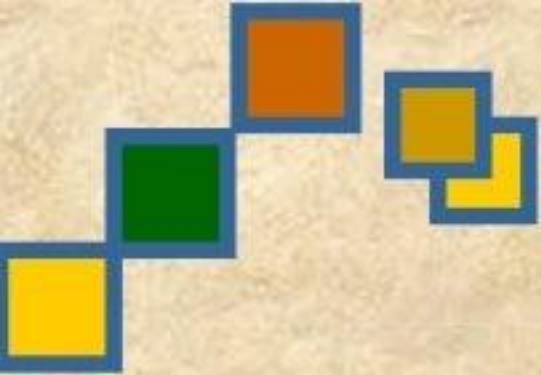


SOURCES OF EMISSIONS FROM AUTOMOBILES & EFFECTS ON HEALTH

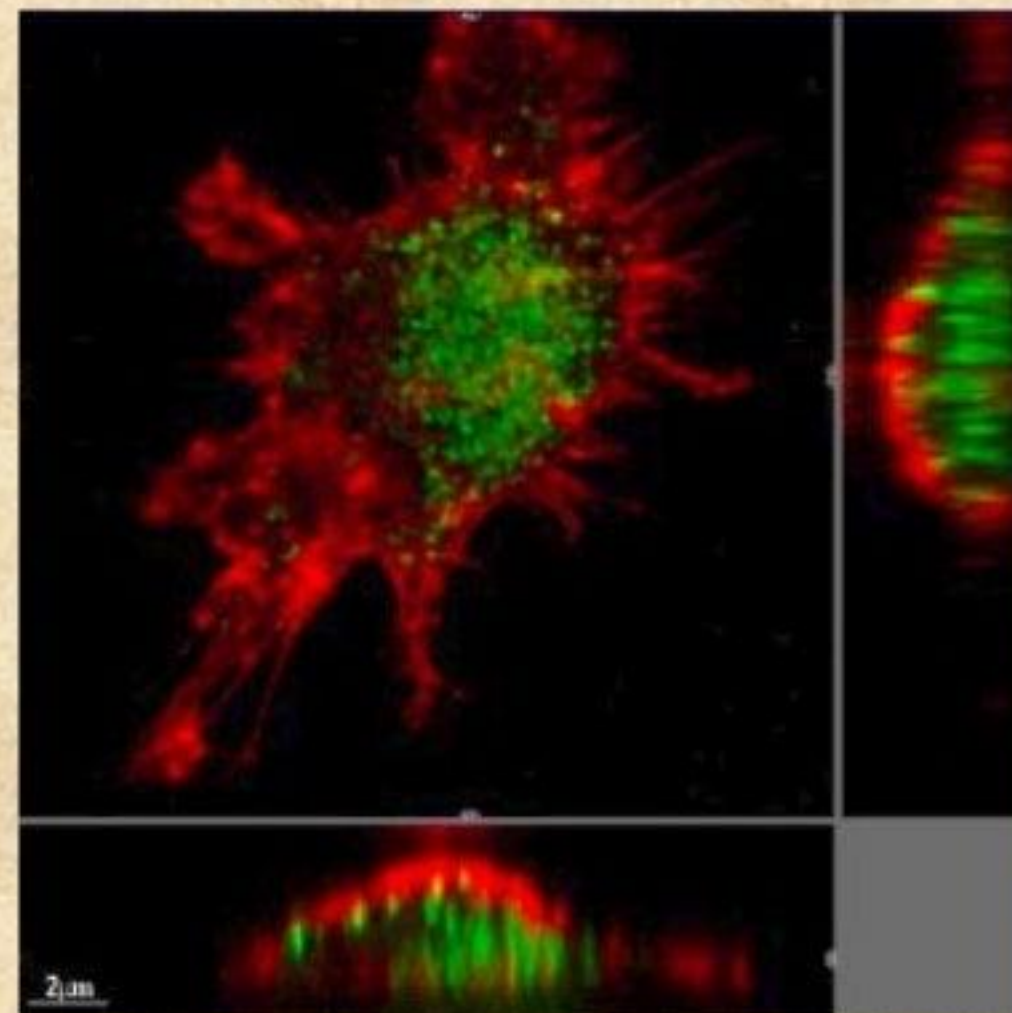
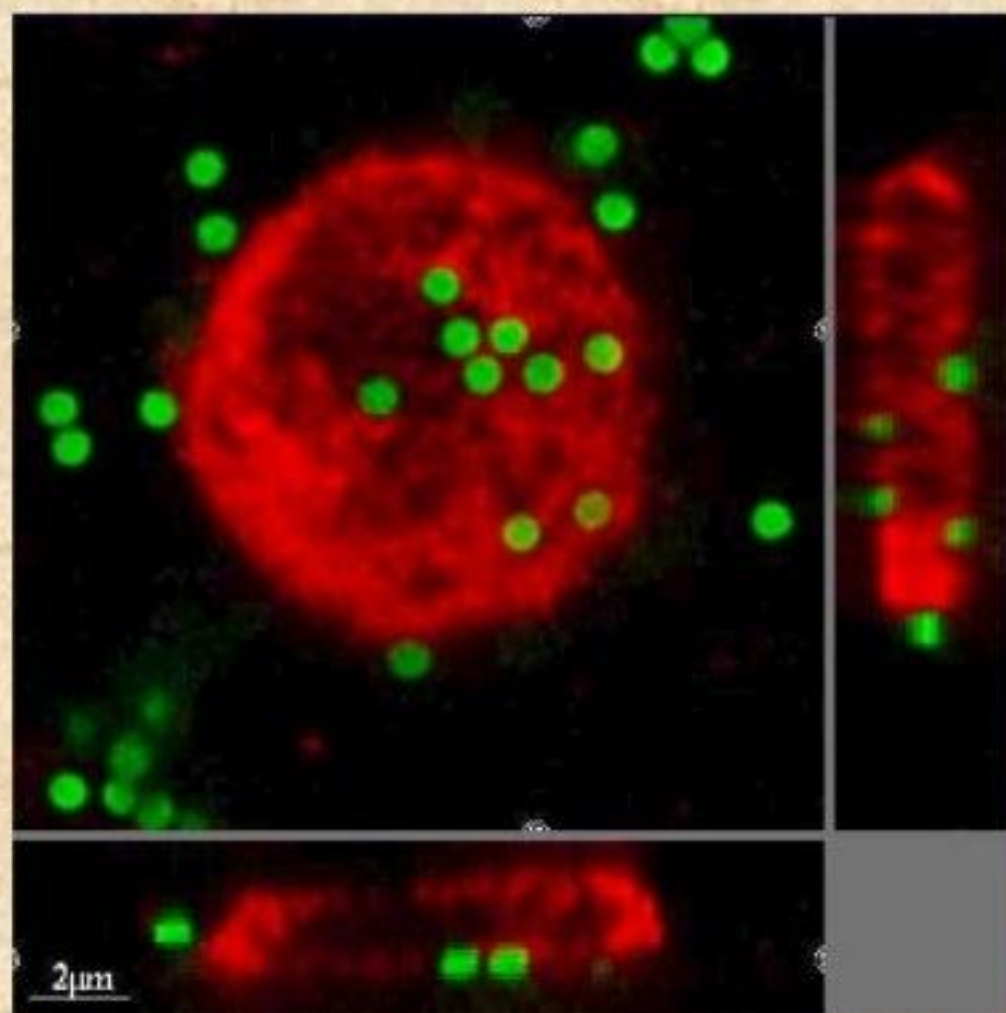


