



# SSRs for LDVs & HDVs - INDIA

Sharif Qamar, TERI

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# LDVs

# Concept and Importance

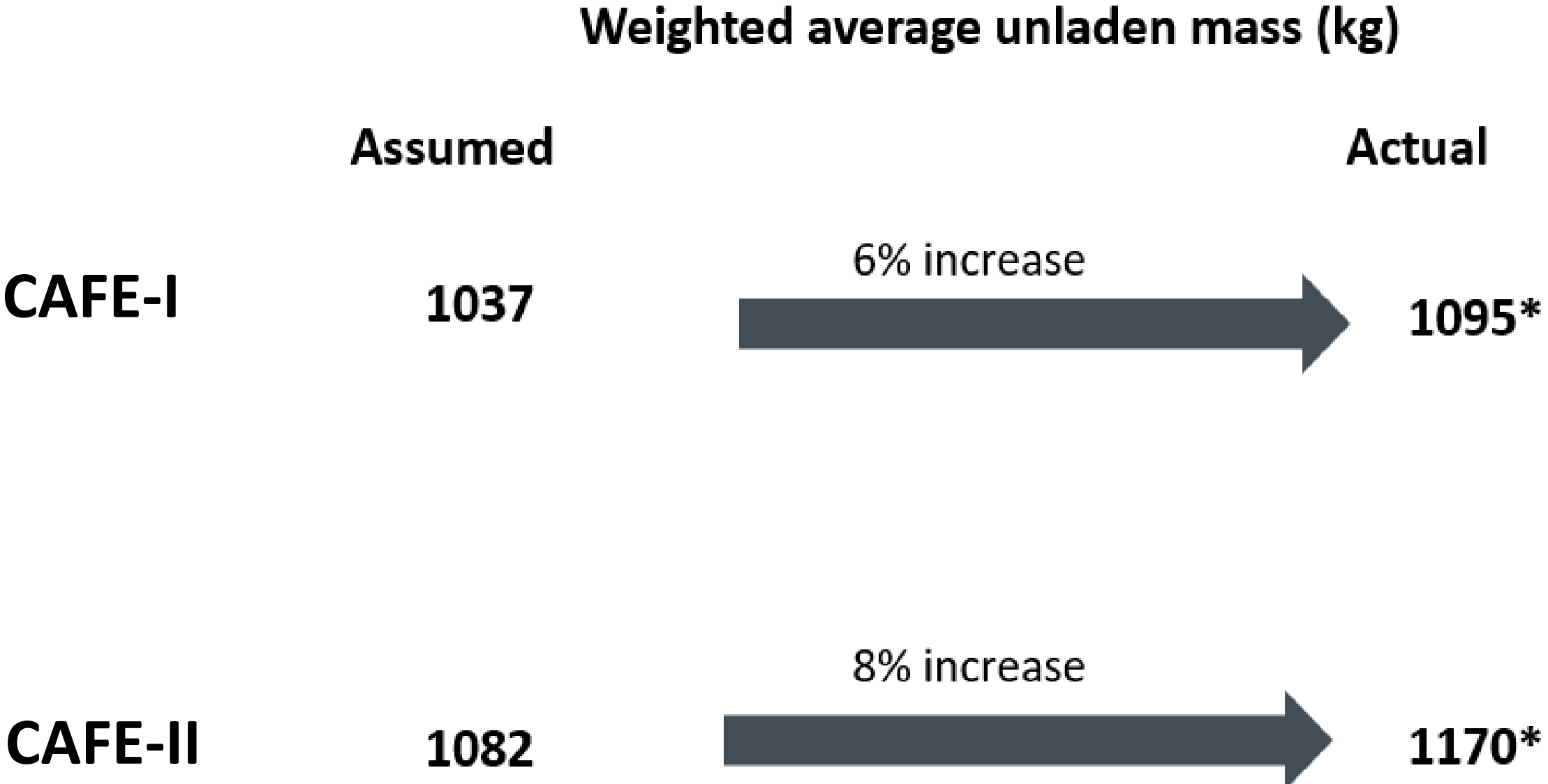
**Aim:** To mitigate fuel consumption by lowering CO<sub>2</sub> emissions, leading to reduced oil dependency and air pollution

