



Real Driving Emission Control for Heavy-Duty Vehicles: Challenges for Euro 7/BS7

NATIONAL AUTOMOTIVE TEST TRACKS

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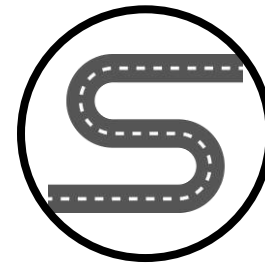
NATRAX

INFRASTRUCTURE & FACILITIES



ABOUT US

NATRAX is one of the state-of-the-art automotive testing and certification center under National Automotive Board (formerly known as NATRIP Implementation Society) and a flagship project of Ministry of Heavy Industry.



TRACKS - 14



LABS -

5



INSTRUMENTATION
FACILITY



LAND AREA
3000 ACRES

AGENDA

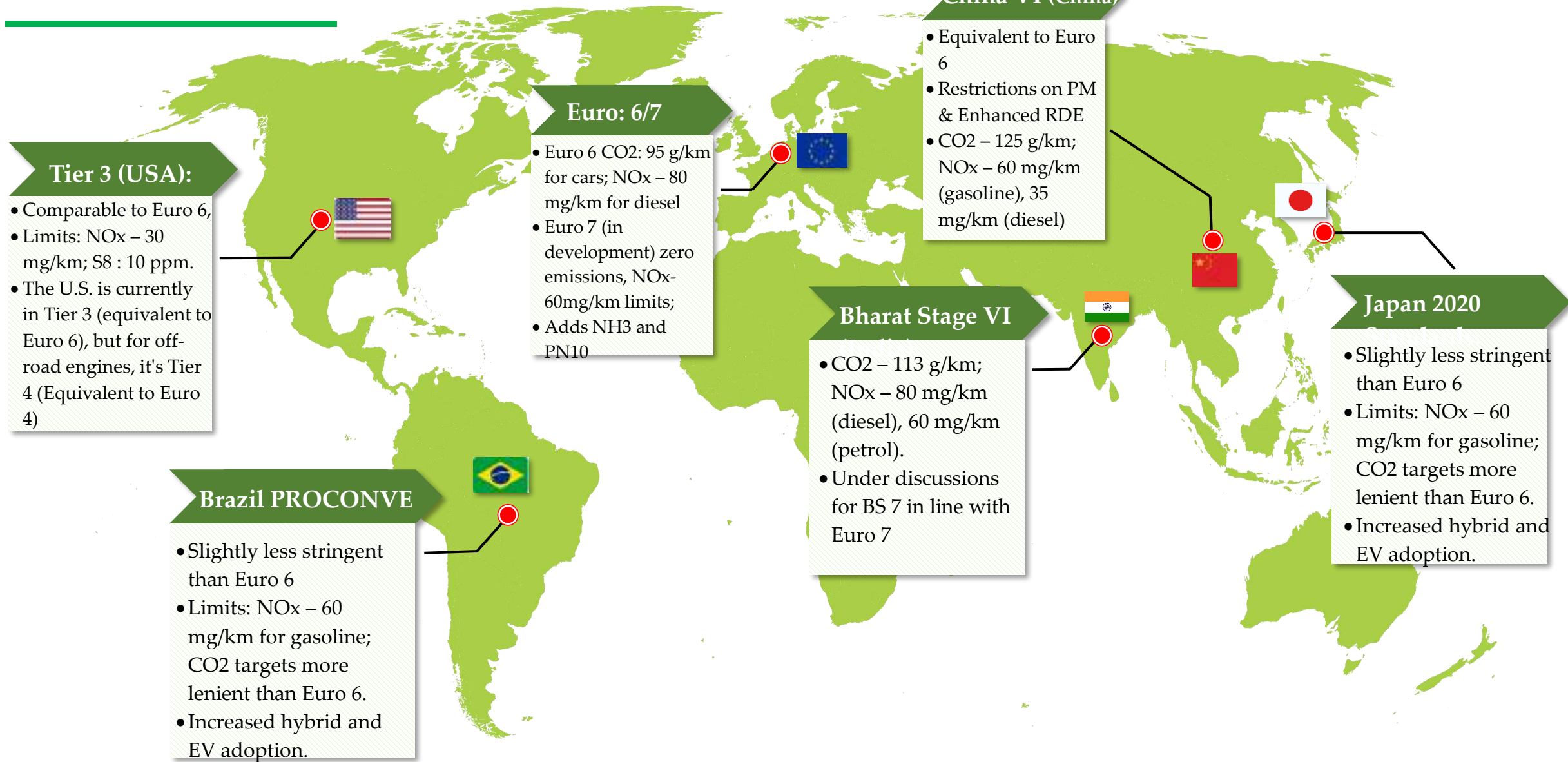
- **Global emission scenario**
- **Journey so far**
- **Journey from BS4 to BS6**
- **Euro 7/BS7 Emission Standards – An Overview**
- **The Role of Testing Agencies in Adapting to BS 7**
- **Challenges in adopting BS 7**
- **Way forward**





