



75
आज़ादी का
अमृत महोत्सव



GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS



FUEL AND POWER TRAIN TECHNOLOGIES FOR INDIA'S NET-ZERO TARGET

icct

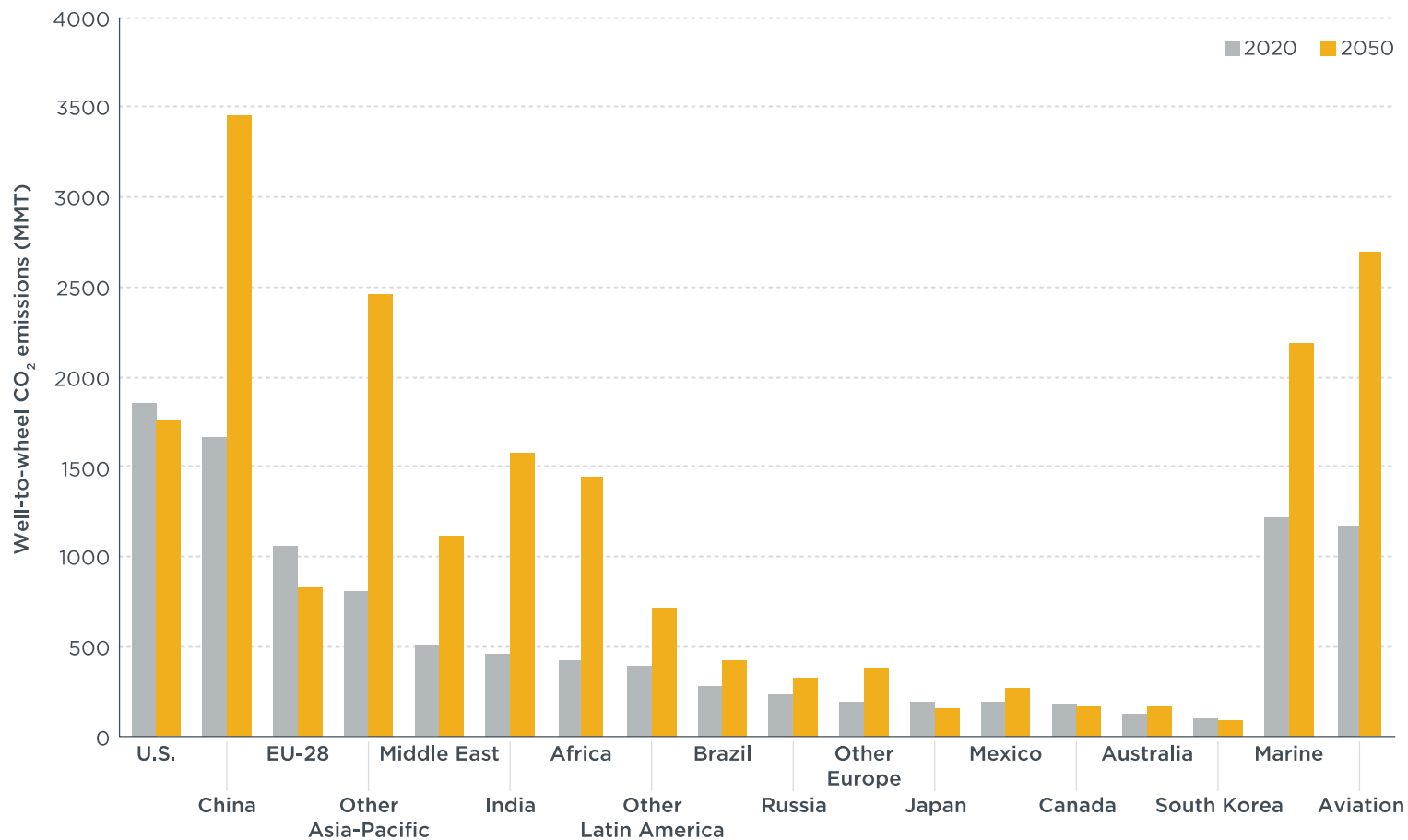
THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