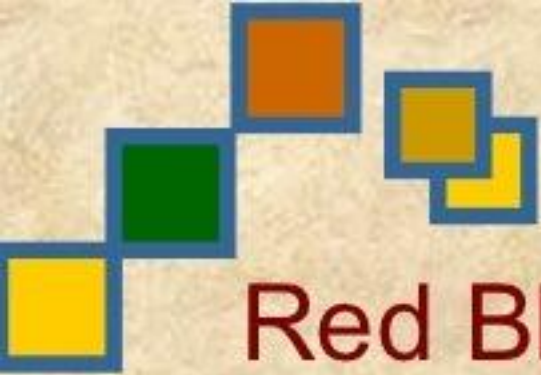
Dr. K. C. Vora

*Dy Director & Head
ARAI Academy,
ARAI, Pune*



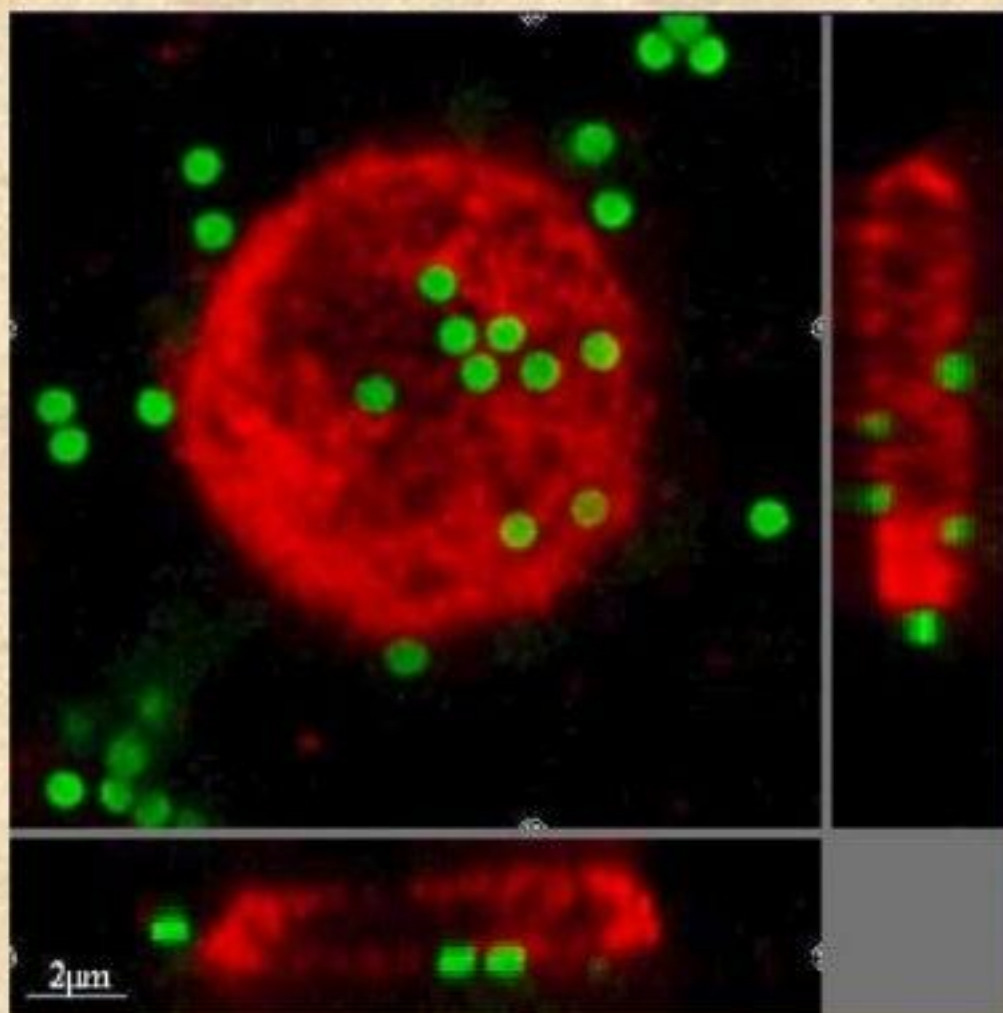
Guess, What is this?



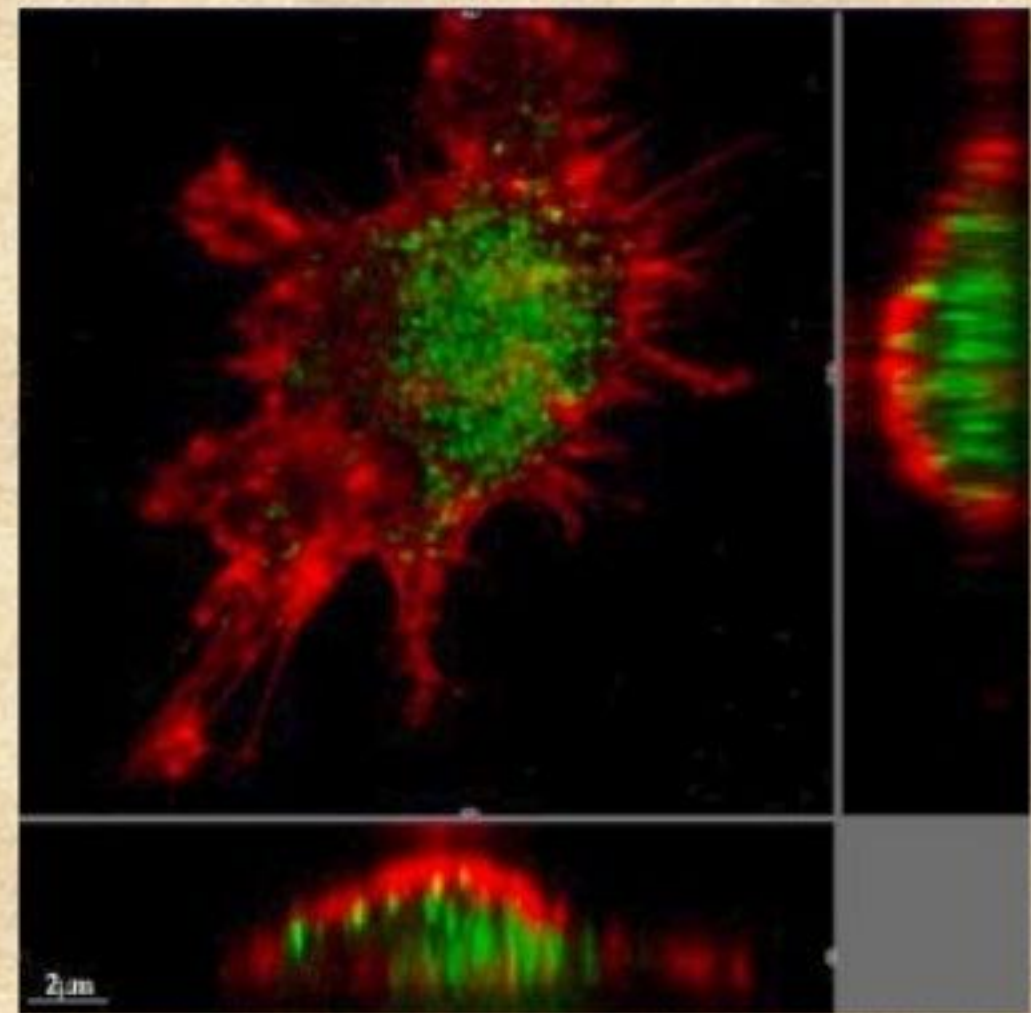


Red Blood Cells Exposed to Particles

1 μm particles



0.078 μm particles

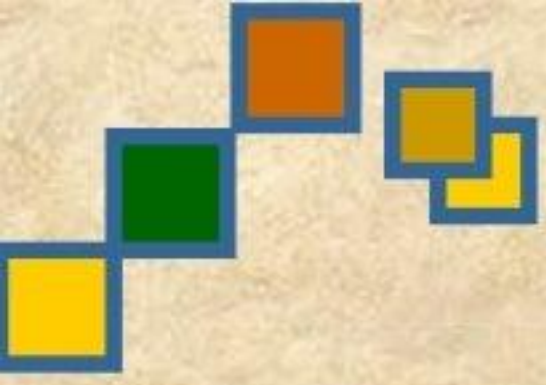


Smaller Particles are More Dangerous



Air Quality in Asian Cities is an Issue





Mobility

Mobility – Movement of people & Material for their Living

Mobility – Essential part of Society- One cannot leave it

Mobility – In the present form leads following issues

- Congestion
- Inadequate Infrastructure
- Noise & Pollution
- Dependence on Non- Renewable Resources



Why Sustainable Mobility ?

