CSE WORKSHOP ON TRANSPORT AND CLIMATE

REGULATORY PREPAREDNESS

By

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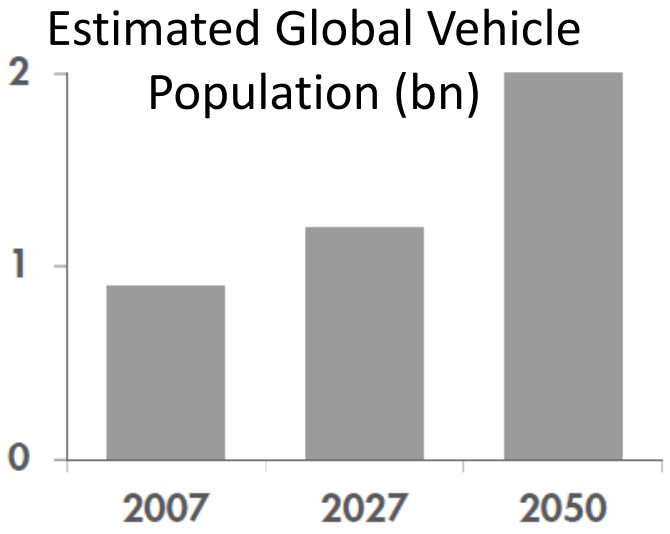
Presentation Layout

- **Global Scenario – Mobility**
- Indian Scenario – Mobility
- Challenges And Concern Areas
- Current Regulatory System
- Way Forward for Regulatory Preparedness

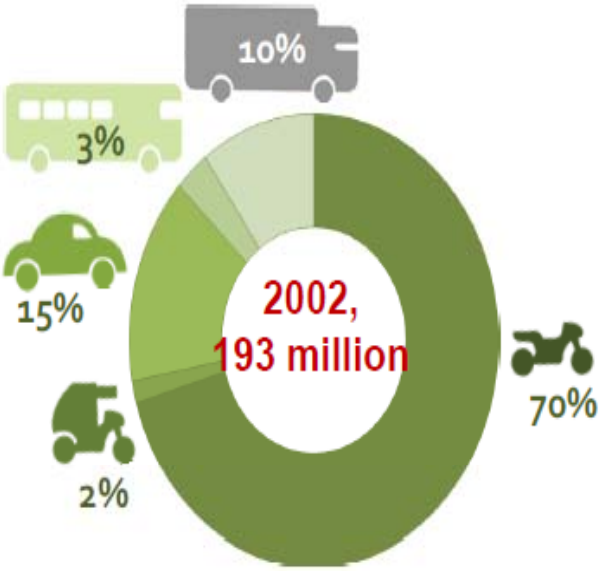
Global Scenario Mobility

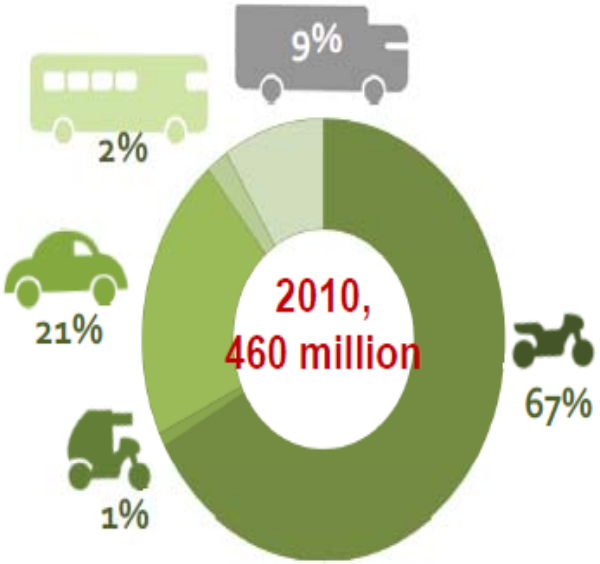
Global Scenario – Mobility

Global vehicle fleet expected to grow to 2 billion by 2050



Source: WBSCD

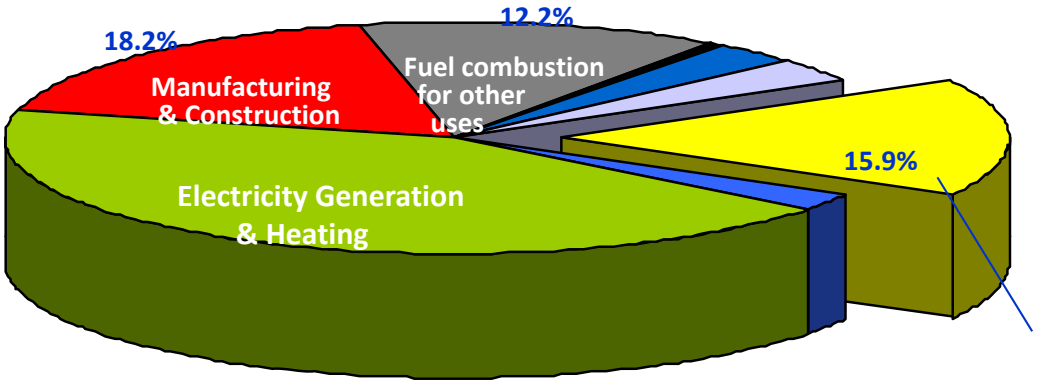




Asia witnessing a growing demand for personal mobility

Source: Clean Air Asia Center, Presentation, Dec 2012

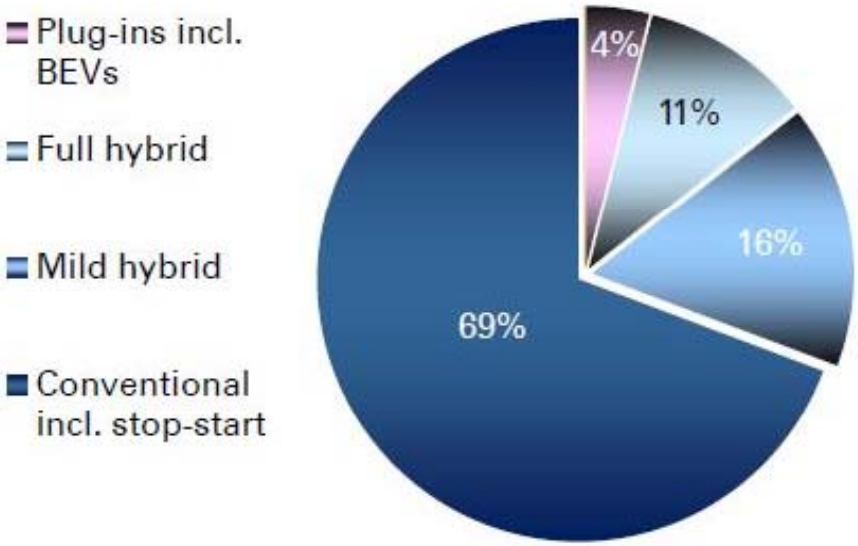
Global Scenario – Mobility



Road Transport accounts for 16% of CO_2 Emissions

Road Transport
(Cars, Trucks & Buses)

Source: OICA Website & Urban Mobility in the 21st Century A Report



Conventional technology vehicles still expected to dominate even in 2030

Source: BP Energy Outlook 2030, Jan 2012

Indian Scenario Mobility

Indian Scenario – Mobility

Before 1982

- 0.4 million units in 1982
- Closed Market
- Seller's Market

1982 - 92

- 0.6 million units in 1992
- JV between Indian Govt. & Suzuki established

1993 - 2007

- 11 million units in 2007
- Sector de-licensed in 1993
- Imports allowed from April 2001

2008 Onwards

- 20.7 million units in 2013
- Removal of most import controls
- Indian companies gaining global identity

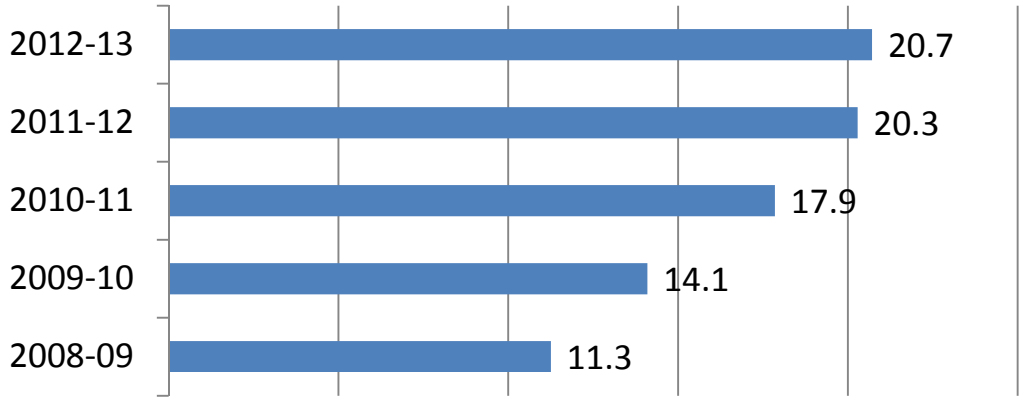
No. of Players in Indian Industry

Passenger Cars	15
Utility Vehicles	10
MHCV	7
LCV	7
Scooters	7
Motorcycles	9
Mopeds	3
3-Wheelers	7

Source: SIAM Database & IBEF Presentation

Sales – Indian Automotive Industry

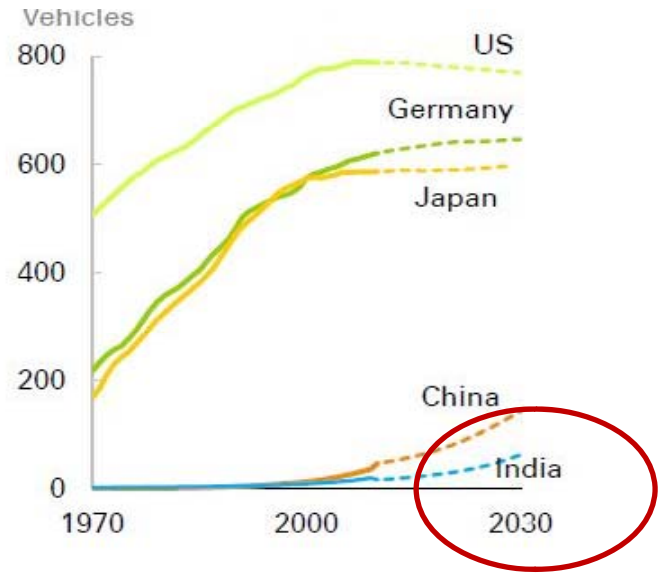
(Million Units)



Indian Scenario – Mobility

Source: SIAM and ACMA Presentations

- 125 million registered vehicles in India
- Automobile production to double by 2020-21

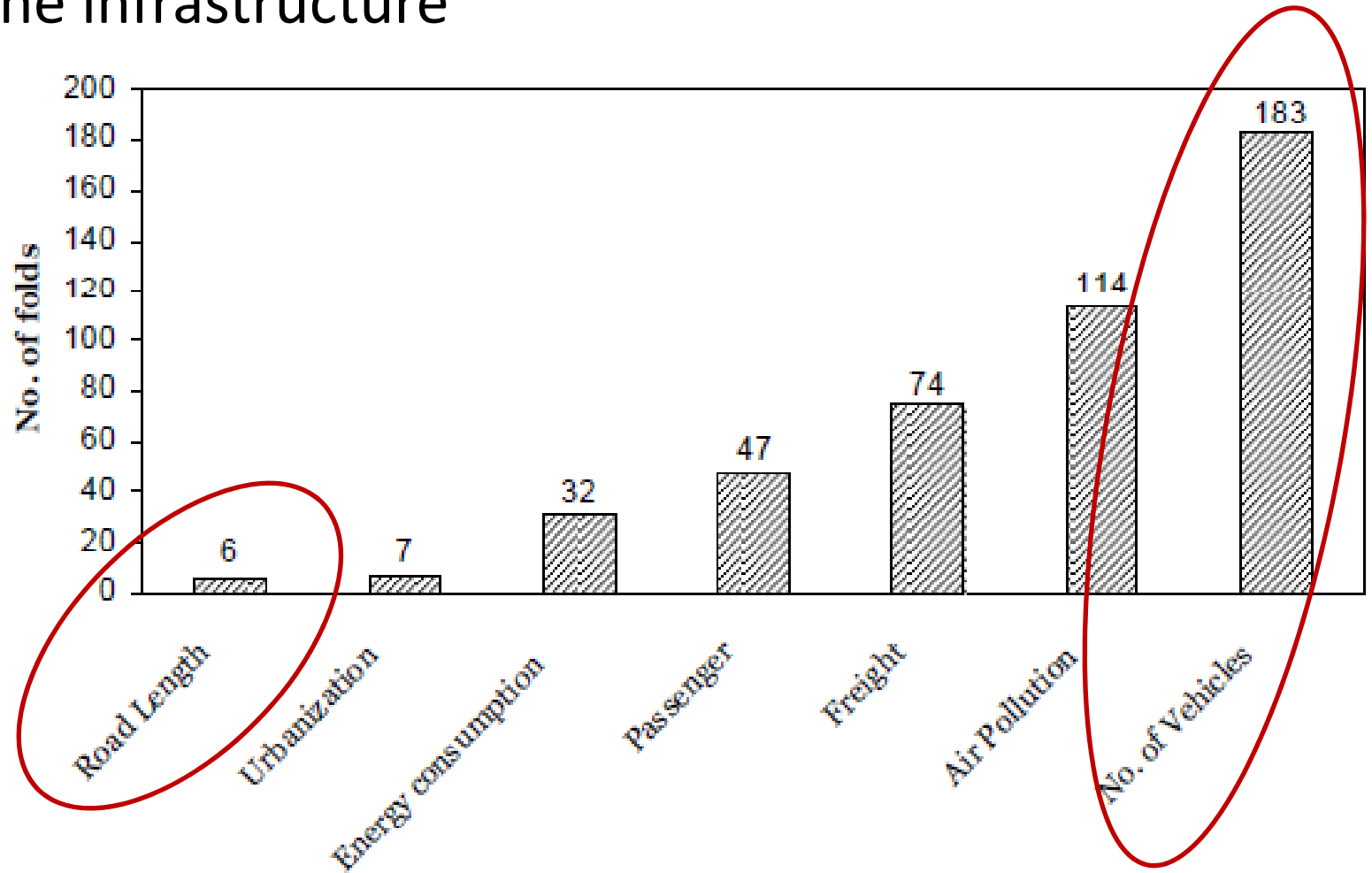


Source: BP Energy Outlook 2030, Jan 2012

- Vehicle density per 1000 population in India expected to grow to 65 by 2030

Indian Scenario – Mobility

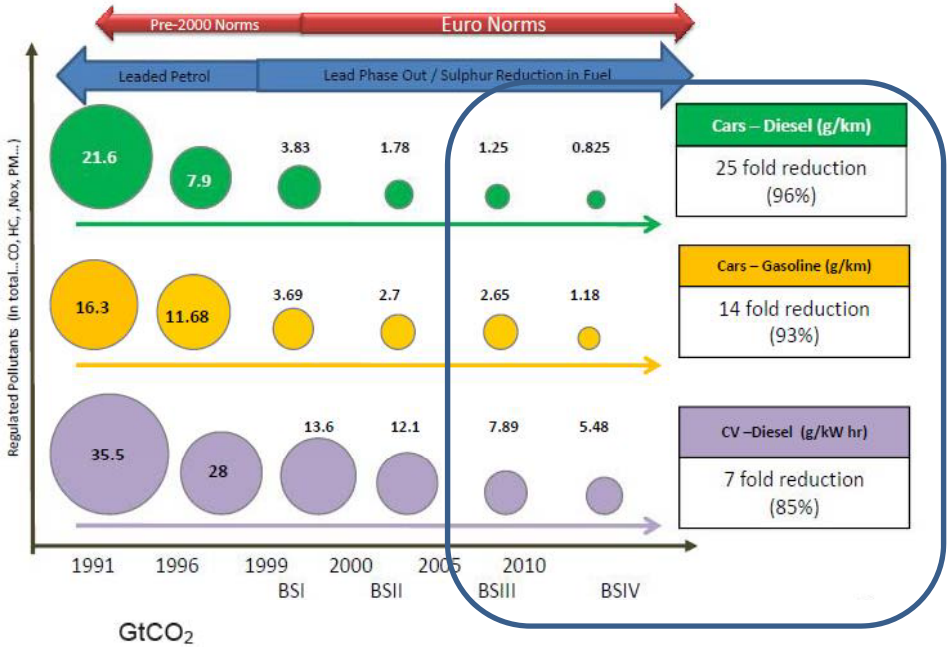
But, Indian Vehicle Population has far outgrown compared to the infrastructure



