

The Challenges of Clean Air - Local, Regional & Global

A Possible Solution

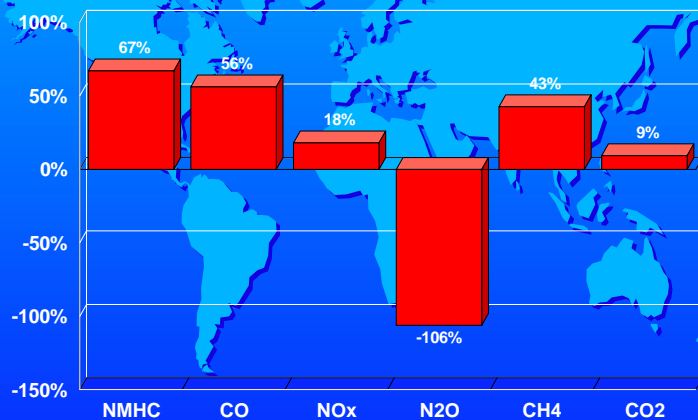
ISATA Congress
Dublin, Ireland - September 2000



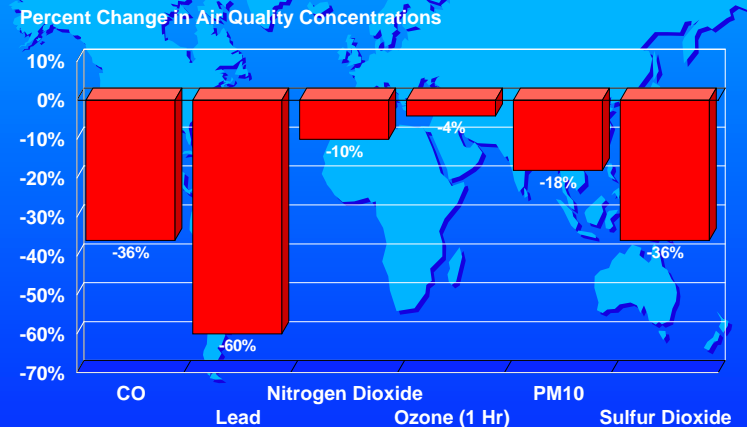
Outline

- Summarize Progress To Date
- Highlight Remaining Problems
- Forecast Future Trends
 - Business AS Usual
 - Alternative Scenarios

Global Motor Vehicle Emissions Reduction Compared To No Control



US National Air Quality Improvements in Past Decade



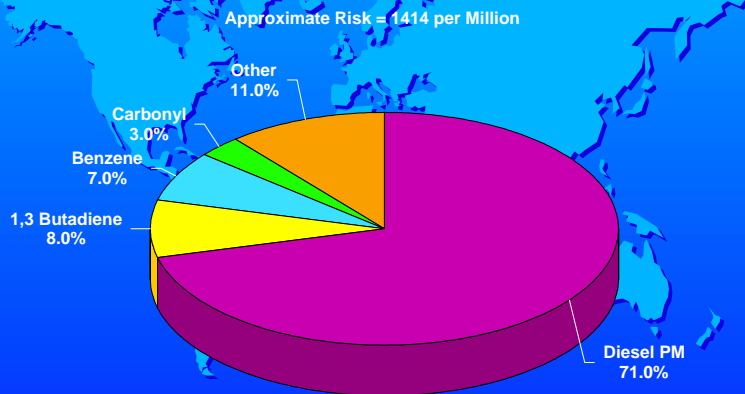


PM10 Study in Europe

(Lancet Medical Journal - September 2, 2000)

- ~6% of all deaths from PM10
- ~40,000 deaths per year in Austria, France, Switzerland; 2 times traffic fatalities
- Motor Vehicles responsible for ~50%
- People in Cities die about 18 months earlier than they would otherwise
- over 300,000 cases of chronic bronchitis; 500,000 asthma attacks; 16 million lost person days of activity
- Health costs from pollution from traffic ~1.7% of total GDP

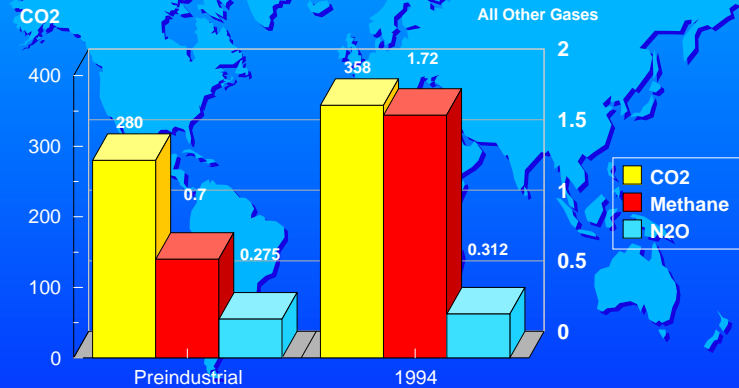
Average Los Angeles Basin Cancer Risk Apportionment