Applicable to petrol/diesel/LPG/CNG/hybrid & electric passenger vehicles with GVW<3,500 kg

CAFE-I & II notified in 2015 under the Energy Conservation Act 2001; **CAFE-I (FY 2017-22); CAFE-II (FY 2022 onwards)**

- With the growth in technological advancements, India has a huge scope to further tighten the CAFE limits
- Implementing stringent CAFE norms can contribute to reduced fuel consumption, faster EV adoption, lower emissions, aligning with our national commitments
- Globally, CAFE norms have been implemented in various countries/regions including Australia, China, European Union(EU), Japan, India, USA, etc.

# Actual performance of automobile industry



*\* Based on the data for FY 2021-22 (CAFE-I) and FY 2022-23 (CAFE-II)*

# Technological advancements in Indian automobile industry

**Electric and Hybrid  
vehicles**

**Advanced engine  
technology**

**BS VI compliant  
vehicles**

**Alternate fuel  
technology**

**Ethanol blending**

**Fuel cell technology**

# CAFE Equation

**Average Fuel Consumption Standard = a x (W-b) + c;**

is converted into CO<sub>2</sub> gm/km as  $(a * (W-b) + c) * 23.7135^{\wedge}$

Where:

Average Fuel Consumption Standard = Average Fuel Consumption Standard of manufacturer in petrol equivalent (L/100km);

a = Constant Multiplier (slope)

b = Fixed Constant (average Kerb weight);

c = Fixed Constant (average fuel consumption (litres/100 kms)

W = Weighted average of unladen mass in kilogram (kg) of all new said motor vehicle, manufactured or imported for sale by the manufacturer

<sup>^</sup>gasoline equivalent factor; electrical energy consumption factor: 0.1028

# CAFE Phase III & Phase IV

## Block Period (5 years):

**CAFE-III: 2027-32**

**CAFE-IV: 2032-37**

**Shift from MIDC to WLTP from  
March 31, 2027**

## Targets:

**Phase-III: 91.7 gmCO<sub>2</sub>/km**

**Phase-IV: 70.0 gmCO<sub>2</sub>/km**

## NOTE:

**MIDC (2000 onwards):** Modified Indian Drive Cycle (equivalent to New European Driving Cycle)

Average speed of IDC is 21.9 km/h

Max speed is set to 90 km/h

**WLTP: Worldwide Harmonized Light Vehicles Test Procedure**

More exhaustive cycle, covers many more data points

Based on power to mass ratios – customization in testing of different vehicles possible