GLOBAL EMISSION SCENARIO

EMISSION LEGISLATION OVERVIEW "WORLDWIDE"



Tier 3 (USA):

- Comparable to Euro 6,
- Limits: NOx – 30 mg/km; S8 : 10 ppm.
- The U.S. is currently in Tier 3 (equivalent to Euro 6), but for off-road engines, it's Tier 4 (Equivalent to Euro 4)

Brazil PROCONVE

- Slightly less stringent than Euro 6
- Limits: NOx – 60 mg/km for gasoline; CO2 targets more lenient than Euro 6.
- Increased hybrid and EV adoption.

Euro: 6/7

- Euro 6 CO2: 95 g/km for cars; NOx – 80 mg/km for diesel
- Euro 7 (in development) zero emissions, NOx-60mg/km limits;
- Adds NH3 and PN10

Bharat Stage VI

- CO2 – 113 g/km; NOx – 80 mg/km (diesel), 60 mg/km (petrol).
- Under discussions for BS 7 in line with Euro 7

China VI (China)

- Equivalent to Euro 6
- Restrictions on PM & Enhanced RDE
- CO2 – 125 g/km; NOx – 60 mg/km (gasoline), 35 mg/km (diesel)

Japan 2020

- Slightly less stringent than Euro 6
- Limits: NOx – 60 mg/km for gasoline; CO2 targets more lenient than Euro 6.
- Increased hybrid and EV adoption.