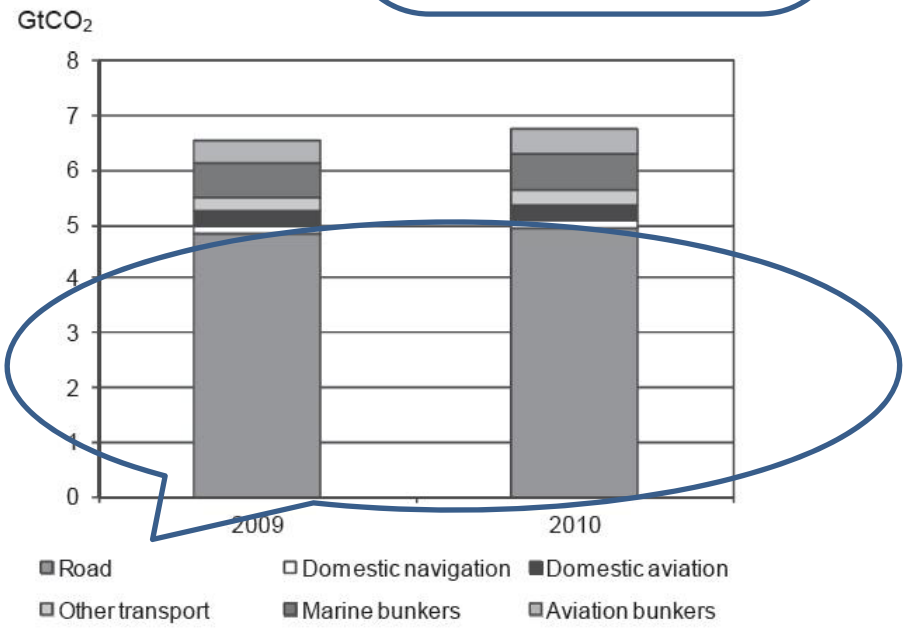
Source: Estimation of Automobile emissions and control strategies – K. S. Nesamani, University of California, 2009

Indian Scenario – Mobility

Automobiles are clean



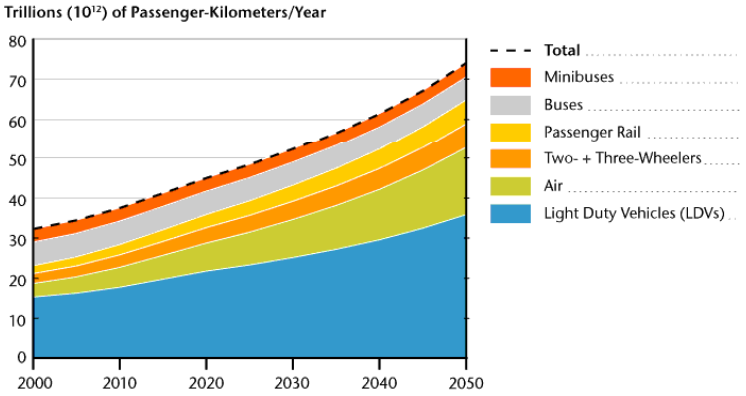
But, still Road Transport alone accounts for about 70% of CO_2 emission in Transport sector

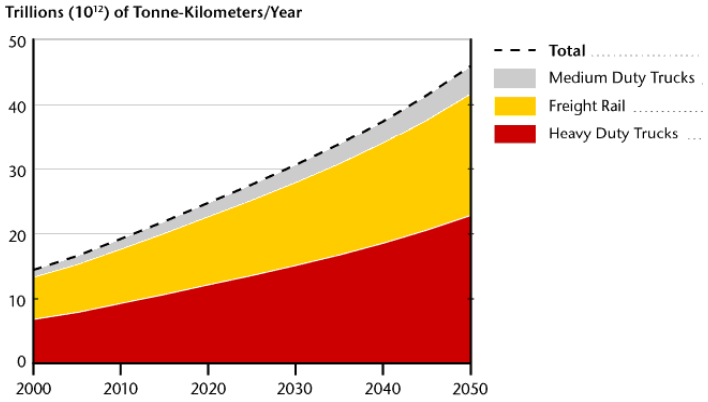


Adapted from SIAM Presentation 2012 on Emissions & Fuel Efficiency

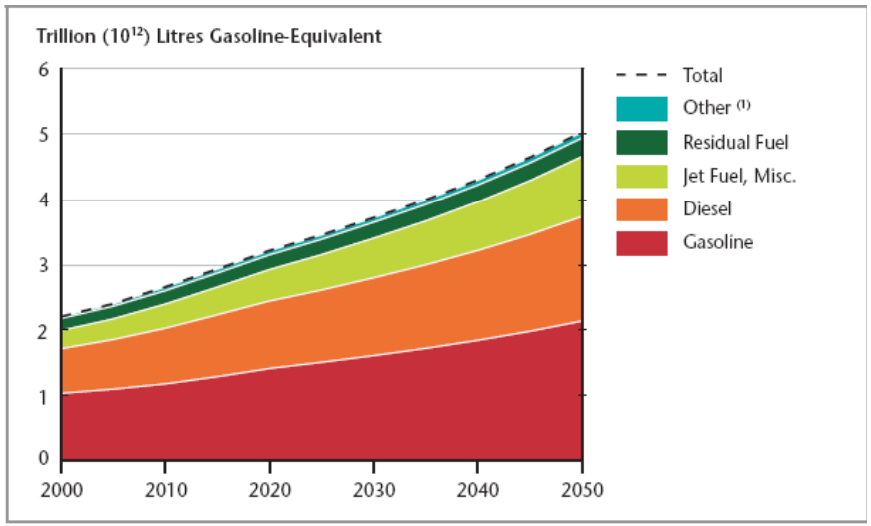
So, trends are relatively clear

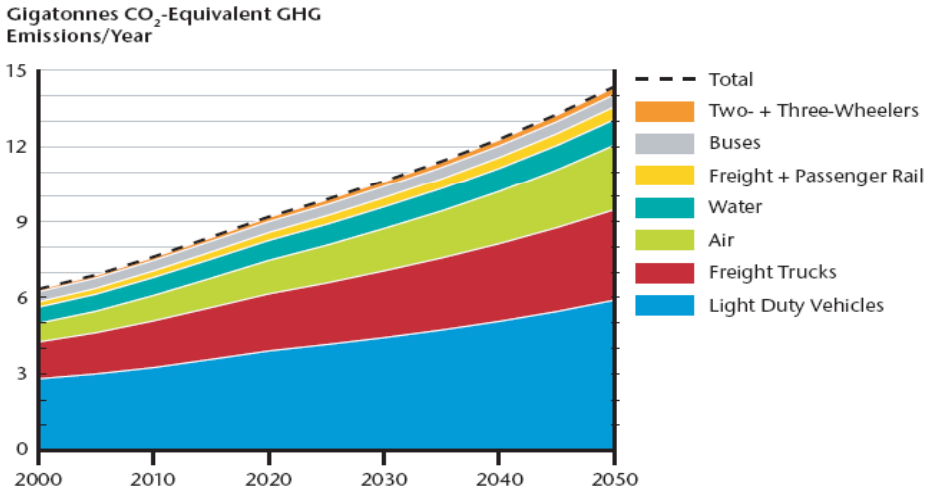
By 2050, Passenger VKT is expected double and Freight VKT triple





Resulting in increased Transport related fuel usage and CO_2 emissions





Source: Transport and Sustainability – CRA International

Resulting in ‘Transportation Imbalance’

Challenges And Concern Areas

So, what does the Environment ???

have in store for the

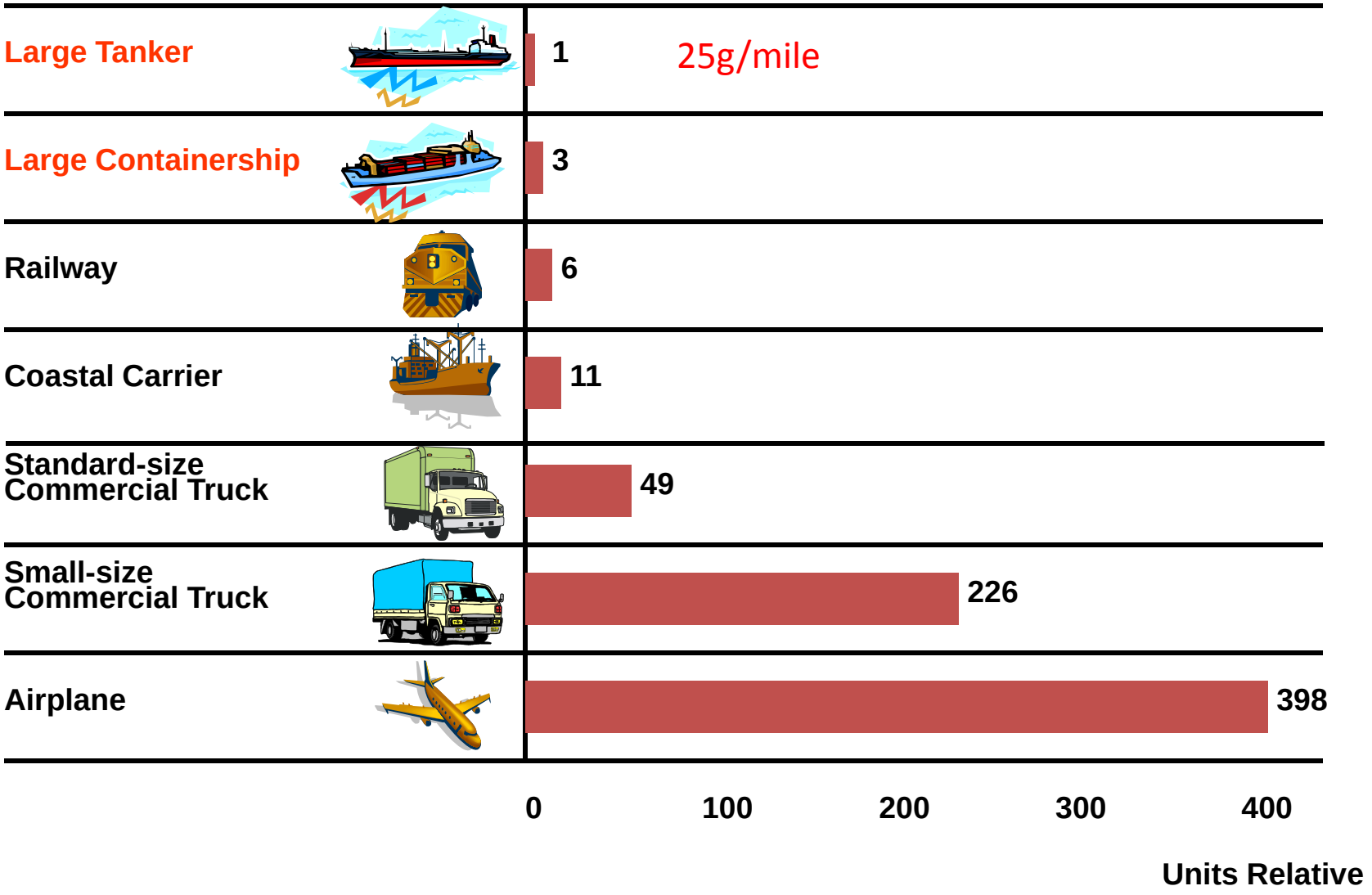
Climate Change

Resource Depletion

Congested Roads

Green House Gases – Transport Sector

CO_2 Emissions per Unit Load by Transport Mode



Main Greenhouse Gases and Characteristics

The main greenhouse gases

Greenhouse gases	Chemical formula	Pre-industrial concentration	Concentration in 1994	Atmospheric lifetime (years)***	Anthropogenic sources	Global warming potential (GWP) *
Carbon-dioxide	CO_2	278 000 ppbv	358 000 ppbv	Variable	Fossil fuel combustion Land use conversion Cement production	1
Methane	CH_4	700 ppbv	1721 ppbv	12,2 +/- 3	Fossil fuels Rice paddies Waste dumps Livestock	21 **
Nitrous oxide	N_2O	275 ppbv	311 ppbv	120	Fertilizer industrial processes combustion	310
CFC-12	CCl_2F_2	0	0,503 ppbv	102	Liquid coolants. Foams	6200-7100 ****
HCFC-22	$CHClF_2$	0	0,105 ppbv	12,1	Liquid coolants	1300-1400 ****
Perfluoromethane	CF_4	0	0,070 ppbv	50 000	Production of aluminium	6 500
Sulphur hexa-fluoride	SF_6	0	0,032 ppbv	3 200	Dielectric fluid	23 900