Serious Ozone Air Pollution Problems Remain in the US

- ~62 (1-hr) to 125 (8-hr) Million People Lived in Non-Attainment Areas in 1999
- EPA's Forecast For 2007
 - 28 Ozone Non-Attainment Areas
 - 80 Marginal Areas
 - 129 Million People Living in These Areas

Global Atmospheric Concentrations of Greenhouse Gases - PPM

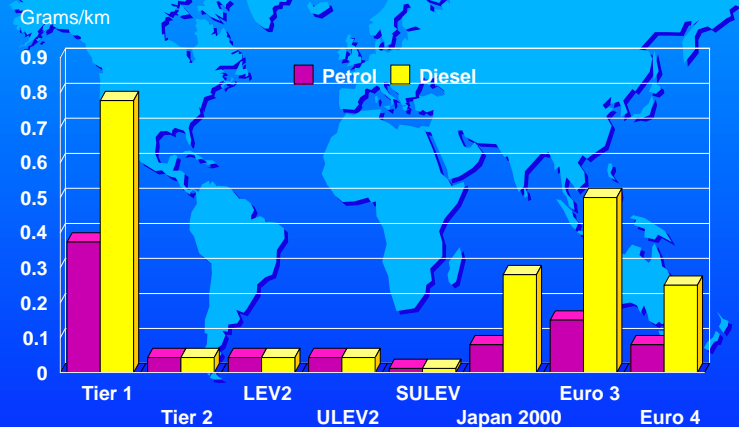


Source: IPCC

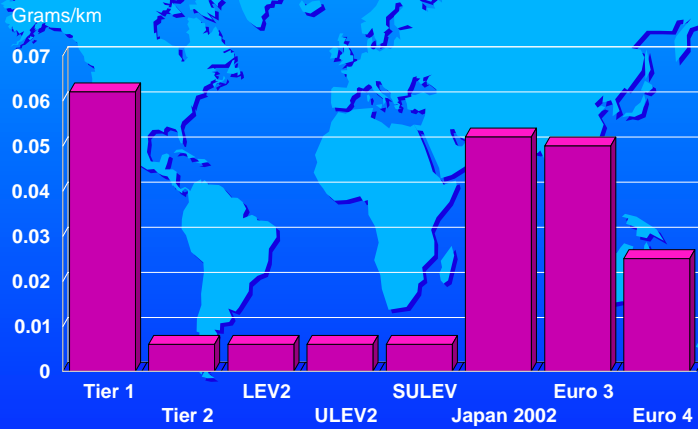
Global Warming Concerns

- IPCC - 1995
 - "the balance of evidence suggests a discernible human influence"
- IPCC - 2000
 - "there has been a discernible human influence on global climate"

