

# **AUTOMOTIVE FUEL ECONOMY MEASURES IN INDIA**

by

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*Energy Efficiency Through Better Car Components  
Workshop at Michelin Bibendum PARIS 2006*

# INDIAN AUTO INDUSTRY

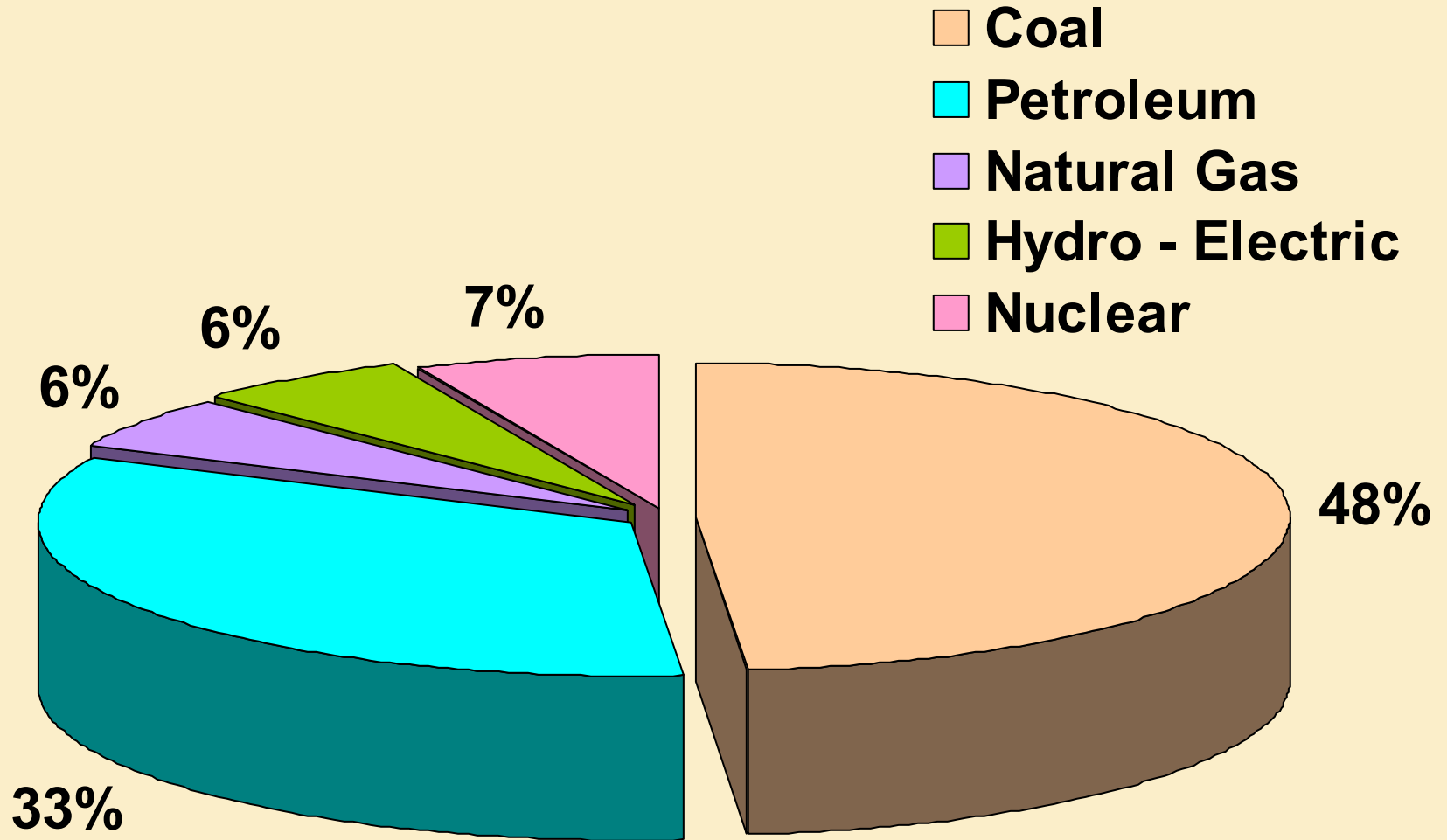
- Largest Three wheeler market in the world
- Second Largest two wheeler market in the world – most stringent emission norms for two wheelers
- Fourth largest passenger vehicle market in Asia
- Fourth Largest tractor market globally
- Fifth largest Commercial Vehicle market in the world
- User of bio-diesel / CNG / LPG
- > 10,000 fleet of CNG buses running successfully in the city of Delhi – an example set in the world
- Third largest coal producer
- Sixth largest energy consumer