More realistic and closer to actual conditions compared to MIDC

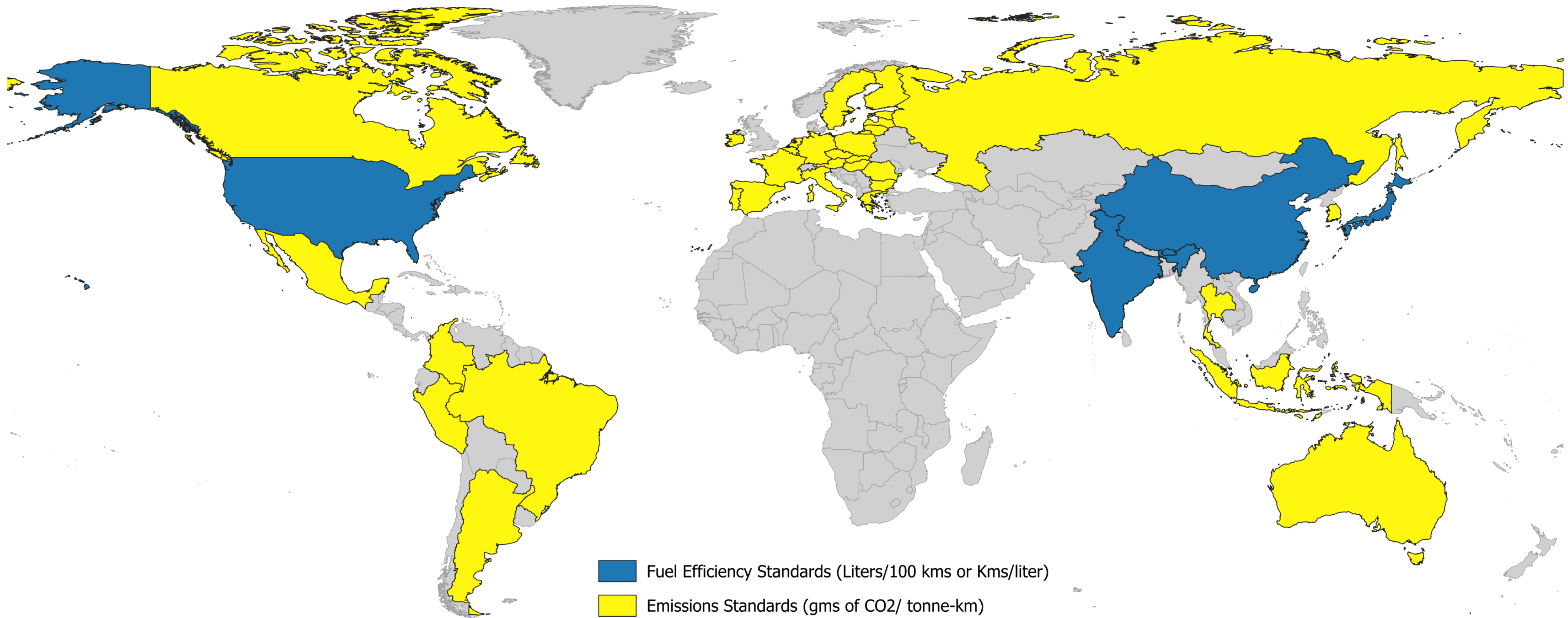
# Volume Derogation Factor for Super Credits

S.no	Vehicle Type	Existing Volume derogation factor for Super Credit	Proposed CAFE-III norms	Proposed CAFE-IV
			2027-2032	2032-2037
1	Hydrogen (FCEV)	3	5	5
2	Pure Electric Vehicle (BEV)	3	4	4
3	PHEV (Battery Pack minimum 7 KW)	2.5	2	1.5
4	Strong Hybrid Electric vehicle	2	1.2	1

Derogation factor is used in calculating the Corporate Average CO<sub>2</sub> performance of a vehicle

