Trends of Vehicles and Air Pollution

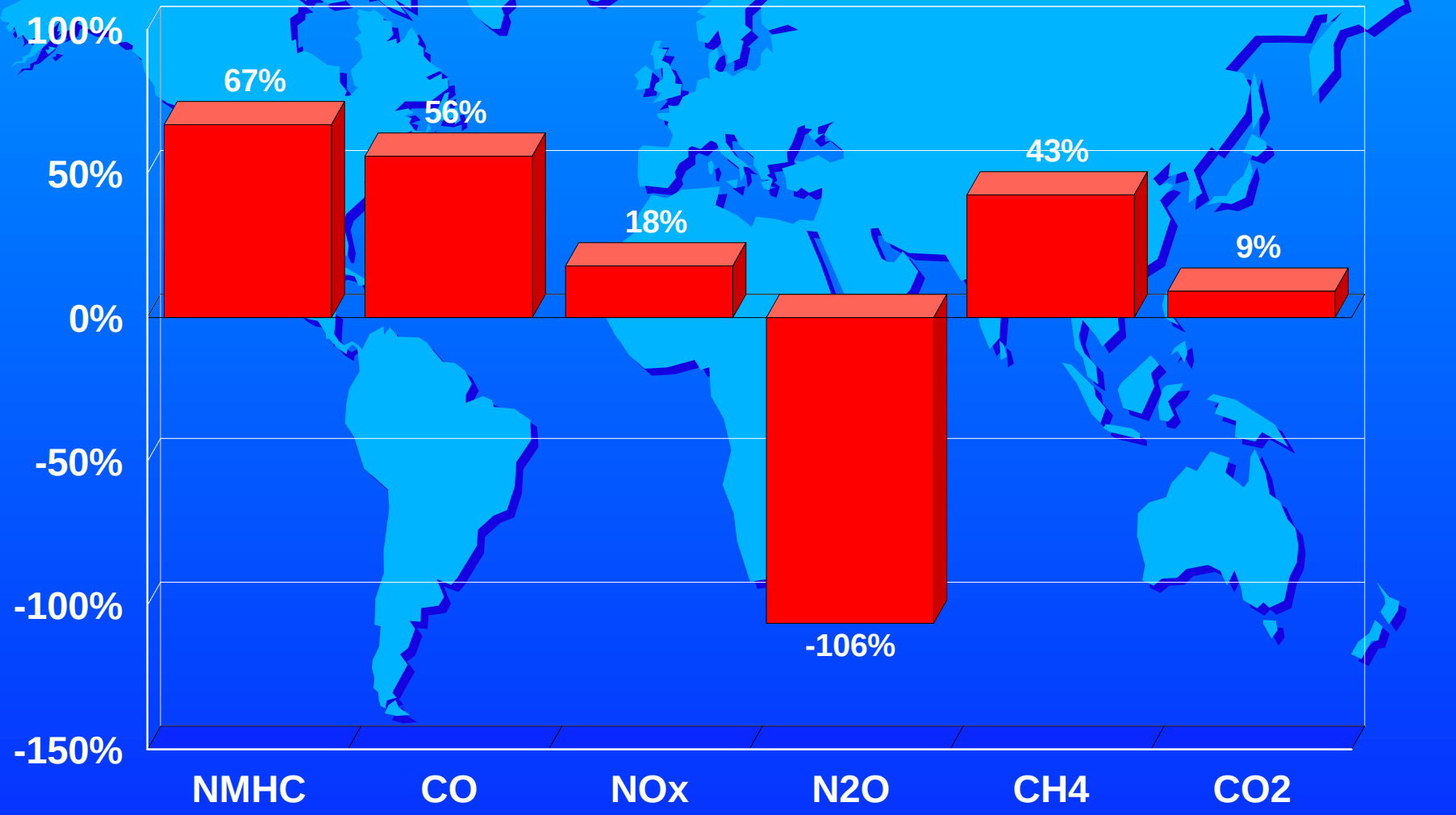
Understanding Urban Air Pollution and the Role of Diesel Exhaust

