A Meta Study of India's Transport Emissions Analyses'

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Decarbonising Transport in India: DTEE + NDC-TIA

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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

On behalf of:
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
of the Federal Republic of Germany

Study boundaries

Scenarios under different models

Models	Transport model	BAU	Mitigation scenarios	
			Moderate	High Ambition
CEEW	Global Change Analysis Model (GCAM)	BAU	New Policy	High Ambition
CSTEP	Transport activity wise India Multi-region Demand Model			
IRADE	Activity Analysis Model			
PNNL	GCAM			
TERI	Transport Demand Model			
ICCT	India Emissions Model (IEM)	BAU	Moderate	High Ambition
IEA	Mobility model*	-	Stated policy	Sustainable Development
ITF	ITF*	Current Ambition	-	High Ambition

*Limited data available

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Scenario description

Modelling team	BAU	Moderate scenario	High Ambition
SGWG (CEEW, PNNL, CSTEP, TERI, IRADE)	No further policy action considered; however, some of the models do incorporate certain improvements	New Policy: This scenario presupposes that policy targets, as announced by GoI are fully effective	High Ambition: This scenario considers that the policy targets set out by the GoI are exceeded
ICCT	No further policy actioned considered, however near term legislated improvements are incorporated	Expresses moderate effort scenario	This scenario incorporates ambitious decarbonisation policies
IEA	-	Stated Policy: This scenario incorporates policy ambitions and targets that have been legislated for or announced by GoI and by other governments around the world.	Sustainable Development Scenario: In the SDS, India is on track to reach net zero emissions in the mid-2060s.
ITF	Current Ambition: In this scenario current and announced mitigation policies are implemented	-	High Ambition: This scenario incorporates more ambitious decarbonisation policies

Analysis and level of disaggregation

Key Parameters

Model	CO2 Emissions (T..	Energy consumption	Sales	Vehicle activity	Vehicle stock
CEEW	■	■		■	
PNNL	■	■		■	
CSTEP	■	■			
IRADe	■	■	■	■	
TERI	■	■			
ICCT	■	■	■	■	■
ITF	■				
IEA_2021	■	■		■	

Eg. Energy consumption > High Ambition scenario

Scenario ty..	Passenger/..	Mode type	Fuel type	Energy Consumption: CEEW	PNNL	CSTEP	TERI	IRADe	ICCT	IEA_2021
High Ambition	Passenger	2&3w	Biofuel						■	
			CNG	■	■	■	■		■	
			Electricity	■	■	■	■	■	■	
			Liquids	■	■	■	■	■	■	
		Bus	Biofuel						■	
			CNG	■	■	■	■		■	
			Electricity		■	■	■	■	■	
			Liquids	■	■	■	■	■	■	
		PLDV	Biofuel						■	
			CNG	■	■	■	■		■	
			Electricity	■	■	■	■	■	■	
			Hydrogen	■	■					
			Liquids	■	■	■	■	■	■	
	Freight	2&3w	Biofuel						■	
			CNG						■	
			Electricity						■	
			Liquids						■	
		HDT	Biofuel						■	
			CNG	■	■					
			Electricity		■				■	
			Liquids	■	■	■	■	■	■	
		LHDT	Biofuel						■	
			CNG	■	■				■	
			Electricity		■				■	
			Liquids	■	■	■	■	■	■	
	Both	Total road	All							■