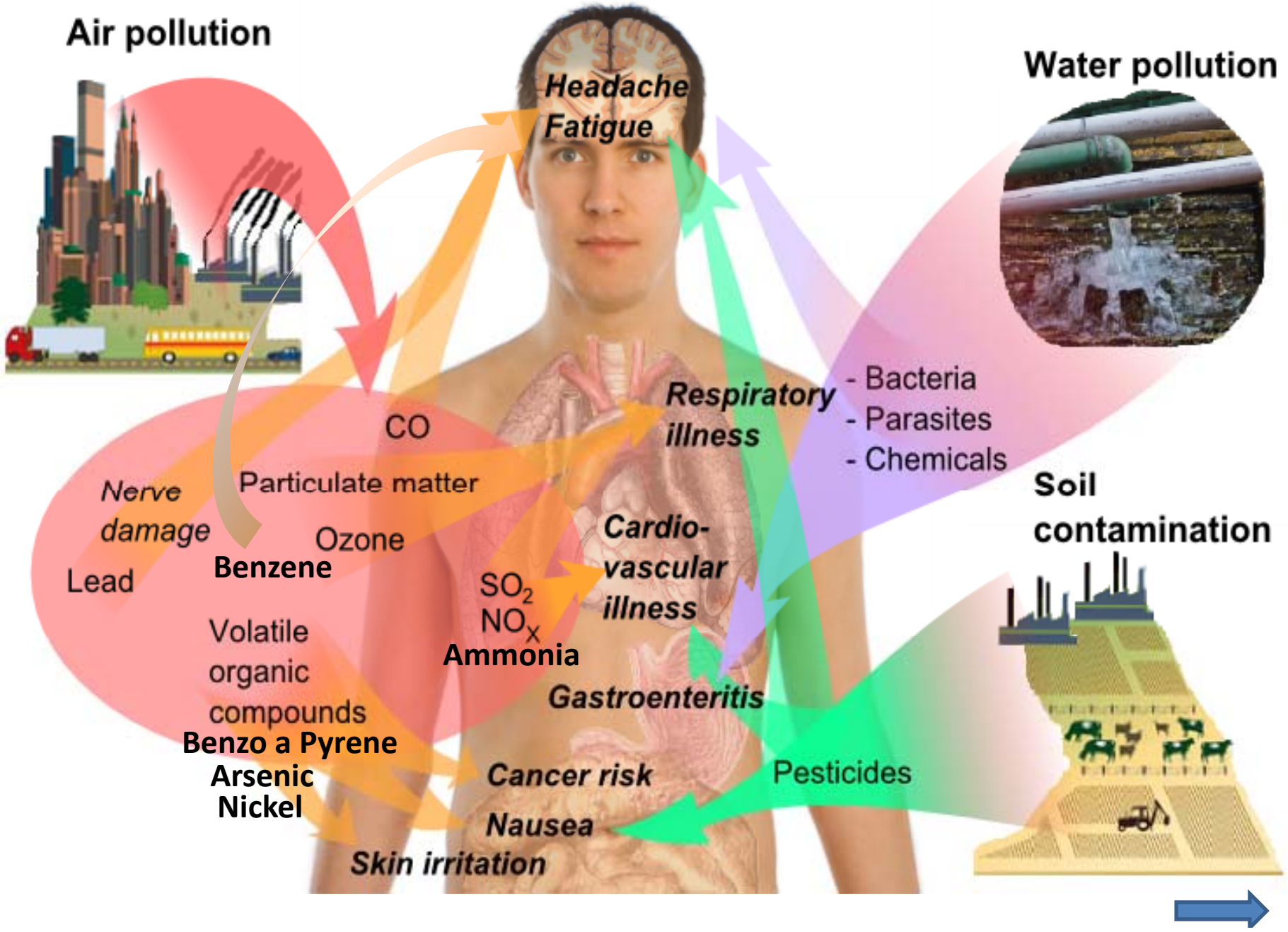
Note : pptv= 1 part per trillion by volume; ppbv= 1 part per billion by volume, ppm v= 1 part per million by volume

* GWP for 100 year time horizon. ** Includes indirect effects of tropospheric ozone production and stratospheric water vapour production. *** On page 15 of the IPCC SAR. No single lifetime for CO_2 can be defined because of the different rates of uptake by different sink processes.**** Net global warming potential (i.e., including the indirect effect due to ozone depletion).

GRID Arendal UNEP

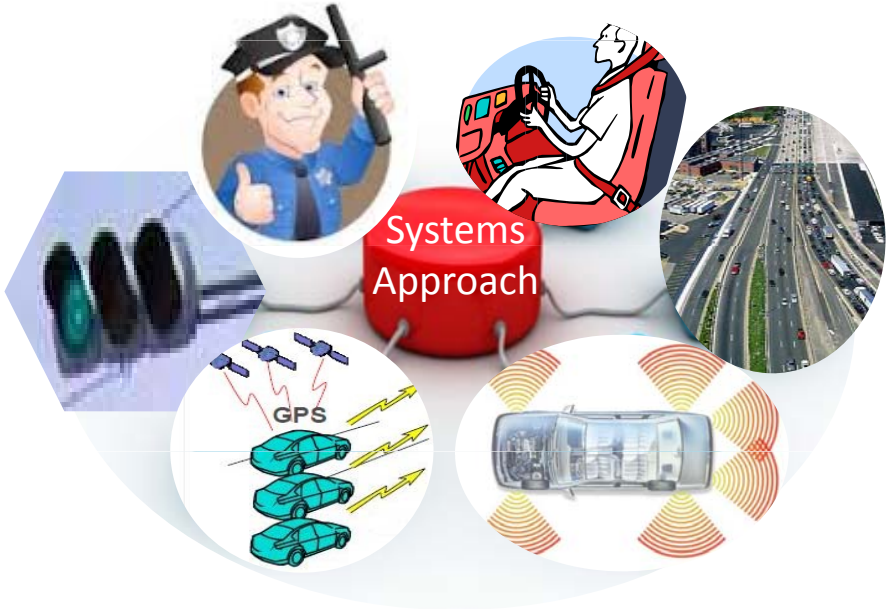
Source: IPCC radiative forcing report ; Climate change 1995, The science of climate change, contribution of working groupe 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge press university, 1996

Health effects of pollution



But does this not mean, we step back in technology…

Rather, we require a systems approach to counter these challenges and to …



Some of foreseen ‘Concerns’ for Mobility in

Concerns are addressable through …

Government

- Promote R&D
- Infrastructure: Road, Rail, Ports, Power AND ITS
- Promote ‘Brand India’
- HR

Industry

- Upgrade Quality Standards
- Upgrade Manufacturing Technology
- Cost Competitiveness
- Develop R&D Capability
- Target Overseas Markets

Reducing CO_2 emissions
The situation in Europe

An integrated approach

1 VEHICLE TECHNOLOGY

Delivering *majority* of new car CO2 reductions

3 DRIVER BEHAVIOUR

ecodriving

5 CO_2-RELATED TAXATION

Influencing demand in a harmonised way

ALTERNATIVE FUELS 2

Sustainable production

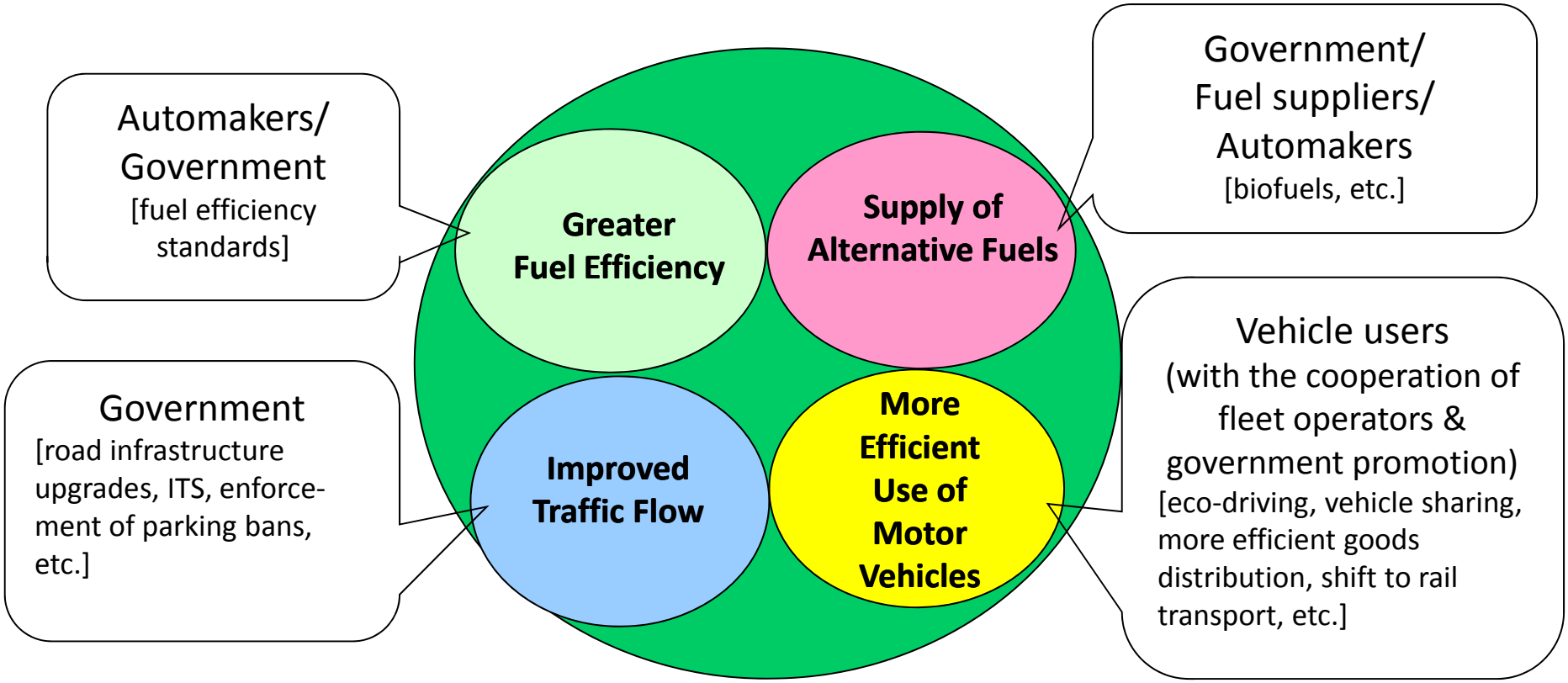
INFRATUCTURE MEASURES 4

Reducing congestion

Japan's Approach to CO_2 Reduction

Adopting an Integrated Sectoral Approach to CO_2 Reduction

Improving automotive fuel efficiency and traffic flow is not enough to reduce CO2 emissions in the road transport sector. An integrated approach is required, which includes the development and supply of alternative fuels and a more efficient use of vehicles. The adoption of these measures will ultimately make CO2 reduction efforts compatible with economic growth.
All stakeholders concerned should identify their individual responsibilities and make their best efforts to carry them out, in a framework of mutual cooperation.



Current Regulatory System

Regulatory Scenario – Emissions

Vehicle Emissions

1991 to 2000
- Emission norms for Catalytic Vehicles
- BS-I (Country)
- BS-II (Metros)

2001 to 2005
- BS-II (Country)
- BS-III (11 Cities)

2006 to 2010
- BS-III (Country)
- BS -IV (13 Cities)

By 2015
- Another 50 Cities to be included by 2015 for BS IV

Diesel Sulphur Reduction

1991 to 2000
- Sulphur 2500 ppm for entire Country

2001 to 2005
- Sulphur 500 ppm for entire Country & 350 ppm (11 Cities)

2006 to 2010
- Sulphur 50 ppm (13 Cities) & 350 ppm for entire Country

Application of Test Requirements for Type-Approval and Extensions – 4 wheelers

Emission Level		BS IV					
Vehicle Category		Vehicles with Positive Ignition					Vehicles with Compression Ignition
		Mono Fuel			Bi fuel		Mono Fuel
Reference fuel		Petrol	LPG	CNG	Petrol CNG	Petrol LPG	Diesel
Type I (Gaseous Pollutants)	CO	✓	✓	✓	✓(both fuels)	✓(both fuels)	✓
	THC	✓	✓	✓	✓(both fuels)	✓(both fuels)	-
	NMHC	-	✓	✓	-	-	-
	NOX	✓	✓	✓	✓(both fuels)	✓(both fuels)	✓
	THC+NOX	-	-	-	-	-	✓
	PM	-	-	-	-	-	✓
	PN	-	-	-	-	-	-
Type II	Idle CO & HC	✓	✓	✓	✓(both fuels)	✓(both fuels)	-
	High Idle Co & Lambda	✓	-	-	✓(Petrol)	✓(Petrol)	-
Free Acceleration Smoke		-	-	-	-	-	✓
Type III	Crank case emission	✓	-	-	✓(Petrol)	✓(Petrol)	-
Type IV	Evaporative Emission	✓	-	-	✓(Petrol)	✓(Petrol)	-
Type V	Durability	✓	✓	✓	✓(Petrol)	✓(Petrol)	✓
OBD		✓	✓	✓	✓(both fuels)	✓(both fuels)	✓
In-service conformity		-	-	-	-	-	-

CO2/FE regulation proposed implementation date : 2016-2017 & 2021-2022.

Emission Level		EURO V(BS V)/EURO VI(BS VI)						
Vehicle Category		Vehicles with Positive Ignition					Vehicles with Compression Ignition	
		Mono Fuel			Bi fuel		Mono Fuel	Flex Fuel
Reference fuel		Petrol E5	LPG	CNG	Petrol E 5 CNG	Petrol E LPG	Diesel B 5	Diesel B 5 Bio Diesel
Type I (Gaseous Pollutants)	CO	✓	✓	✓	✓(both fuels)	✓(both fuels)	✓	✓(Diesel)
	THC	✓	✓	✓	✓(both fuels)	✓(both fuels)	-	-
	NMHC	✓	✓	✓	✓(both fuels)	✓(both fuels)	-	-
	NOX	✓	✓	✓	✓(both fuels)	✓(both fuels)	✓	✓(Diesel)
	THC+NOX	-	-	-	-	-	✓	✓(Diesel)
	PM	-	-	-	-	-	✓	✓(Diesel)
	Particle Number	✓	-	-	✓(Petrol)	✓(Petrol)	✓	✓(Diesel)
Type II	Idle CO & HC	✓	✓	✓	✓(both fuels)	✓(both fuels)	-	
	High Idle Co & Lambda	✓	-	-	✓(Petrol)	✓(Petrol)	-	
Free Acceleration Smoke		-	-	-	-	-	✓	✓(Diesel)
Type III	Crank case emission	✓	-	-	✓(Petrol)	✓(Petrol)	-	
Type IV	Evaporative Emission	✓	-	-	✓(Petrol)	✓(Petrol)	-	
Type V	Durability	✓	✓	✓	✓(Petrol)	✓(Petrol)	✓	✓(Diesel)
OBD		✓	✓	✓	✓(both fuels)	✓(both fuels)	✓	✓
In-service conformity		✓	✓	✓	✓(both fuels)	✓(both fuels)	✓	✓(Diesel)
CO2/FE regulations		✓	✓	✓	✓(both fuels)	✓(both fuels)	✓	✓(Diesel)

European Regulation- Application of Test Requirements for Type-Approval and Extensions – 2 wheelers (Euro IV,-2017, Euro V-2021)