AMIT BHATT

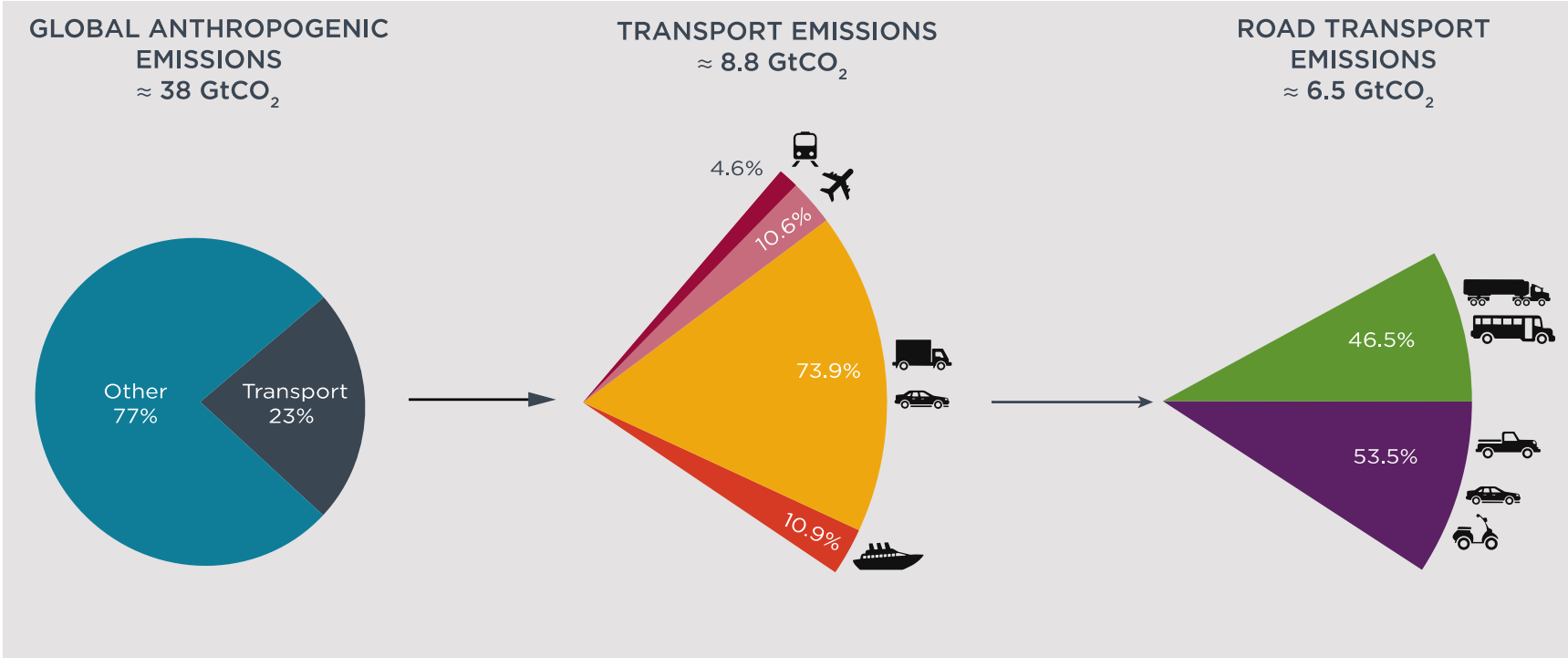
MANAGING DIRECTOR (INDIA)