Global Trend in Light Duty NOx Control

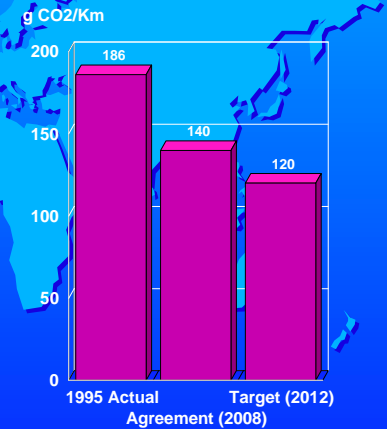


Global Trend in Light Duty Diesel PM Control

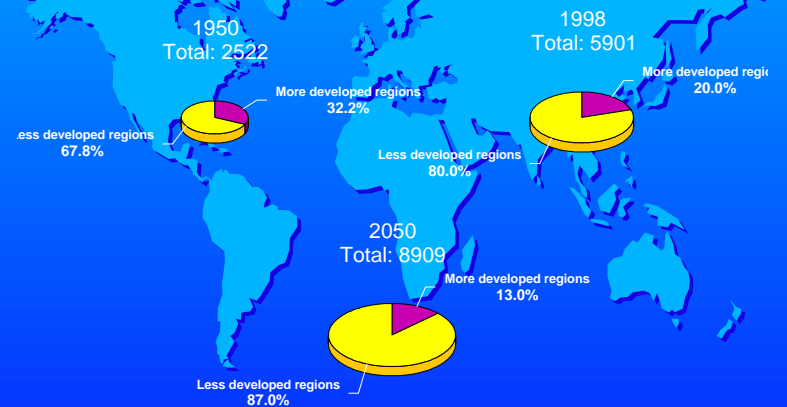


European Agreement to Lower CO2 Emissions

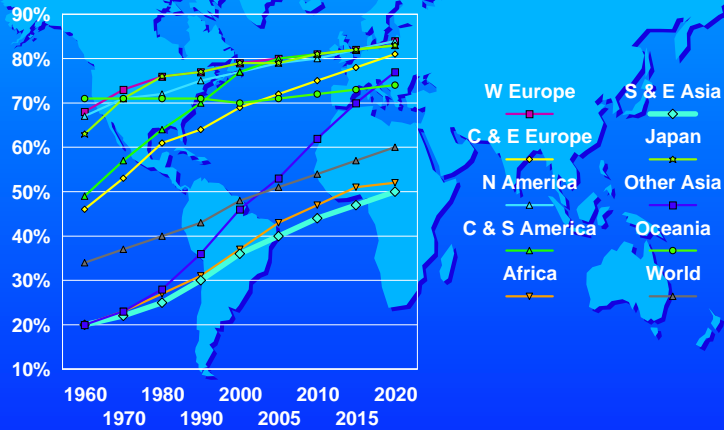
- Some 120 g/km cars in 2000
- Target Range of 165-170 g/km in 2003
- Review Feasibility of 120 g/km for Average car by 2012 in 2003



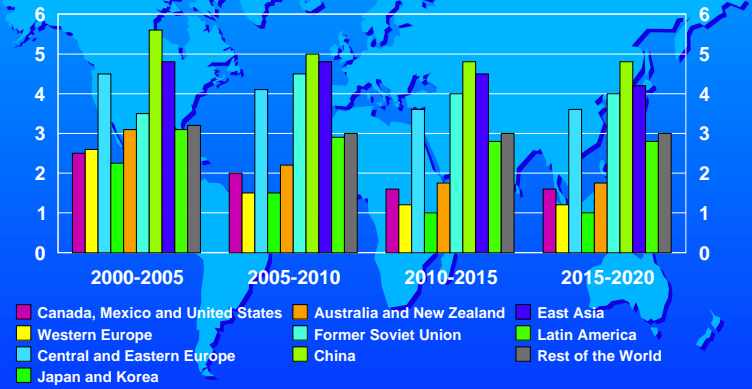
Shifting Distribution of World's Population



Global Urbanization is Occurring

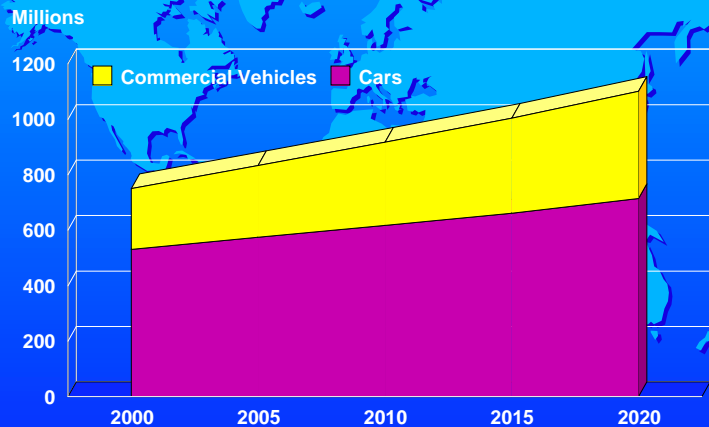


Projected GDP Growth Rates

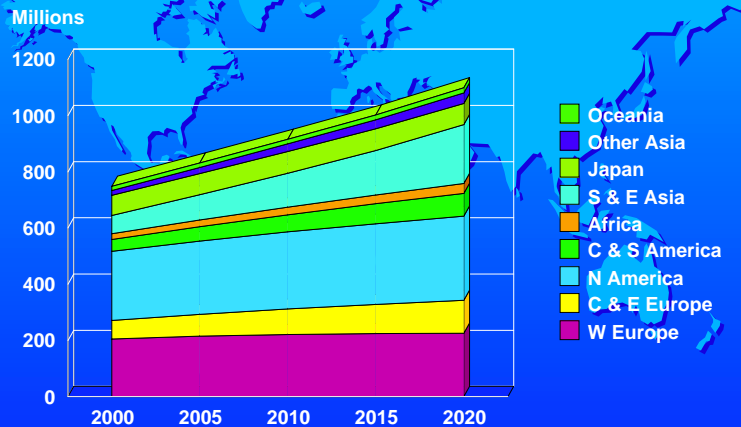


Source: OECD

Global Trends in the Total Vehicle Population (Excluding Motorcycles)