	Vehicle with PI engines including hybrids									Vehicles with C.I. engines including hybrids	
	Mono fuel				Bi fuel			Flex fuel		Flex fuel	Mono Fuel
Reference Fuel	Petrol (E5)	LPG	NG/ Biomethane	H_2	Petrol (E5)	Petrol (E5)	Petrol (E5)	Petrol (E5)	NG/ Biomethane	Diesel (B5)	Diesel (B5)
					LPG	NG/ Biomethane	Hydrogen	Ethanol (E85)	H_2NG	Biodiesel	
Type I Test Tailpipe emissions after cold start	Yes	Yes	Yes	Yes	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (B5 only)	Yes
Type I Test Particulates mass (Euro 5 only)	Yes	No	No	No	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	No	Yes (B5 only)	Yes
Type II Test Emissions at idling and increased idling speed & Smoke opacity for CI only	Yes	Yes	Yes	Yes	Yes (both fuels)	Yes (both fuels)	Yes (petrol only)	Yes (both fuels)	Yes (NG/ biomethane only)	Yes (B5 only)	Yes
Type III test Crankcase Emissions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Type IV Test Evaporative emissions	Yes	No	No	No	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	No	No	No
Type V Test Durability of pollution control devices	Yes	Yes	Yes	Yes	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (NG/ biomethane only)	Yes (B5 only)	Yes
Type VII test CO2 emissions	Yes	Yes	Yes	Yes	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes
Type VIII test OBD tests	Yes	Yes	Yes	Yes	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (NG/ biomethane only)	Yes (B5 only)	Yes

Way Forward for Regulatory Preparedness

Chassis Dynamometer Facilities – Euro V / Euro VI

4W Chassis Dynamometer 4 x 2

HCV Chassis Dynamometer

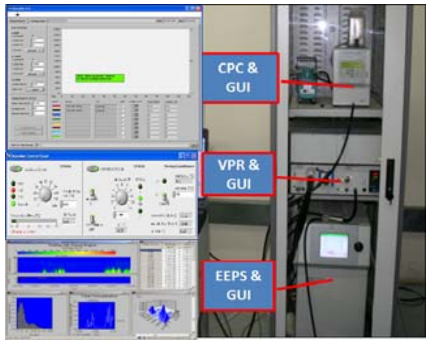
2W Chassis Dynamometer

4W Chassis Dynamometer 4 x 4

Transient Dynamometer

2W/3W Chassis Dynamometer

SHED



Particle Number Measurement

Mileage Accumulator Dyno with Robot 4 x 4

Establishment – New Facilities

	VTC	CVTC	MACD
Description	4W Mass emission testing	Climatic chamber to carryout Type-VI test- measurement of CO and HC at -7 °C	Mileage accumulation chassis dyno.
	4 x 4	**4 x 4**	**4 x 4**
Base Inertia	1200 kg per axle	1200 kg per axle	1300 kg per axle
Inertia simulation range of unit	454 to 5448 Kg	454 to 5448 Kg	454 to 5448 Kg
Max Speed	250 km/h	250 km/h	250 km/h

This total facility will be ready for customers by April 2014

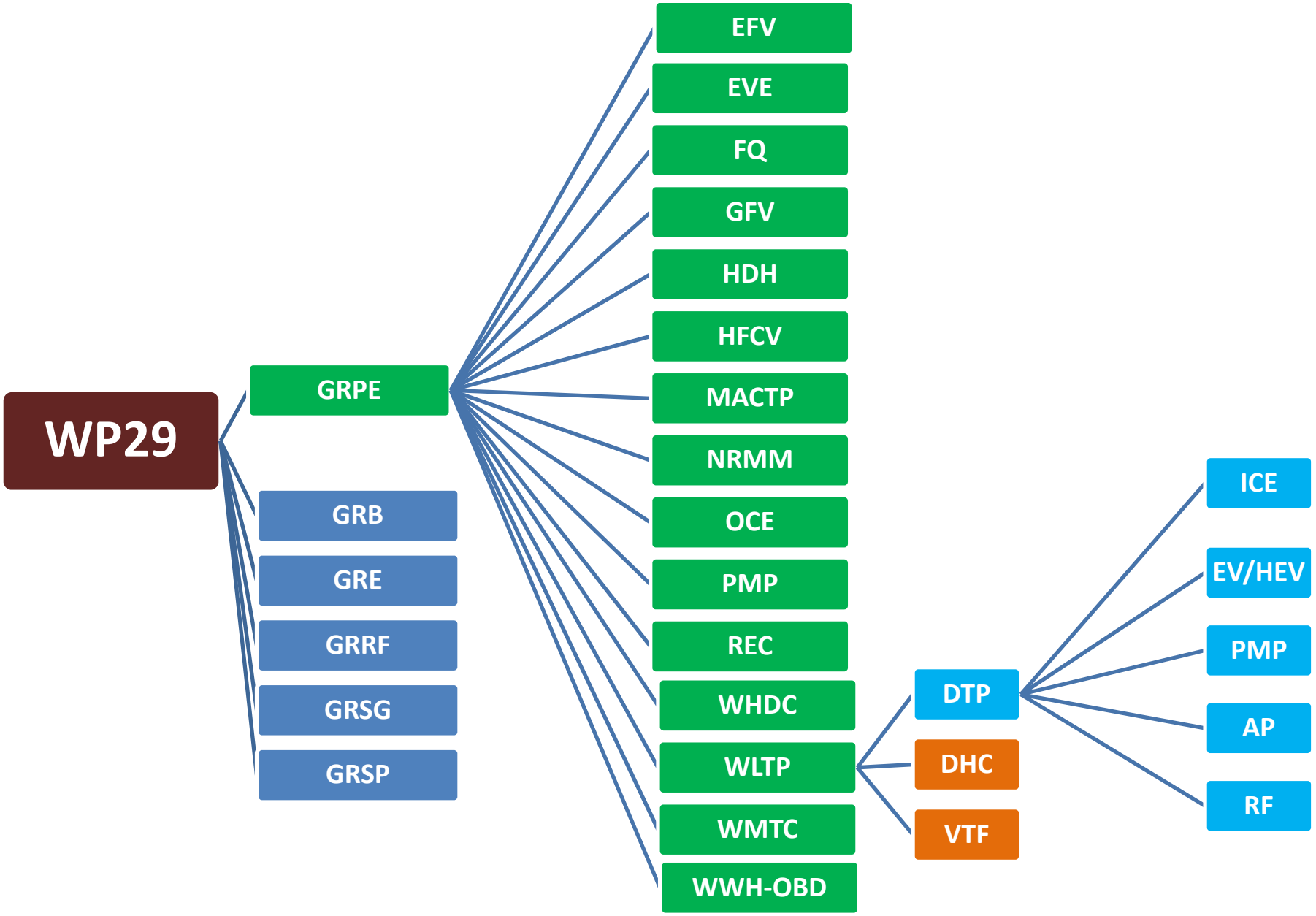
Particle Number measurement for Euro 5 and Euro 6

SHED (Evaporative Emission Determination)

Climatic chamber for temperatures from -30°C to + 55°C and 20% RH to 75 % RH

Export Homologation

Organization Structure for WP.29



India's Position

- **Active participation in WP.29 & GR meetings**

- **Signatory to 1998 agreement under which GTRs (Global Technical Regulations) are being formulated**

- **Our national standards are being updated for alignment with ECE regulations**

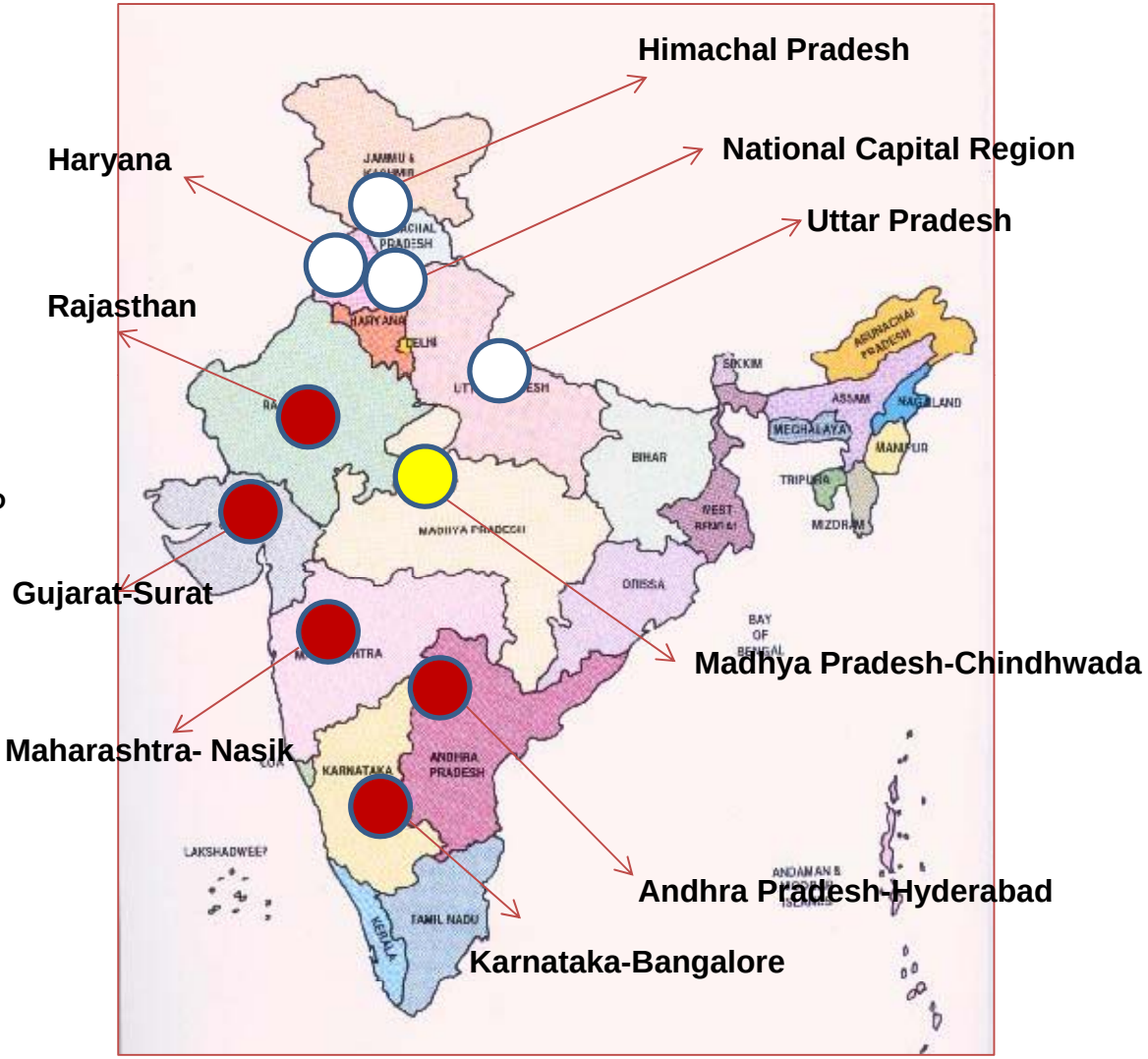
Policy Initiatives of Government of India (GoI)

- Inspection and Certification Program
- National Electric Mobility Mission Plan (NEMMP) 2020
- Traffic Management through Intelligent Transport Systems
- Auto Fuel Vision & Policy 2025 Committee – Four Working Groups formulated already

Inspection and Certification Program for In-use Vehicles

10 Model Test Centers being established

- Centers to be facilitated by ARAI
- Centers to be facilitated by NATRiP
- Center to be facilitated by SIAM



Inspection and Certification Program for In-use Vehicles

Benefits :

Safer & Cleaner Vehicles

Reduced Accidents & Fatalities

Identification & Reduction of Gross Polluting Vehicles

Improvement in Fuel Consumption

Establishment of Desired facilities for Test Centres and Garages

Inputs for End of Life of Vehicles

Networking of Data

Inspection and Certification Program
Expected Road Map

2009

Commercial Vehicles
Vehicle Population
LCV +HCV = 11701141
No. of Lanes reqd.= 405
Centers reqd.=101
Approx. Inv.=1012 cr.

Passenger Vehicles
Population=32548928
No. of lanes reqd.=753
Centers reqd.=188
Approx. Inv.=1318 cr.

2Wheeler
Population= 82402105
No of lanes reqd.=1601
Centers reqd.=400
Approx. Inv.=2001 cr.

2015

Commercial Vehicles
Vehicle Population
LCV +HCV = 20729285
No. of Lanes reqd.= 716
Centers reqd.=179
Approx. Inv.=1700 cr.

Passenger Vehicles
Population=57662411
No. of lanes reqd.=1335
Centers reqd.=334
Approx. Inv.=2336 cr.

2Wheeler
Population=145980355
No of lanes reqd.=2838
Centers reqd.=709
Approx. Inv.=3500 cr.

2020

Commercial Vehicles
Vehicle Population
LCV +HCV = 33384721
No. of Lanes reqd.=1154
Centers reqd.=288
Approx. Inv.=2885 cr.

Passenger Vehicles
Population=92865890
No. of lanes reqd.=2150
Centers reqd.=537
Approx. Inv.=3763 cr.

2Wheeler
Population=235102822
No. of lanes reqd.=4567
Centers reqd.=1141
Approx. Inv.=5709 cr.

2035

Commercial Vehicles
Vehicle Population
LCV +HCV = 139456264
No. of Lanes reqd.=4820
Centers reqd.=1205
Approx. Inv.=12050 cr.

Passenger Vehicles
Population=387923870
No. of lanes reqd.=8980
Centers reqd.=2245
Approx. Inv.=15715 cr.

2Wheeler
Population=982082834
No. of lanes reqd.=19077
Centers reqd.=4769
Approx. Inv.=23846 cr.

Above lane requirements are based on following assumptions:
2 shift operation and 80 % lane occupancy
75 % operating efficiency and 300 working days in one year.
Based on the vehicle population data available from year 2009 by MoRTH- Provisional (10% vehicle growth for every year is considered.)