Maintaining the capability to provide non-declining accessibility in time

Sustainable Mobility to Add

- Economic Growth
 - Environment Improvement
 - Social Progress
- Profit
 - Planet
 - People

3P > Bottom of Pyramid to Sustainability

Global Challenges and Requirements

Global Challenges

FACTS

- Increasing world population
- Increasing energy demand
- Limited energy supplies
- Environmental effects of energy use



CONSEQUENCES

- Development of new technologies
- Efficient use of energy
- Use of all energy carriers
- Use of environment protecting technologies

Requirements for Vehicle

LEGISLATION

- Consumption
- Safety
- Emissions
- Noise

CUSTOMER

- Manufacturing cost
- Driving pleasure
- Operating cost
- Sound



Recycling

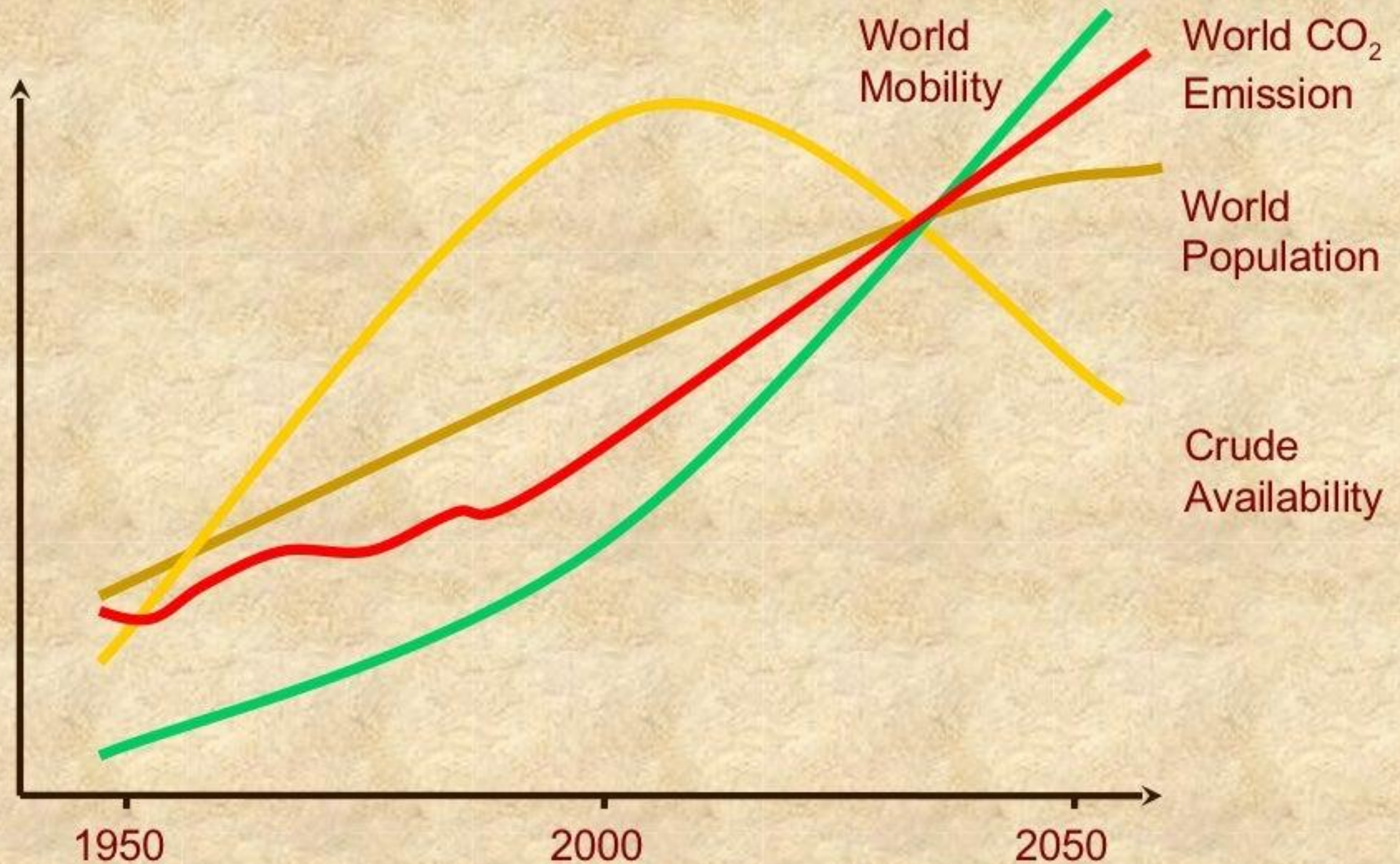
Resources

ENVIRONMENT

Main Focus

Reduction in Resource Consumption
Reduction of CO₂ Emission

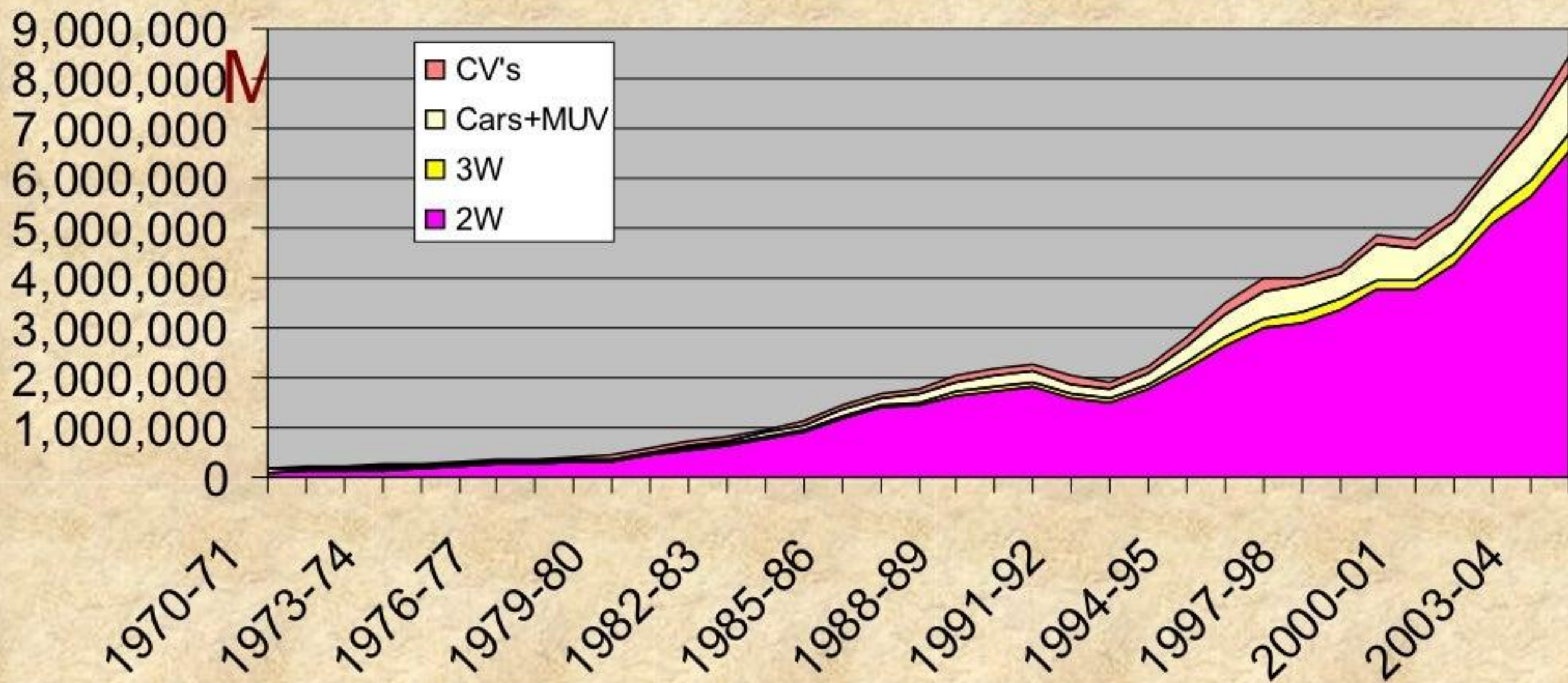
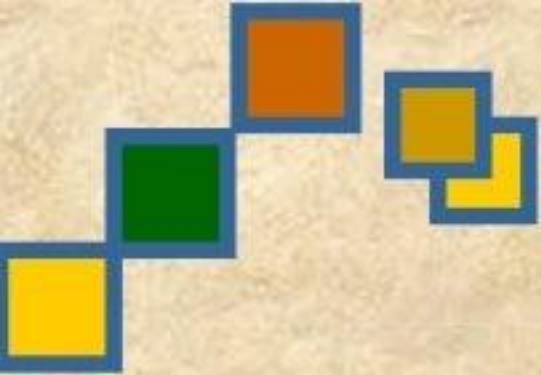
Global Challenges and Requirements