**HDVs**

# HDV FE/GHG Emission Standards Worldwide

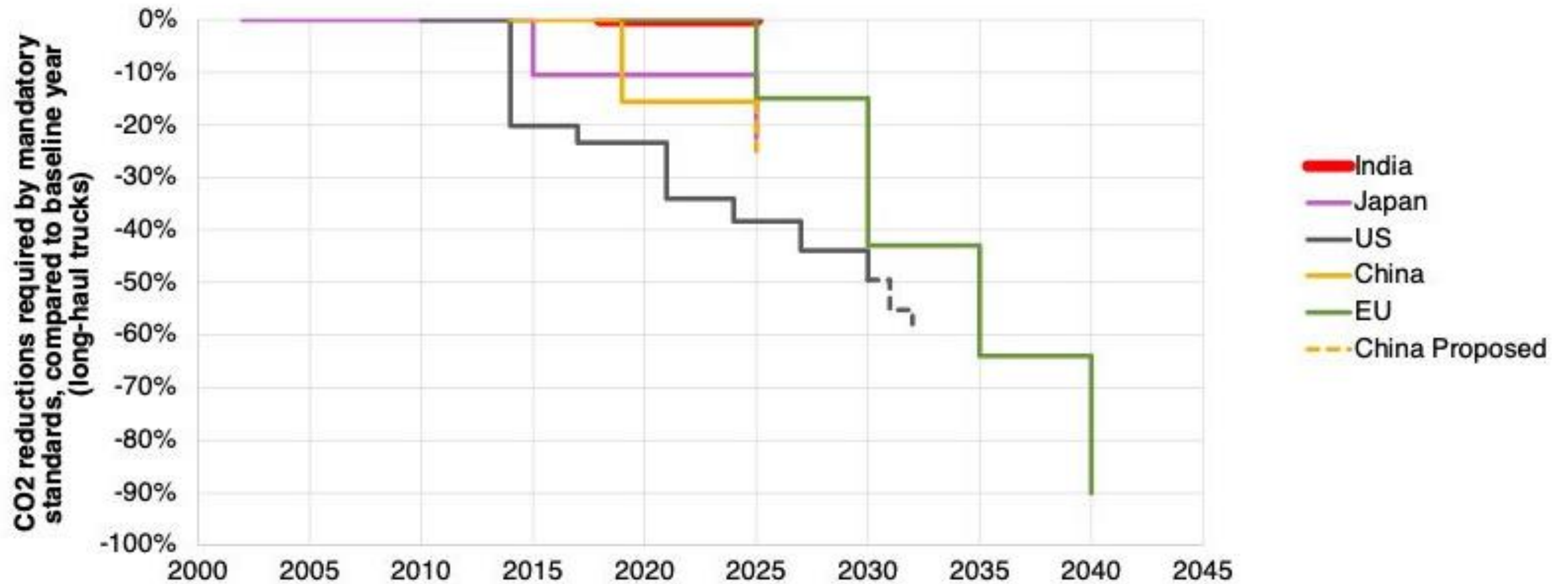


- **Fuel efficiency standards** for HDVs limit their mileage to a certain minimum kilometre per litre and have been implemented in countries such as United States, Japan etc.
- **GHG emissions standards** are applied to limit the overall GHG emissions from the HDVs and have been implemented in countries such as Brazil, Canada, Mexico, Russia, Australia, Indonesia and the EU.

# Comparative Assessment: HDV FE Norms

Country/Region	<a href="#">United States</a>	<a href="#">China</a>	<a href="#">Japan</a>	<a href="#">European Union</a>
<b>Classification of HDVs</b>	GVWR>= 3.85 tonnes	GVW> 3.5 metric tonnes	GVW> 3.5 tonnes	GVW> 3.5 tonnes
<b>Type of standard</b>	HDV fuel efficiency standards	HDV fuel consumption standards	HDV fuel efficiency standards	HDV CO <sub>2</sub> emission standards
<b>Regulating agencies</b>	US Environmental Protection Agency (EPA); National Highway Traffic Safety Administration (NHTSA)	Ministry of Industry and Information Technology (MIIT); China Automotive Technology & Research Centre (CATARC)	Ministry of Economy, Trade and Industry (METI); Ministry of Land, Infrastructure, Transport & Tourism (MLIT)	European Union (European Commission, Parliament, Council, and Member States)
<b>Applicability of HDV norms</b>	All on road vehicles with GVWR>= 3.85 tonnes	HDV diesel and gasoline vehicles with GVW> 3.5 tonnes	Diesel trucks and diesel highway buses with (GVW) >= 3.5t; Diesel tractor trucks, and transit buses with GVW >= 6t	All on road vehicles with GVW> 3.5t
<b>Proposed</b>	2014	2012	2015	2018
<b>Phased implementation?</b>	Yes	Yes	Yes	Yes
<b>Phase 1 timeline</b>	2014–2018	2012–2013	2015–2019	2019–2024
<b>Phase 2 timeline</b>	2018–2027	2014–2019	2020–2025	2025–2029
<b>Phase 3 timeline</b>	NA	2021 onwards	NA	2030 onwards
<b>Units</b>	grams CO <sub>2</sub> / payload ton-mile, gallons/1,000 payload ton-miles	litres/100 kilometres	kilometres/litre	grams CO <sub>2</sub> /ton-km
<b>Simulation models used</b>	GHG Emissions Model	Engine testing and simulation	-	VECTO
<b>Future Target</b>	50% CO <sub>2</sub> reduction by 2030	25% CO <sub>2</sub> emission reduction by 2025	25% CO <sub>2</sub> emission reduction by 2025	90% CO <sub>2</sub> reduction by 2040