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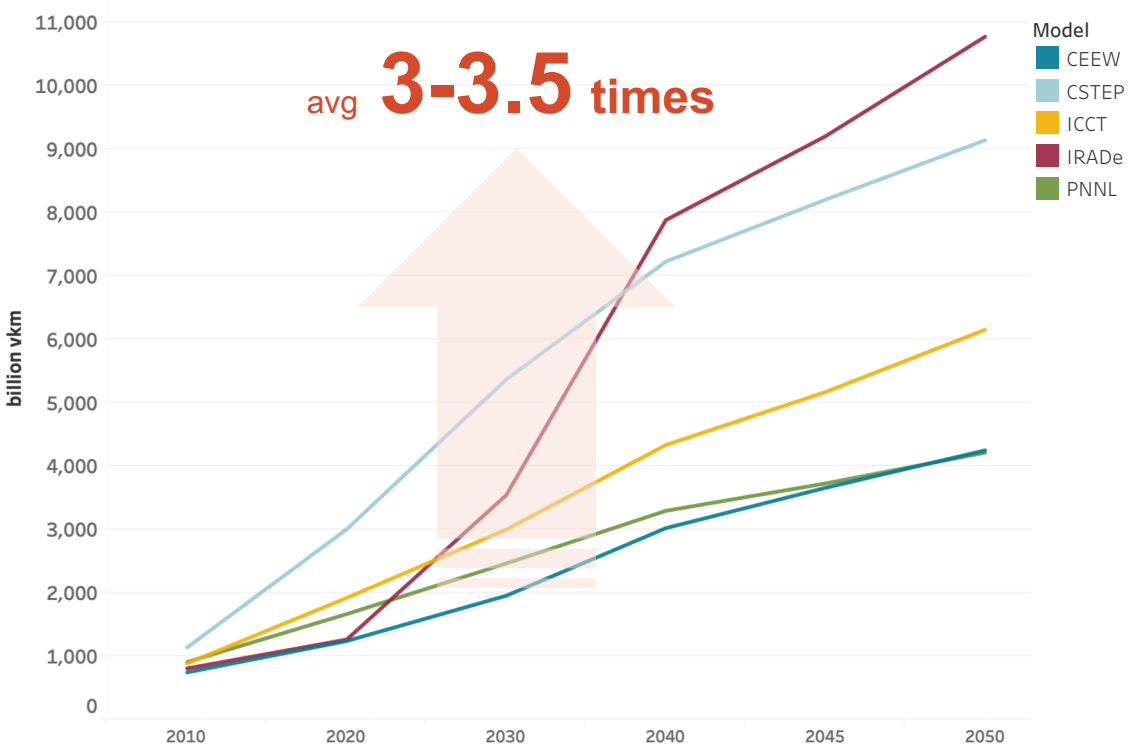
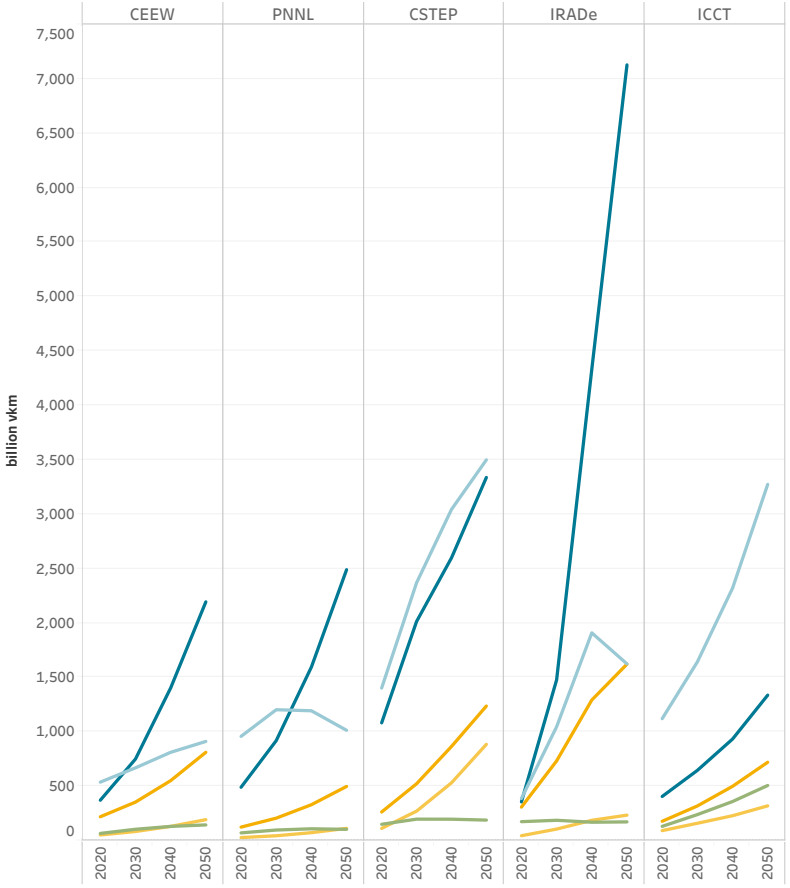
The BAU: Unabated vehicular activity