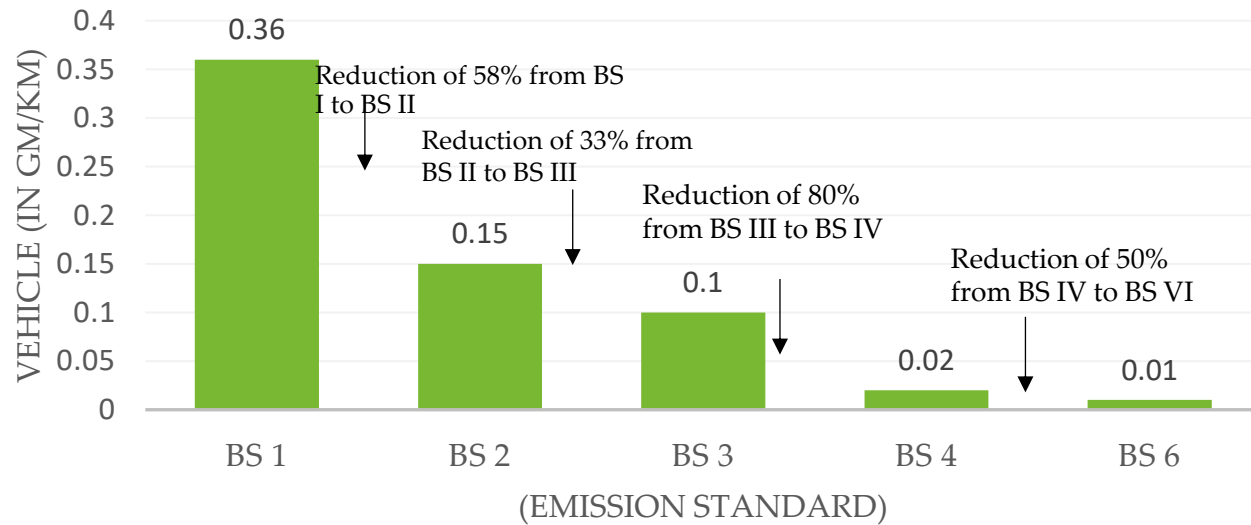


JOURNEY SO FAR

EFFECT OF SUCESSIVE BHARAT STAGE STANDARDS

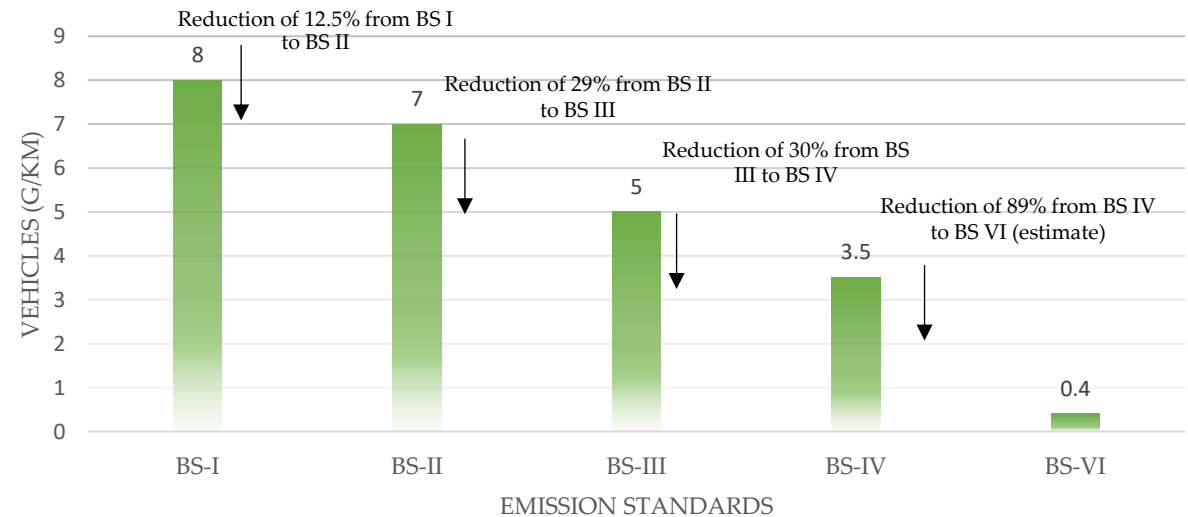


EFFECTIVE OF SUCESSIVE BS STANDARD ON PARTICULATE MATTER



Gm/Kwh	BS-I	BS-II	BS-III	BS-IV	BS-VI	CHANGE
	-	2005	2010	2017	2020	
CO	4.5	4	5.45	4	4	0%
HC	1.1	1.1	0.78	0.55	0.16	71%
NOX	8	7	5	3.5	0.4	89%
PM	0.36	0.15	0.1	0.02	0.01	50%

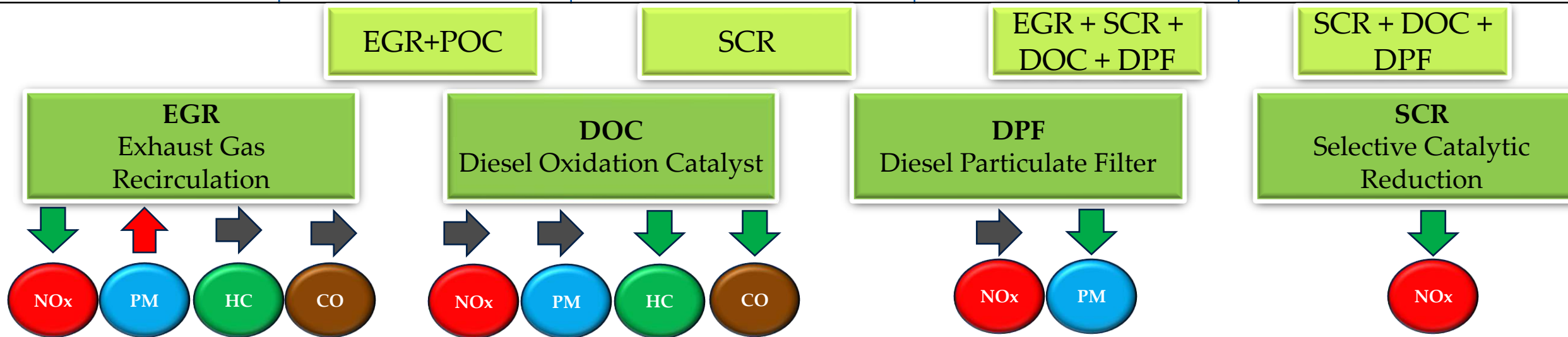
EFFECT OF SUCESSIVE BHARAT STAGE STANDARDS ON NOX



Reduction of PM & NOX (BS I – BS VI)

