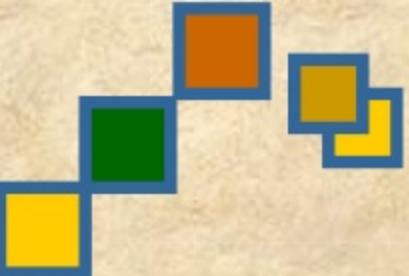


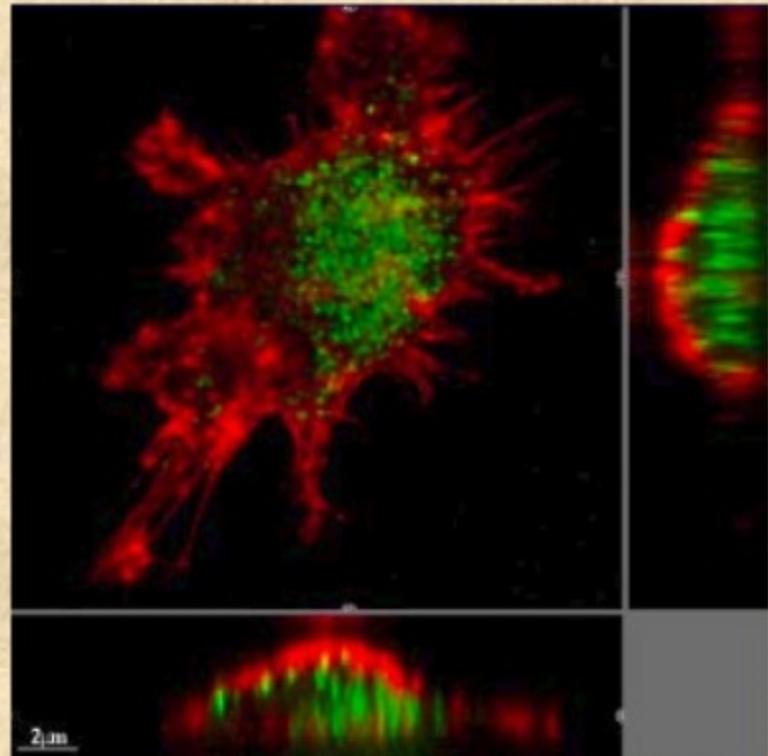
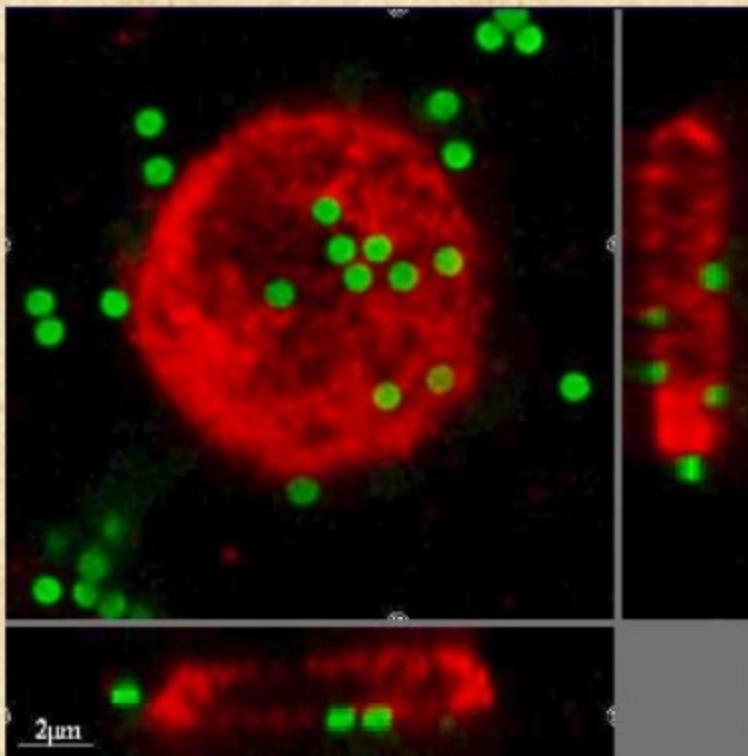
# SOURCES OF EMISSIONS FROM AUTOMOBILES & EFFECTS ON HEALTH

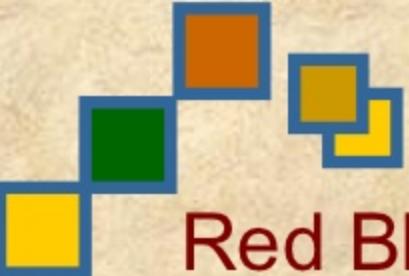


**Dr. K. C. Vora**  
*Dy Director & Head*  
*ARAI Academy,*  
*ARAI, Pune*



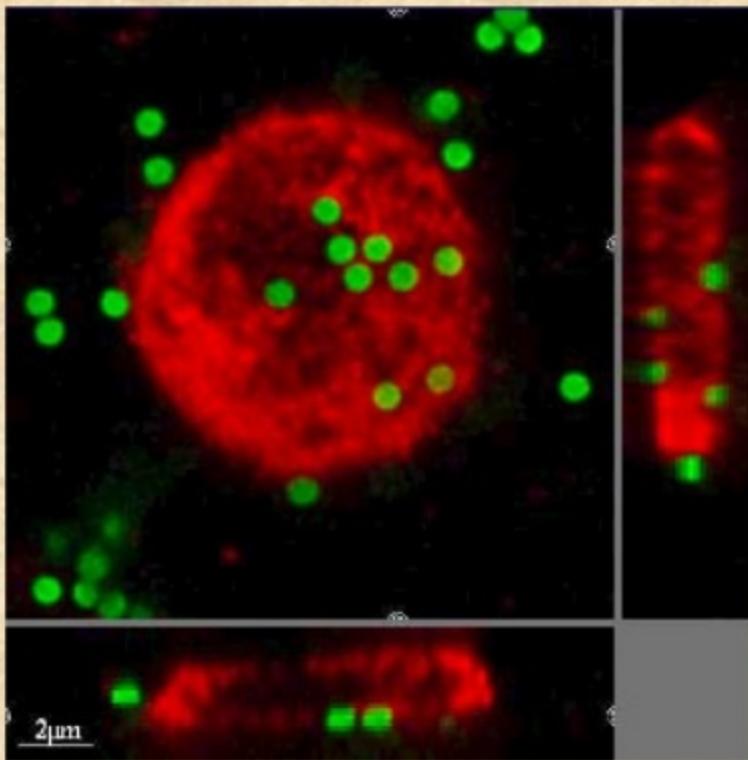
# Guess, What is this?