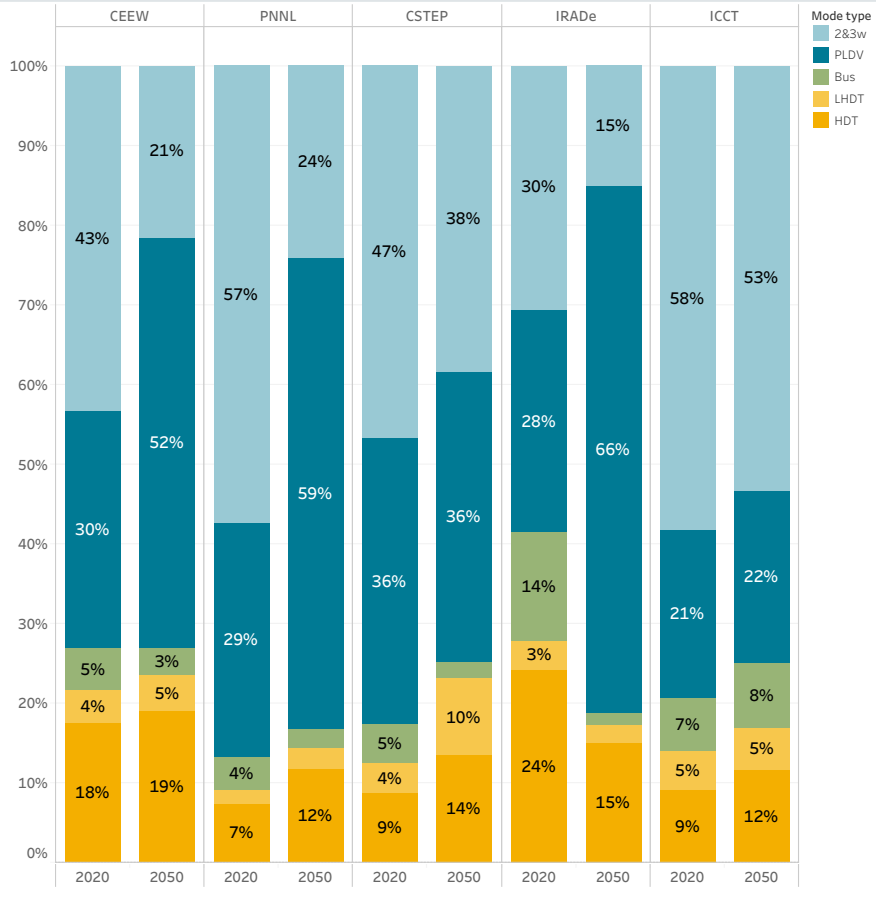


Average VKT:

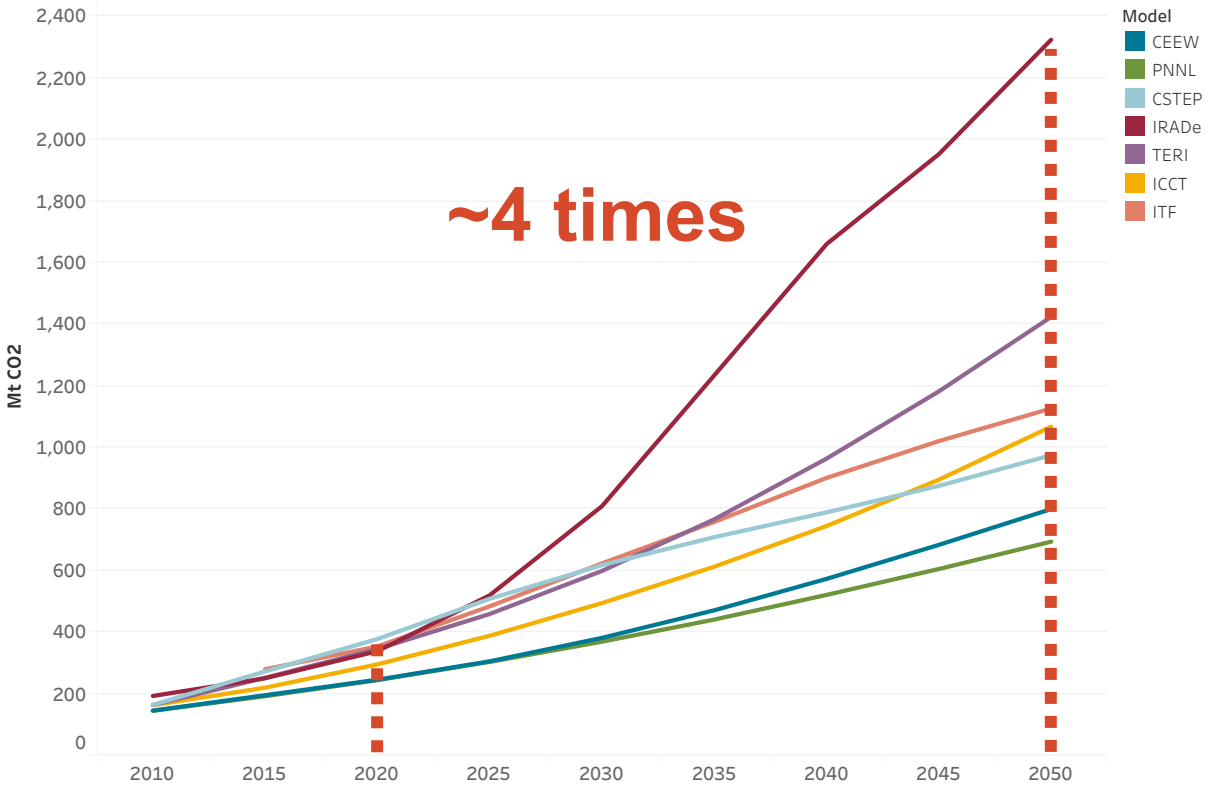
- 2020 ~1.8 Trillion
- 2050 ~ 7 Trillion