A.BHATT@THEICCT.ORG

TRANSPORTATION CO₂ EMISSIONS BY REGION, IN 2020 AND 2050



GLOBAL EMISSION AND TRANSPORT SECTOR

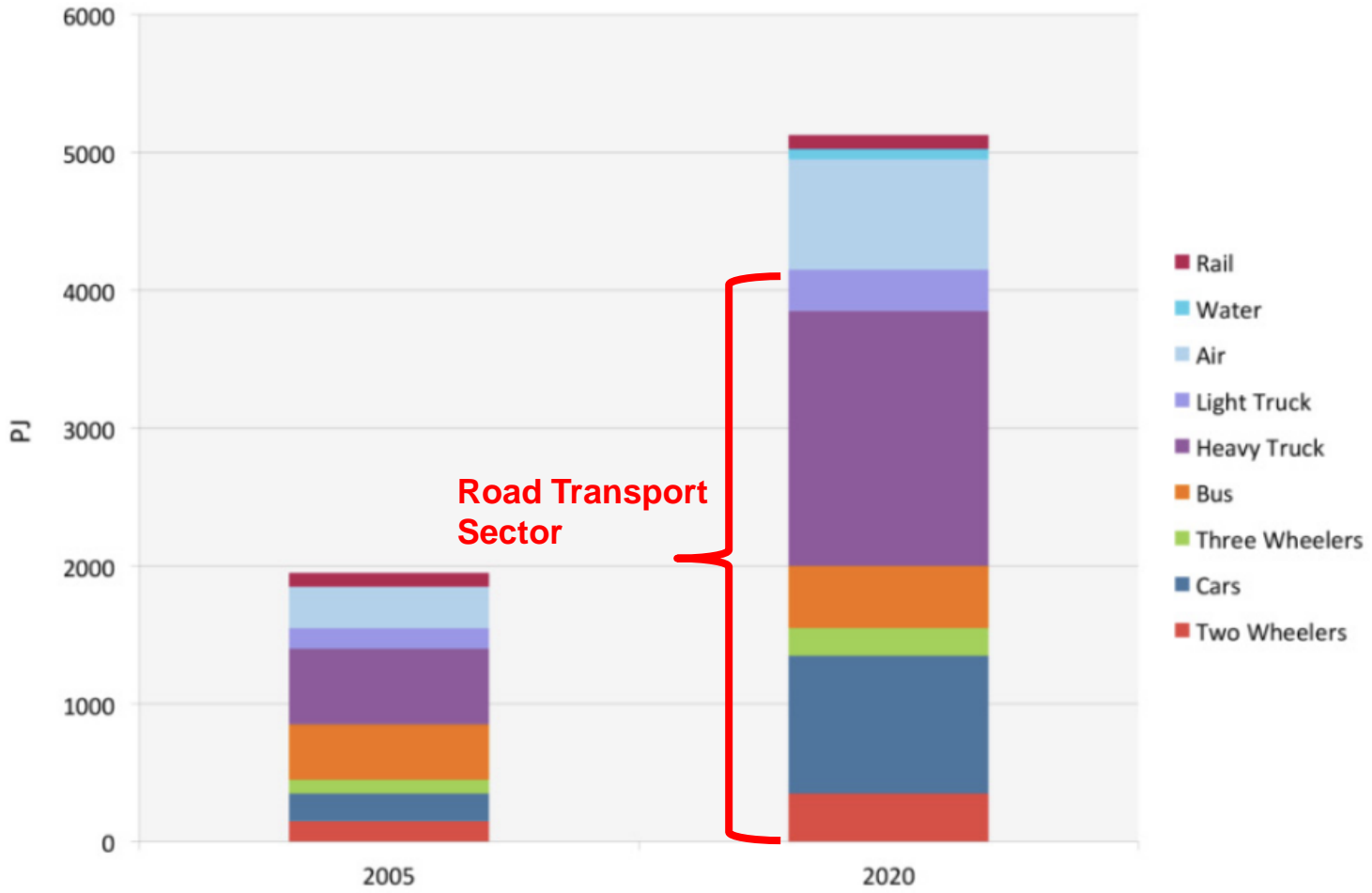


LEGEND

- RAIL
- AVIATION
- ROAD
- MARINE
- HEAVY-DUTY VEHICLES
- LIGHT-DUTY VEHICLES

Notes:
Global anthropogenic CO₂ emissions in 2010 based on IPCC (2014).
Transport CO₂ emissions in 2010 estimated by ICCT (2014) include the full fuel lifecycle, including direct emissions from combustion & upstream emissions from extraction, refining, & distribution of fuels.