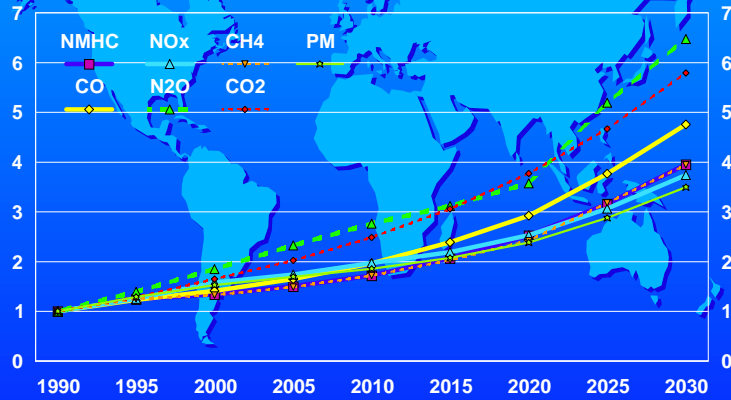


Global Trends in the Total Vehicle Population (Excluding Motorcycles)

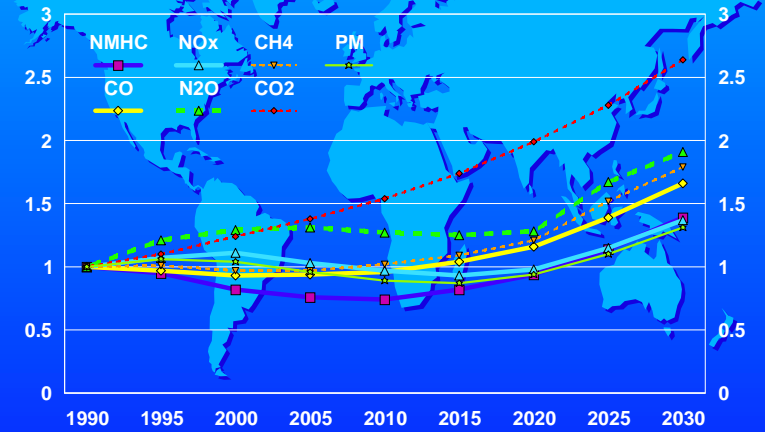


Global Trends in On Road Motor Vehicle Emissions (Normalized to 1990)

Non OECD Countries Only



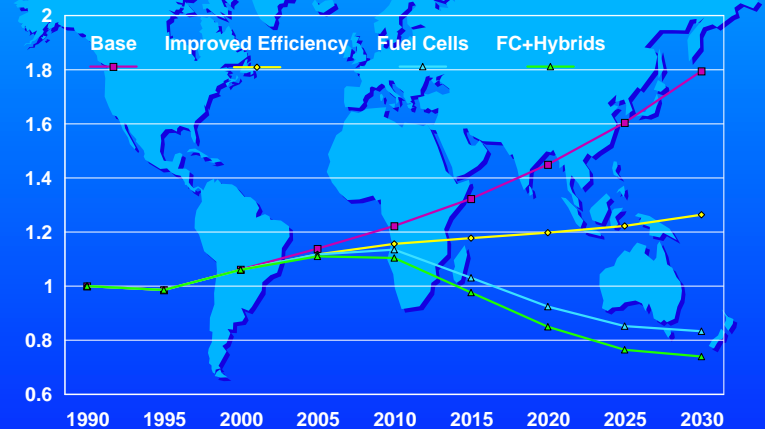
Global Trends in On Road Motor Vehicle Emissions (Normalized to 1990)



Advanced Technologies Are Emerging

- Toyota Prius Hybrid
- Honda Insight Hybrid
- Hydrogen Fuel Cell Bus
- Battery Electric
- Fuel Cell Cars

Passenger Car CO2 Trends



Challenges Ahead For An Increasingly Mobile World

- Accelerated Spread of Low Emissions Technologies & Fuels To Rapidly Developing Countries
- Comparable Controls For Heavy Duty & Off Road Vehicles & Engines
- Very Low Sulfur Gasoline & Diesel Fuel
- Much Cleaner/Eliminate 2 Stroke MCs
- Very High Efficiency Vehicles/Engines
- Low Carbon/Renewable Fuels
- Lower Toxic Emissions

Concluding On A High Note!



- Progress is Occurring
- Strong Push Over Next 5 - 8 Years
- Advanced Technologies Critical