80% vehicle activity to be contributed by Cars & 2ws in 2050





CO_2 emissions (TTW) continue to grow…



Avg CO_2 emissions:

- 2020: ~ 300 Mt
  ± 50

-2050: ~ 1200 Mt
  ± >700

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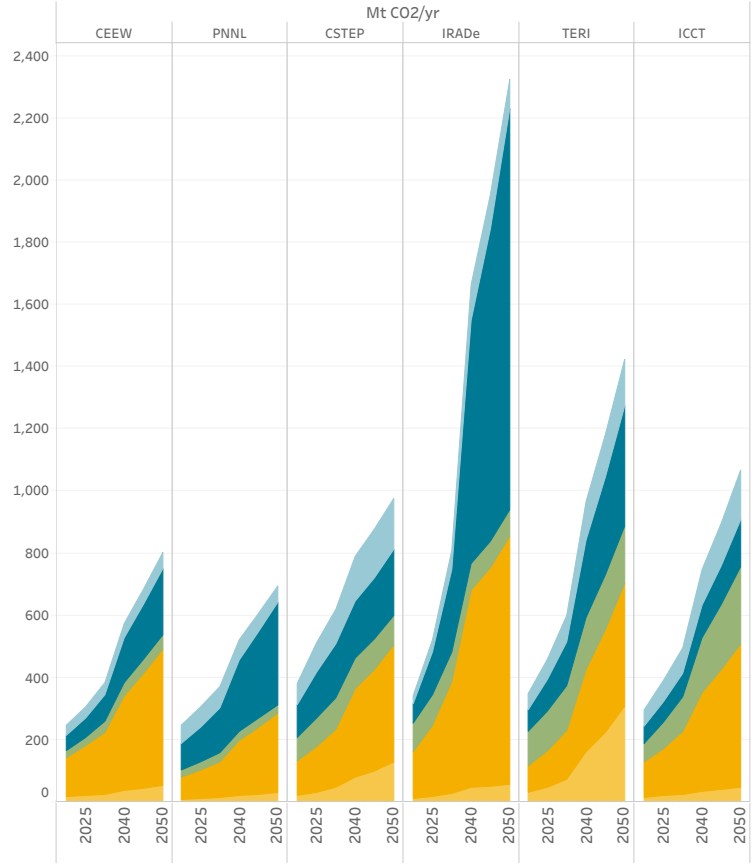
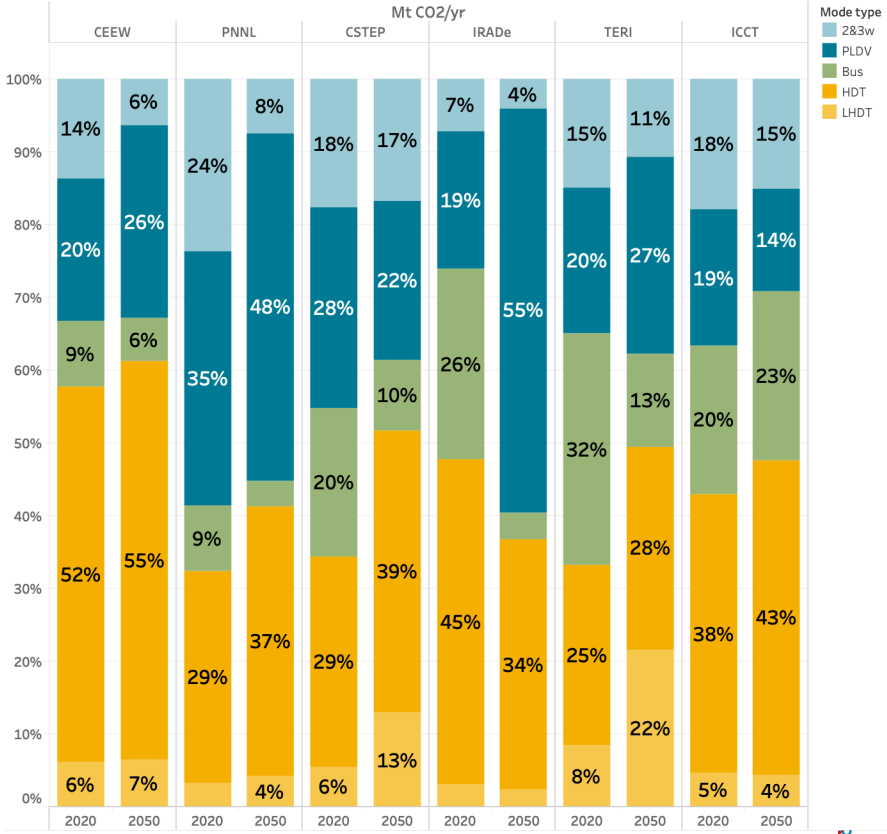
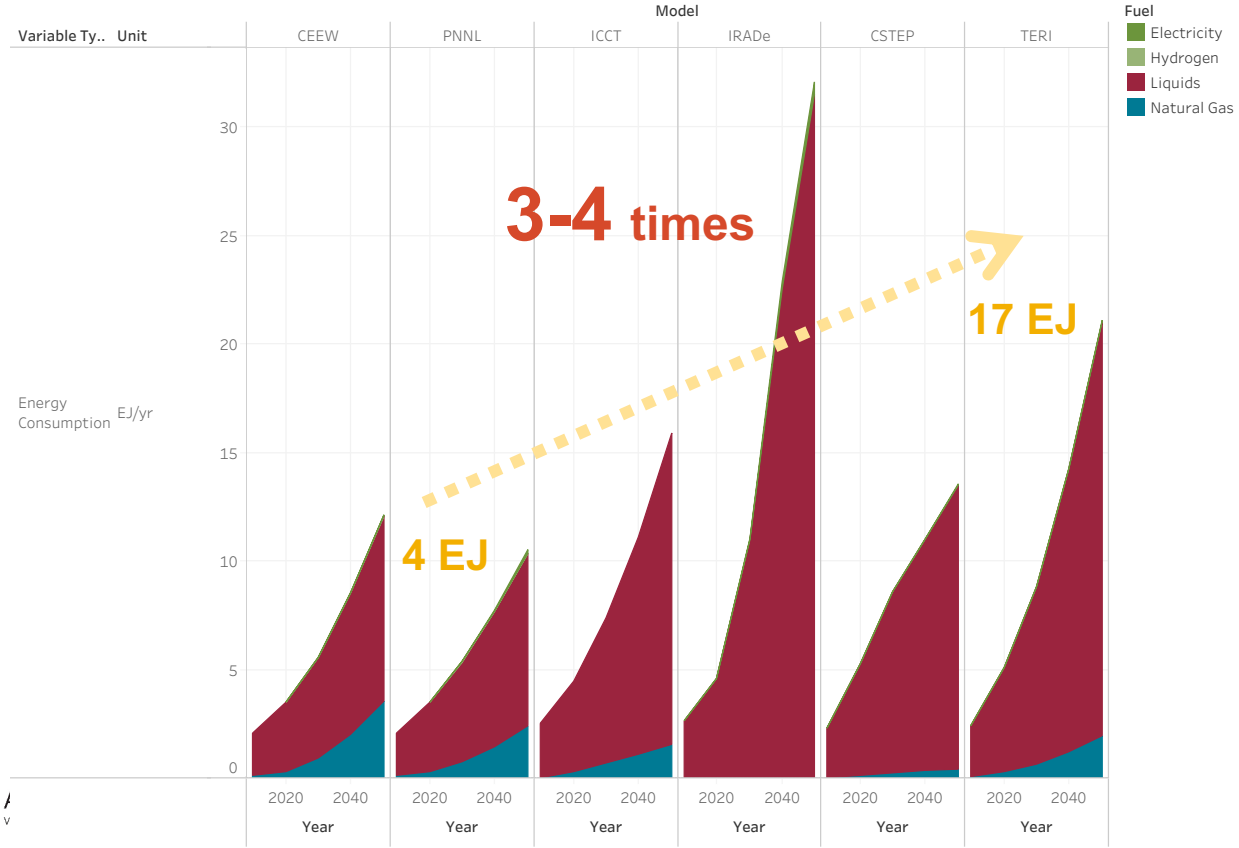
Heavy duty trucks & Cars – key contributors to CO_2 emissions