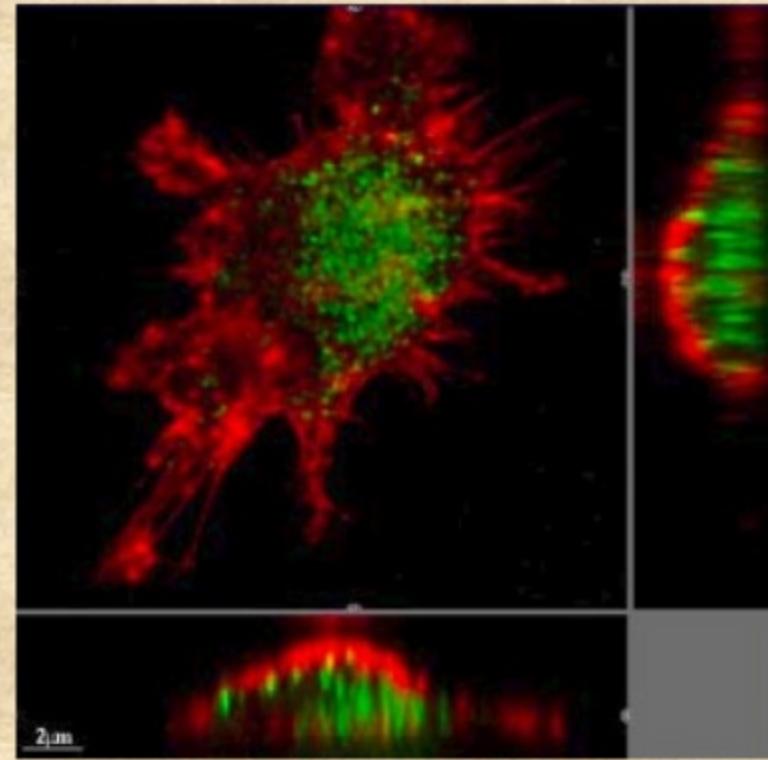


## Red Blood Cells Exposed to Particles

1  $\mu\text{m}$  particles



0.078  $\mu\text{m}$  particles

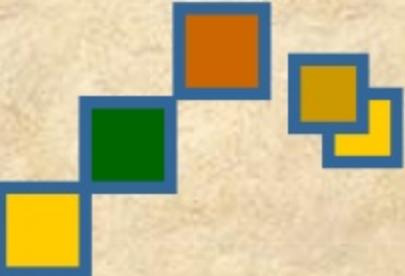


Smaller Particles are More Dangerous



# 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



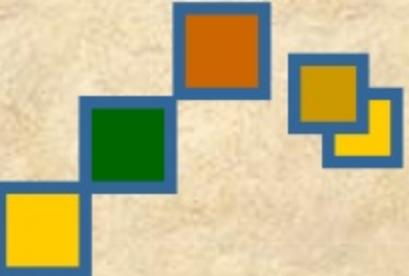
# Why Sustainable Mobility ?

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



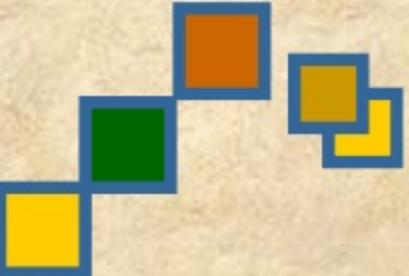
### ENVIRONMENT

### CUSTOMER

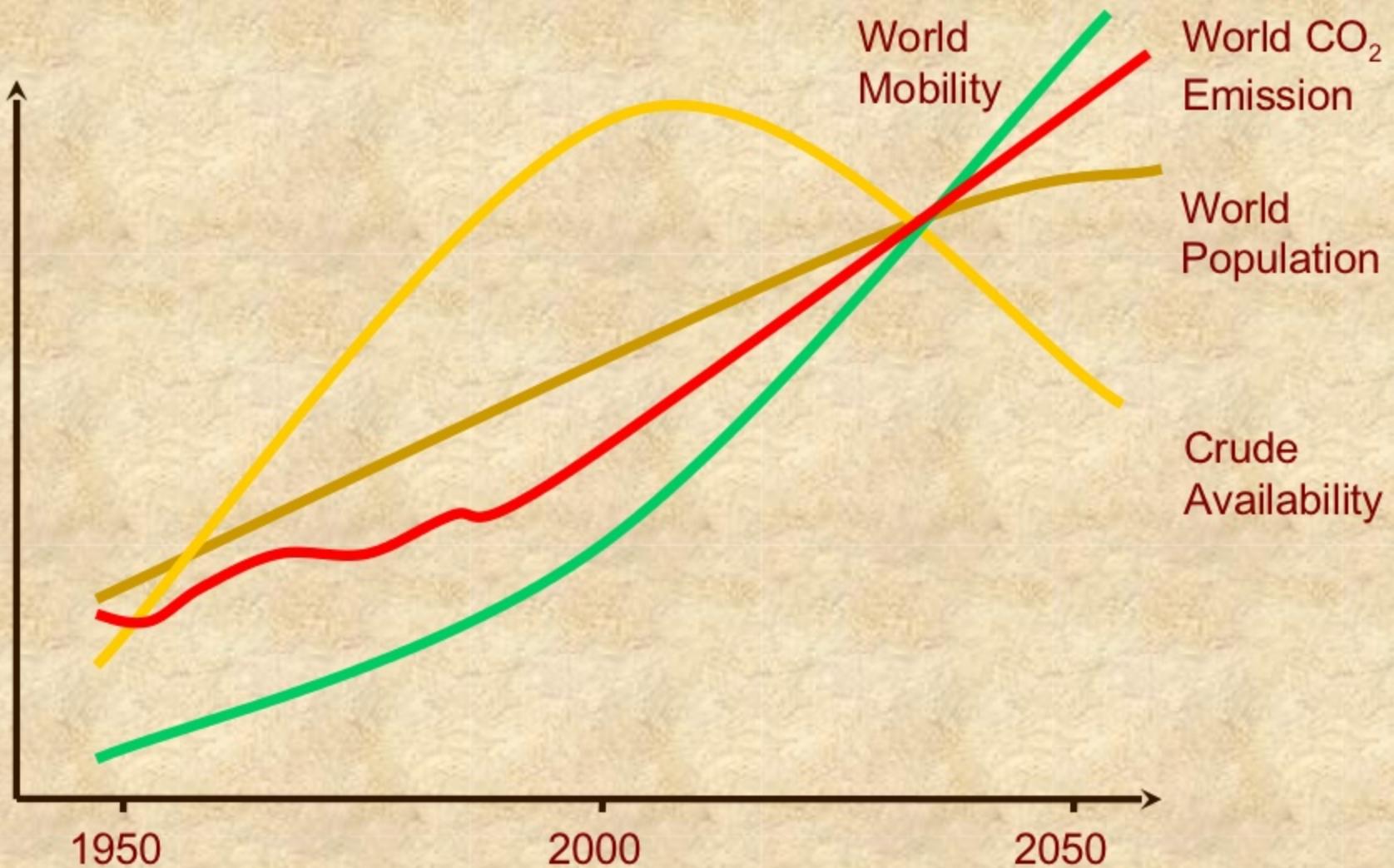
- Manufacturing cost
- Driving pleasure
- Operating cost
- Sound
- Resources
- Recycling