# INDIAN AUTO INDUSTRY VEHICLE POPULATION (FY – 2005)

■ 3 W	:	305,720	(4%)
■ 2 W	:	6,198,318	(78%)
■ Cars + UV's	:	1,116,170	(14%)
■ CV	:	261,276	(4%)
		<hr/>	
<b>Total</b>	<b>:</b>	<b>7,881,484</b>	

Source : SIAM

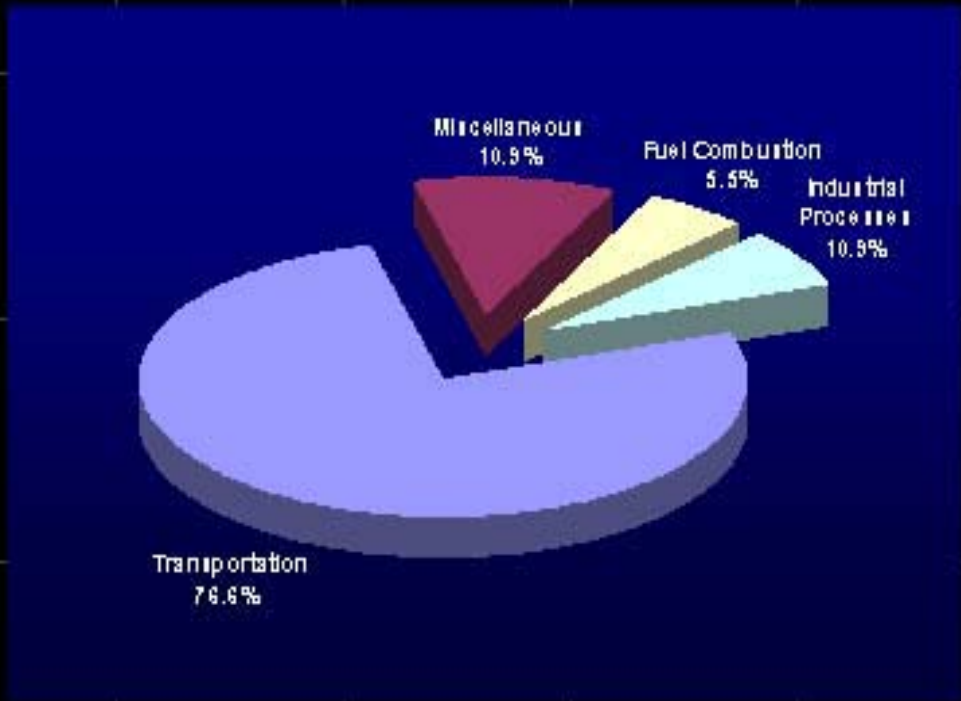
# ENERGY CONSUMPTION DISTRIBUTION IN INDIA



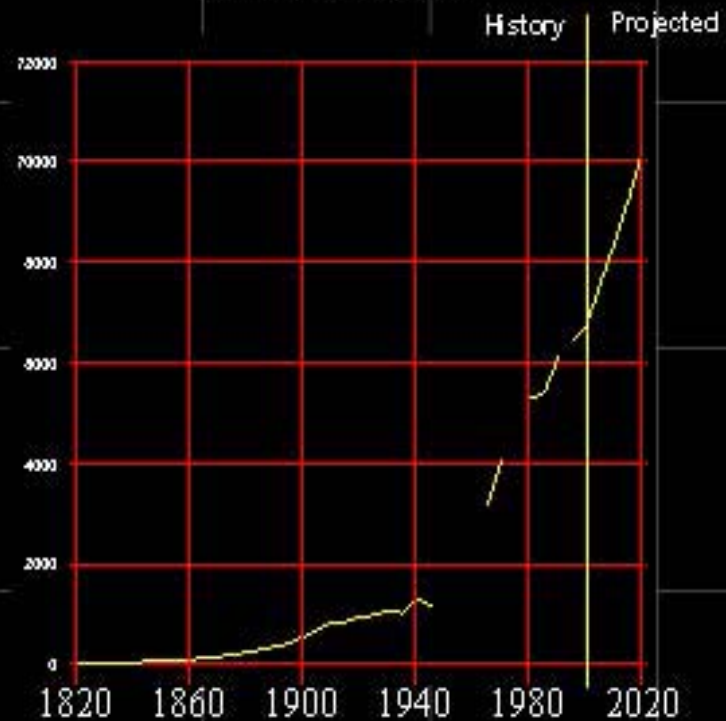
# GREENHOUSE EMISSIONS & GLOBAL WARMING



## Source of U.S. CO<sub>2</sub> Emissions 1997



## Global Carbon Emissions 1820 to 2020



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# **WHY FUEL ECONOMY ?**

- ☛ **Number of vehicles are increasing**
- ☛ **We can save money upto \$ 500 per year**
- ☛ **Strengthens National Energy Security**
- ☛ **Reduces dependence on import of petroleum**