Heavy dependence on petroleum…



Other fuel sources

- CNG
- LPG
- Biofuels
- Electricity
- Hydrogen

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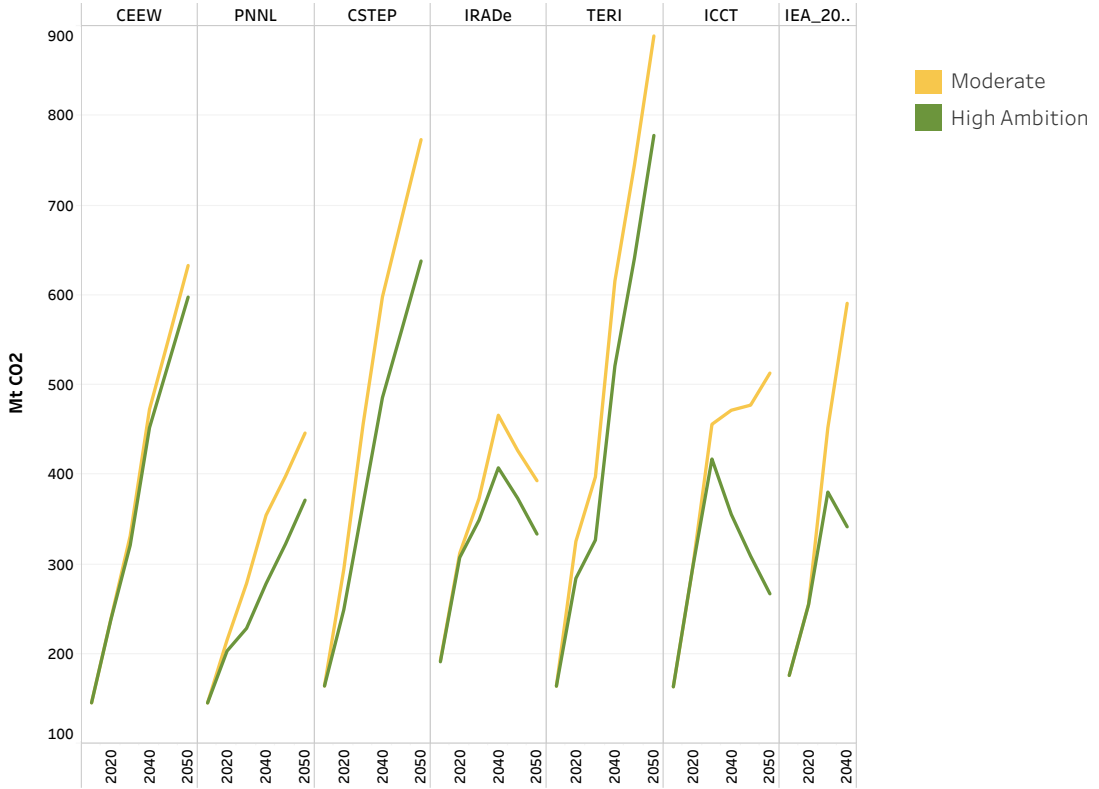
Mitigation scenarios

Moderate vs. High Ambition Scenarios



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High Ambition Scenario: Key interventions

Electrification in 2050 (sales)

Modes	ICCT*	SGWG+	IEA (#2040)
2w	100%	80%	-
3w		100%	-
PLDV		30%	90%#
Bus	95%	40%	
LHDT	100%	0%	-
MHDT	90%		-
HHDT			-
All	~100%	-	86%#

Efficiency improvements

	ICCT*	SGWG+
Annual reduction	1-3% between 2021-50	1.8-2.7% between 2021-30

Biofuel blending in 2050

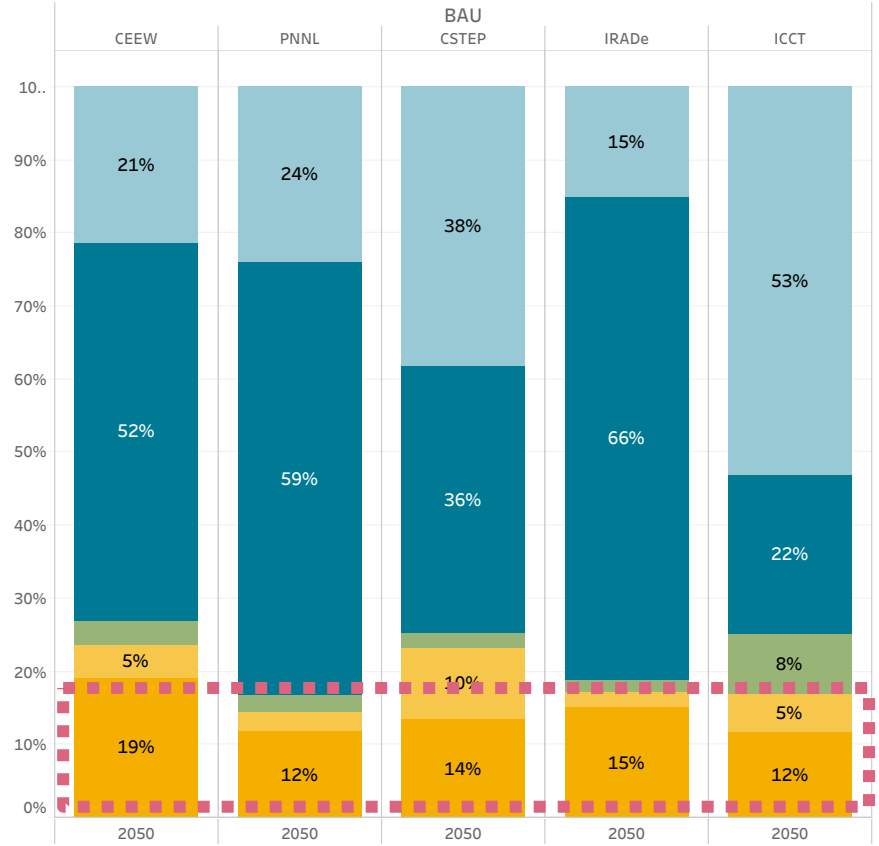
% Biofuel in	ICCT & SGWG+
Petrol	20%
Diesel	5%