Main Focus

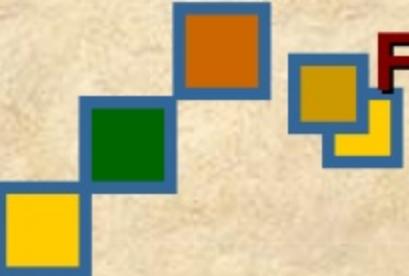
Reduction in Resource Consumption  
Reduction of CO<sub>2</sub> Emission



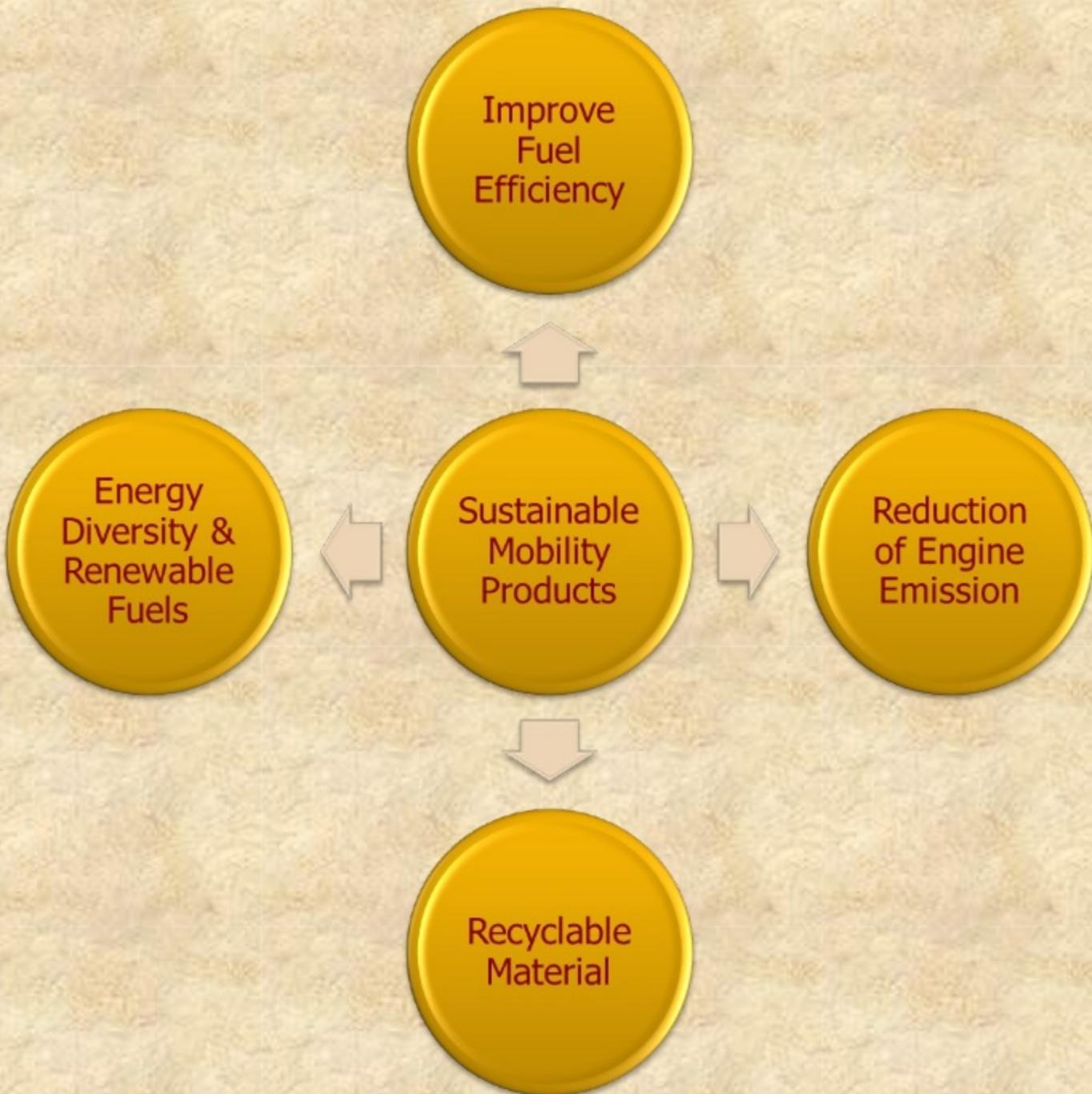
# Global Challenges and Requirements

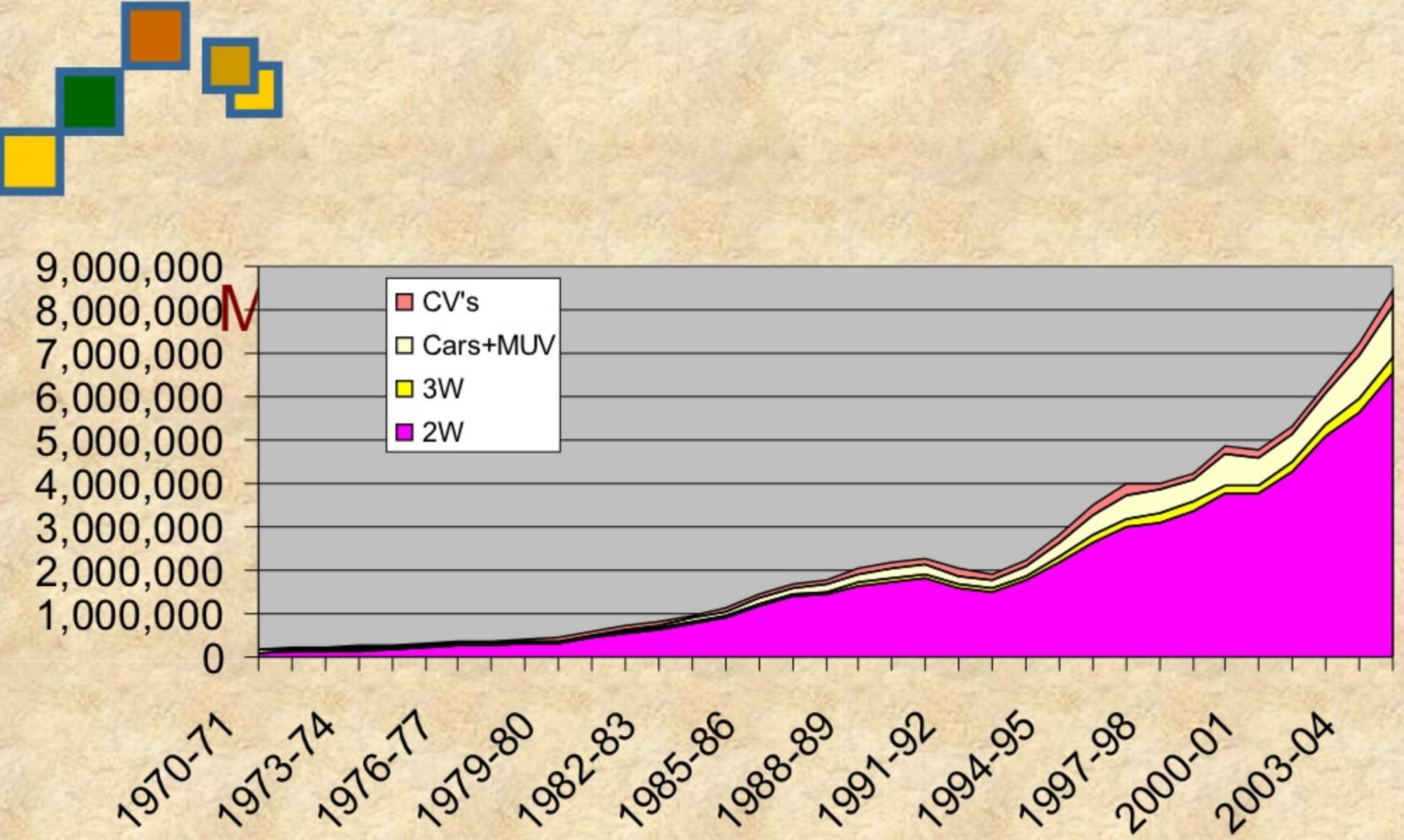


Source: ASPO 2004, Solcomhouse.com

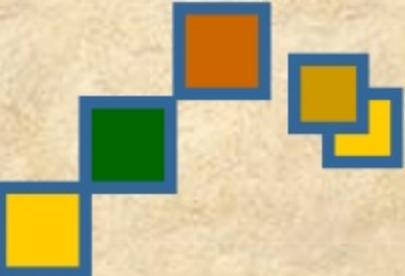