Source: ASPO 2004, Solcomhpouse.com

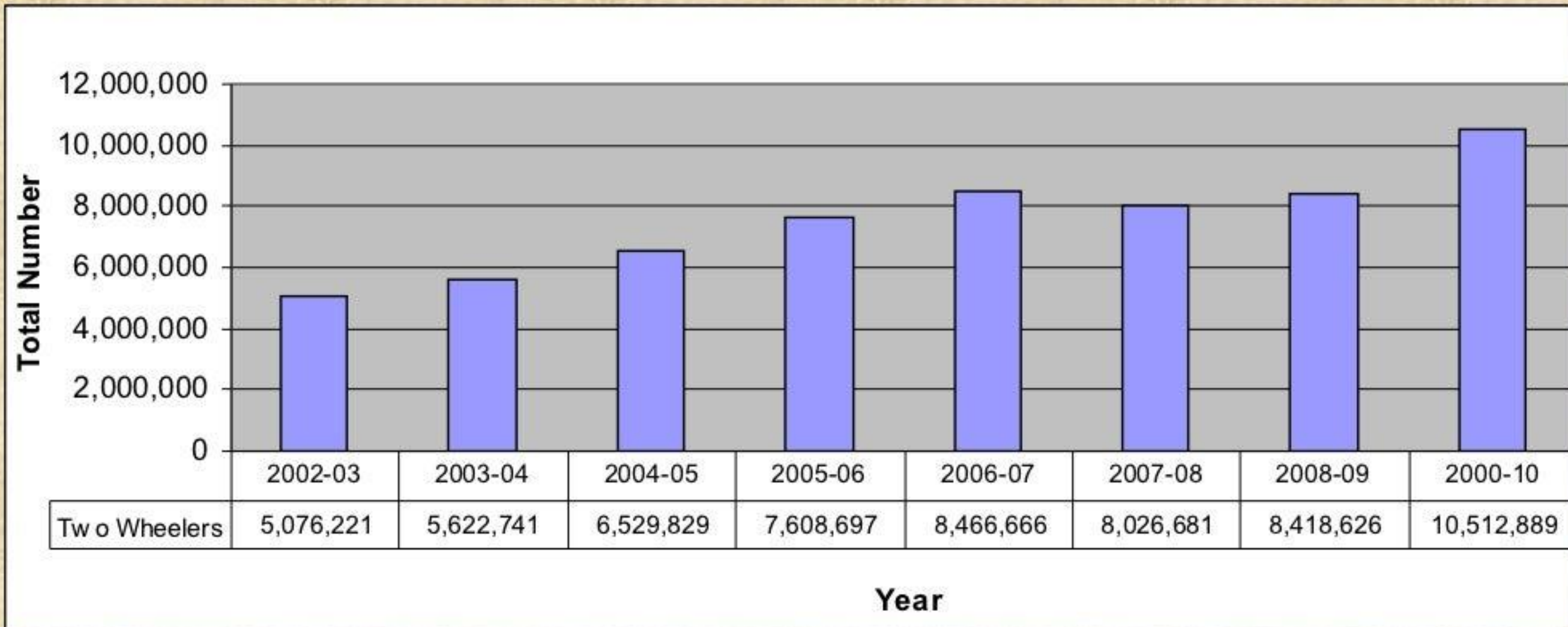
Factors contributing to Sustainable Mobility