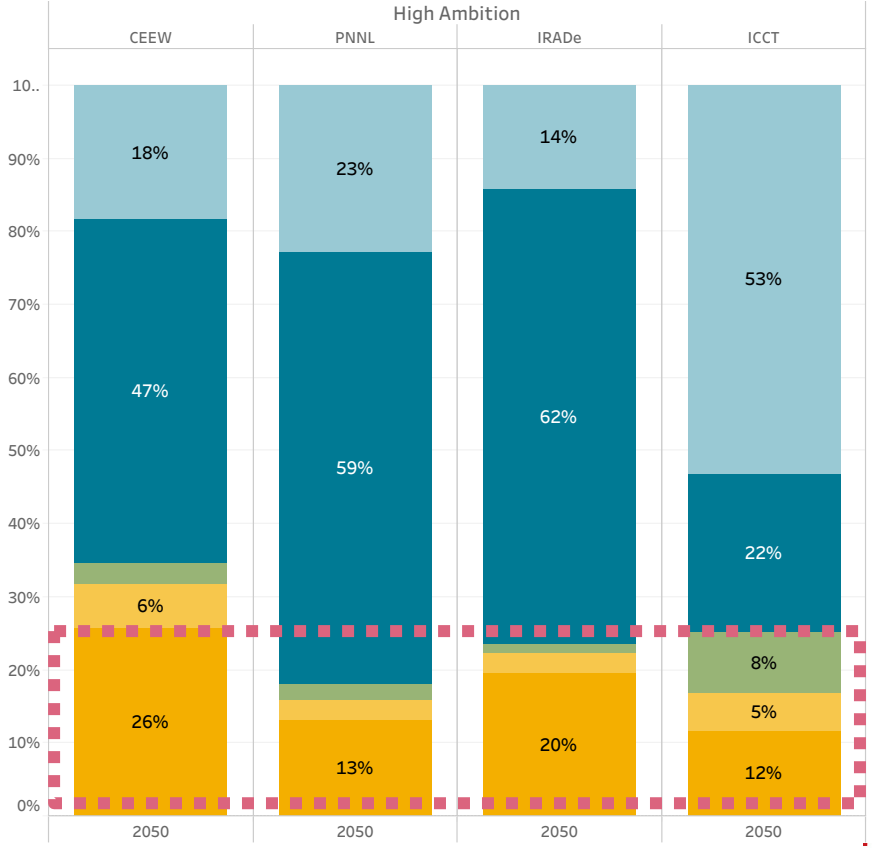
Lower travel demand

	ICCT	SGWG+
Reduction in vkm	Not considered #	-15% till 2030 - 20% till 2050 from 2015 levels

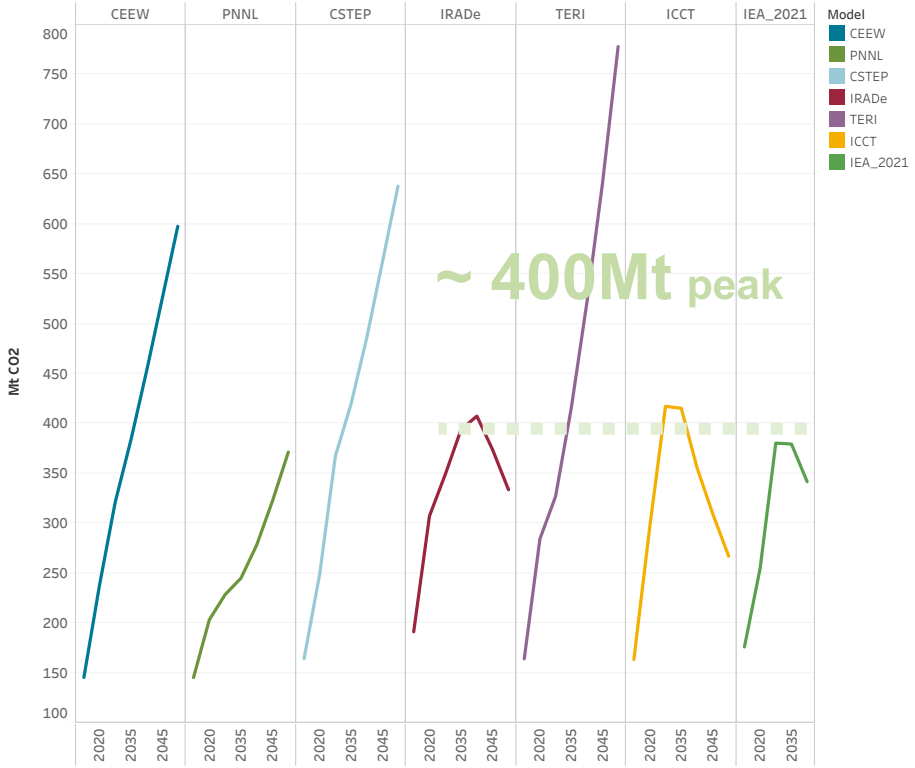
SGWG+: CEEW, PNNL, CSTEP, TERI, IRADE; represents highest ambition; not all interventions were adopted by all models. Eg. no electrification adopted by CEEW & CSTEP; *Grid decarbonisation also considered; - Data Not Available with us; # the numbers for IEA correspond with the horizon period of 2040