* We have not considered the failed vehicles and recertification for same in above considerations

National Electric Mobility Mission Plan (NEMMP) 2020

Encourage Reliable, Affordable and Efficient xEVs

Enable Indian Automotive Industry to achieve xEV manufacturing leadership

Contribute towards National Fuel Security

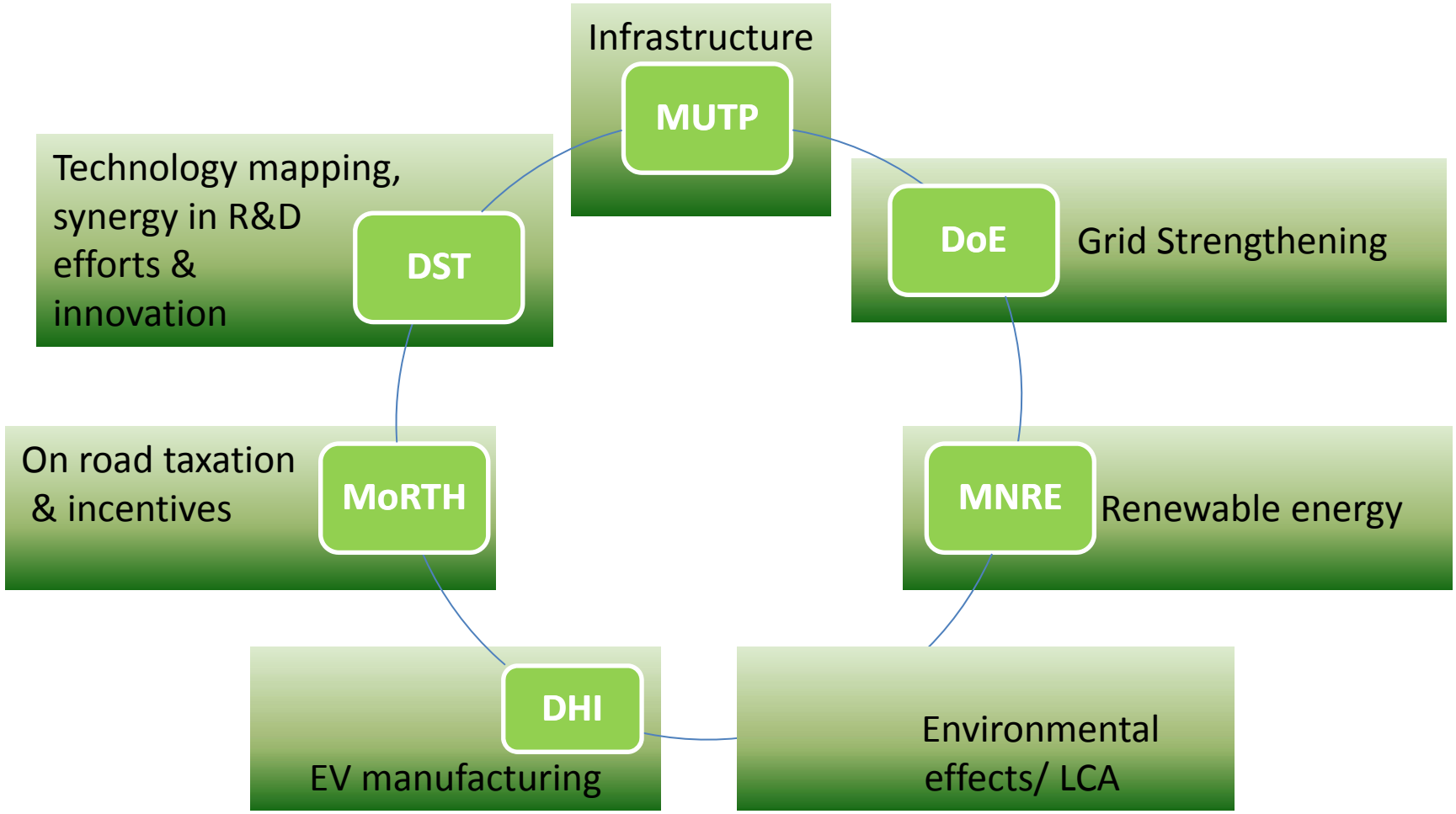
Emerge as world leader in xEV 2-Wheeler and 4-Wheeler market by 2020

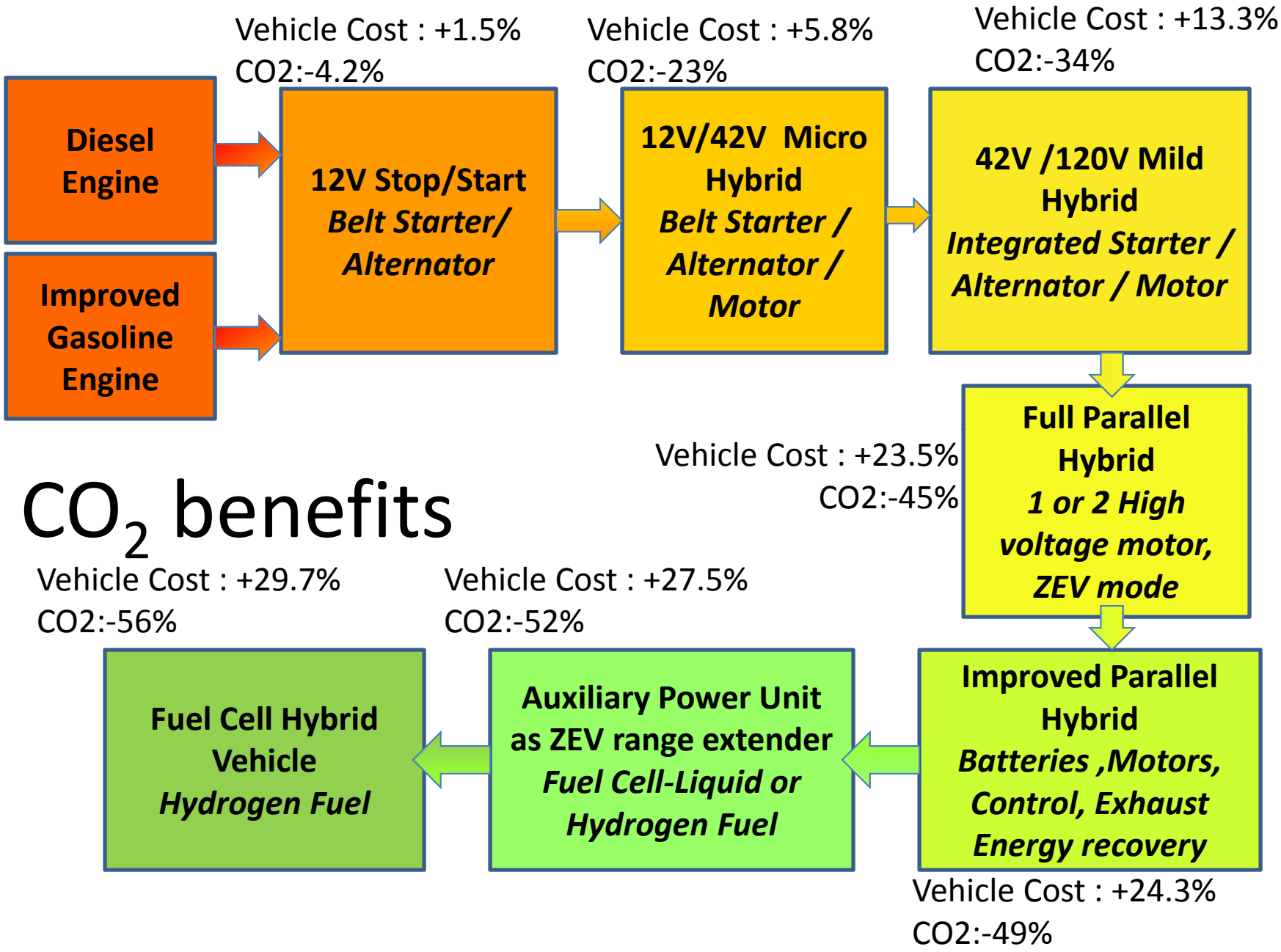
Total projected sales of 6-7 million units

National Electric Mobility Mission Plan (NEMMP) 2020

Working Group on R&D	• BMS & Battery • Power Electronics & Motors • Testing Infrastructure, Human Resources, Energy efficient Technologies
Working Group on Infrastructure	• Technology & Standards • Infrastructure Rollout
Working Group on Demand & Supply	• Demand Incentive Scheme • Incentive Delivery & Monitoring Mechanism • Promotion of Hybrid Retro-fitment Kits

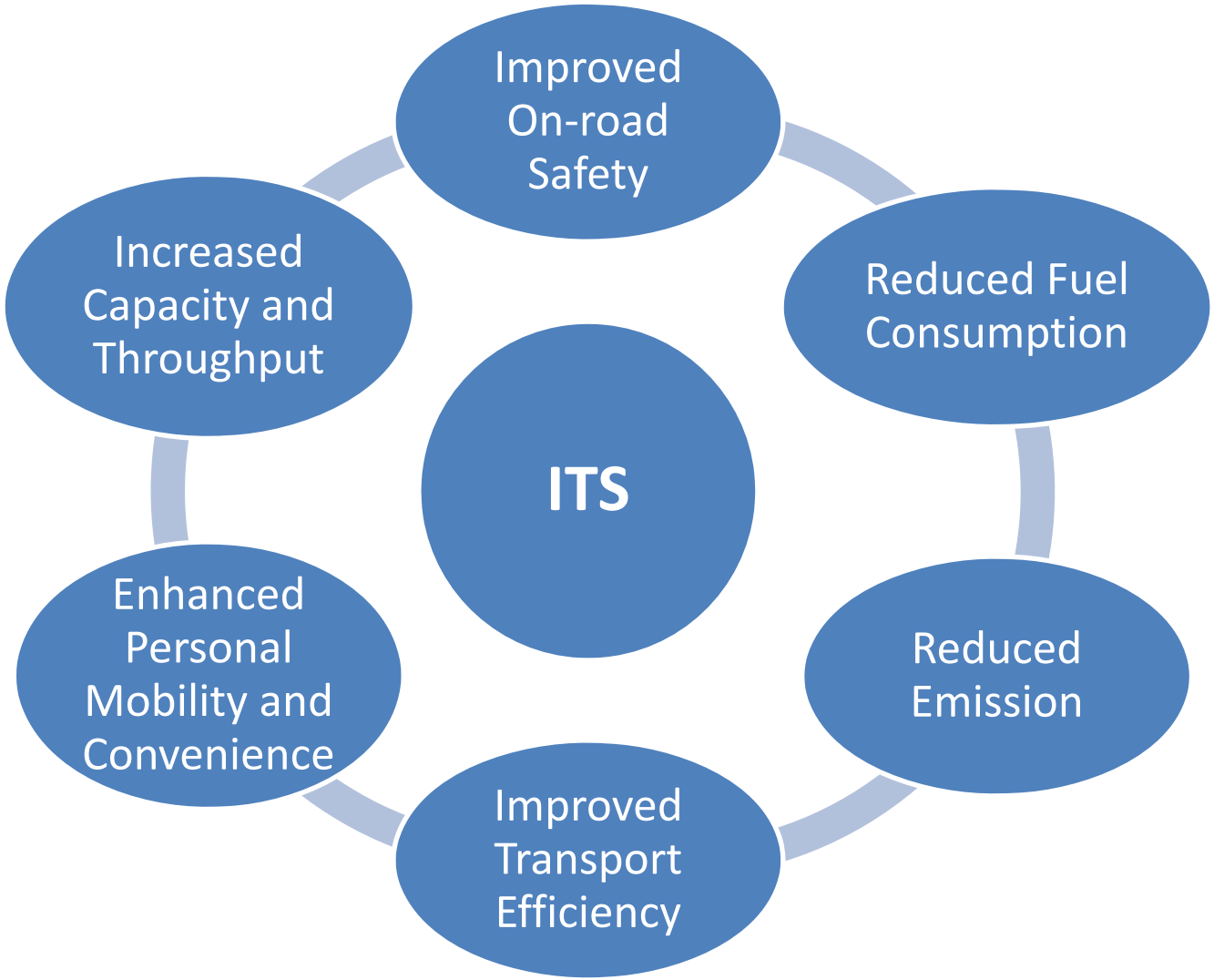
Everyone has a role to play





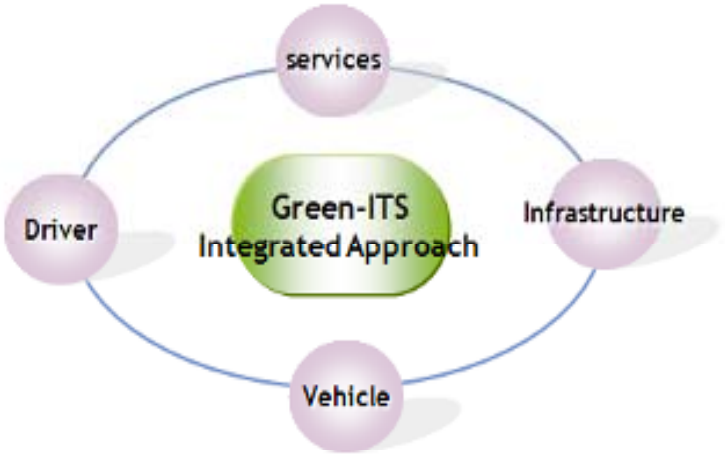
CO_2 benefits

Traffic Management



Traffic Management

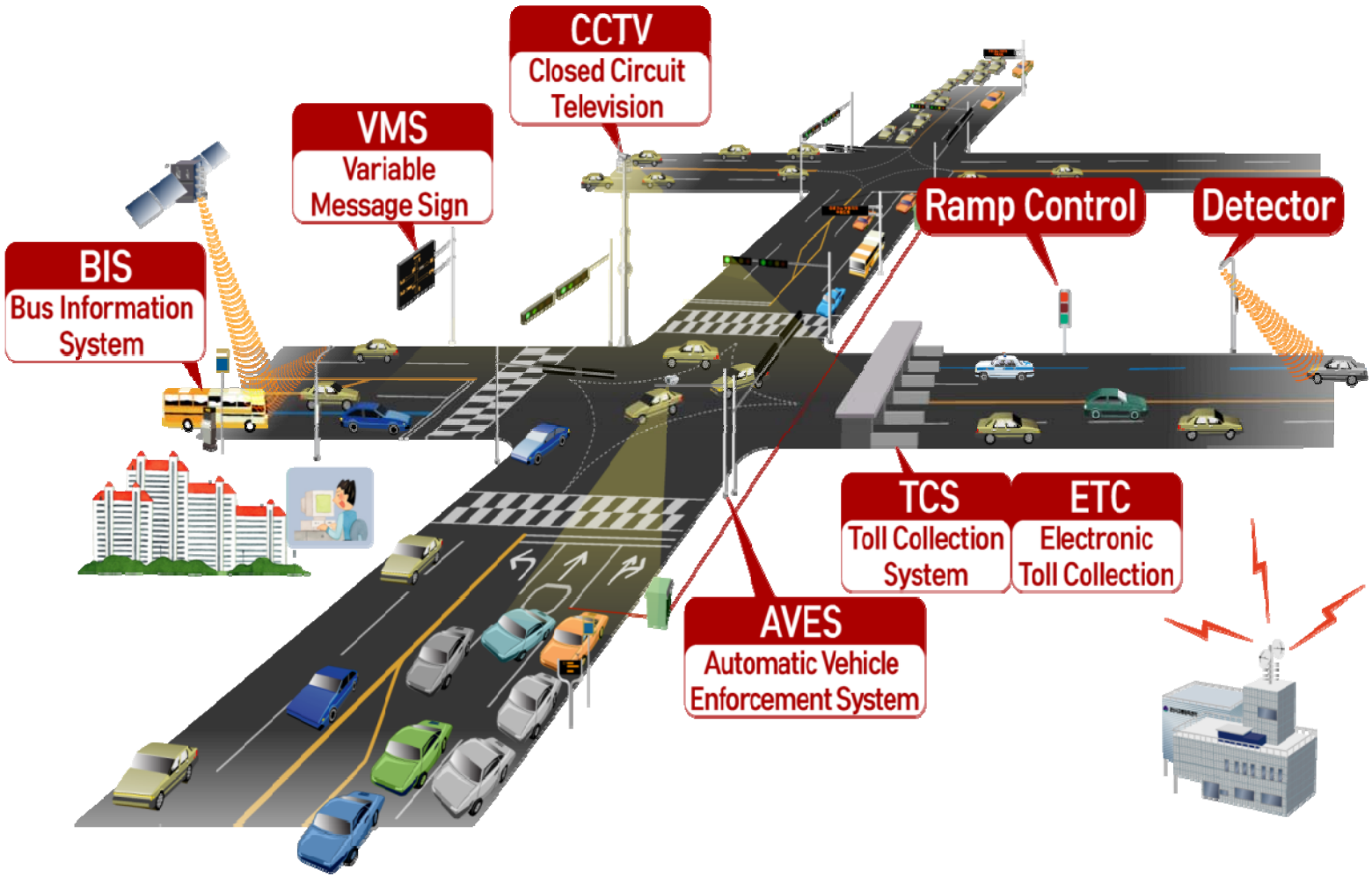
Intelligent Transport System (ITS) one of the key technologies which can contribute to mitigating climate change