Delhi, India - November 6-11 2000

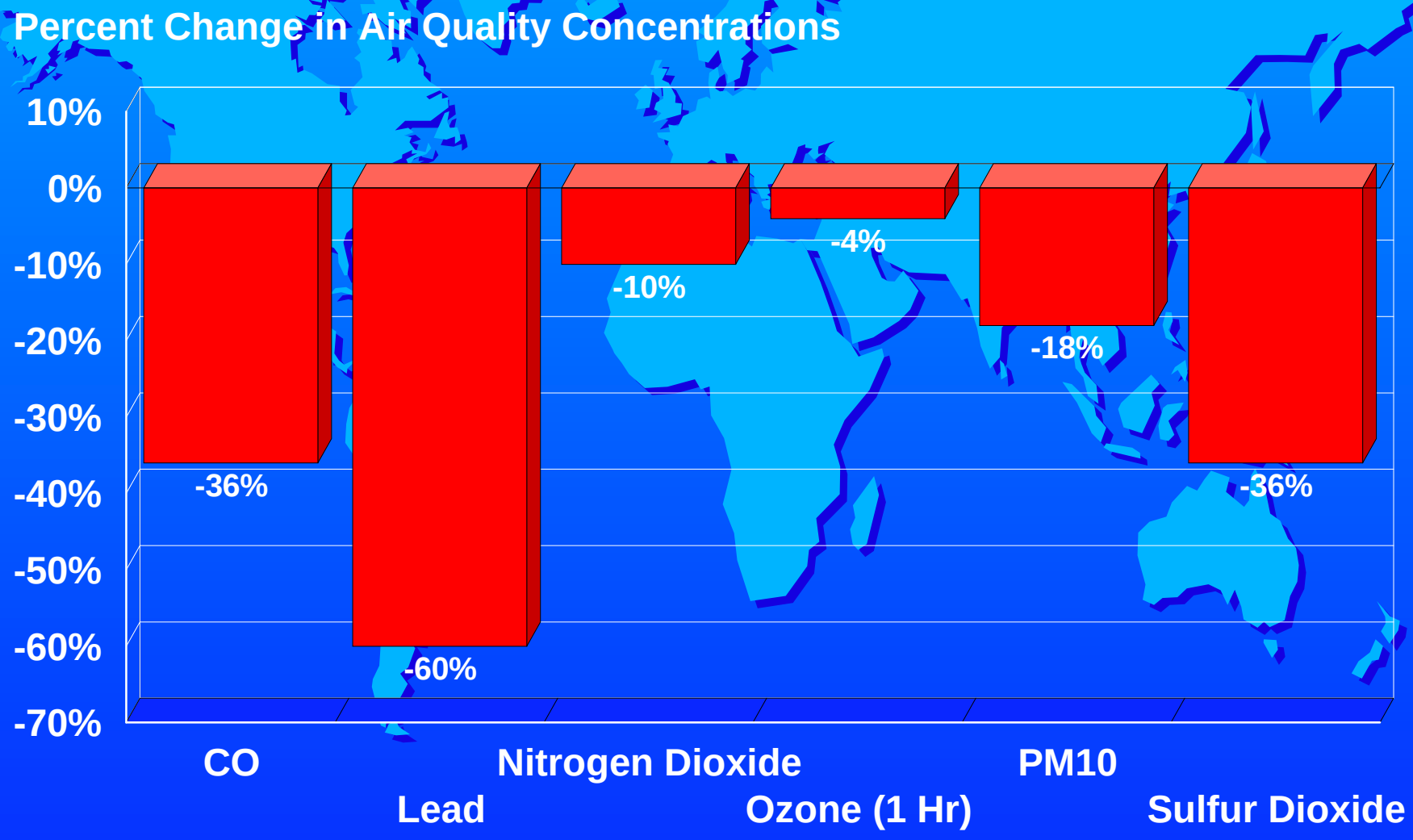
Outline

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