# Factors contributing to Sustainable Mobility

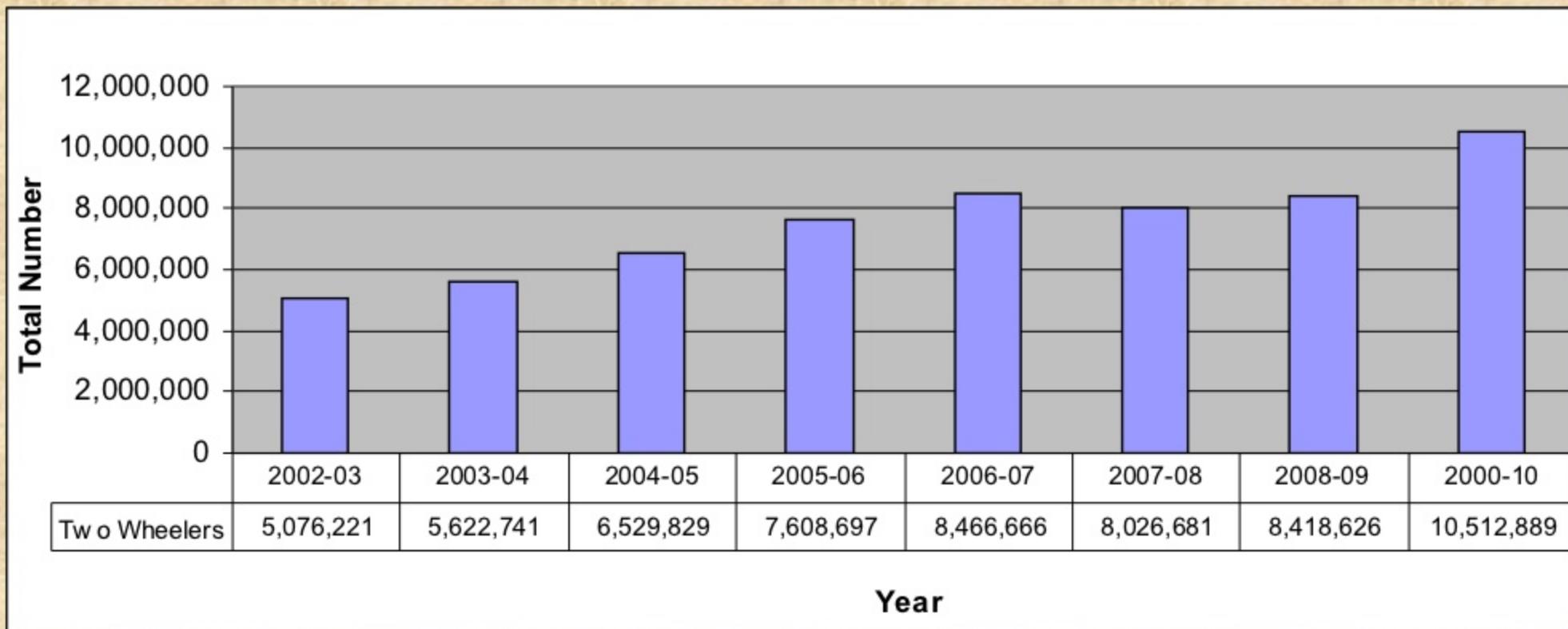




\* Source SIAM

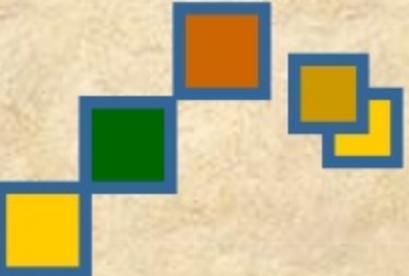


## 2 Wheeler Production Scenario in India

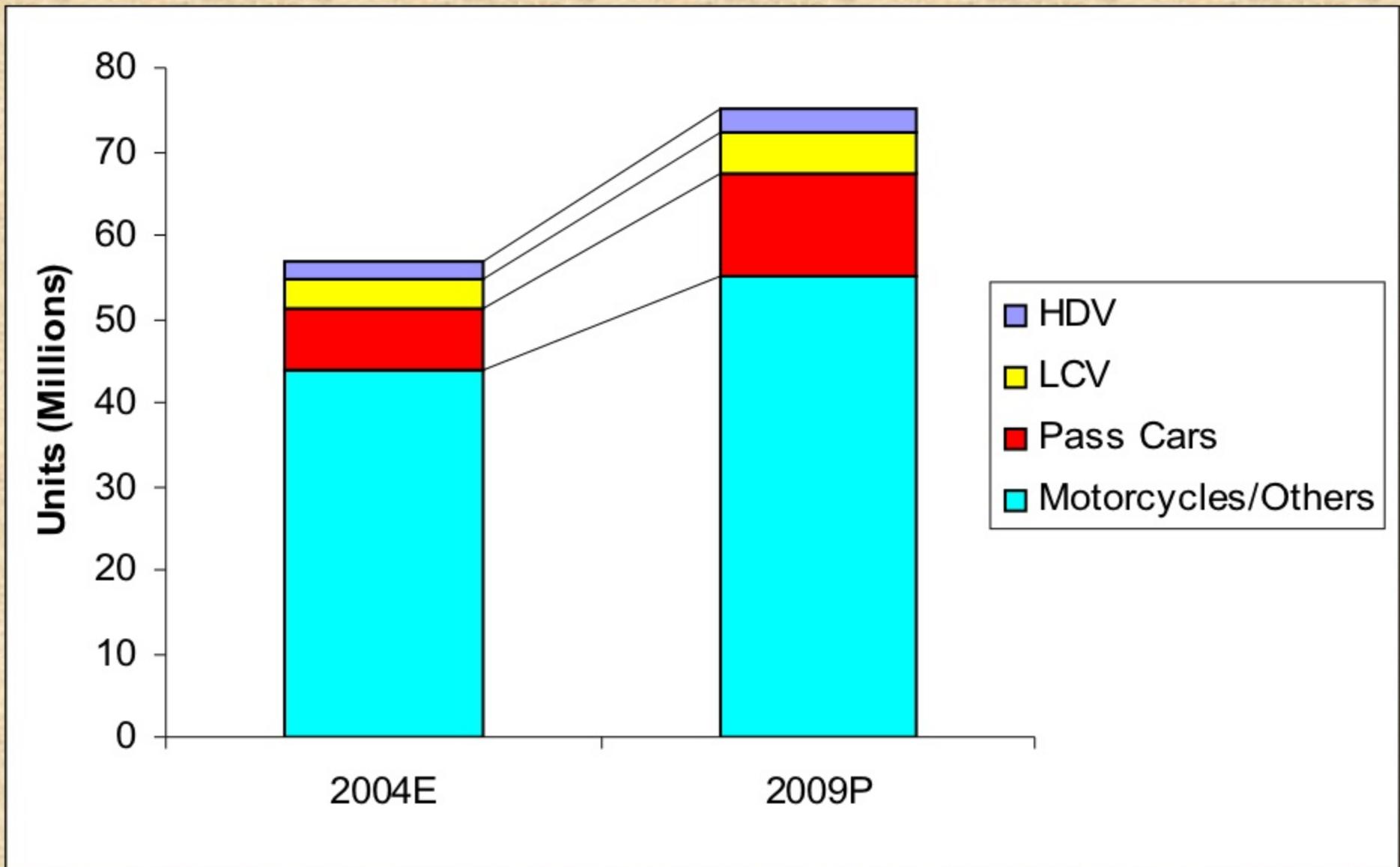


**Total 2 wheeler population in India ≈ 91,415,534**

Sources: MoRTH & SIAM website



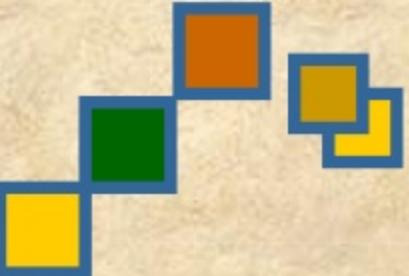
# India's Vehicle Population is Accelerating....