- ☛ **Protects the Environment**
- ☛ **Conserves resources**

# FUEL ECONOMY TIPS

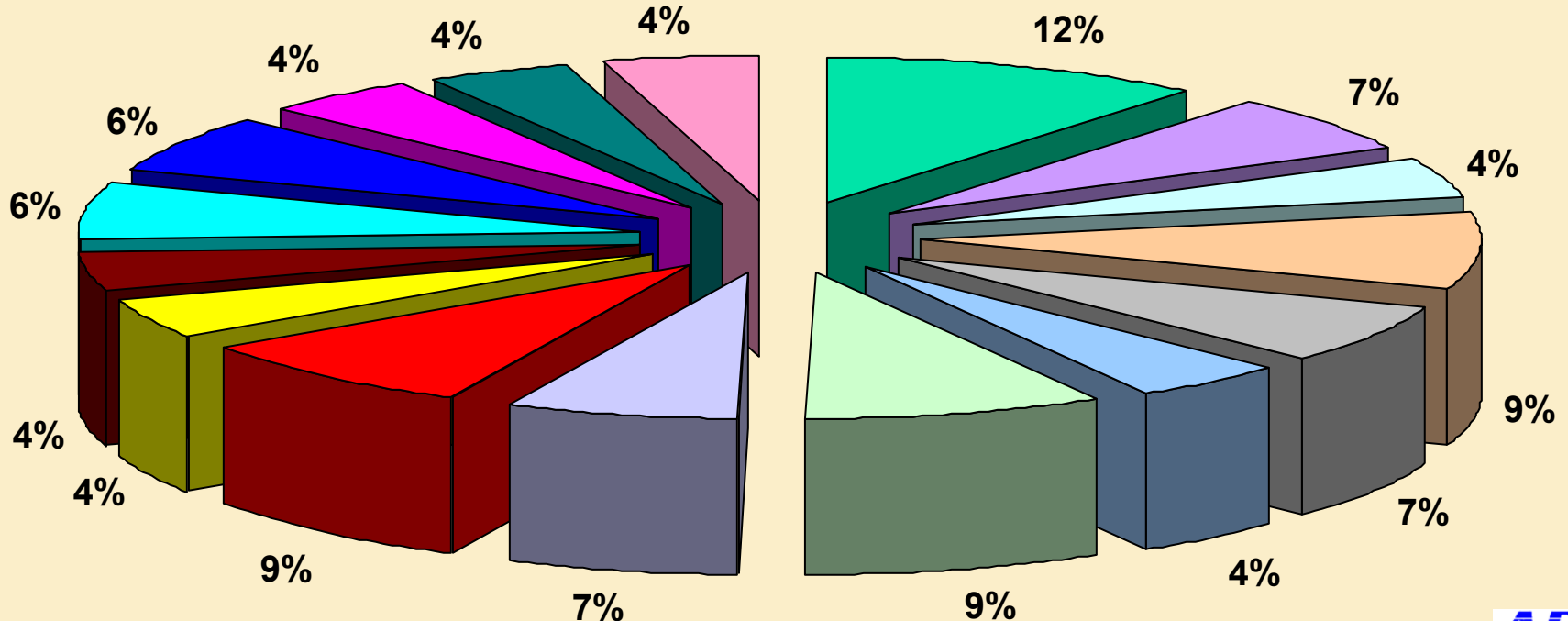
- **Better traffic management**
- **Driving more efficiently**
- **Keeping vehicle in shape**
  - *Keep engine properly tuned – fuel economy upto 4%*
  - *Check & replace air filters regularly – fuel economy upto 10%*
  - *Keep tyres properly inflated – fuel economy upto 3%*
  - *Use recommended grade of oil – fuel economy upto 3%*
- **Planning & combining trips – Car Pooling**
- **Choosing a more efficient vehicle**
- **Use of better fuel formulation**
  - *Higher H/C ratio*
  - *Composition consisting of C, H & O : Oxygenated Fuels*
  - *More percentage of renewable energy*