ADDITIONAL TECHNOLOGIES REQUIRED TO MEET EMISSION LIMITS

EMISSION	BSIV		BSVI	
CO Carbon Monoxide	-		-	
HC Hydrocarbons			Doc	
NOx Nitrogen oxides	EGR	SCR	EGR + SCR	SCR
PM Particulate Matter	POC	-	DPF	DPF

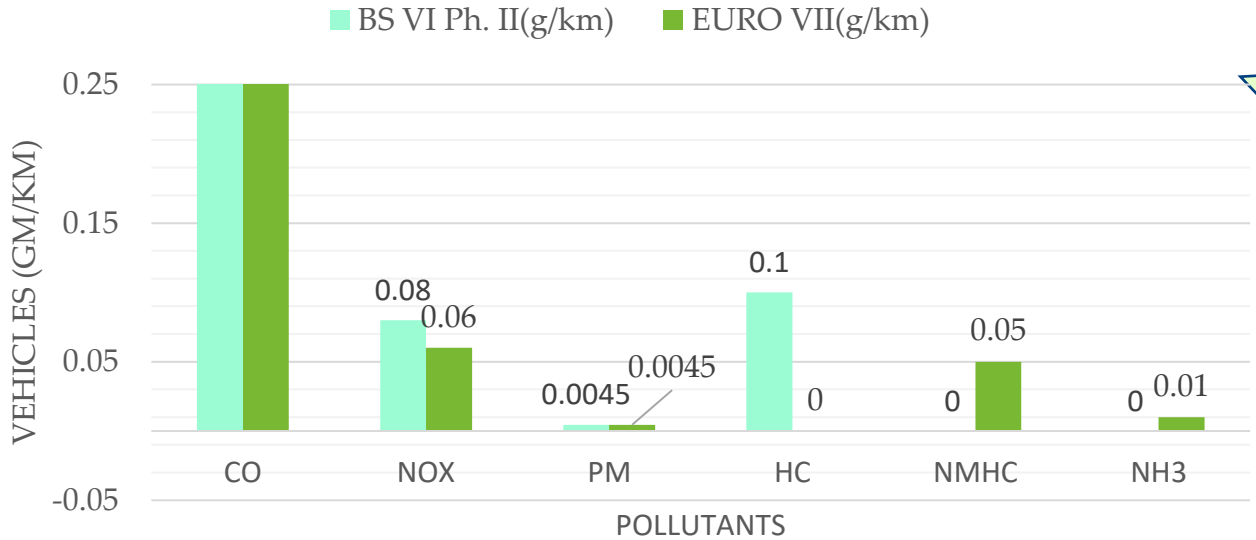




EURO 7/BS7 EMISSION STANDARDS – AN OVERVIEW

BS7- WHAT'S NEW FROM BS 6

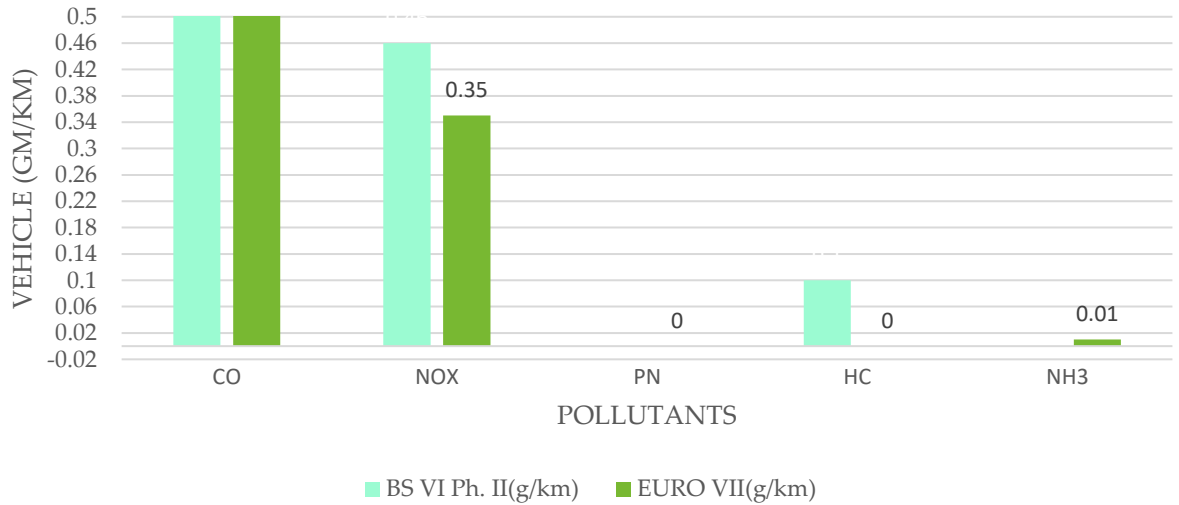
Pollutant values in Petrol Vehicles



Reduction in Petrol Vehicles

Reduction in Diesel Vehicles

Pollutant Values in Diesel Vehicles



COMPARISON BETWEEN BS 6, BS 6 PHASE 2 AND EURO 7

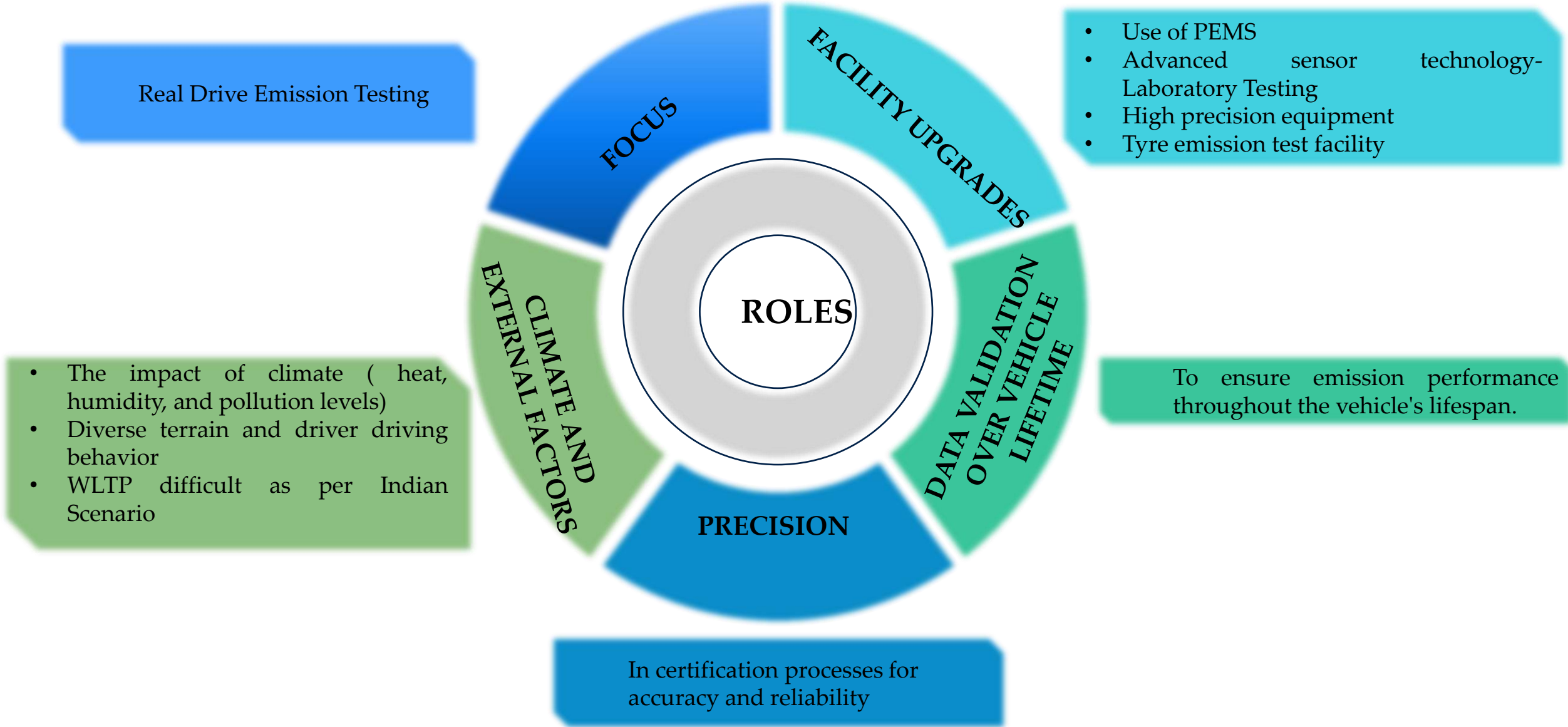


Criteria	BS6	BS6 Phase 2	Euro 7
Implementation Year	April 2020	April 2023	Expected LDVs from 2027 HDVs from 2028 and Tyre emissions from 2028
Pollutants Regulated	CO, NOx, PM, HC	CO, NOx, PM, HC, Particle Number (PN)	CO, NOx, PM, HC, PN, Methane (CH ₄), Ammonia (NH ₃)
Emission Limits for Passenger Cars (g/km)	CO: 1.0, NOx: 0.08, PM: 0.0045, HC: 0.1	CO: 1.0, NOx: 0.08, PM: 0.0045, HC: 0.1	CO: 1.0, NOx: 0.06, PM: 0.0045, HC: 0.1, NH ₃ : 0.01 (Limits mostly same as EURO-6 PN10 is now regulated instead of PN23, with lower cut-off point of 10nm instead of 23nm, Particle number limit is more stringent)