# THE EARLY DAYS OF AIR POLLUTION





# What Causes Air Pollution Today?

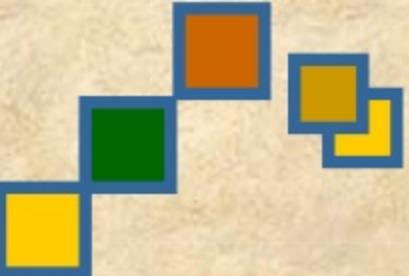


## Stationary Sources

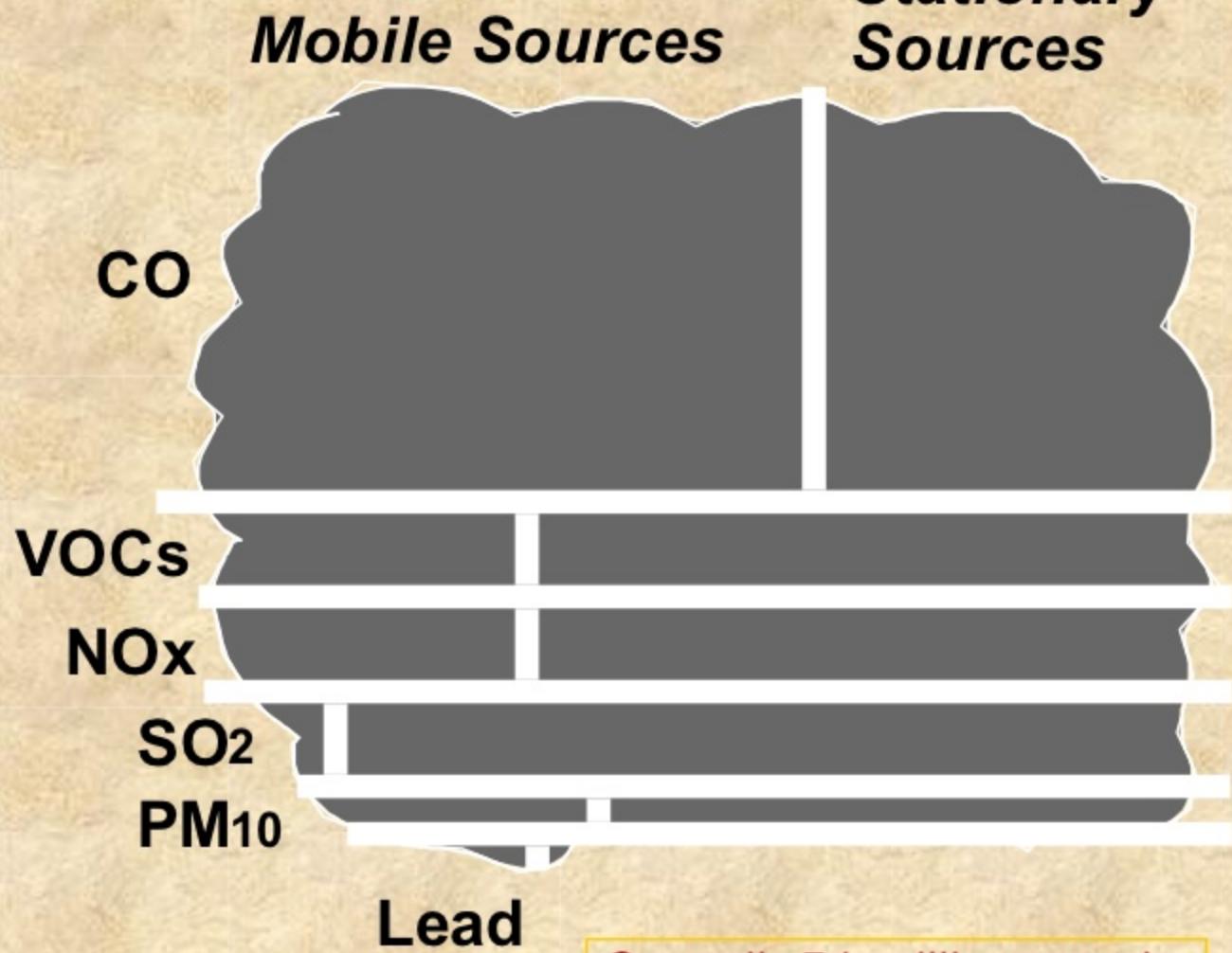
- Combustion of fuels for power and heat
- Other burning such as incineration or forest fires
- Industrial/commercial processes
- Solvents and aerosols