ROAD TRANSPORT IS INDIA'S LARGEST SOURCE OF OIL CONSUMPTION SECTOR

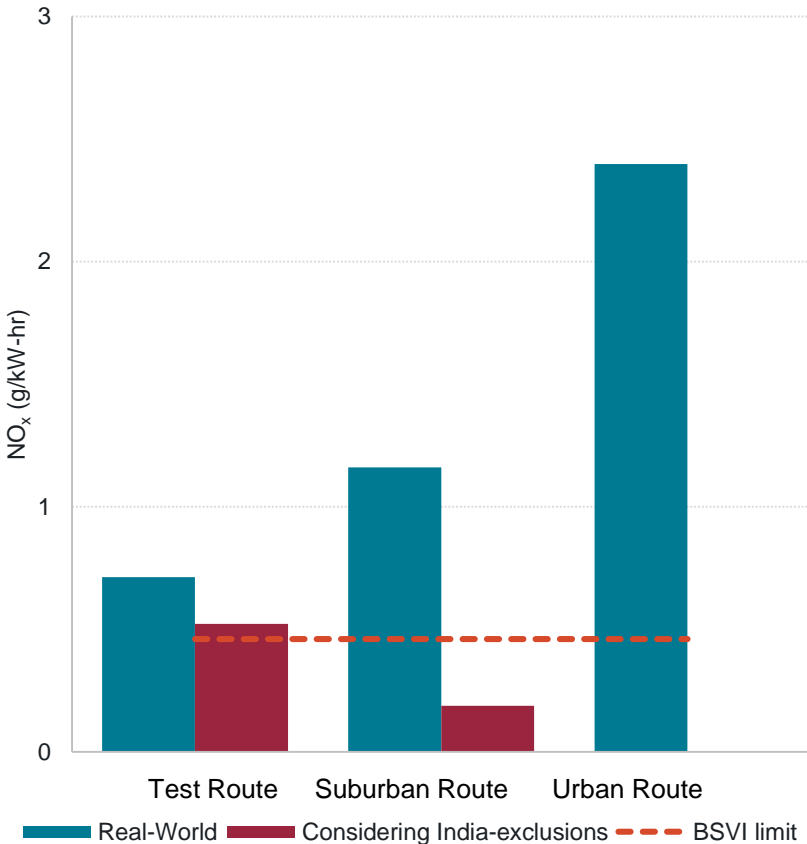


Source: I. Pinna et al., Energy used by transport systems in India: the role of the urban population, sources, alternative modes and quantitative analyses, WIT Transactions on Ecology and The Environment, Vol 190, 2014 WIT Press