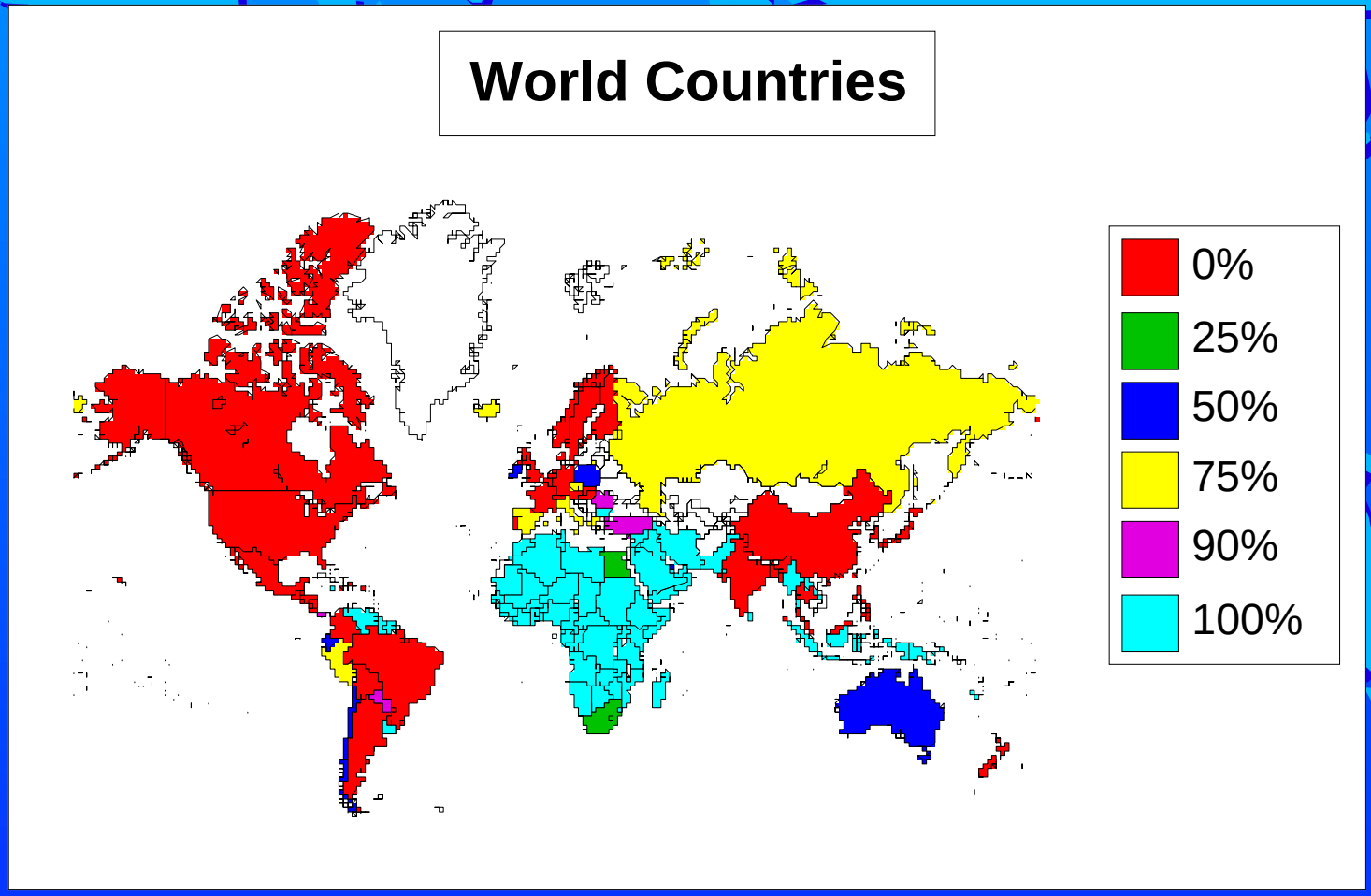
Global Motor Vehicle Emissions Reduction Compared To No Control