## 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



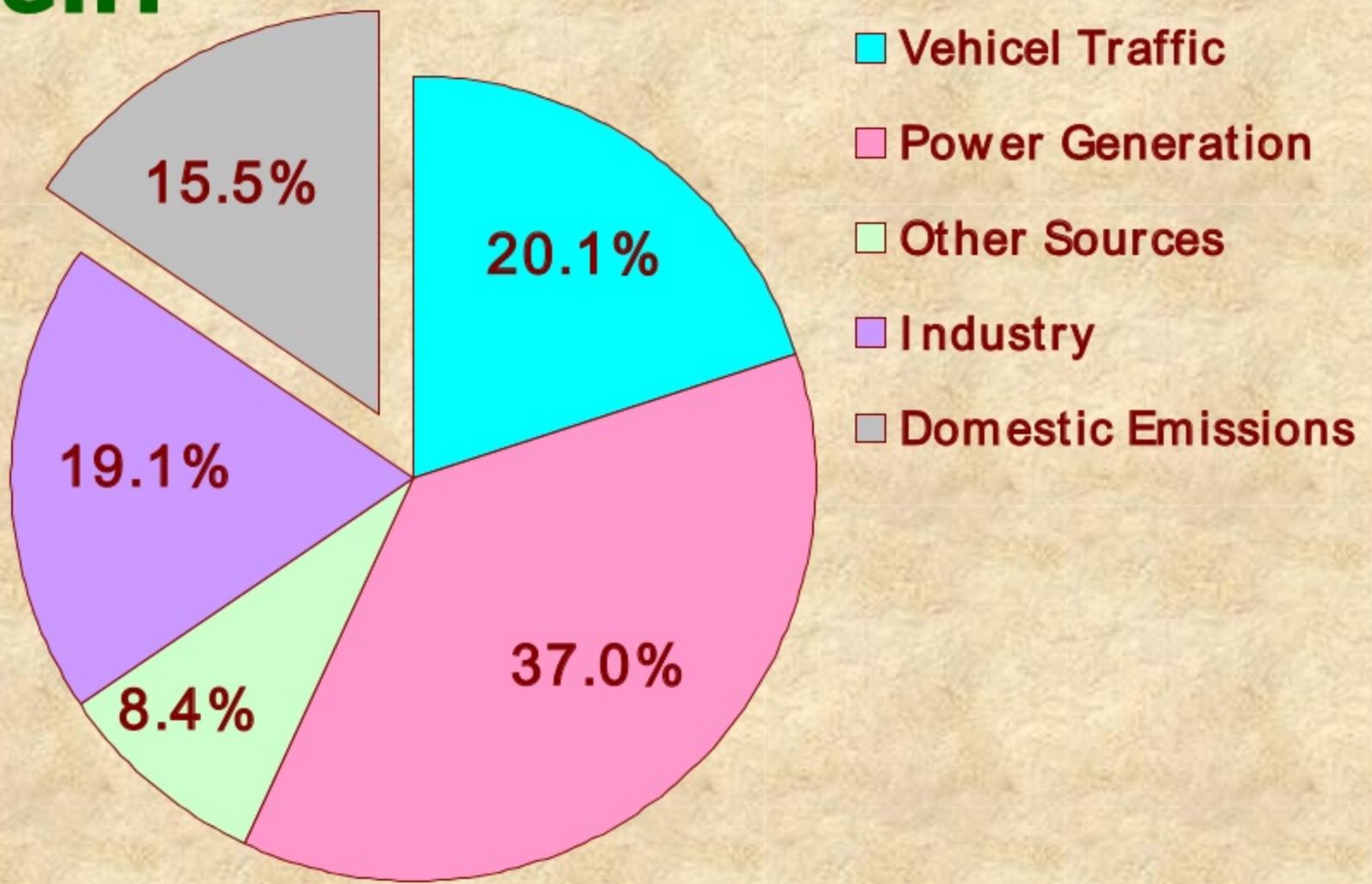
# The Extent of Air Pollution Today



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

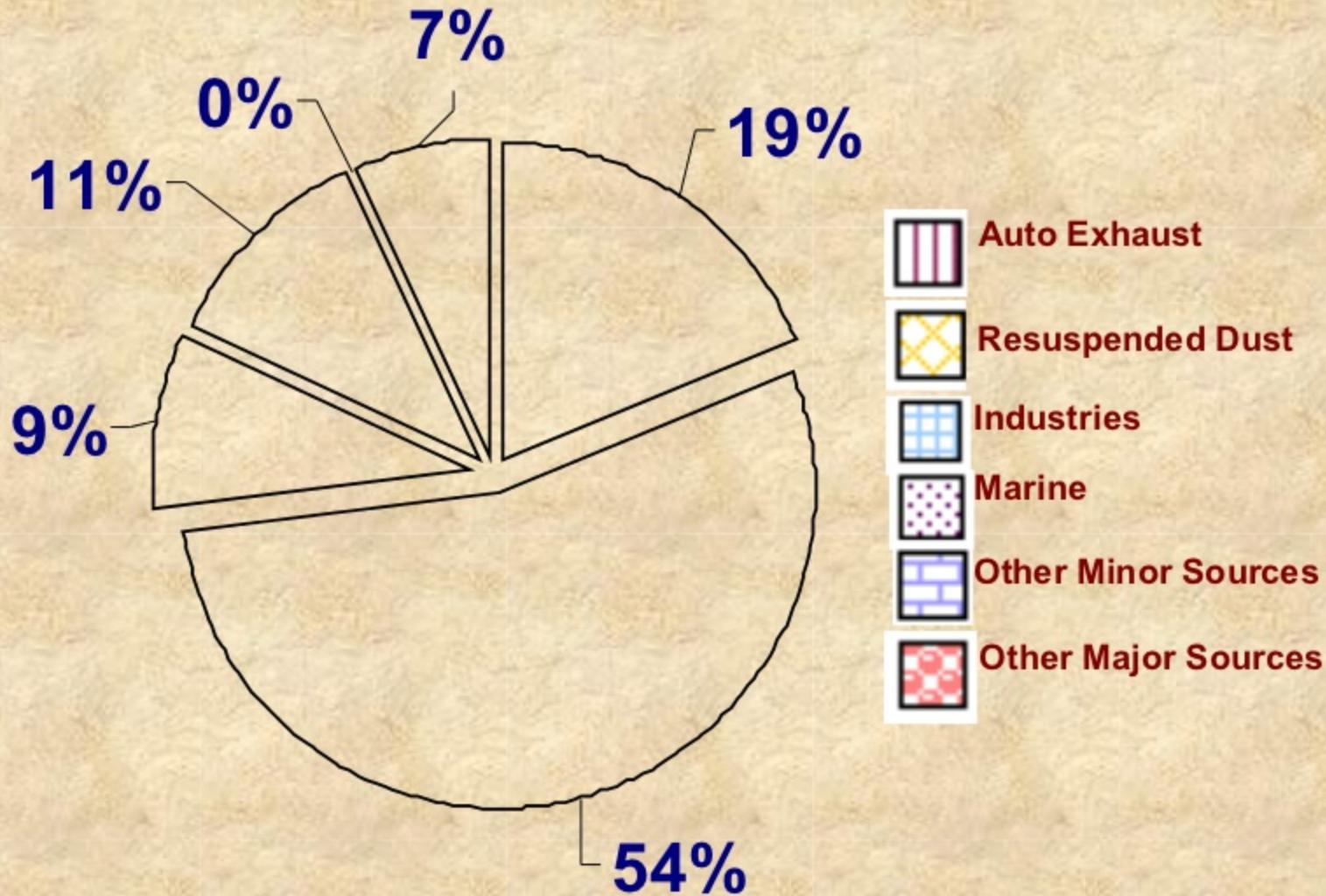


