million and 4 million respectively for these two measures above.

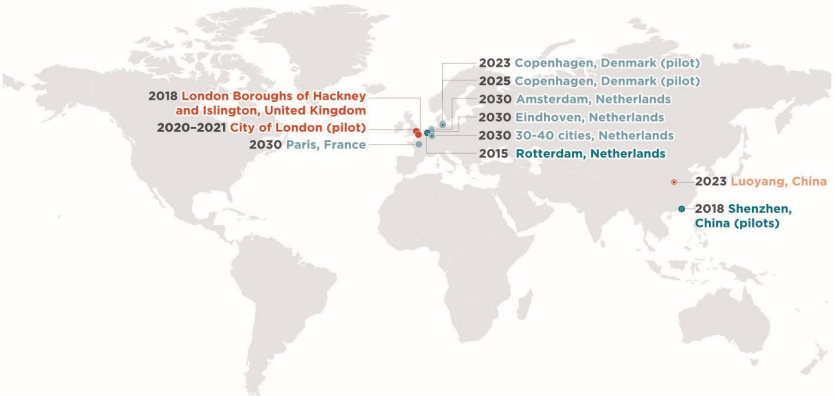
Reference: *Air quality and health impacts of heavy-duty vehicles in G20 economies*, ICCT, Jul 2021

Avoided PM_{2.5} and ozone deaths attributable to diesel HDV emissions in 2040 compared with adopted policies in G20 economies.



Cities are taking action to support the ZEV transition

Cities with implemented and planned zero-emission zones and variants globally* (Status: Through July 2022)



	Zero-emission zone (ZEZ) to allow BEVs and FCEVs only	Near-zero-emission zone (near-ZEZ) to allow BEVs, FCEVs, and PHEVs only
Implemented	—	●
Planned	●	—

Applies to all motorized vehicles

	Zero-emission zone for freight (ZEZ-F) to allow BEVs and FCEVs only	Near-zero-emission zone for freight (near-ZEZ-F) to allow BEVs, FCEVs, and PHEVs only
Implemented	●	—
Planned	●	●

Applies to freight vehicles only (e.g., urban delivery vehicles and trucks)

*For planned ZEZs and near-ZEZs, the dates displayed are the dates when all vehicle types would need to be battery electric vehicles (BEVs), fuel cell electric vehicles (FCEVs), or plug-in hybrid electric vehicles (PHEVs). Affected areas of zones range from a single street to an entire city or metropolitan area.

Vehicle restrictions as well as other measures are gaining traction in cities. Dutch cities lead in planning zero-emission zones, followed by Denmark, United Kingdom and France.

Top 25 EV metro areas

- 32% of global EV sales (2020)
- 13% of global vehicle sales
- 4% of the world’s population

ZEZs are regulated areas that only allow access to zero tailpipe emission vehicles (BEVs and FCEVs), pedestrians, and cyclists.

Only battery-electric and hydrogen fuel cell vehicles have the potential to achieve near-zero GHG emissions

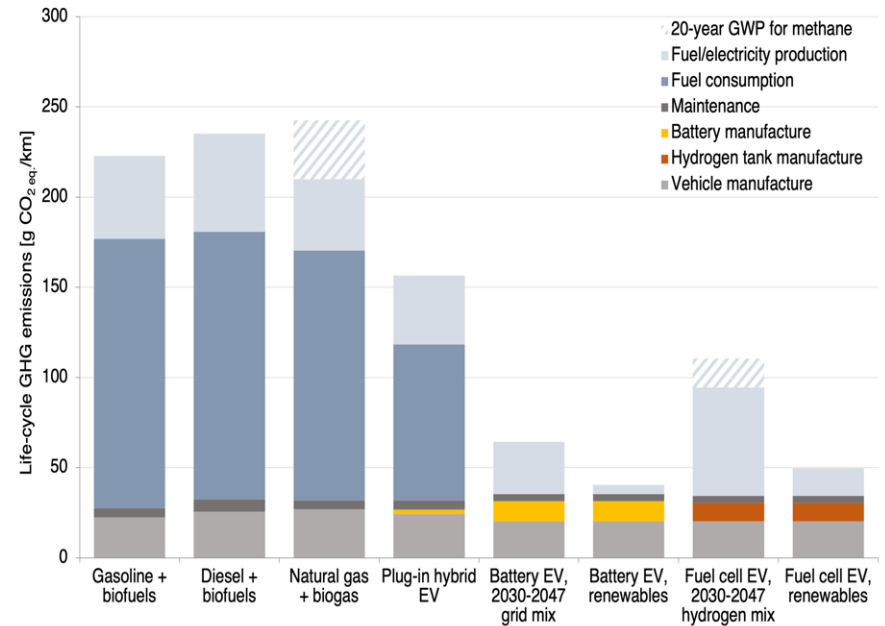
There is no realistic pathway to fully decarbonize the internal combustion engine.

- Current biofuels have relatively high GHG emissions and minor growth potential due to limited feedstock.
- Methane's modest GHG reductions at tailpipe are offset by upstream leakage.
- Hybrid and plug-in hybrids achieve near-term gains but do not offer long-term zero-emission potential.
- E-fuels offer near-zero carbon emissions, but cost parity to fossil fuels only by 2050 in best case.

Even today, EVs have by far the lowest lifetime GHG emissions compared to all other technologies.

As electric power becomes lower carbon, GHG emissions from electric vehicles will decline further.

Lifecycle GHG emissions for typical passenger car sold in 2030



Our analysis shows net air quality and health benefits from vehicle electrification in India even with no new grid policies

- Vehicle electrification leads to net air quality and health benefits in India even when assuming no new policies to decarbonize or tighten grid emissions (REF).
- A greater number of premature deaths could be avoided with the adoption of stringent power sector emission control (IEC), stronger decarbonization policies (CP), and ideally both (COM).



Thank you

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