Emission Limits for Heavy-Duty Vehicles (g/kWh)	CO: 1.5, NOx: 0.46, PM: 0.01	CO: 1.5, NOx: 0.46, PM: 0.01, PN: 6.0x10 ¹¹	CO: 1.5, NOx: 0.35, PM: 0.01, PN: 6.0x10 ¹¹ , NH ₃ : 10ppm
Emission Control Technologies	Diesel Particulate Filter (DPF), SCR	DPF, SCR, Gasoline Particulate Filter (GPF)	Advanced DPF, SCR, Ammonia Slip Catalysts, GPF
Real Driving Emissions (RDE)	Introduced (Light-duty vehicles)	Stricter RDE norms for all vehicle types	Comprehensive RDE for all vehicle types
Onboard Diagnostics (OBD)	OBD Stage 1	OBD Stage 2 (more advanced)	Enhanced OBD with real-time monitoring
Durability Requirements	160,000 km	200,000 km	240,000 km
Test Cycles	Modified Indian Drive Cycle (MIDC)	Worldwide Harmonized Light Vehicles Test Procedure (WLTP)	WLTP and more realistic urban driving conditions
Fuel Efficiency Impact	Moderate impact	Improved fuel efficiency requirements	Stricter fuel efficiency requirements
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Stringency Level	Less stringent than Euro 6	Closer to Euro 6 standards	Most stringent emission standards globally



THE ROLE OF TESTING AGENCIES IN ADAPTING TO BS7

THE ROLE OF TESTING AGENCY IN ADAPTING TO BS 7





CHALLENGES IN ADOPTING BS 7

CHALLENGES OF REAL DRIVE EMISSION (RDE) TESTING FOR HEAVY VEHICLES UNDER EURO



7/BS7



Increased R&D Cost

Need heavy investment to comply with RDE protocols, increasing costs.

Heavy vehicles need diverse test cycles and the deployment of mobile emission measurement systems (PEMS), raising operational costs.

Technical Complexity in Measurement

Difficulty in collecting accurate, real-time emissions data during various driving conditions.

Requires advanced sensors and data analytics tools.

Drive Cycle Mismanagement

Emissions vary significantly based on load, weather, and road gradients, complicating compliance for different heavy-duty vehicles.

India has extreme terrains, diverse traffic and extreme temperature conditions

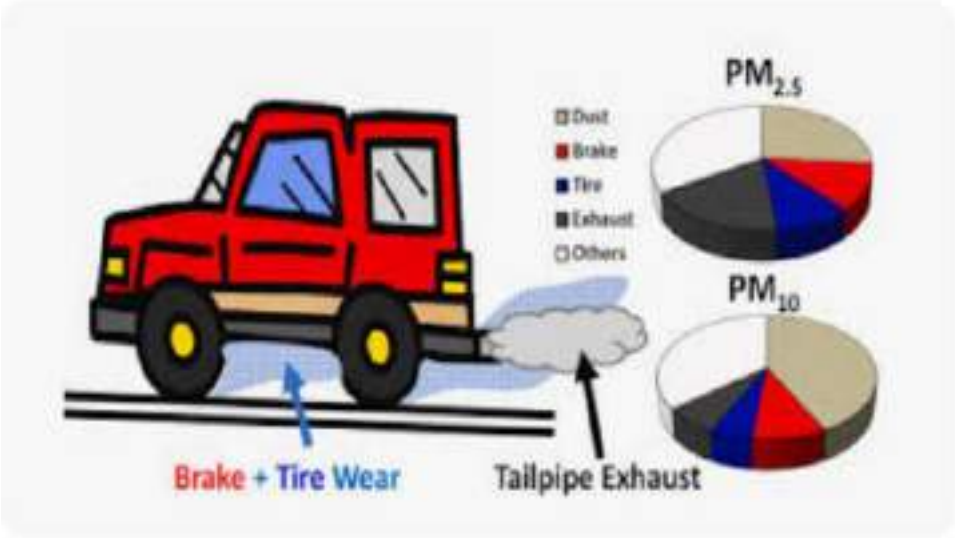
Data Calibration & Validation

Ensuring real-world emissions data matches laboratory standards.