- **ITS is designed to achieve**
  - Improvement of road safety and reduction of traffic accidents –
  - Increase of traffic efficiency;
  - Improvement of freight and public transportation efficiency;
  - Reduction of CO_2 emissions.
  - Driver assist and management

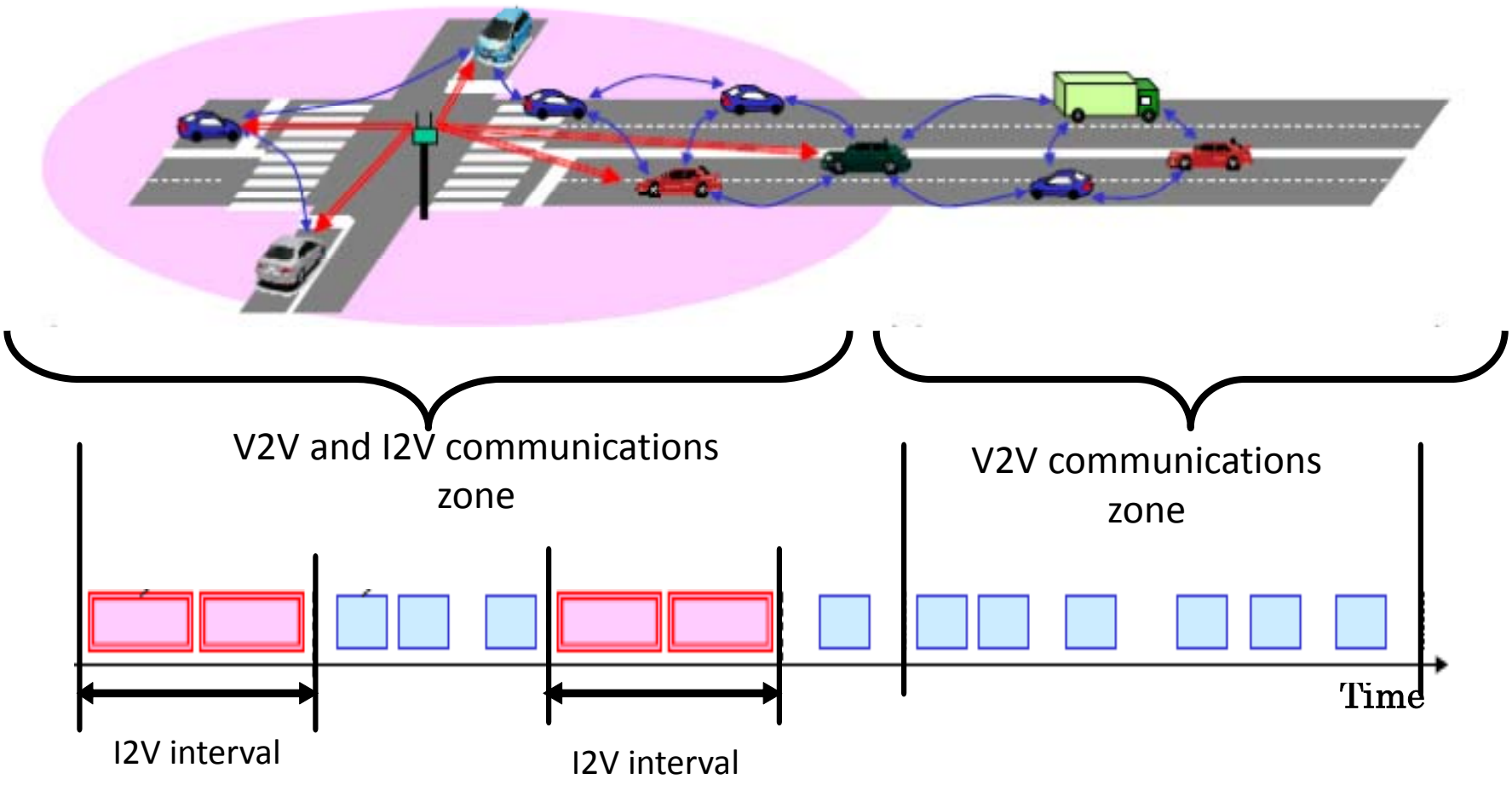
Traffic Management

ITS Conceptual Diagram



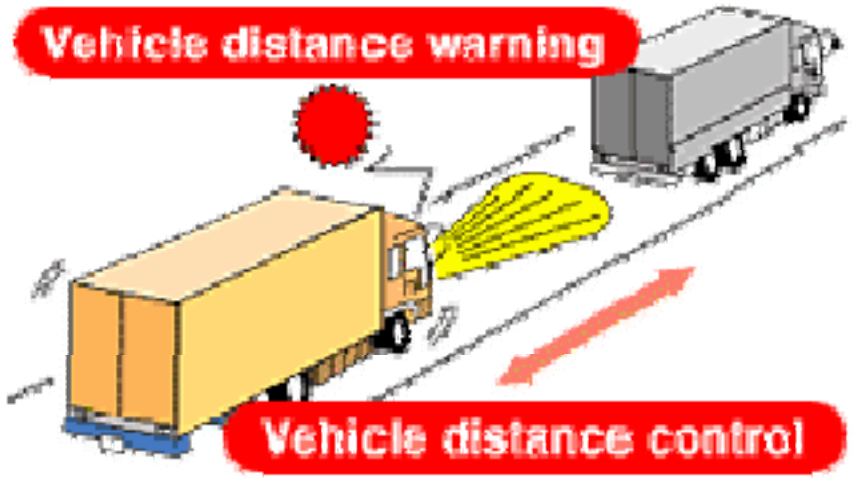
Traffic Management

V2V and I2V Communication



Traffic Management

Advanced Public Transportation Systems



Advanced Vehicle Control Systems - Intelligent Cruise Control System

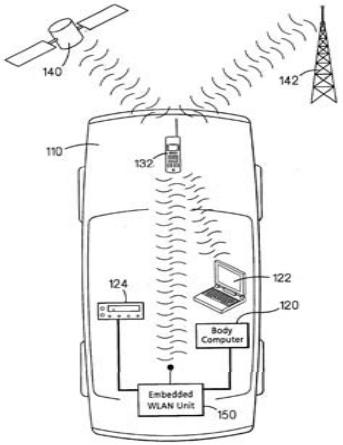
Traffic Management

Intelligent Transportation Systems – Technologies supporting ITS

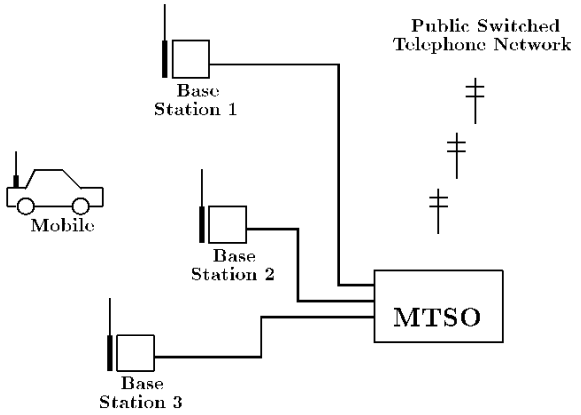
-Global Positioning System(GPS)

-Dedicated Short Range Communications(DSRC)

-Wireless Networks



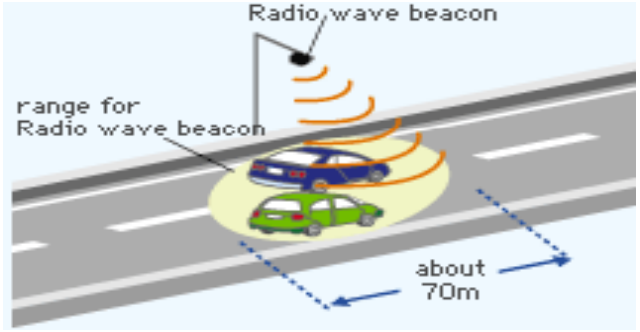
-Mobile Telephony



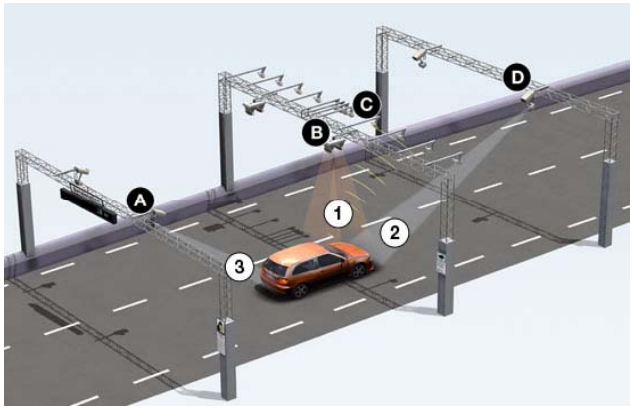
Traffic Management

Intelligent Transportation Systems – Technologies supporting ITS Cont..

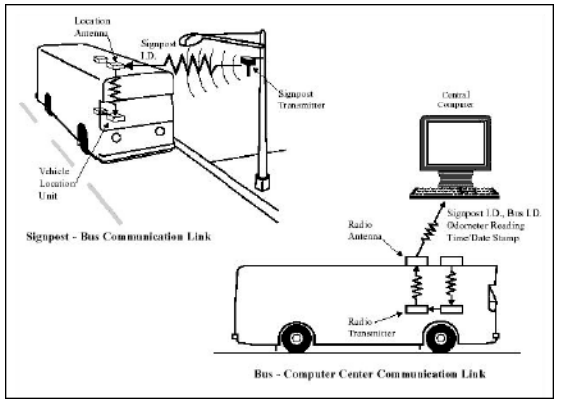
-Radio Wave or IR Beacons Recognition



- Roadside Camera

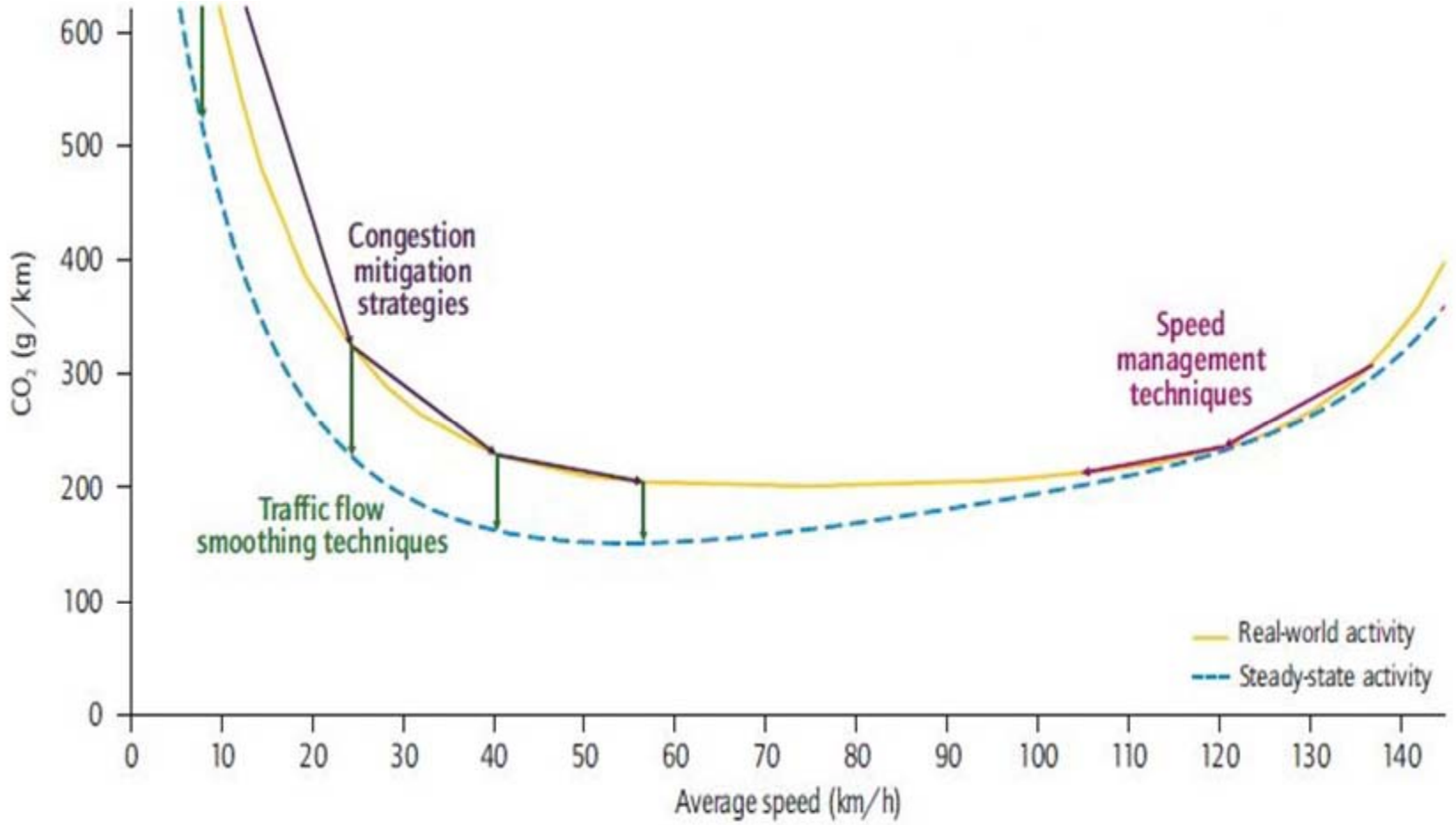


-Probe Vehicles or Devices



Traffic Management

Thereby, leading to improved fuel economy, reduced congestion and more road safety



Source: IEA_Technology_Roadmap_Fuel_Economy_2012

Traffic Management

Intelligent Transportation Systems – World Experiences: South Korea

- Started in 2000 with 20 years blue print
- Investment US$ 1.3 billion
- Started in a model city in 1998, expanded to 25 cities by 2007
- Economic benefit of US$ 109 m every year due to reduced transportation time, accidents, environmental pollution

Traffic Management

Intelligent Transportation Systems – World Experiences: Japan

- Started in late 90s
- US$ 640 m every year
- Extensive use of real time traffic information
- Extensive use of probe vehicles

Traffic Management

Intelligent Transportation Systems – Benefit : Cost studies

- ITS deployment in Tucson, Arizona
  - 6% decrease in congestion
  - 70% decrease in incident related delay on freeways
  - Reduction in annual fuel by 11%
  - CO, HC, NOx reduction between 10~16%
  - Benefit:Cost ratio of 6.3:1