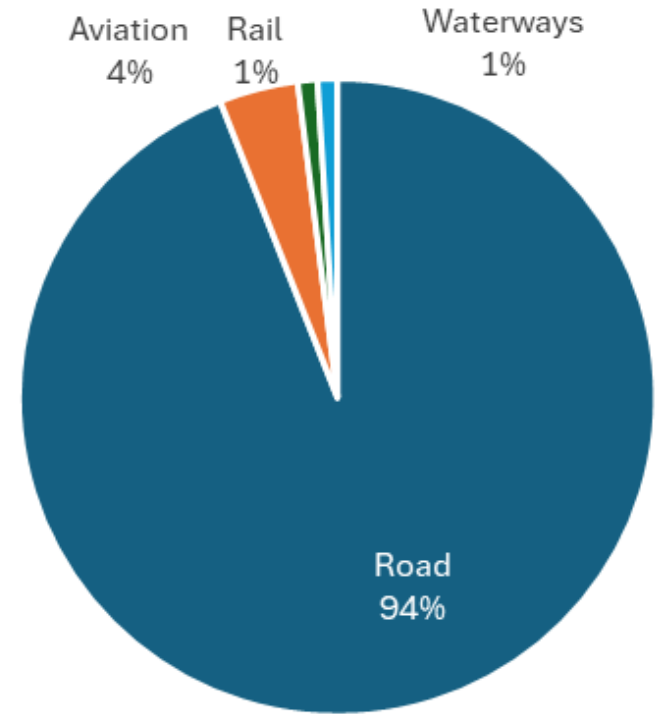
# HDV (Long-haul) Emissions reductions requirements under HDV FE Standards