BAU v. High Ambition – increase in share of vehicle activity of Heavy duty trucks





2050 CO_2 emissions to rise (>600 Mt) or reverse (~250 Mt) under High Ambition scenario?



- Trajectory 1: Rising emissions

  ~600-750 Mt by 2050

- Trajectory 2: Reversal in emissions
  - Peaking by 2030/40
  - ~ 250 Mt by 2050

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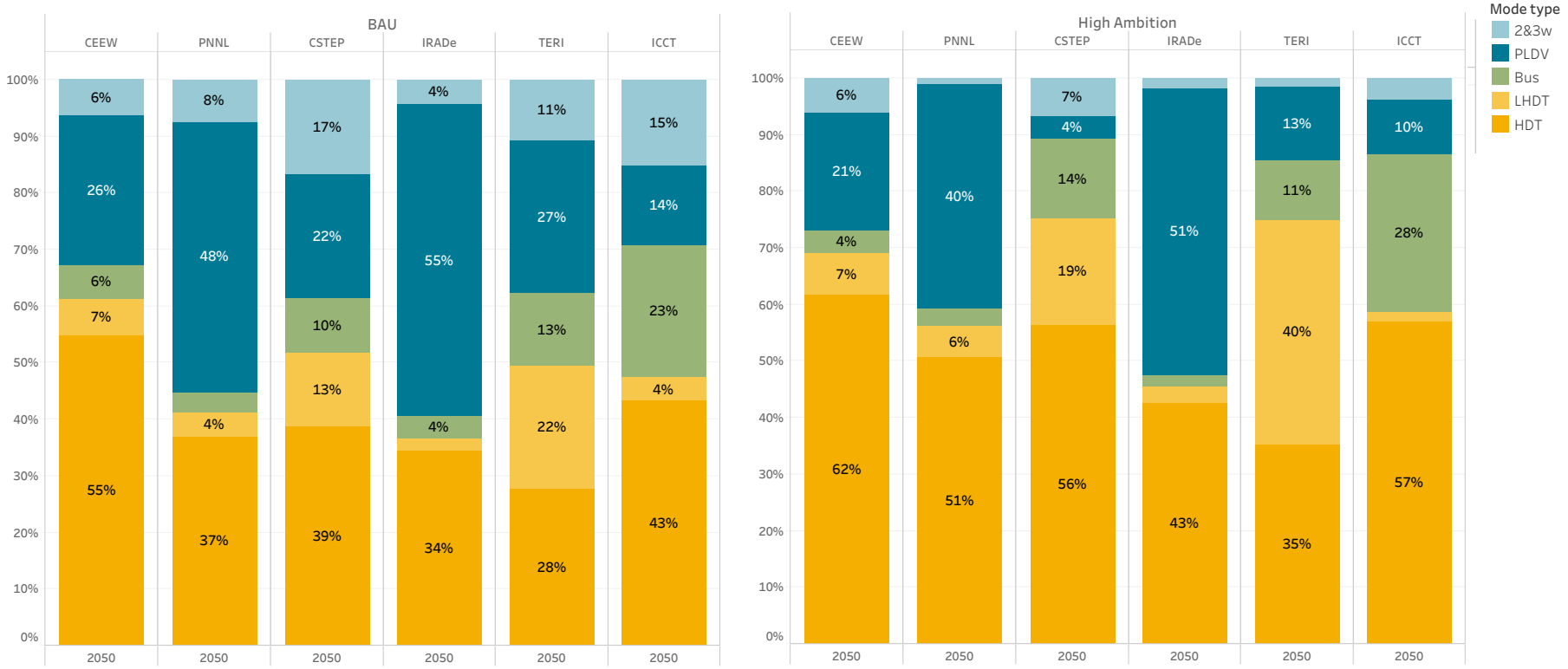
Heavy duty trucks to contribute to over half the CO_2 emissions by 2050



Energy consumption in 2050: 100% 2&3w, >60% Buses & Cars to run on Electricity

High Ambition far from net zero

- Aggressive electrification & continued efficiency improvements lead to reversal in emission trends
- Passenger vehicles would likely** decarbonize
- Freight vehicles would be difficult** to decarbonize

Sum up

- BAU highly Undesirable
- Current High Ambition scenarios fall far short of carbon neutrality by 2050

Call for…

Highest possible effort

- Aggressive electrification
- Transport specific mitigation targets in next round of NDCs

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