* Source SIAM

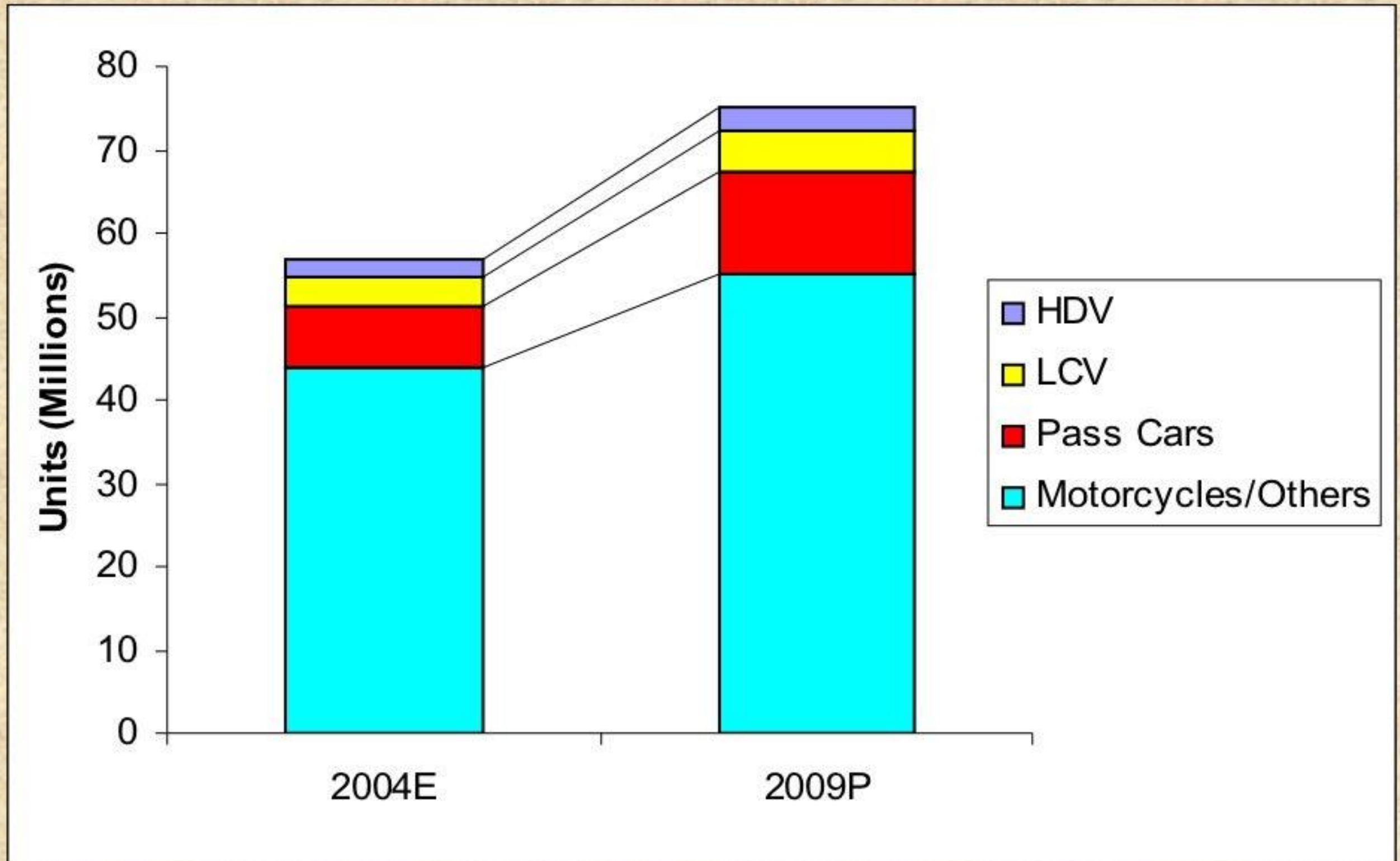
2 Wheeler Production Scenario in India



Total 2 wheeler population in India \approx 91,415,534

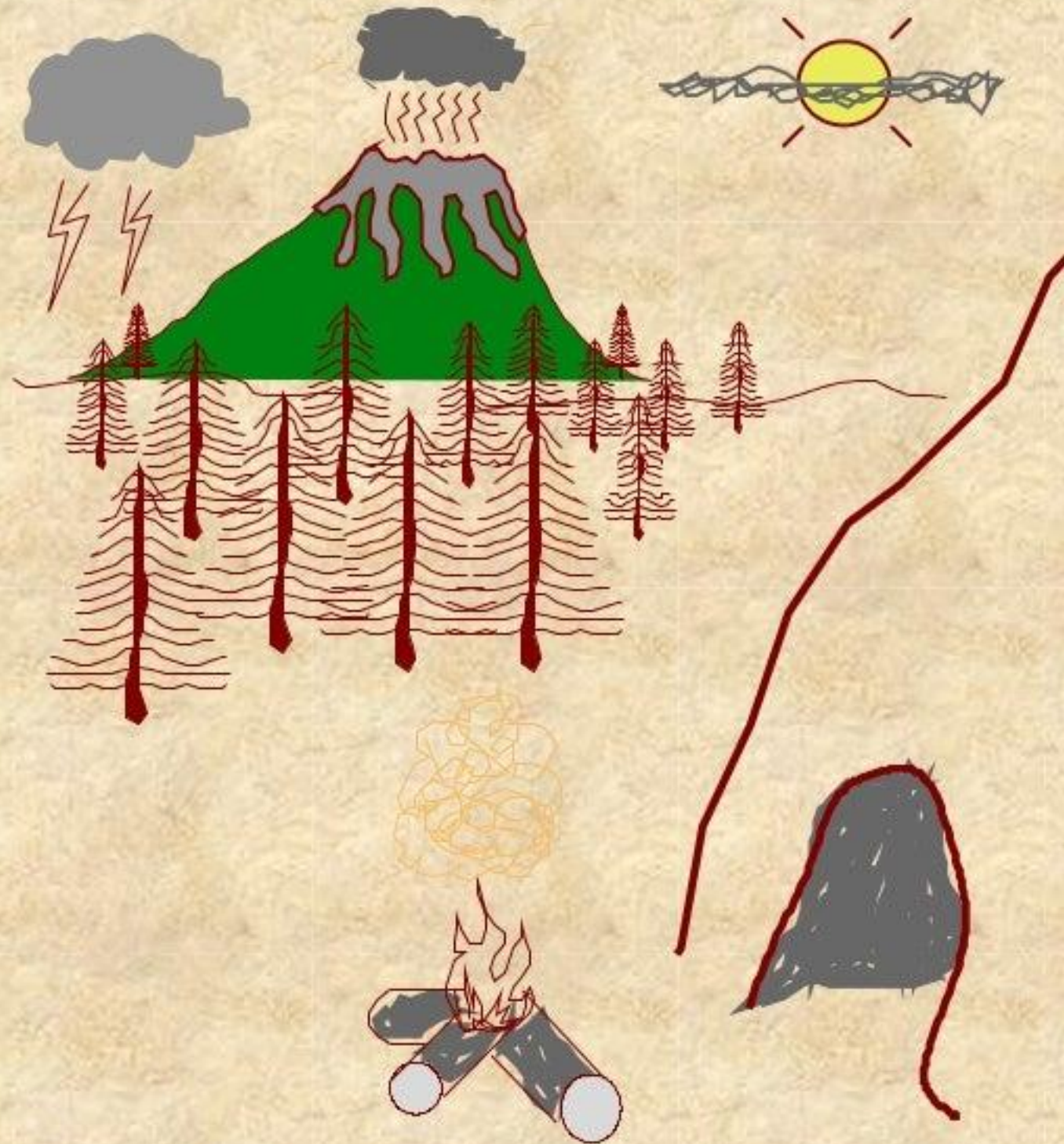
Sources: MoRTH & SIAM website

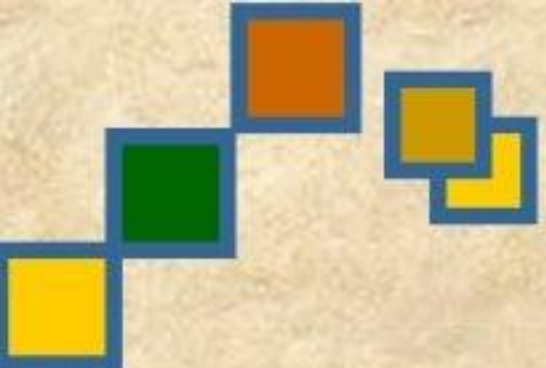
India's Vehicle Population is Accelerating....





THE EARLY DAYS OF AIR POLLUTION





What Causes Air Pollution Today?