US National Air Quality Improvements in Past Decade

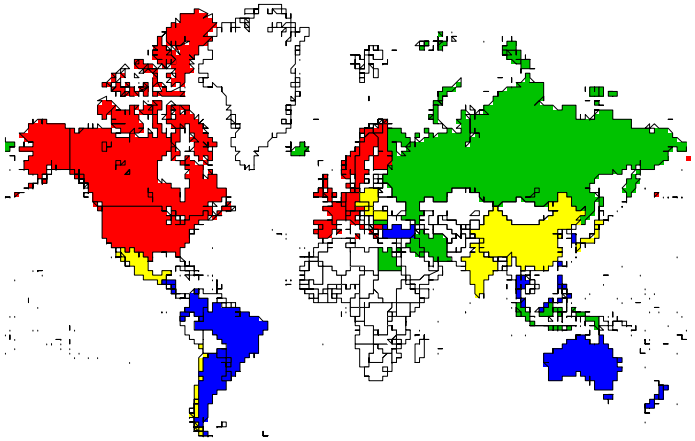


Leaded Gasoline Sales in 2000



New Vehicle Emissions Standards

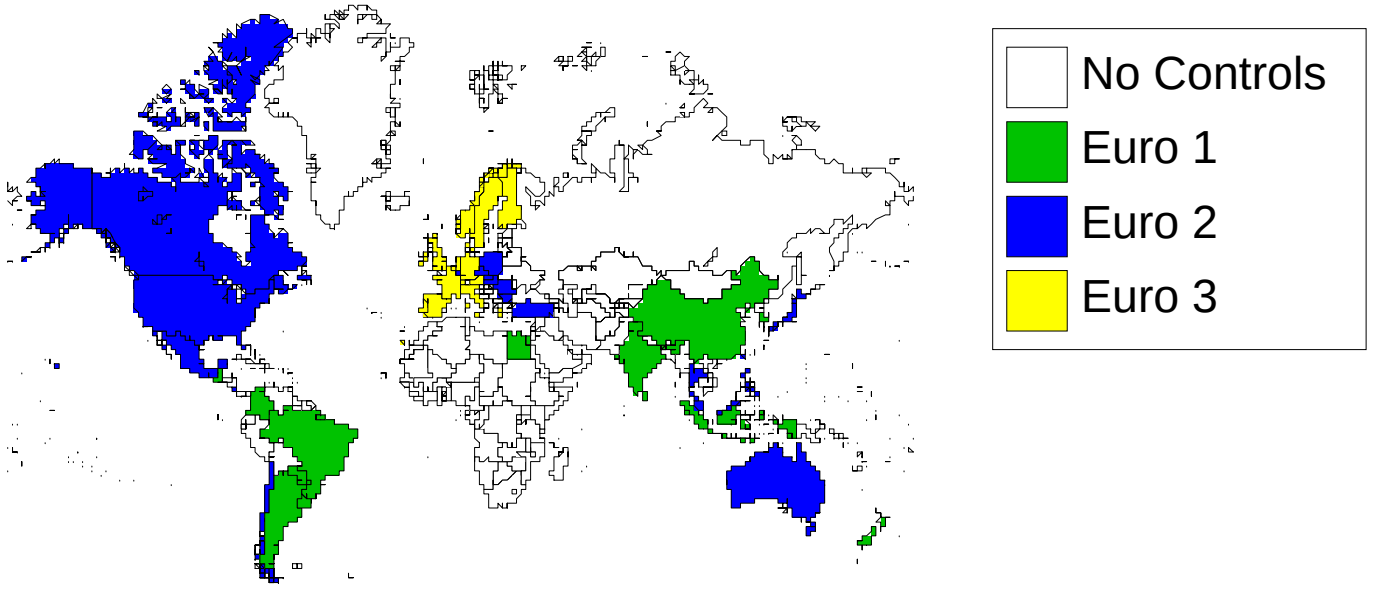
Emissions Controls
Light Duty Gasoline Vehicles 2000



- No Controls
- Engine Modifications
- Three Way Catalysts
- Tier 1/Euro 1
- LEV/Euro 3