Component Upgrades

Larger catalytic converters and advanced EGR systems are required for RDE testing.

CHALLENGES OF NON-TAILPIPE EMISSIONS



Tyre Wear & Microplastic Emissions

Tyre wear releases microplastics, which are difficult to control.

High Frequency Data Logging

Real-time tracking of non-tailpipe emissions requires efficient data systems.

Data Storage & Security

Storing large datasets from emissions monitoring raises concerns about data integrity and privacy.

Cost Implications for Manufacturers

Significant R&D investments increase production costs for heavy-duty vehicles.

Infrastructure Deficiencies

Inadequate infrastructure for refueling and maintaining advanced emission technologies hinders mass adoption.

Supply Chain Constraints

Semiconductor shortages and supply disruptions further slow down the adoption of emission control systems.

BROADER CHALLENGES IN BS 7 IMPLEMENTATION



Increased Vehicle Costs

- High-tech components like DPFs and advanced Onboard Diagnostics (OBD) raise vehicle prices.



Fuel Efficiency Loss

- Due to stronger Diesel Particulate Filters (DPFs) and Selective Catalytic Reduction (SCR) systems, fuel efficiency could be compromised.



Maintenance Challenges

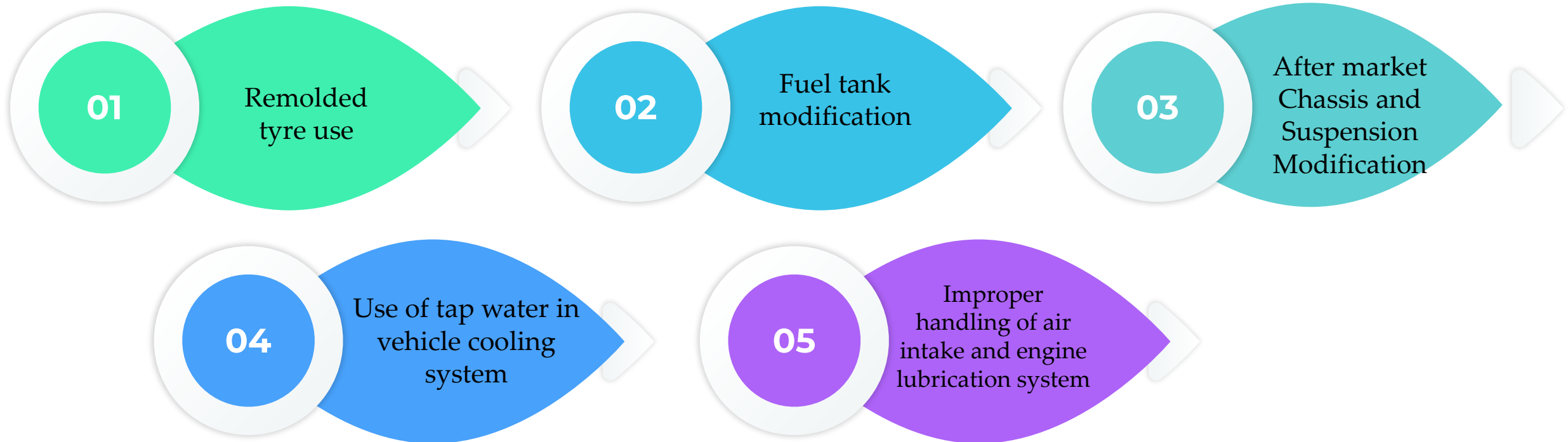
- Emission control systems require frequent maintenance, driving up costs for both manufacturers and consumers.



Emission Control Technologies

- Systems like Diesel Oxidation Catalysts and EGR can cause back pressure, affecting engine performance.