Traffic Management

Intelligent Transportation Systems – Benefit : Cost studies

- ITS systems 9:1 as against 2.7:1 for addition of conventional highway capacity
- Florida University: US$ 142 m annually 14:1 ratio
- Texas: optimization of traffic signal operation 38:1
- Generally the benefits far outweigh the investments

Traffic Management

Intelligent Transportation Systems – Efforts in India

- Location Technologies

  GPS based tracking for public transport in use in Delhi, Bangalore, Indore

- Fare collection Technologies

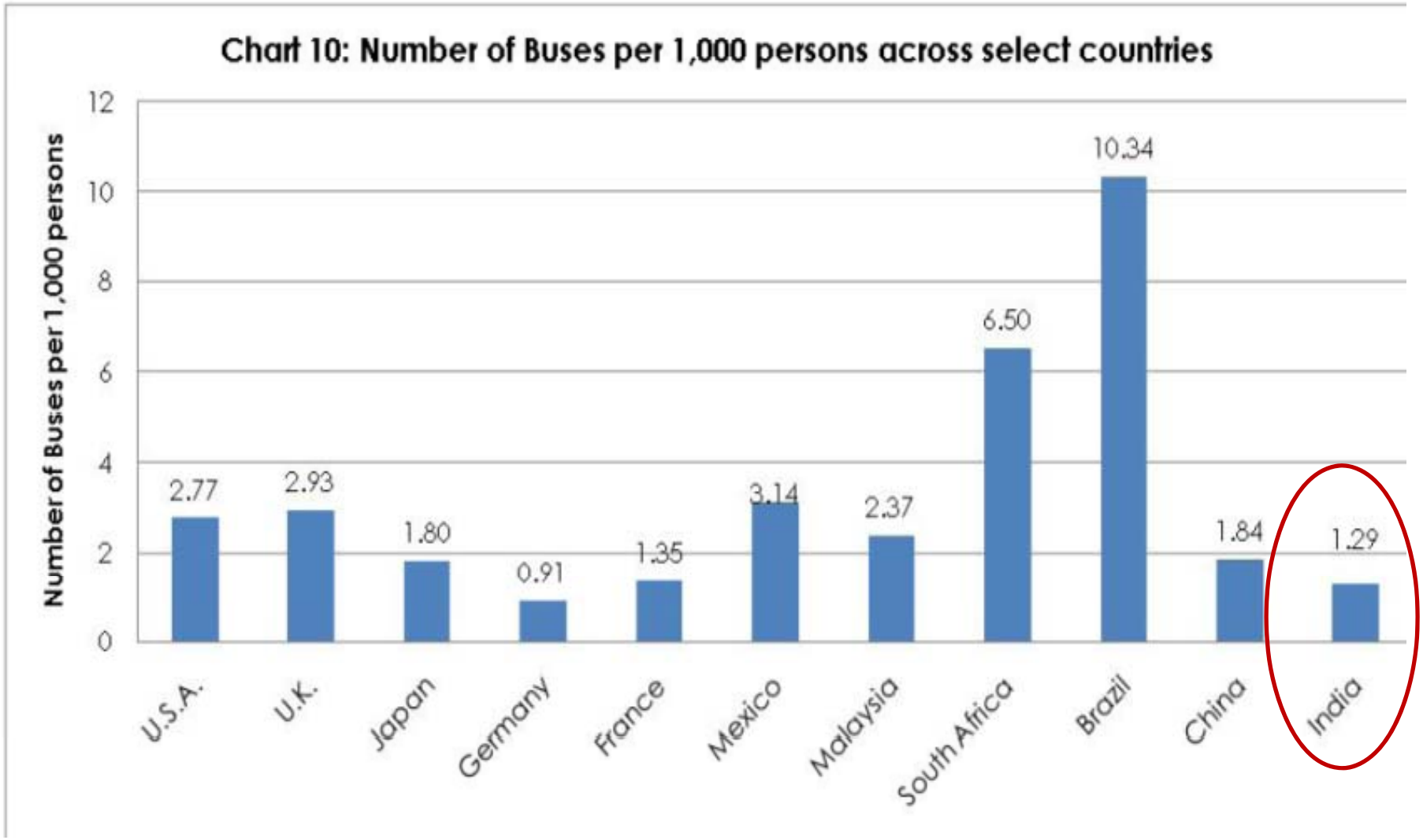
  Delhi Metro

- Electronic Toll Collection

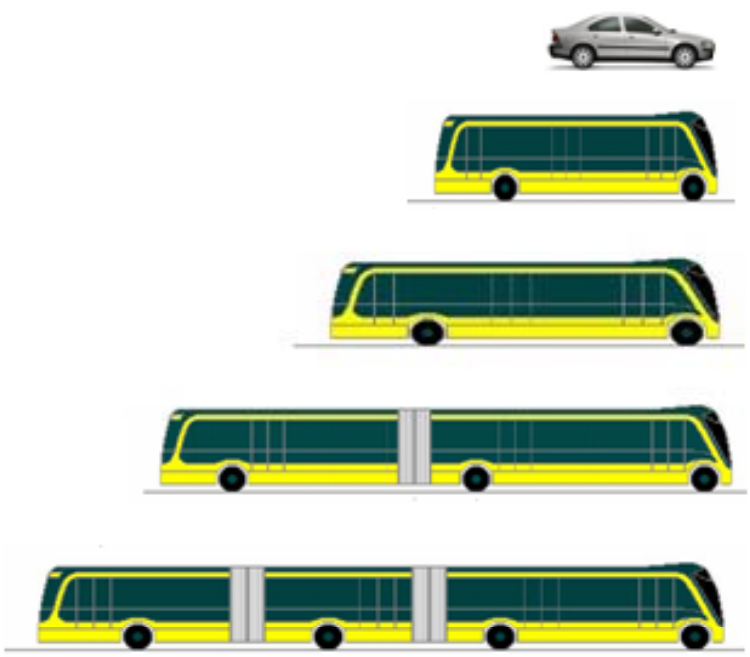
  Delhi-Noida Highway, Bangalore Electronic City Highway

Traffic Management

Bus Population in India Comparison (2012)



Why Public Transport: Because Transporting 10,000 People for 1 km requires…



Passengers (numbers)	Vehicles (numbers)	Space (m^2)	Fuel (liters)
5	2000	24000	200
25	400	8800	120
100	100	3400	50
175	57	2850	35
270/300	37	2370	26

To carry 50,000 people per hour per direction requires:

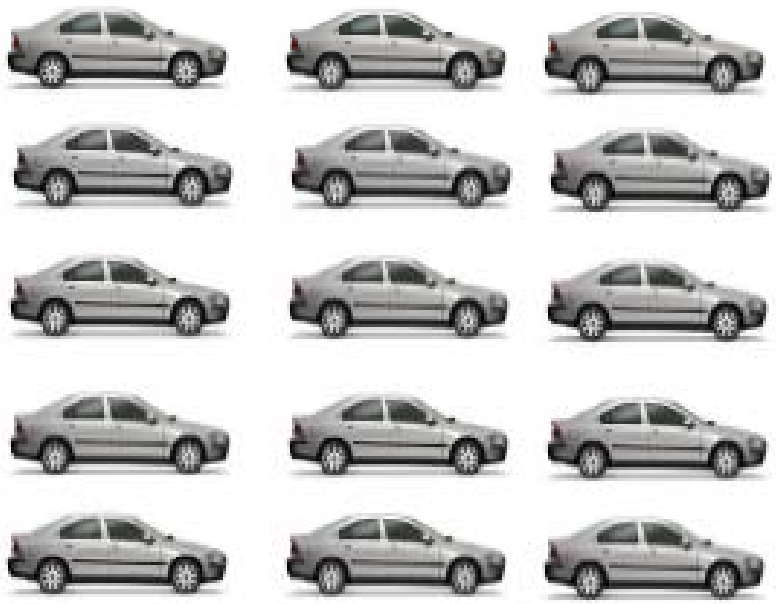
- 175 m wide road used only by cars, or
- 35 m wide road used only by buses.

Source: Report of UTIP

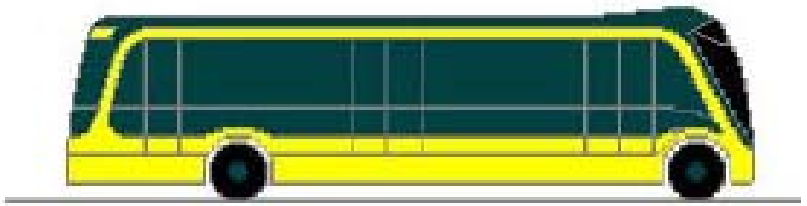
Traffic Management

Why Public Transport:

20% people using 80% roads?



80% people using 20% roads?

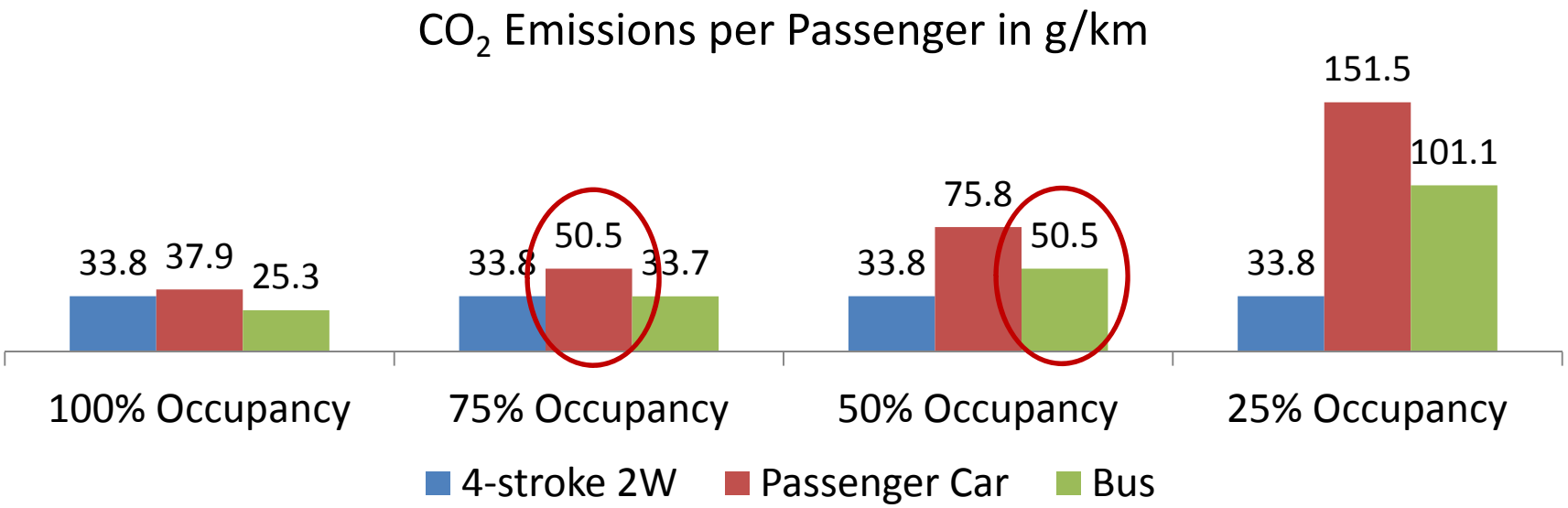


Traffic Management

Why Public Transport?

A comparative study of CO_2 emissions per passenger indicates:

- Similar amount of emissions for bus with 50% occupancy vis-à-vis car with 75% occupancy



Steps required for Improving Air Quality in Urban Areas

Roads:

- Better Maintenance
- Paving of Roads
- footpaths or low-elevation concreting of unpaved surfaces
- Use of fly ash bricks for pavement
- Road construction & maintenance guidelines by concerned authorities

Minimizing vehicular emissions:

- Implementation of progressive norms
- Road map for fuel quality improvement

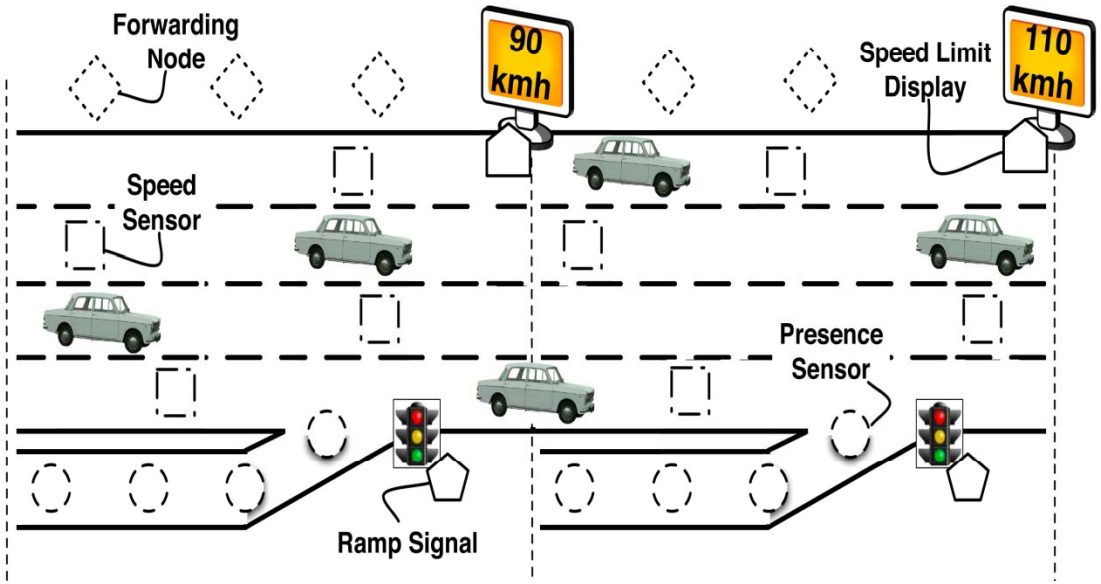
One country One fuel quality and One regulation….

Continued…

Steps required for Improving Air Quality in Urban Areas

Evolving of Comprehensive Vehicle Scrap Policy

Periodical Inspection and Maintenance



- Management options like :
  - Synchronizing traffic signals
  - Staggering business hours
  - Restricting vehicular movements in high pollution level areas
  - Fiscal incentives / disincentives
  - Banning odd/even vehicles on major roads
- Development of mass rapid transportation system.

Summing up…. Integrated Approach for Clean Air

Auto Industry

- Adoption of Advanced Technology
- Fuel Efficient Vehicles

Policy Makers

- Policy Framework
- Transport Management
- I & M Regime
- ITS
- Vehicle scrapping policy

Vehicle Owners

- Good Maintenance Practices
- Better Driving Habits

OIL INDUSTRY

- PROVISION OF CLEAN FUEL

To Conclude……

- AIR QUALITY WILL ONLY REMAIN A DREAM UNLESS AN INTEGRATED APPROACH AND SIMULTANEOUS ACTIONS ARE TAKEN IN IMPLEMENTING NEW VEHICLES IMPROVEMENTS , I&M, ITS. MULTIMODAL TRANSPORT.
- CONSIDERING LONG GESTATION PERIOD THE ACTIONS NEED TO BE TAKEN IMMEDIATELY.