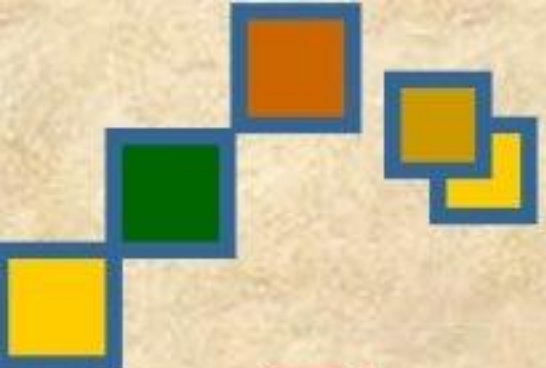


Stationary Sources

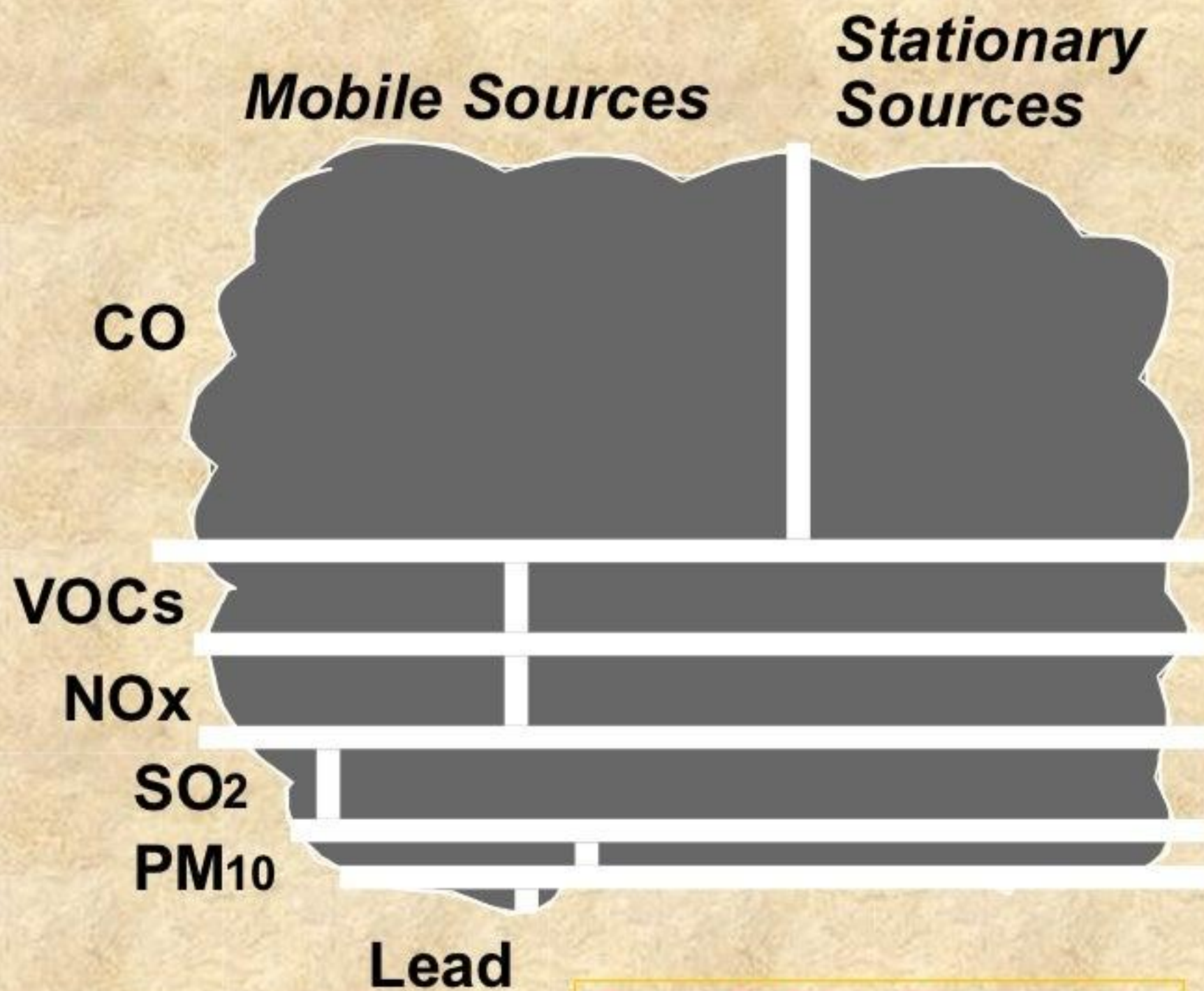
- **Combustion of fuels for power and heat**
- **Other burning such as incineration or forest fires**
- **Industrial/commercial processes**
- **Solvents and aerosols**

Mobile Sources

- **Highway vehicles: cars, trucks, buses and motorcycles**
- **Off-highway vehicles such as aircraft, boats, locomotives, farm equipment, RVs, construction machinery and lawn mowers**



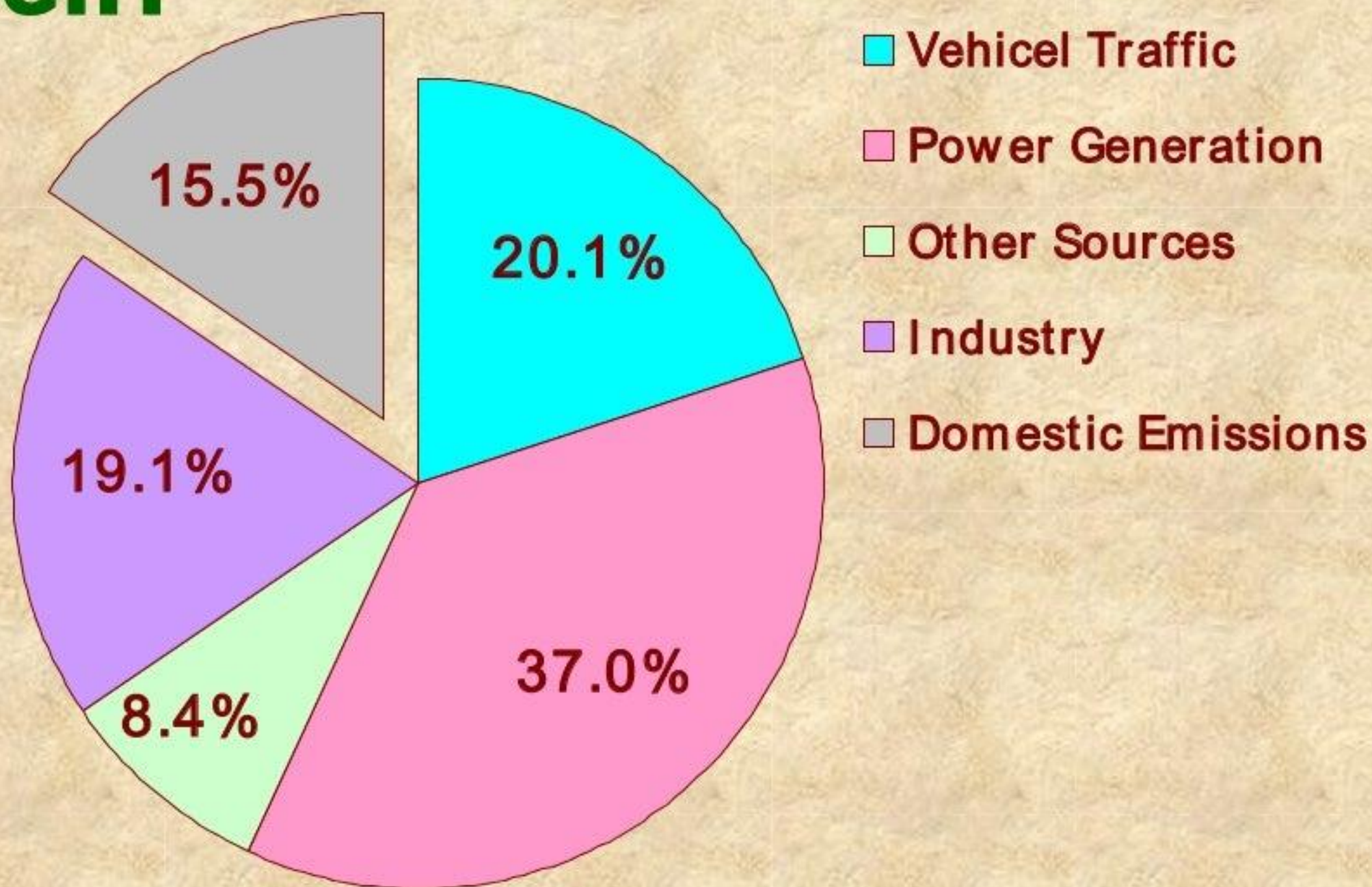
The Extent of Air Polluti on Today



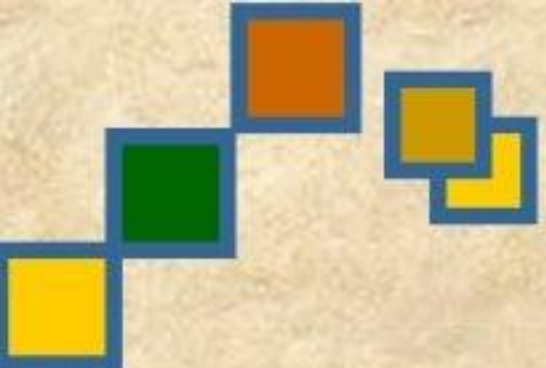
Overall, 54 million metric tons from mobile sources in 1990 (43% of total)