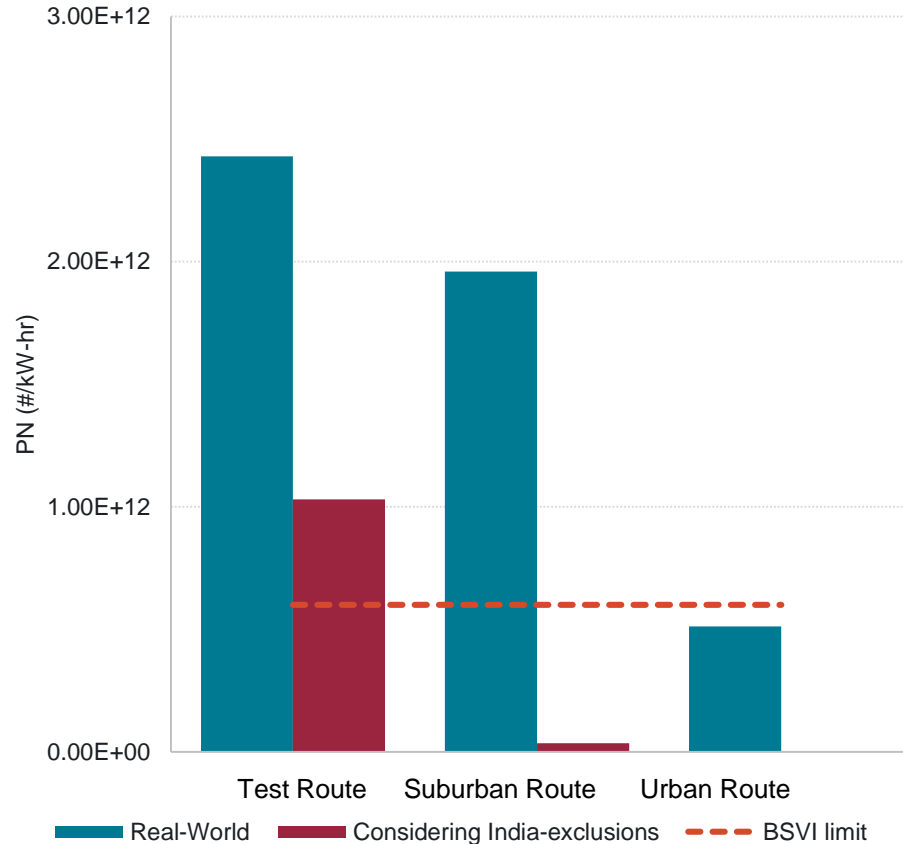
REAL WORLD EMISSIONS FROM ICE VEHICLES

Real world emissions from a BS-VI Bus

NOx emissions



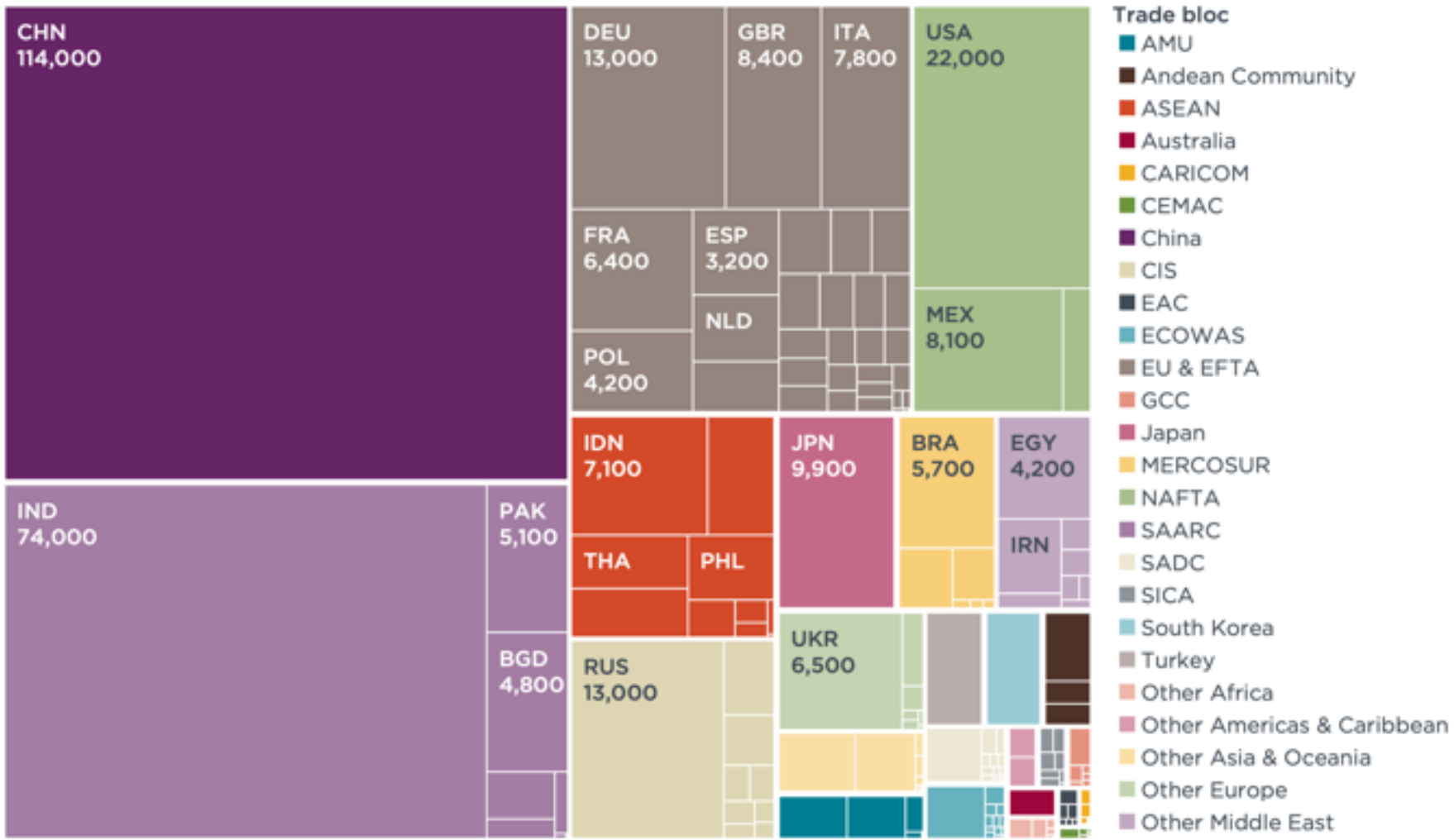
PN emissions



Source: <https://theicct.org/publication/real-world-emissions-performance-of-a-bharat-stage-vi-truck-and-bus/>