## TOTAL EMISSION IN PERCENT BY WEIGHT

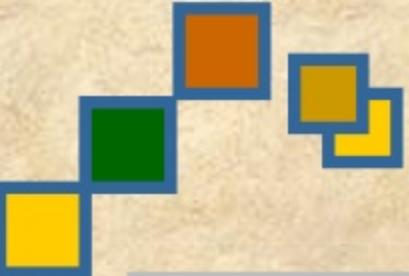


Source : Emissions protection report issued by government

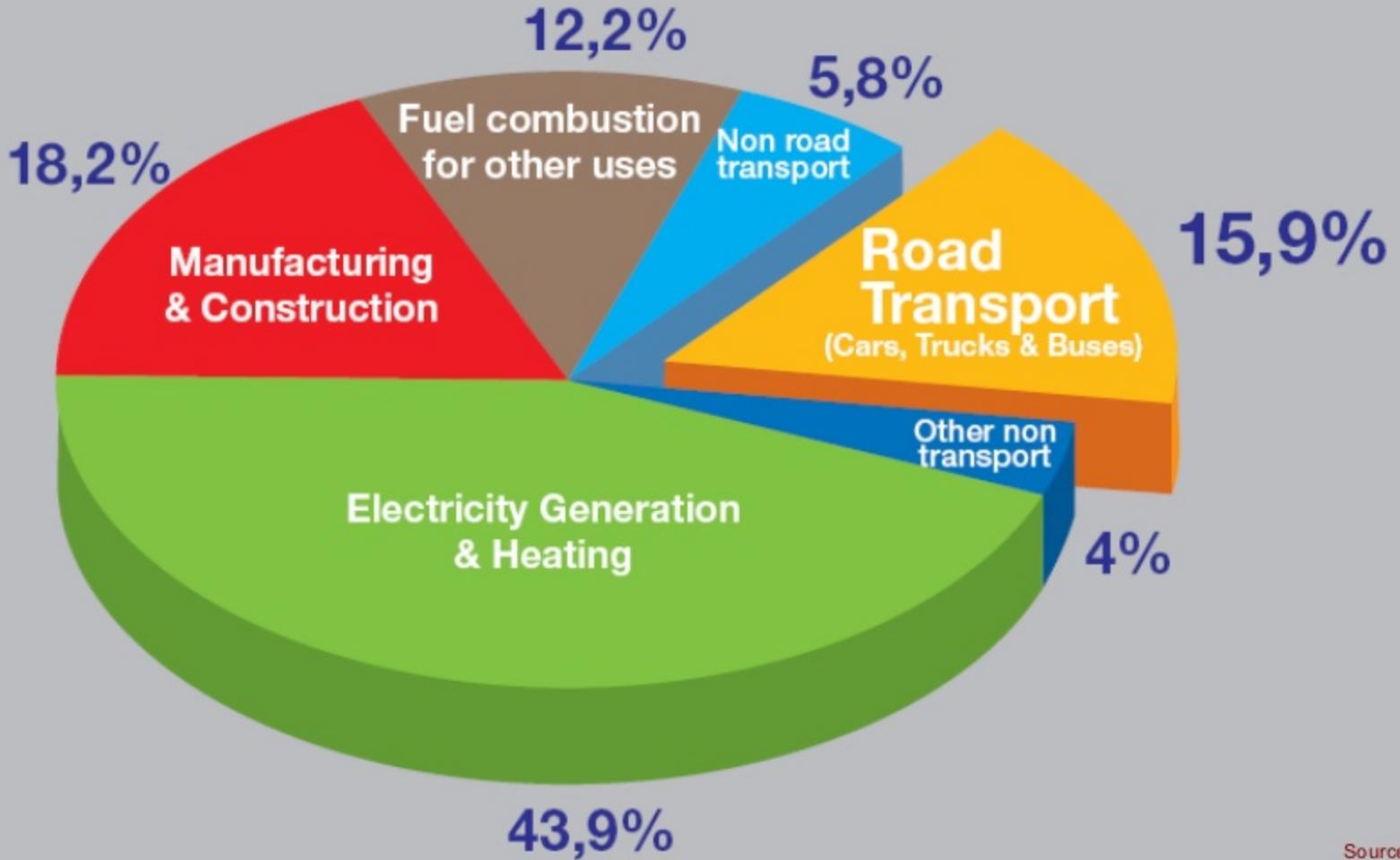
# Source Apportionment of PM10 Emissions in Mumbai City