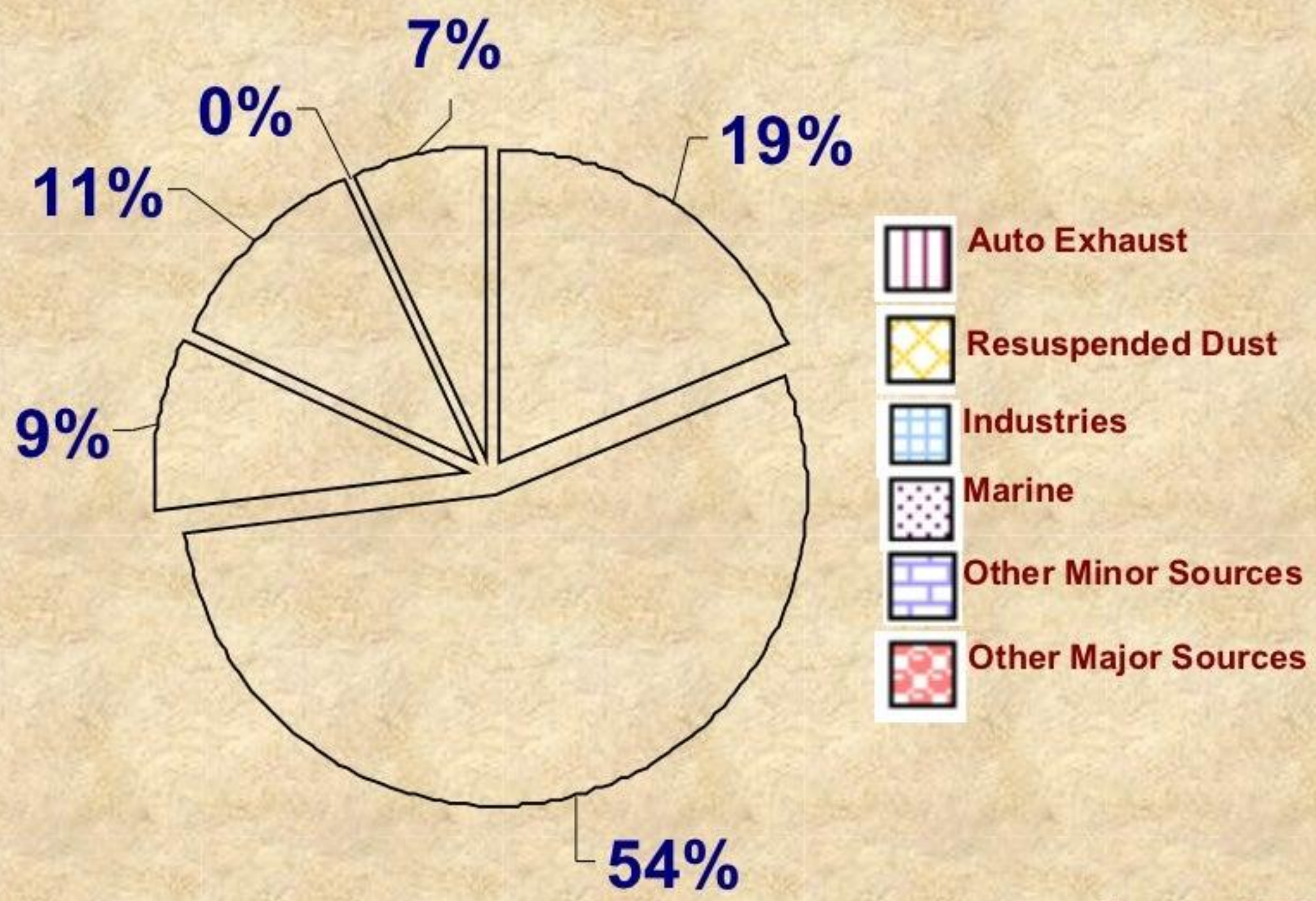
TOTAL EMISSION IN PERCENT BY WEIGHT



Source : Emissions protection report issued by government

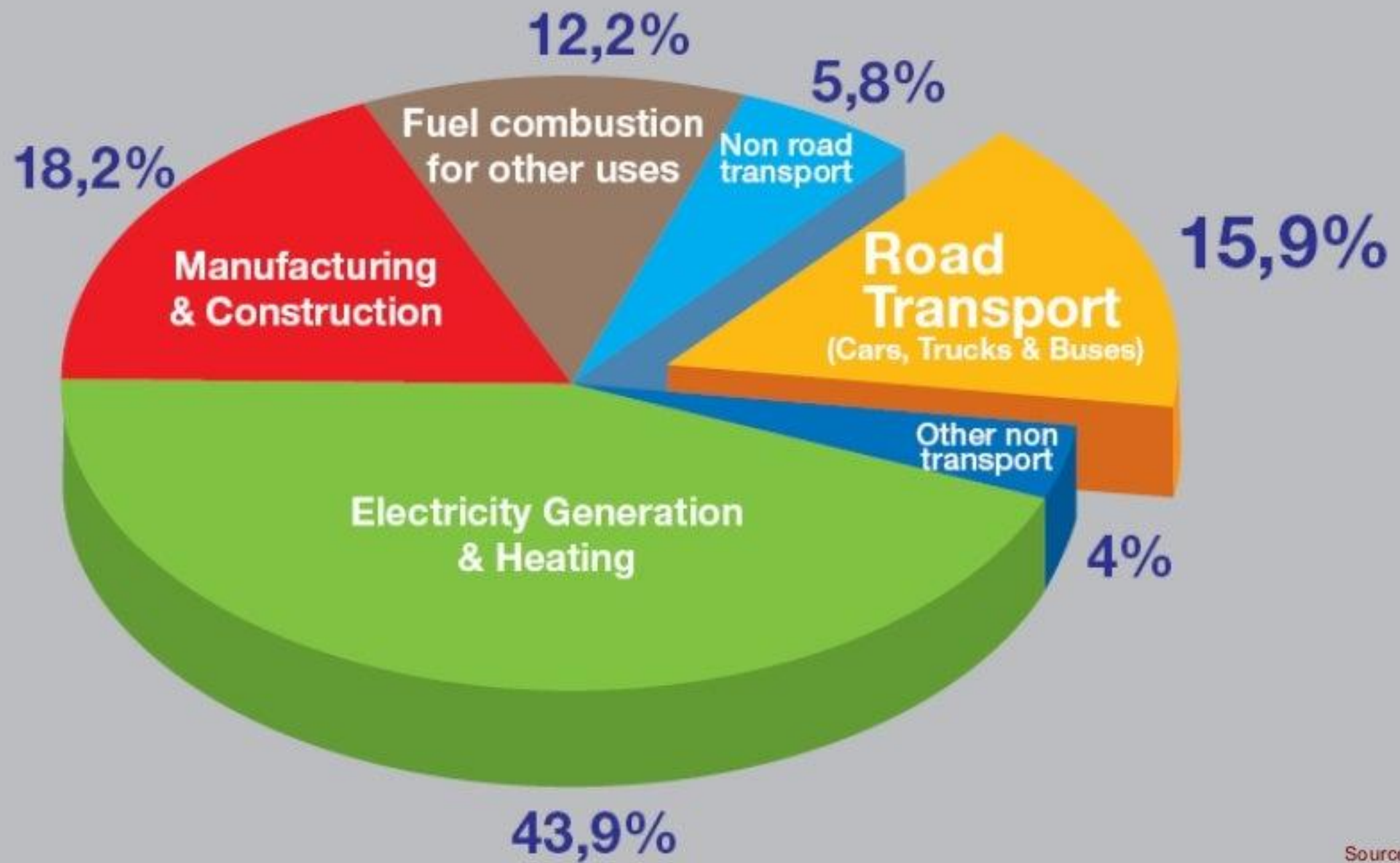


Source Apportionment of PM10 Emissions in Mumbai City

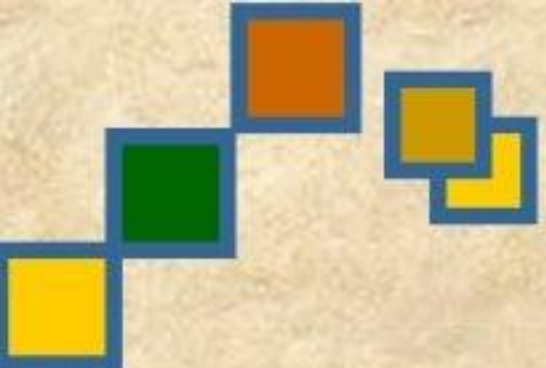


Source: NEERI

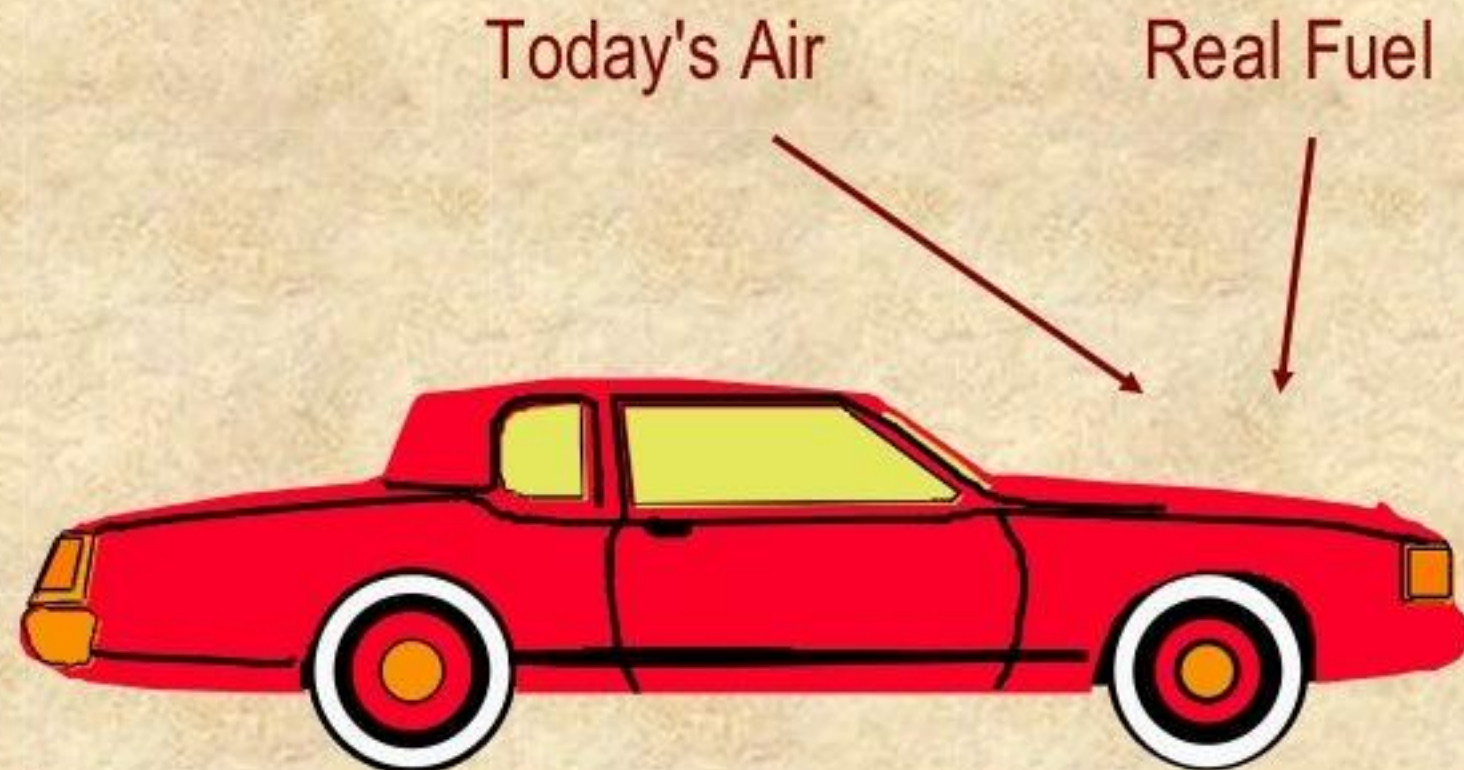
Road Transport Contribution to CO₂



Source: OICA