New Vehicle Emissions Standards

Emissions Controls
Light Duty Diesel Vehicles 2000

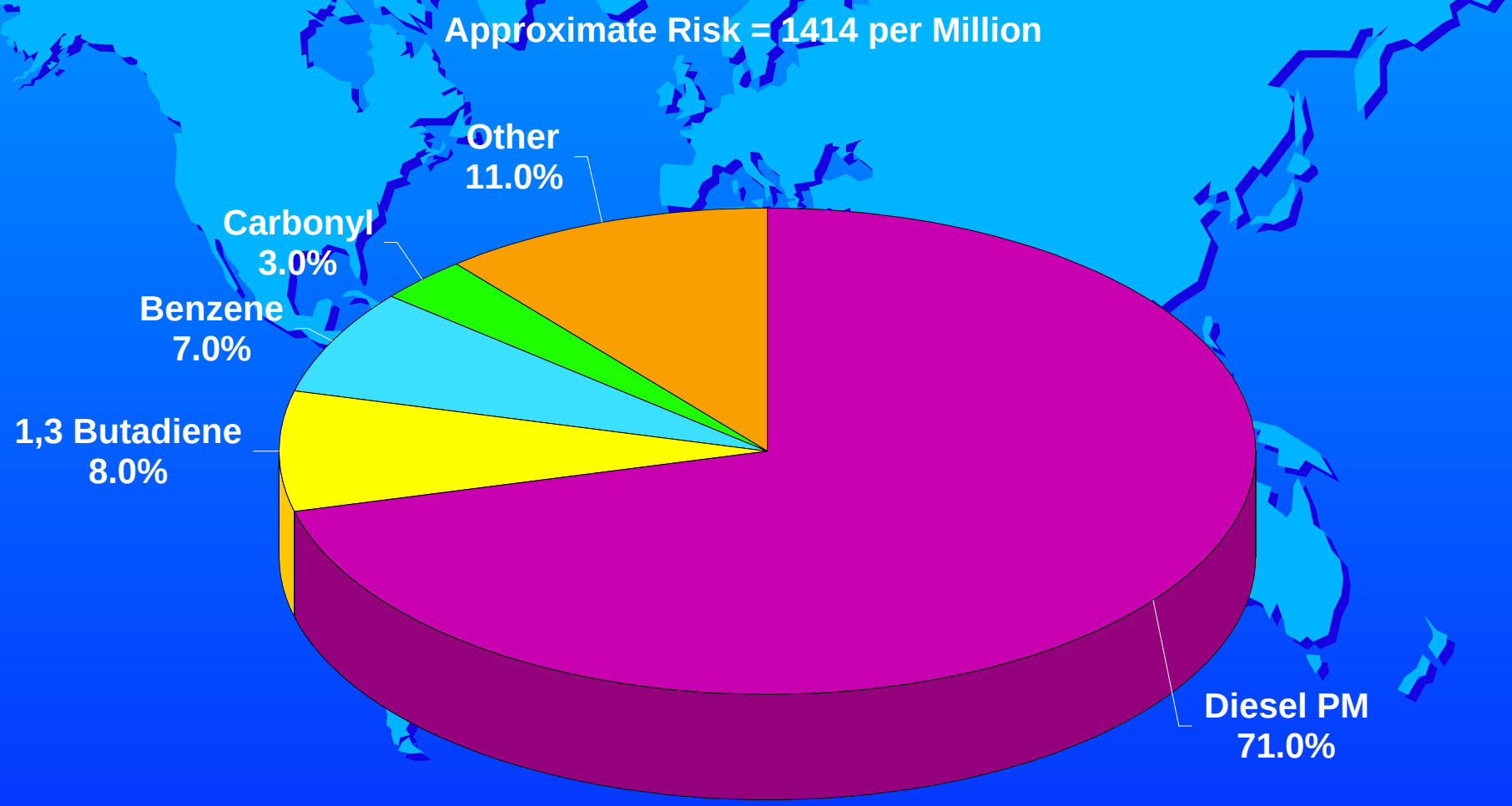