# TRENDS

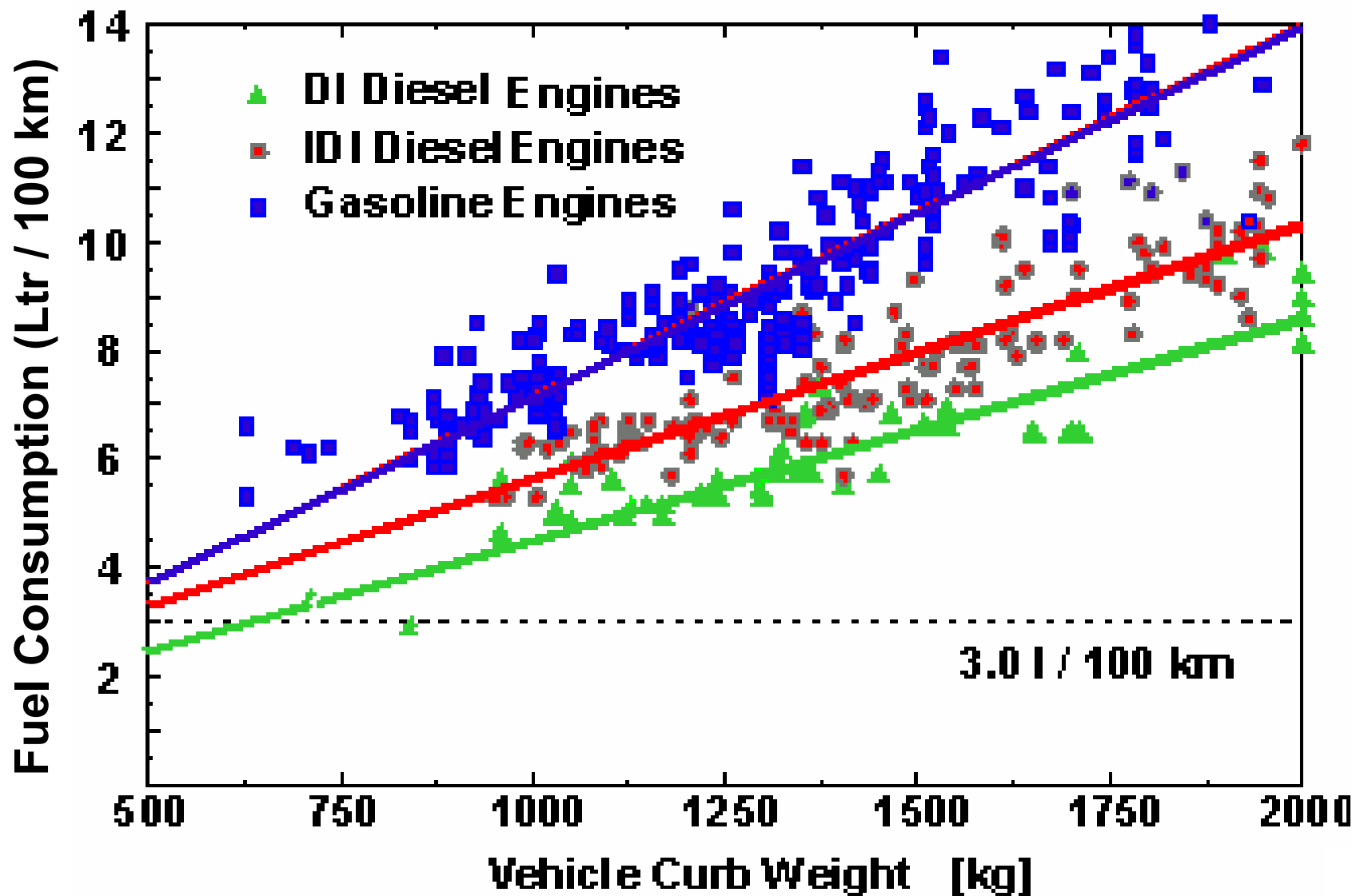
- ☛ **Customers give 50% weightage to enhanced fuel economy**
- ☛ **If there is no extra cost, customers would prefer hybrid vehicles**
- ☛ **More diesel vehicles with DI, 4V configuration**
- ☛ **Comport cars with higher power/weight ratio**