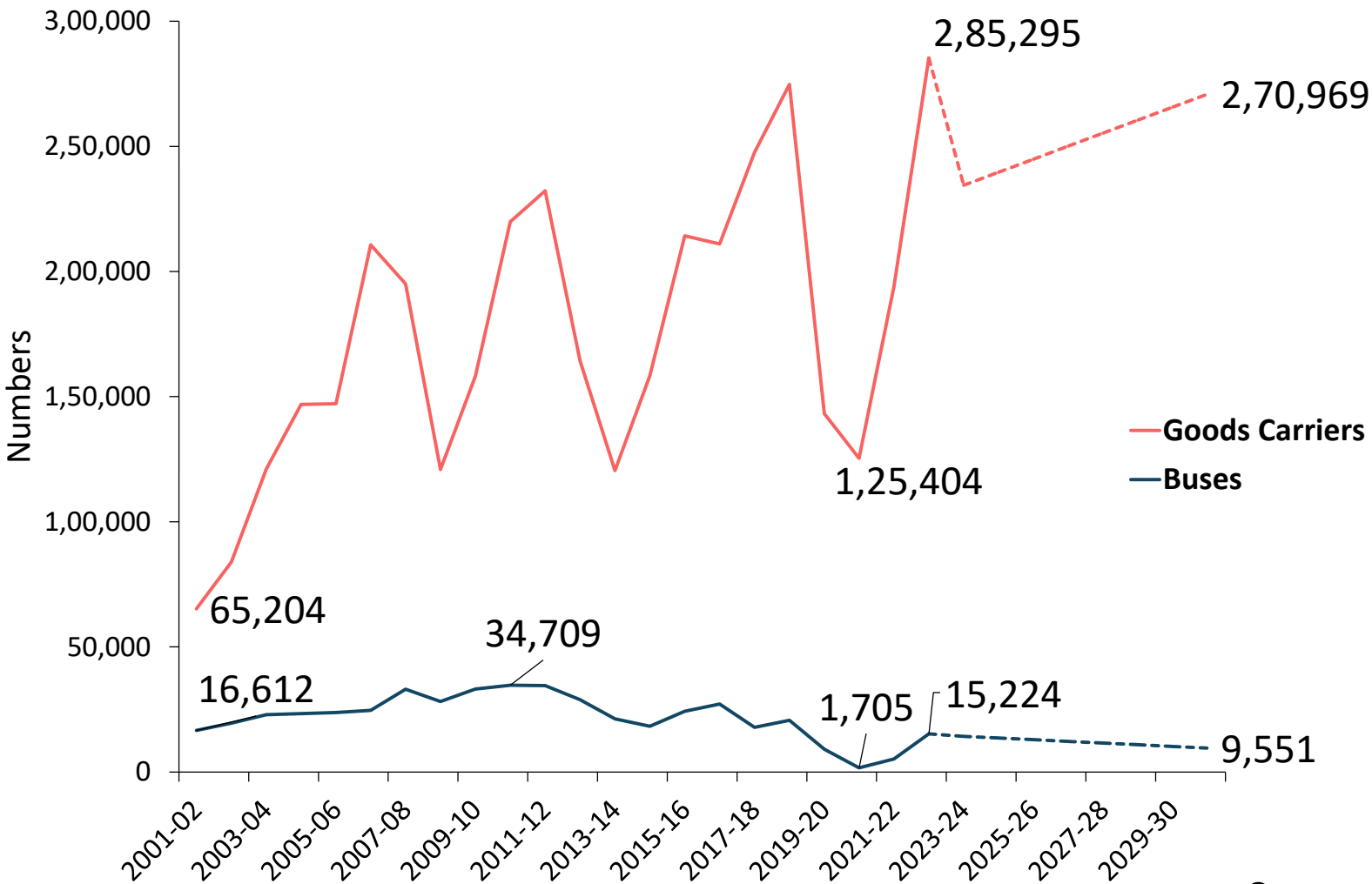
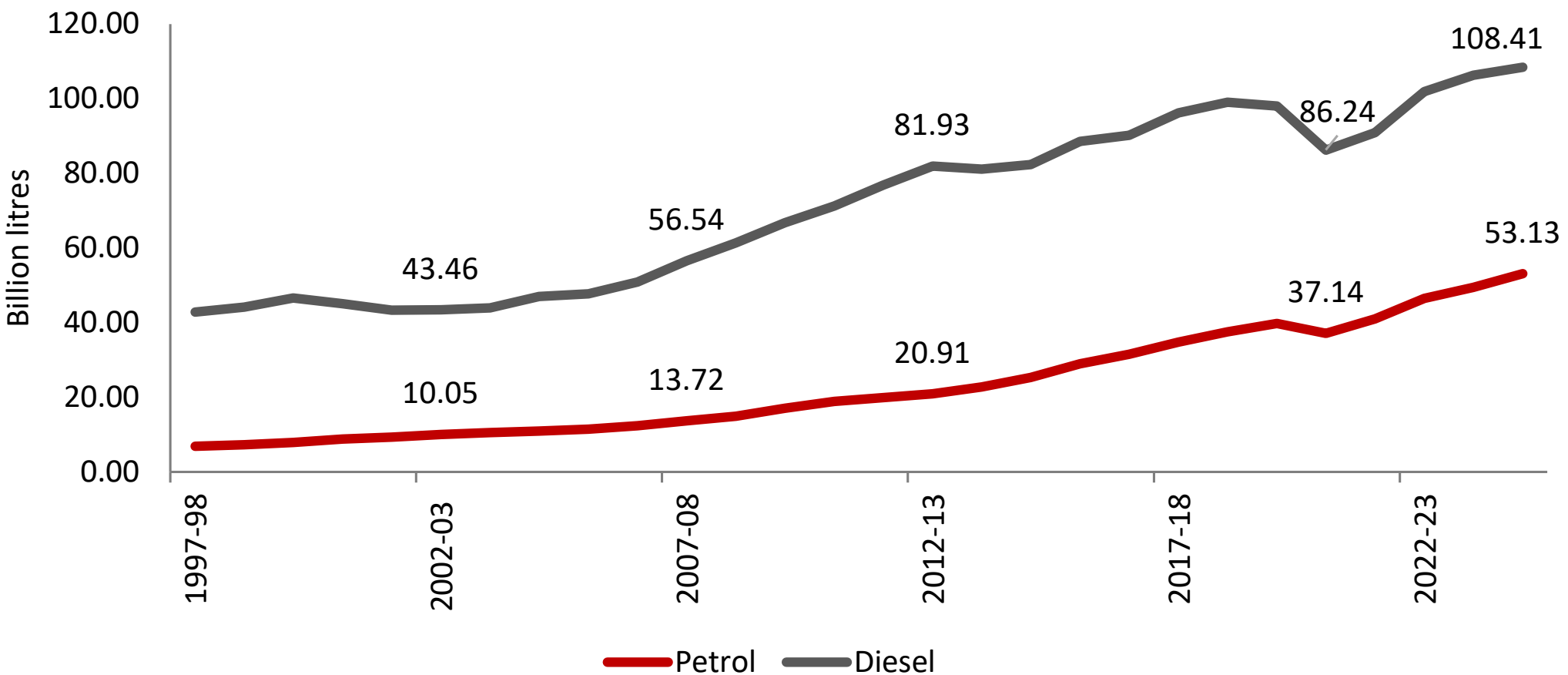
# India: Why HDV standards are required?