PM10 Study in Europe

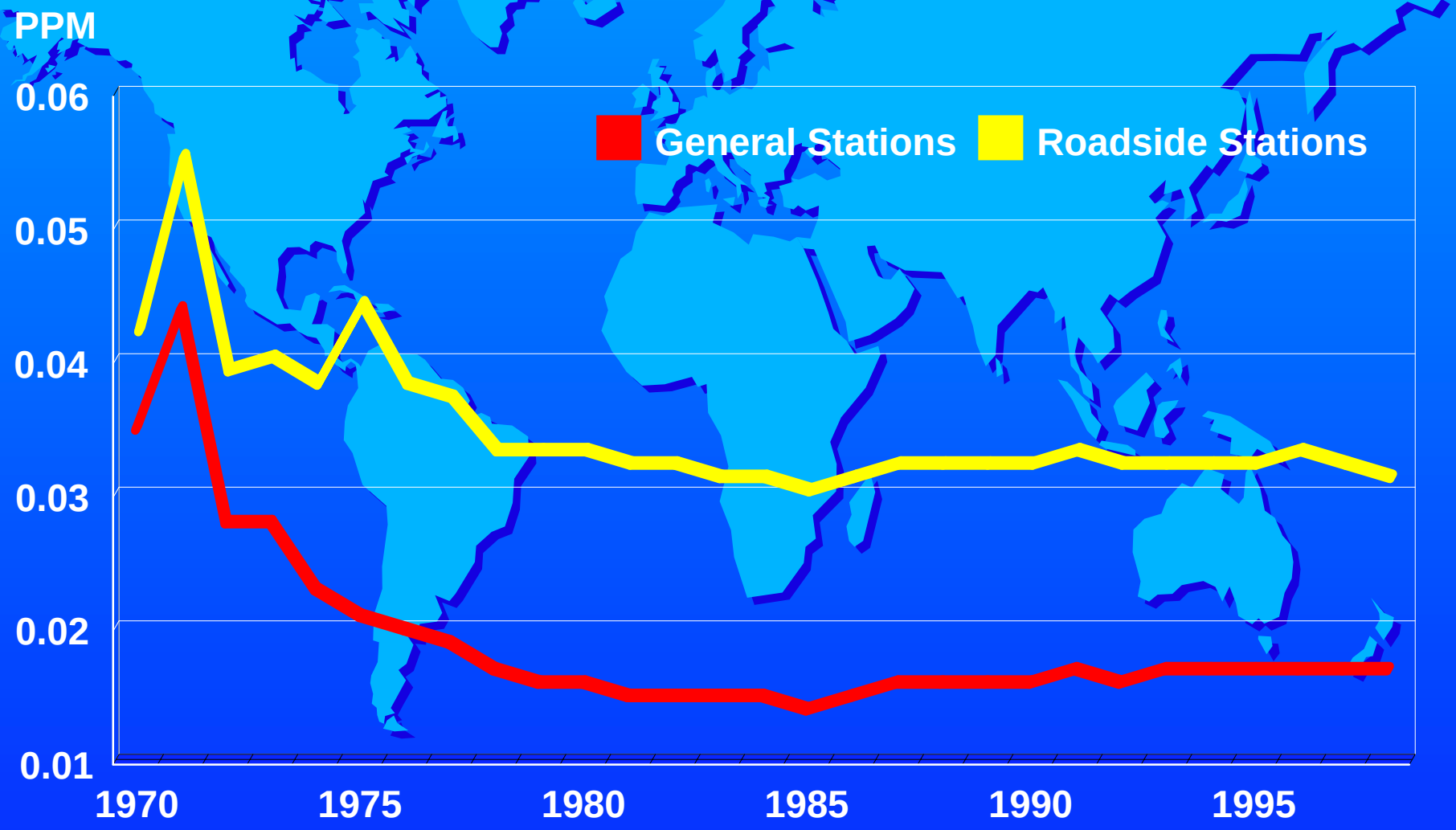
(Lancet Medical Journal - September 2, 2000)