Source: NEERI



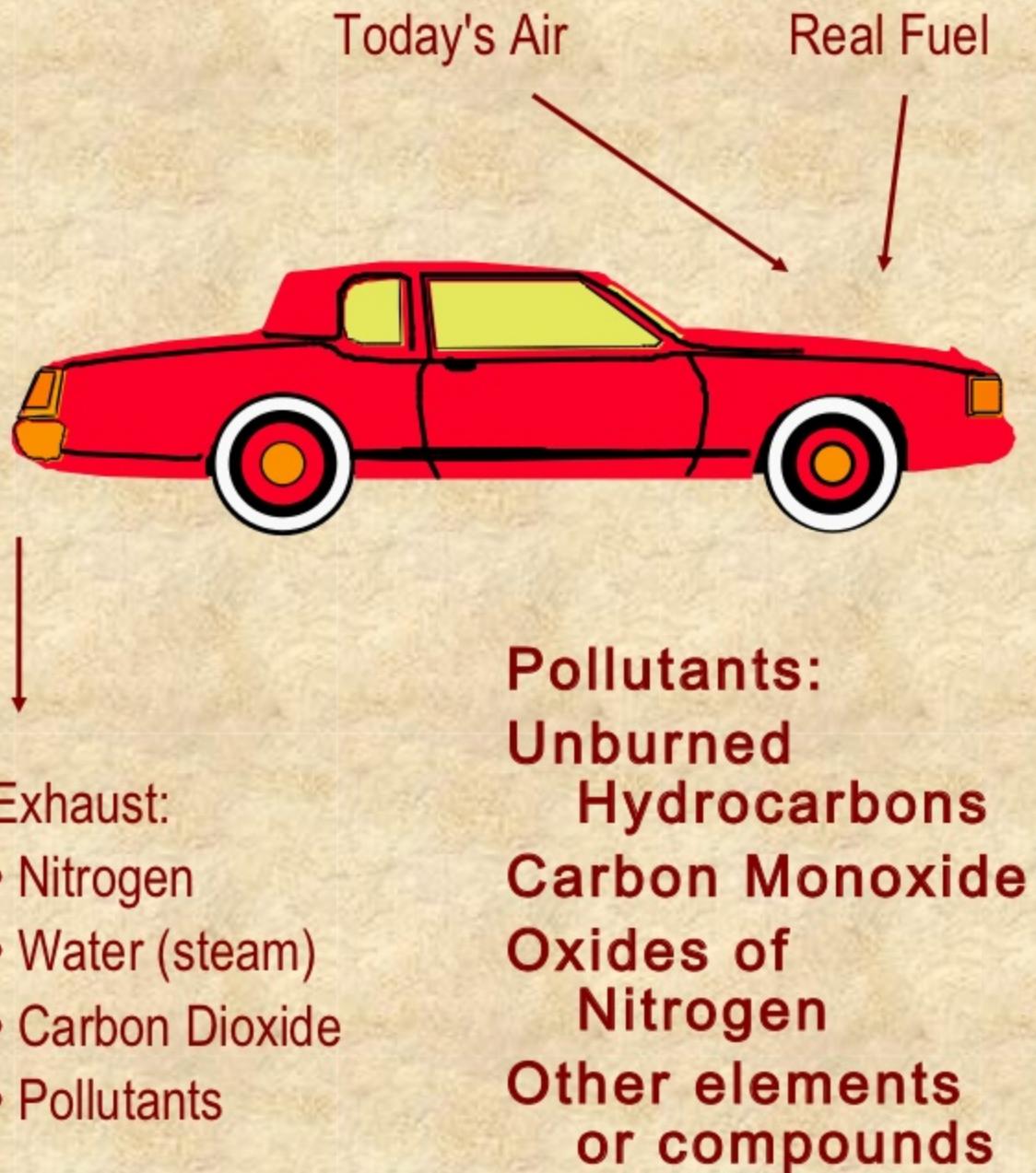
# Road Transport Contribution to CO<sub>2</sub>

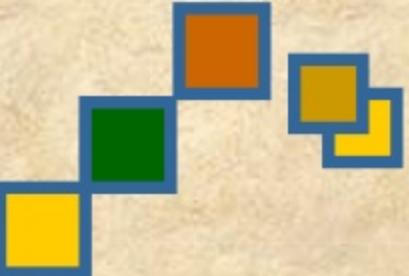


Source: OICA

# The Combusti on Process

(actual)





# The Motor Vehicle as a Source of Air Pollution

Refueling  
Losses

Evaporative  
Emissions



Exhaust  
Emissions



Crankcase  
Losses,  
etc.