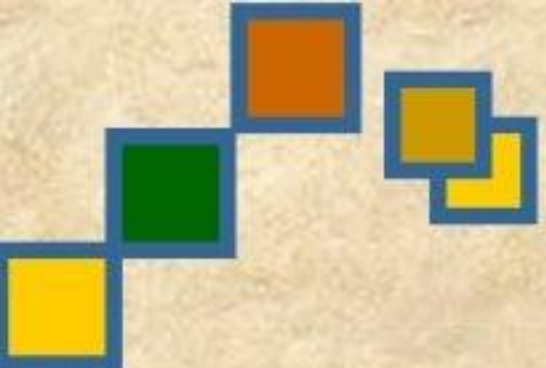


The Combustion Process (actual)



- Exhaust:
- Nitrogen
 - Water (steam)
 - Carbon Dioxide
 - Pollutants

Pollutants:
Unburned Hydrocarbons
Carbon Monoxide
Oxides of Nitrogen
Other elements or compounds

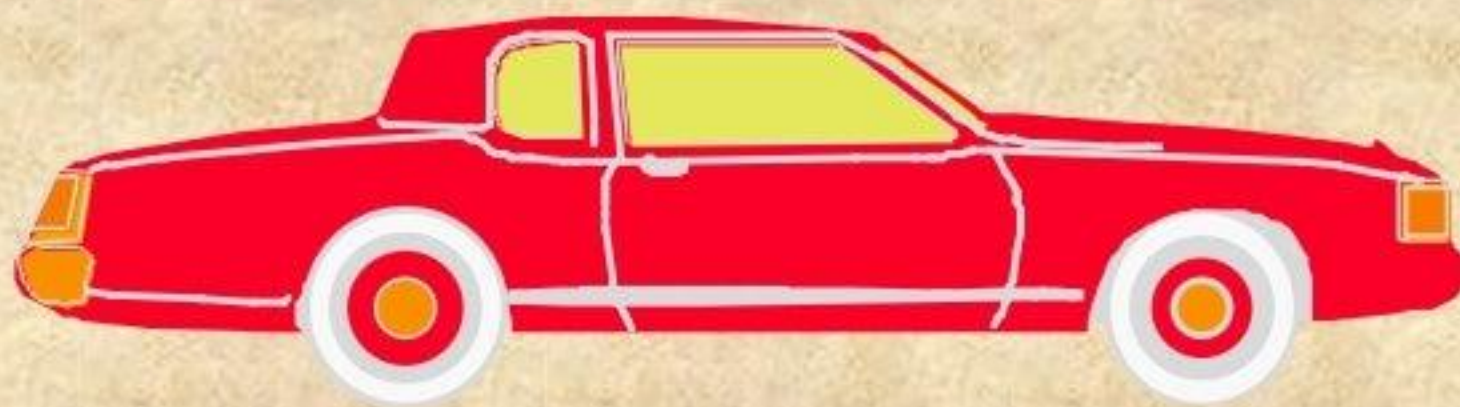


The Motor Vehicle as a Source of Air Pollution

Refueling Losses



Evaporative Emissions



Exhaust Emissions



Crankcase Losses, etc.