- ~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

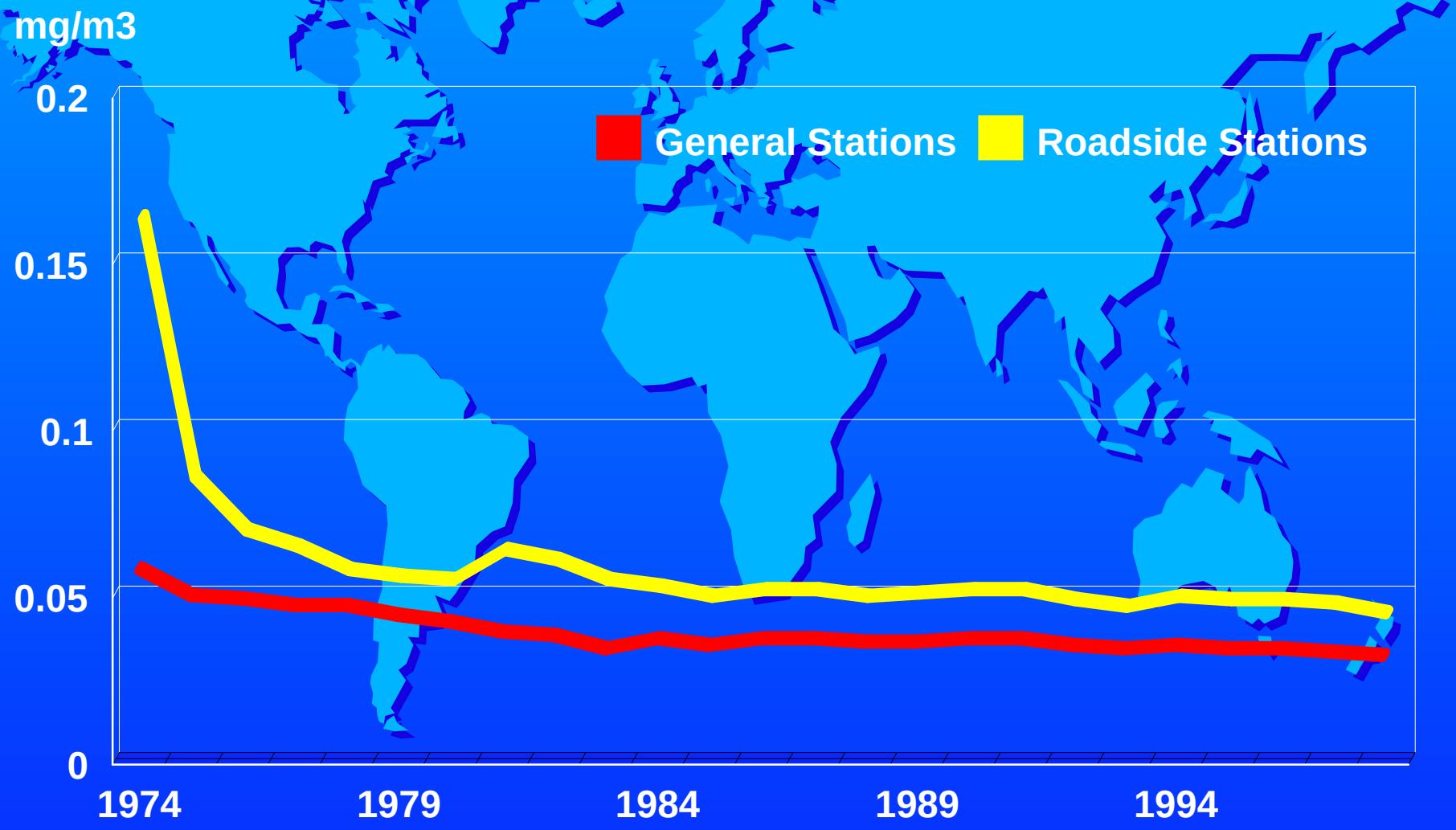
Average Los Angeles Basin Cancer Risk Apportionment