# FACTORS CONTRIBUTING TO VEHICLE FUEL ECONOMY

- Improved BSFC of Enigne
- Flywheel inertia optimisation
- Better vehicle aerodynamics
- Reduction in Axle Ratio
- Low resistance tyres
- Air conditioner optimisation
- Decreasing idling fuelling
- Reduction in intake depression
- Low Engine accessory losses
- Vehicle weight reduction
- Low drive train friction losses
- Reduction in gear box ratios
- Low drive train inertia
- Optimum engine operating temp
- Reduction in back pressure
- Low consumption electrical equip








# FUEL CONSUMPTION v/s CURB WEIGHT



# **ADVANTAGES OF DIESEL OVER GASOLINE ENGINES w.r.t. CO<sub>2</sub>**

- **Highest thermodynamic efficiency.**
- **Superior fuel economy with corresponding lower CO<sub>2</sub> emissions.**
- **Modern diesels have no visible smoke, neither at sea level nor at altitude.**
- **High-tech diesels maintain their extremely low HC & CO emissions, as well as NOx & PM emission levels, without any deterioration over the usage period.**
- **No issue of evaporative emissions.**
- **Superior reliability and durability in field operation.**
- **Fuel economy better by 10 to 20%.**
- **4 Valve and direct injection configuration has additional potential for 10 to 20% improvement.**

# INDIAN SCENARIO

-  Fuel economy has been a major attraction to user.
-  Fuel consumption norms were employed for diesel and gasoline vehicles, agricultural tractors - for tax incentive.
-  After introduction of emission regulations, norms on fuel consumptions were either relaxed or withdrawn for some categories.
-  Traffic situation and inadequate road infrastructure adds to poor fuel efficiency.
-  Traffic signals not synchronized. Idle running of vehicles quite intermittently cause increased fuel consumption.

# **INDIAN SCENARIO** (contd. ...)



**Pricing structure of commodities greatly depends on transportation cost - specially commercial diesel vehicles. Hence, fuel economy improvement is vital requirement for Indian economy. It would give by-product benefit of CO<sub>2</sub> emission reduction addressing global warming issues.**



**Fuel consumption targets to be revived for all categories of vehicles, however, with some incentive and without compromise on emissions. Legislative body is reviewing fuel consumption norms afresh.**



**Low speed, low load operation is more used in Indian conditions. Engines having high torque at lower speeds are demanded.**



**Fuel adulteration is a critical issue.**



**Tempering of fuel system is also a critical issue for some category of vehicles.**

# **PARTICIPATION OF ARAI**

- **Importance of fuel economy measures are well appreciated**
- **Indian customers pro-actively demand fuel efficient vehicles. Fuel prices are increasing at a steep rate. On 1<sup>st</sup> June 2006, fuel prices have gone up by 5 to 10%.**
- **ARAI is willing to participate in the global efforts towards improvement in vehicle fuel economy & CO<sub>2</sub> reduction.**
- **ARAI will be pleased to join the consortium in these efforts.**

# *A Panoramic View of ARAI*



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**THANK YOU**

# ABOUT ARAI



# **A**utomotive **R**esearch **A**ssociation of **I**ndia

- Was established in 1966 as co-operative research center by Automotive Industry as an autonomous institution registered under the Societies Registration Act.
- Caters to certification and homologation needs of almost 90% of the Indian Auto Industry.
- Conducts M. Tech Course in Auto. Engg. in collaboration with Vellore Institute of Technology.
- NABL accredited Certification & Calibration Laboratories.
- An ISO 9001, ISO 14001 and OHSAS 18001 Certified Organization.



# Roles of ARAI

- **Govt. approved test agency to carry out mandatory/certification testing.**
- **Research association & service provider to carry out sponsored R&D work and development testing.**
- **Govt. affiliated research organization to**
  - **prepare & harmonize standards.**
  - **deliberate policy matters affecting auto R&D.**
  - **create facilities and build competence by undertaking forward looking research & technology demonstration projects.**
- **National institution to disseminate information and create forum for knowledge sharing in association with industry/academia**

# CORE CAPABILITIES