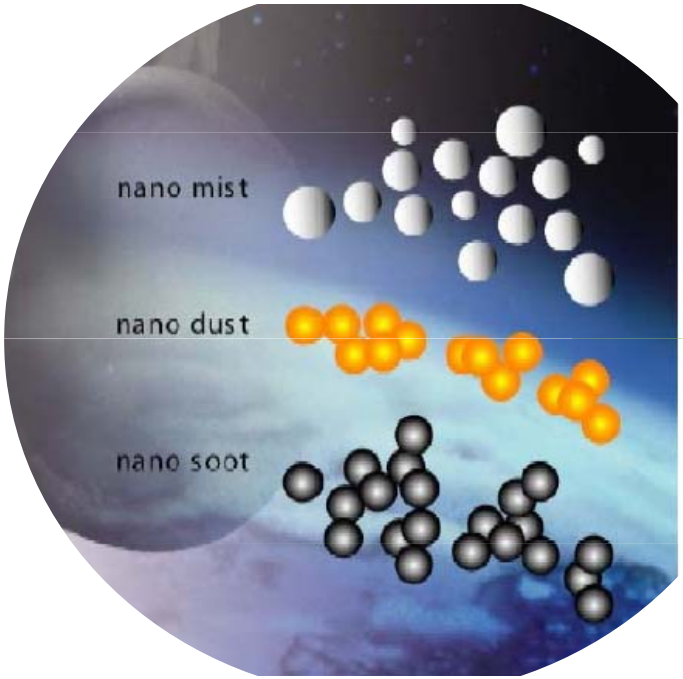
- NEED TO ALSO PROMOTE INLAND WATER TRANSPORTATION, RAILWAYS. WE ARE A WAY BEHIND THE WORLD IN USING THESE MODES OF TRANSPORT WHICH ARE CLEANER, THOUGH SLOWER, THAN AUTOMOBILE TRANSPORT.

Conclusion contd.

- NECESSARY TO HAVE A ‘SOUND & ROBUST ROADMAP’ SINCE ALL ARE LONG GESTATION PROJECTS
- REGULATIONS FOR ALL OF THEM NEED TO BE DEVELOPED
- RESPONSIBILITY LIES WITH EVERYONE, I.E. GOVERNMENT, CORPORATES AND CITIZEN FOR CLEAN AIR

Thank you

Problems associated with Particle Number Measurement



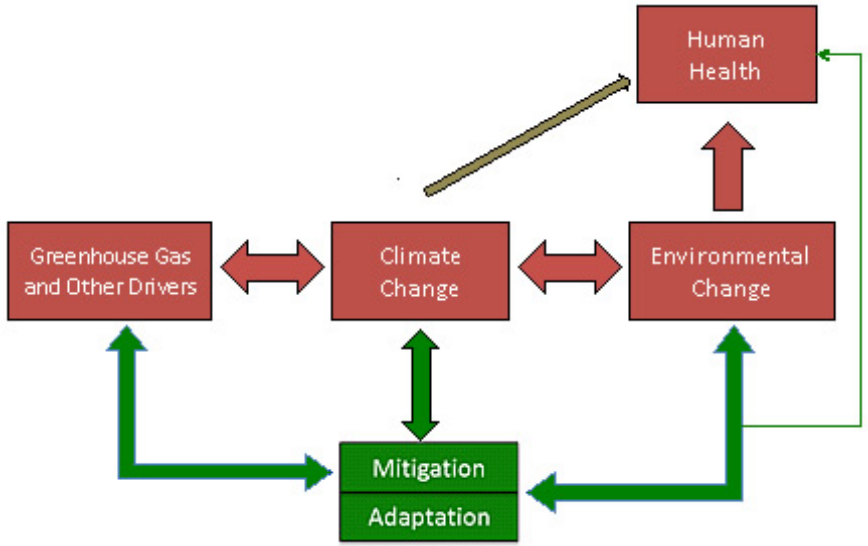
Maturity of the PN measurement method.

Long term stability of the complete particle counter instrument.

Repeatability of the calibration and validation methods.

Integrated Approach to reduce Road Transport CO_2

- Vehicle technology and its penetration
- Improved traffic management
- Fuel infrastructure
- Final consumer –
  - ECO driving



Government policies:

Clear	Coherent
Predictable	Stable

Overview of Current Fuel consumption targets in EU, US and Japan

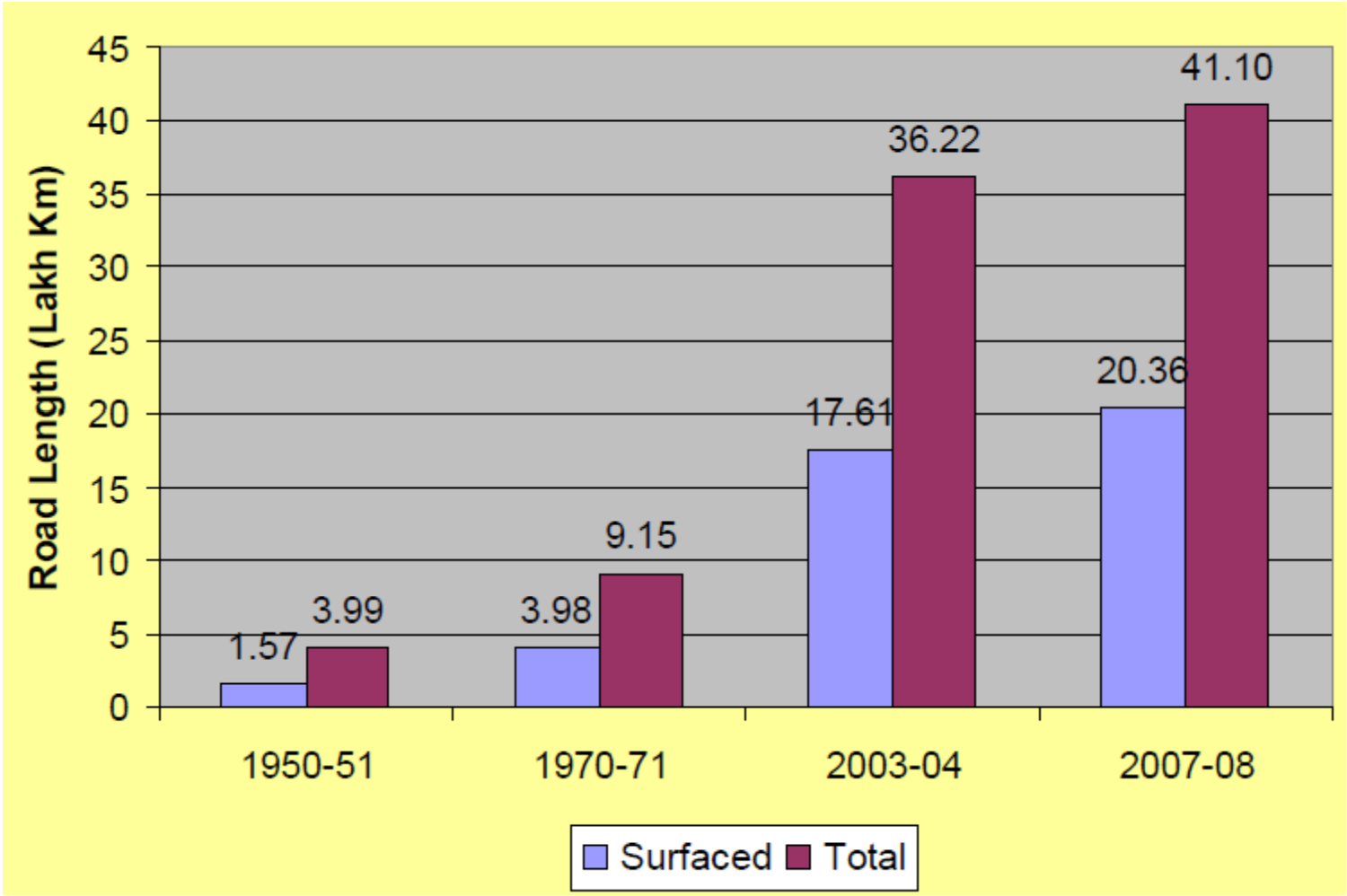
- Corporate Average Fuel Economy (Uniform Target)
- Present target: 27,5 mpg = ~ 204 gCO_2/km (US Cycle)
- Penalties: 5,5 $ per 0,1 mpg = ~ 5 € per gCO_2/km x vol. cars
- Future Target: 35 mpg by 2020 = ~ 160 gCO_2/km (US Cycle)

- Parametric approach: Weight (segmentation)
- Future Target: 16.8 km/l by 2015 = 138 g CO_2/km (Japan Cycle)
- Penalties: ~ 6.000 €/manufacturer
- Integrated Approach: Approximately 50% CO2 reduction by infrastructure

Commission proposal - under discussion

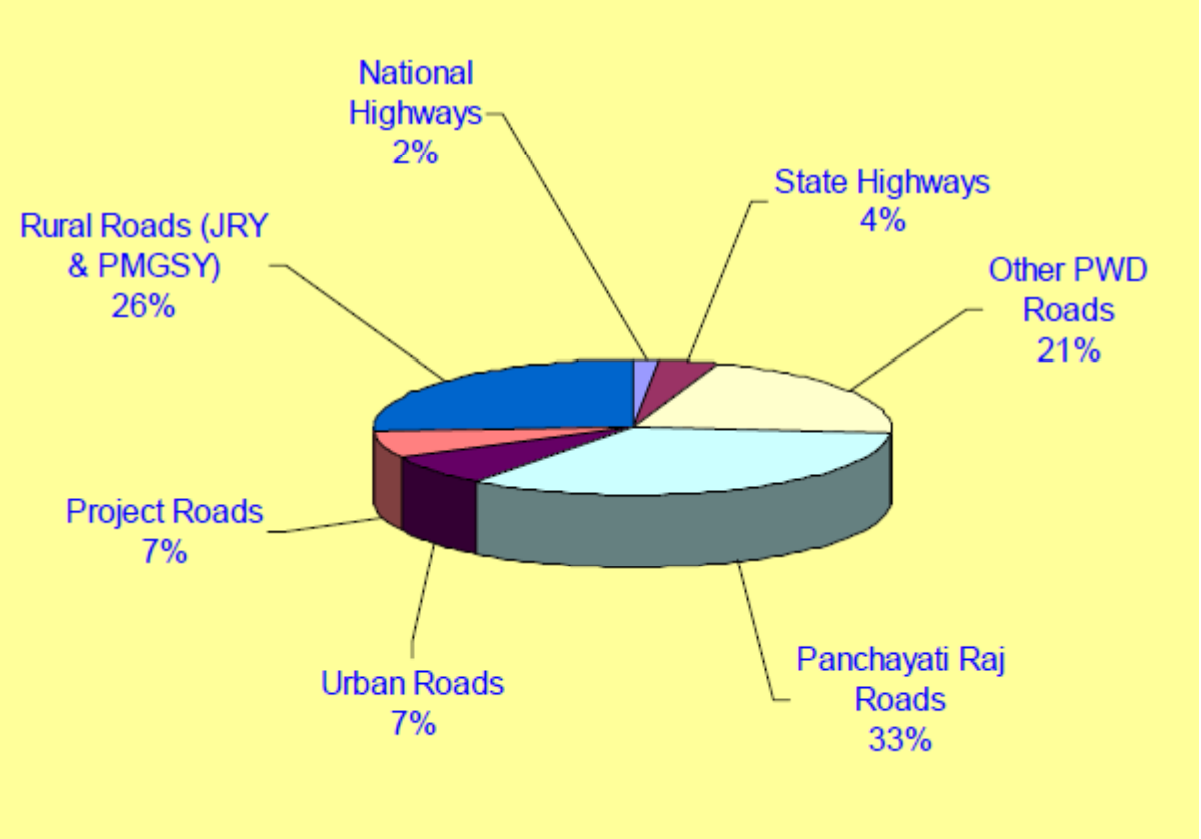
- Parametric approach: Weight (segmentation)
- Target: 120 gCO_2/km by 2012
  (130 g through Vehicle Technology
  - 10 g through Complementary measures & biofuels)
- Penalties: 2012 / 2013 / 2014 / 2015
  20 / 35 / 60 / 95 € / g CO_2/km x vol. cars
- Integrated Approach : 5 gr CO_2 reduction by biofuels – NO reduction by Infrastructure

Total & Surfaced Road Length (1950-51 to 2007-08)



Source: BASIC ROAD STATISTICS OF INDIA, 2004-05, 2005-06, 2006-07 & 2007-08, MoRTH, TRANSPORT RESEARCH WING, NEW DELHI, JULY 2010

Category-wise Road Length in India- 2008



Source: BASIC ROAD STATISTICS OF INDIA, 2004-05, 2005-06, 2006-07 & 2007-08, MoRTH, TRANSPORT RESEARCH WING, NEW DELHI, JULY 2010

Summing up the 'Focus Areas'

Vehicle:

- *IC Engines*
- *Use of alternate fuels*
- *Electric mobility*
- *Implementation of I&M*

Infrastructure:

- *Uniform fuel specifications*
- *Establishing robust I&M system*
- *Conceptualization of ITS Roadmap and time-bound implementation with necessary funding*
- *Generation of gaseous fuel from waste*

Driver:

- *Training of drivers for Eco-driving*

Mass emission standards (Draft Bharat Stage IV) for Two wheelers

A. Two Wheeled Vehicles fitted with Gasoline engines

I. Mass emission standards (Bharat Stage IV) for two wheelers, with engine capacity exceeding 50 cc and a maximum design speed exceeding 50 km/hour:

Class	TA=COP norms (g/km)		
	CO	HC + NOx	
		If the evaporative emission complies with 2 g/test	If the evaporative emission complies with 6 g/test
(1)	(2)	(3)	(4)
Class 1 & Sub class 2-1	1.403	0.890	0.690
Sub class 2-2	1.970	0.690	0.490
Sub class 3-1 & Sub class 3-2	1.970	0.420	0.220

	Definition of class
Class 1	50 cm^3 < engine capacity < 150 cm^3 and Vmax $\leq$ 50 km/h or engine capacity < 150 cm^3 and 50 km/h < Vmax < 100 km/h
Sub Class 2-1	Engine capacity < 150 cm^3 and 100 km/h $\leq$ Vmax < 115 km/h or Engine capacity $\geq$150 cm^3 and Vmax < 115 km/h
Sub Class 2.2	115 km/h $\leq$ Vmax < 130 km/h
Sub Class 3-1	130 km/h $\leq$ Vmax < 140 km/h
Sub Class 3-2	Vmax $\geq$140 km/h subclass 3-2.

II. Mass emission standards (Bharat Stage IV) for two wheelers with Spark Ignition engines, other than those specified above:

Pollutant	TA=COP norms (g/km)	Deterioration Factor (D.F.)
(1)	(2)	(3)
CO	0.75	1.2
HC + NOx	0.75	1.2

B. BSIV emission norms Two Wheeled vehicles fitted with diesel engines:

The mass emission standards shall be same as those applicable for Diesel Three-wheelers.