PUBLIC HEALTH IMPACT OF ON ROAD TRANSPORTATION EMISSIONS-MORTALITY



ONLY BATTERY-ELECTRIC & HYDROGEN FUEL CELL VEHICLES CAN ACHIEVE NEAR-ZERO GHG EMISSIONS

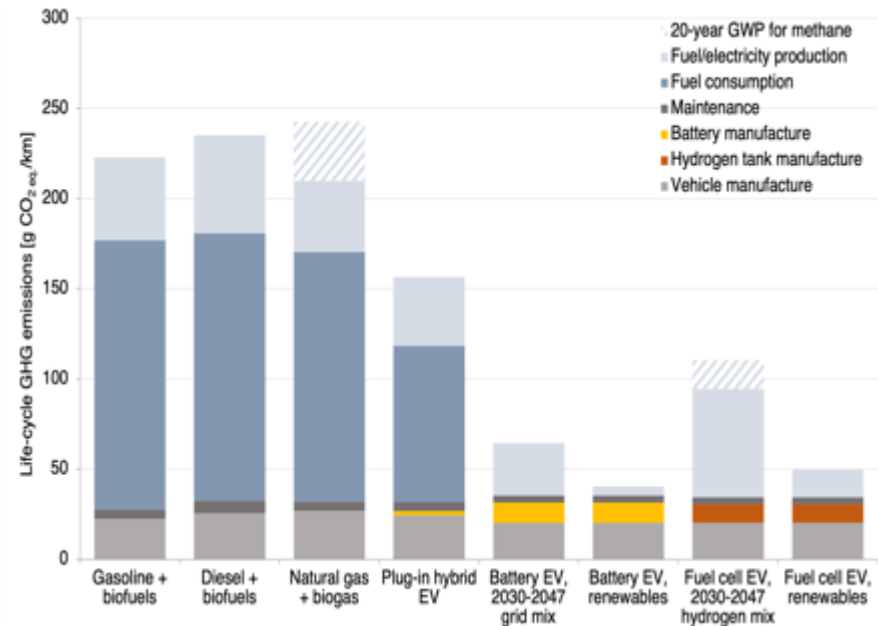
There is no realistic pathway to fully decarbonize the internal combustion engine.

- **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

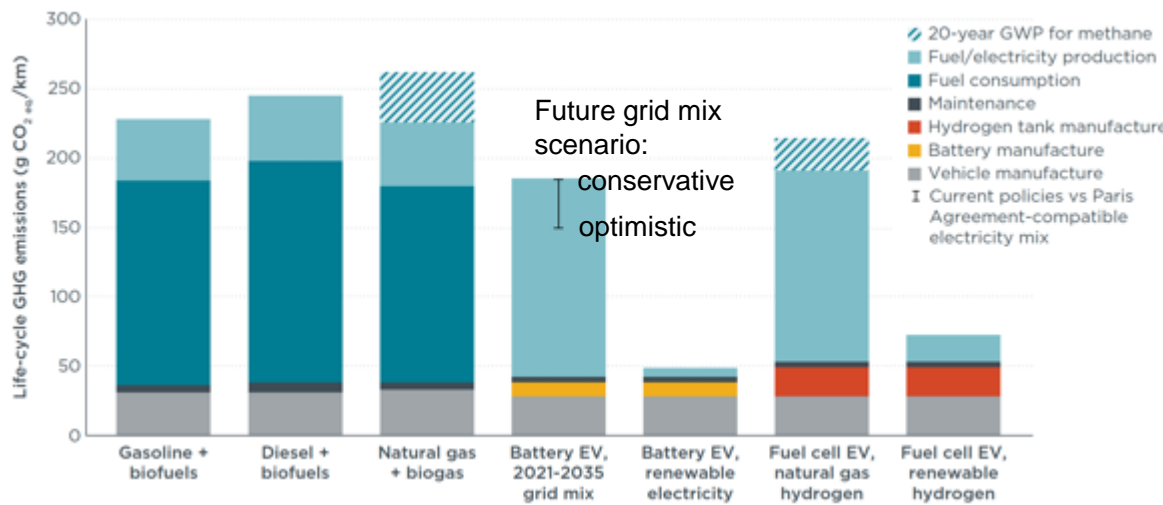


Reference: *Decarbonizing road transport by 2050, Zero-emission pathways for passenger cars*, ICCT, April 2021

EVEN WITH INDIA'S COAL-HEAVY ELECTRIC GRID, EVS ARE STILL CLEANER THAN ICE VEHICLES

- **Gasoline cars:** biofuels offer only modest GHG reduction
- **Diesel and CNG cars:** no GHG emissions benefit
- **Battery EVs:** lowest GHG emissions, also in India: **19%–34%** reduction for **2021** cars, **30%–56%** reduction for **2030** cars, **79%** reduction with renewables
- **Fuel cell EVs:** no GHG emission benefit with natural gas hydrogen, 68% lower with renewables