CHALLENGES IN TECHNOLOGY ADOPTION DUE TO IMPROPER MARKET PRACTICES



OTHER CHALLENGES

Industry

- Increase use of Platinum and Iridium in SCR can lead to theft
- Increase use of Ad Blue urea
- Increase in back pressure can lead to poor engine performance and more GHG emission
- Use of RDE and OBD can cause frequent malfunction if driver is not educated

Overloading and Customization- After Market

- Overloading Impact on Tires
- Suspension Modifications
- Fuel Tank Modification

Poor Maintenance Practices

- Remolding and retreading of tyres
- Poor maintenance of Air intake system
- Engine Cooling System Mismanagement

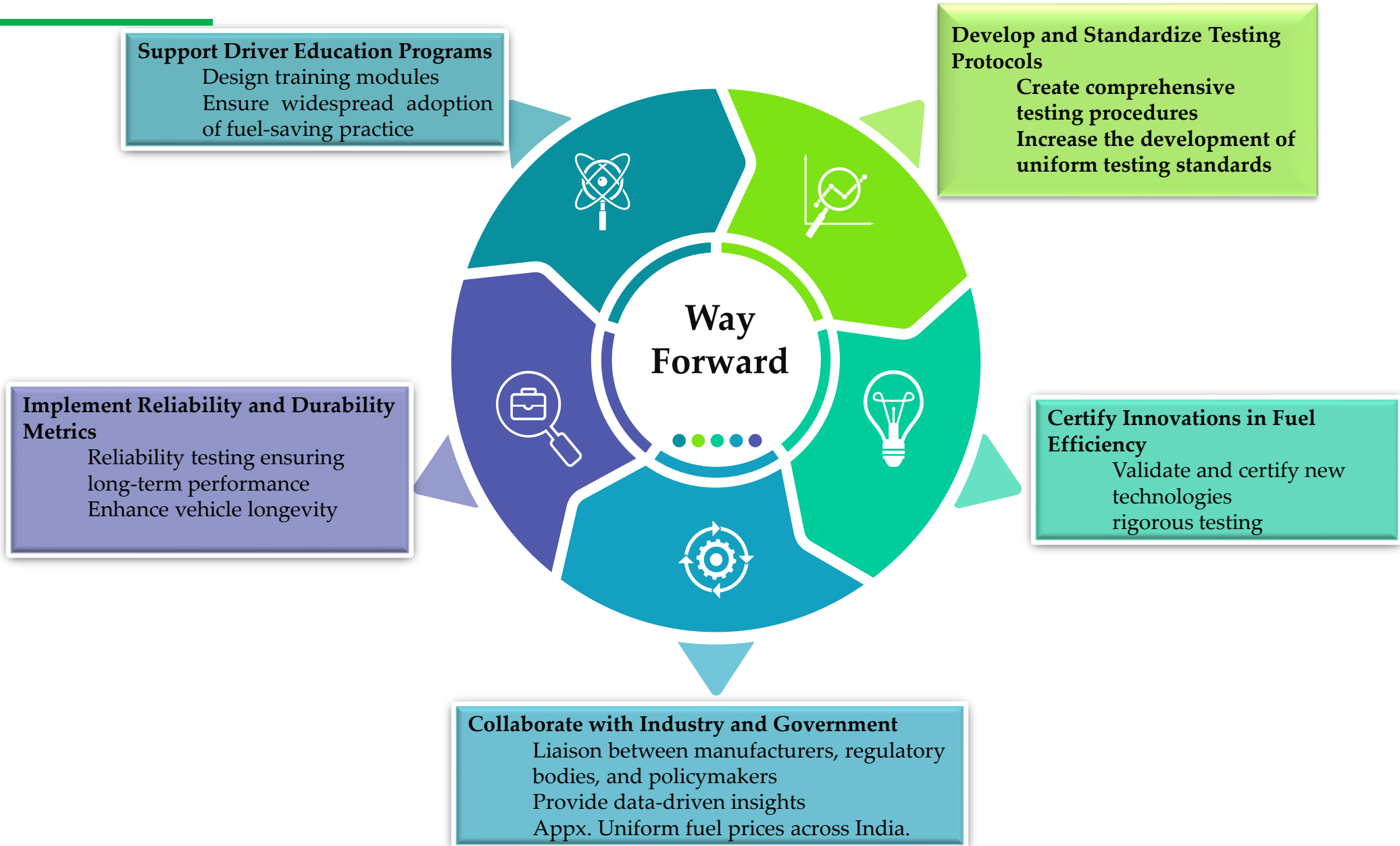
Engine Oil Management and Broader Solutions

- Use of Correct Engine Oil Quality
- Need for driver education
- Reliability measures



WAY FORWARD

WAY FORWARD





Thank You