- ~4.4%** Share of HDVs (passengers and goods) in total on-road vehicular stock in India
- 97%** Market projected to be dominated by **Goods Carriers**
- ~40%** Share of Freight in **Total Energy Use** in transport sector
- 6X** Increase in BTKM from HDVs (goods) from 2024-25 to 2050-51

## Transport account for 14% of India's GHG emission



## Domestic Fuel Consumption - Diesel and Petrol



Source: Ministry of Petroleum and Natural Gas, India

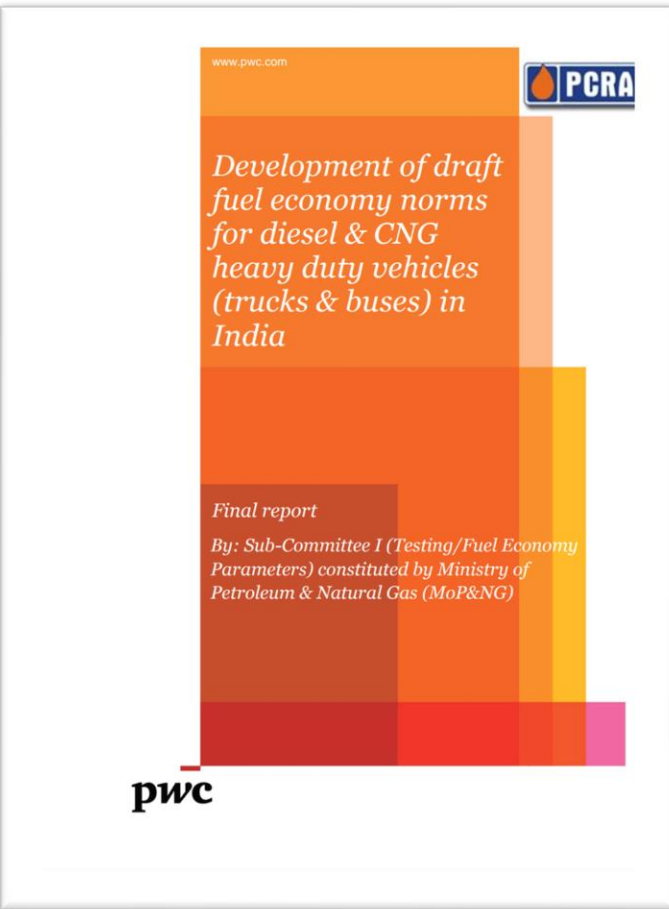
Source: TERI

# Truck Group-wise Domestic Sales (FY 2023-24)

GVW Category	Domestic Sales in FY 2023-24	% share of total HDV (goods) sales
<b>Truck Group</b>		
>12 – <=14.5	4,985	1.8%
>14.5 - <=16.2	13,805	4.9%
>16.2 -<= 18.5	43,915	15.6%
>18.5 -<= 25	25,419	9.0%
>25 - <= 34	43,905	15.5%
>34 - <= 40	23,594	8.4%
>40 - <= 45	10,791	3.8%
>45 - < = 49	46,888	16.6%
<b>Haulage Tractor</b>		
>18.5 - <=31	0	0.0%
>31 - <=40	6,091	2.2%
>40 - <= 46	3,090	1.1%
>46 -<= 55	59,908	21.2%
<b>Total</b>	<b>2,82,391</b>	

Source: SIAM (2023-24)

# Phase – I Standard



- Based on 216 Vehicles Data by ARAI, CIRT and VRDE between 2014 and 2015
- Limits apply to individual vehicles
- Phase 1: 50<sup>th</sup> Percentile (Planned 2018, Implemented 2023)
- Phase 2: 20<sup>th</sup> Percentile (Dropped)

Fuel Economy (Y) in litres/100 km = a + b. X;  
Where X is the GVW and a,b are the intercept and slope

Gross Vehicle Weight (GVW)	Axle Configuration	Fuel Consumption target (L/100 km)	
		X= GVW in tonnes	
		40 km/h	60 km/h
<b>N3 Rigid Vehicles</b>			
≥ 12.0 tonnes	4×2	0.362X + 10.327	0.788X+9.003
≥ 16.2 tonnes	6×2	0.603X + 6.415	0.755X + 9.546
≥ 16.2 tonnes	6×4	0.723X + 4.482	1.151X + 3.122
≥ 25.0 tonnes	8×2	0.527X + 8.333	0.650X + 12.160
≥ 25.0 tonnes	8×4	0.928X - 0.658	0.968X + 7.692
≥ 31.0 tonnes	10×2	0.960X - 5.100	0.650X + 12.160
<b>N3 Tractor trailers</b>			
≥ 35.2 tonnes	4×2	0.986X-7.727	0.208X+32.198
≥ 40.2 tonnes	6×2	0.628X + 6.648	0.628X + 15.298
≥ 40.2 tonnes	6×4	1.255X - 18.523	1.342X - 13.390
<b>M3 Vehicles- Buses</b>			
≥ 12.0 tonnes	4×2 and 6×2	0.509X+11.062	0.199X+19.342

Source: Gazette Notification S.O. 2670 (E) dated September 21, 2020

# Recommendations

1

The consortium recommends **transitioning to fleet averaging within truck groups** for the next regulatory cycle starting in **2027**.

2

**Penalty mechanism as per EC Act to ensure compliance.**

3

Going forward, BEE may recommend **development of a computer-based simulation tool**, provisionally named the **Bharat Energy Efficiency Tool (BEET) or Bharat VECTO**, to assess the fuel efficiency of vehicles.



# Thank You

**Sharif Qamar**

[Sharif.Qamar@teri.res.in](mailto:Sharif.Qamar@teri.res.in)



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