Life-cycle GHG emissions for average **medium-size cars** sold in India in **2021**



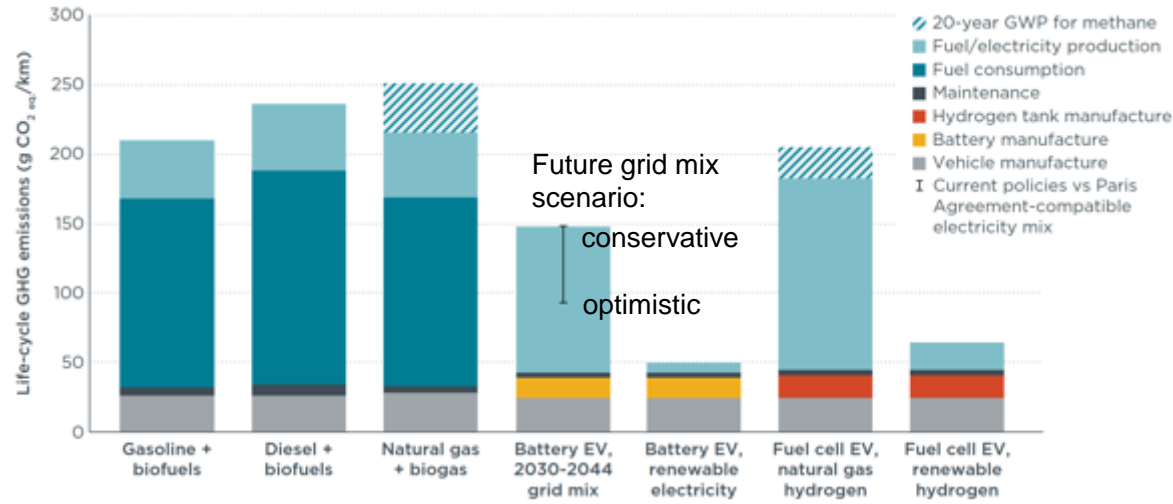
- **Electric two-wheelers:** same trends, 33%-50% reduction for 2021-2032, 45%-70% reduction for 2030-2041

Reference: A global comparison of the life-cycle GHG emissions of combustion engine and electric passenger cars, ICCT, July 2021

EVEN WITH INDIA'S COAL-HEAVY ELECTRIC GRID, EVS ARE STILL CLEANER THAN ICE VEHICLES

- **Gasoline cars:** biofuels offer only modest GHG reduction
- **Diesel and CNG cars:** no GHG emissions benefit
- **Battery EVs:** lowest GHG emissions, also in India: **19%–34% reduction for 2021 cars, 30%–56% reduction for 2030 cars, 79% reduction with renewables**
- **Fuel cell EVs:** no GHG emission benefit with natural gas hydrogen, 68% lower with renewables

Life-cycle GHG emissions for average **medium-size cars** sold in India in **2030**



- **Electric two-wheelers:** same trends, 33%-50% reduction for 2021-2032, 45%-70% reduction for 2030-2041

Reference: A global comparison of the life-cycle GHG emissions of combustion engine and electric passenger cars, ICCT, July 2021

BEST PRACTICES IN ACCELERATING CLEAN TRANSPORT

Category	Government Action	India's Status
Setting the Vision	<ul style="list-style-type: none"> Phase out targets for fossil fuel vehicles, or 100% electrification targets 	Inspite of being one of the largest global vehicle market by sales, India is yet to have commitment towards 100% new ZEV sales
Vehicle Supply	<ul style="list-style-type: none"> Fiscal incentives Fuel economy / ZEV credits 	Government of India offers wide range of mechanisms of getting fiscal incentives like purchase incentives, road tax exemption, income tax benefit tec. However, weak fuel economy targets do not require/enable rapid electrification
Support Infrastructure	<ul style="list-style-type: none"> Electric charging Hydrogen 	Increased focus of EV charging infrastructure in mega cities with population over nine million. India's ambition to install 450 GW renewable energy capacity aims to drive green hydrogen manufacturing
Market Demand	<ul style="list-style-type: none"> Consumer education Commercial HDV fleet sales targets 	Encouraging nationwide campaign to spread awareness of e-mobility