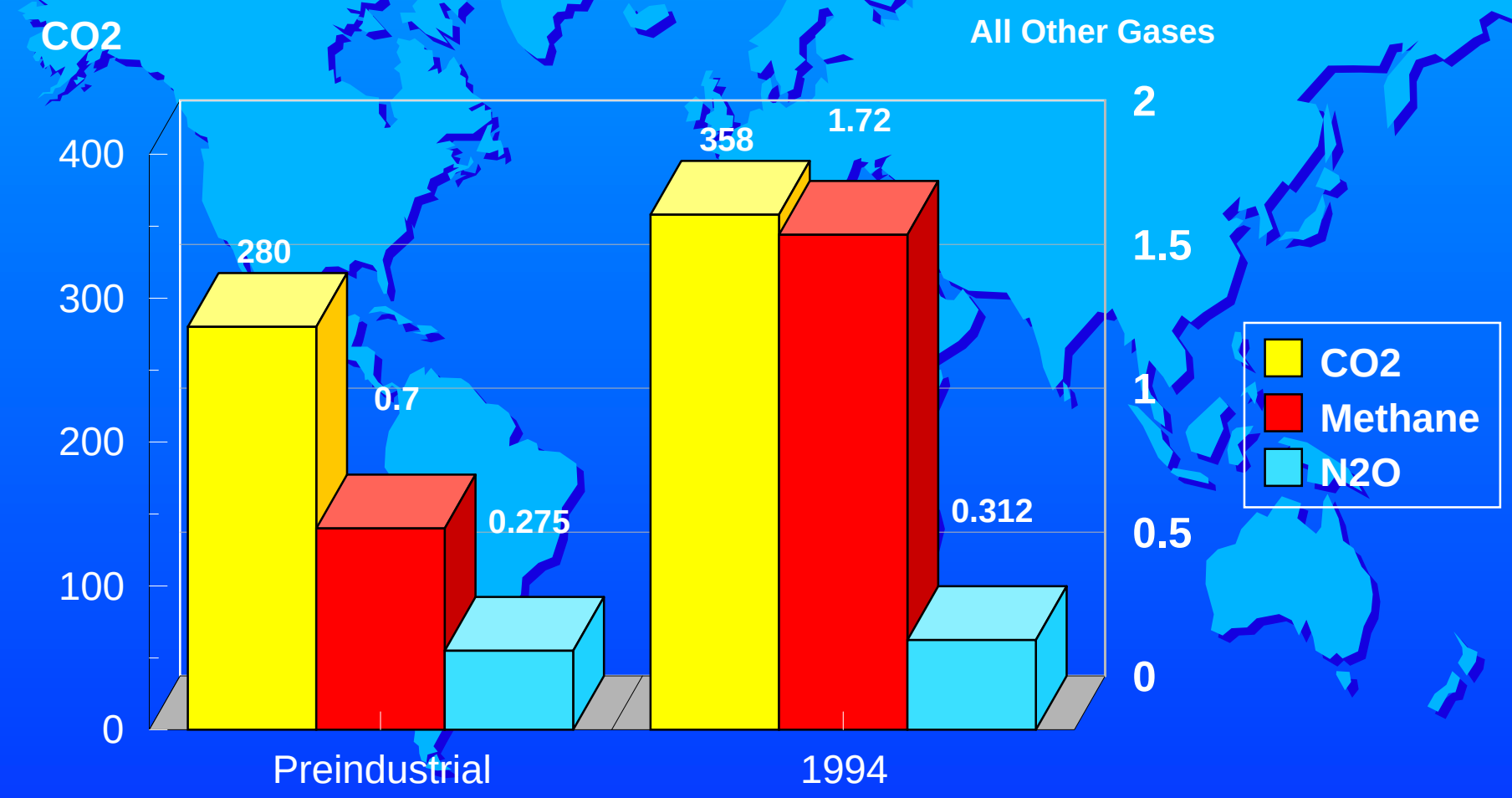
Nitrogen Dioxide Air Quality Trends In Japan



Suspended Particulate Matter Air Quality Trends In Japan



Global Atmospheric Concentrations of Greenhouse Gases - PPM

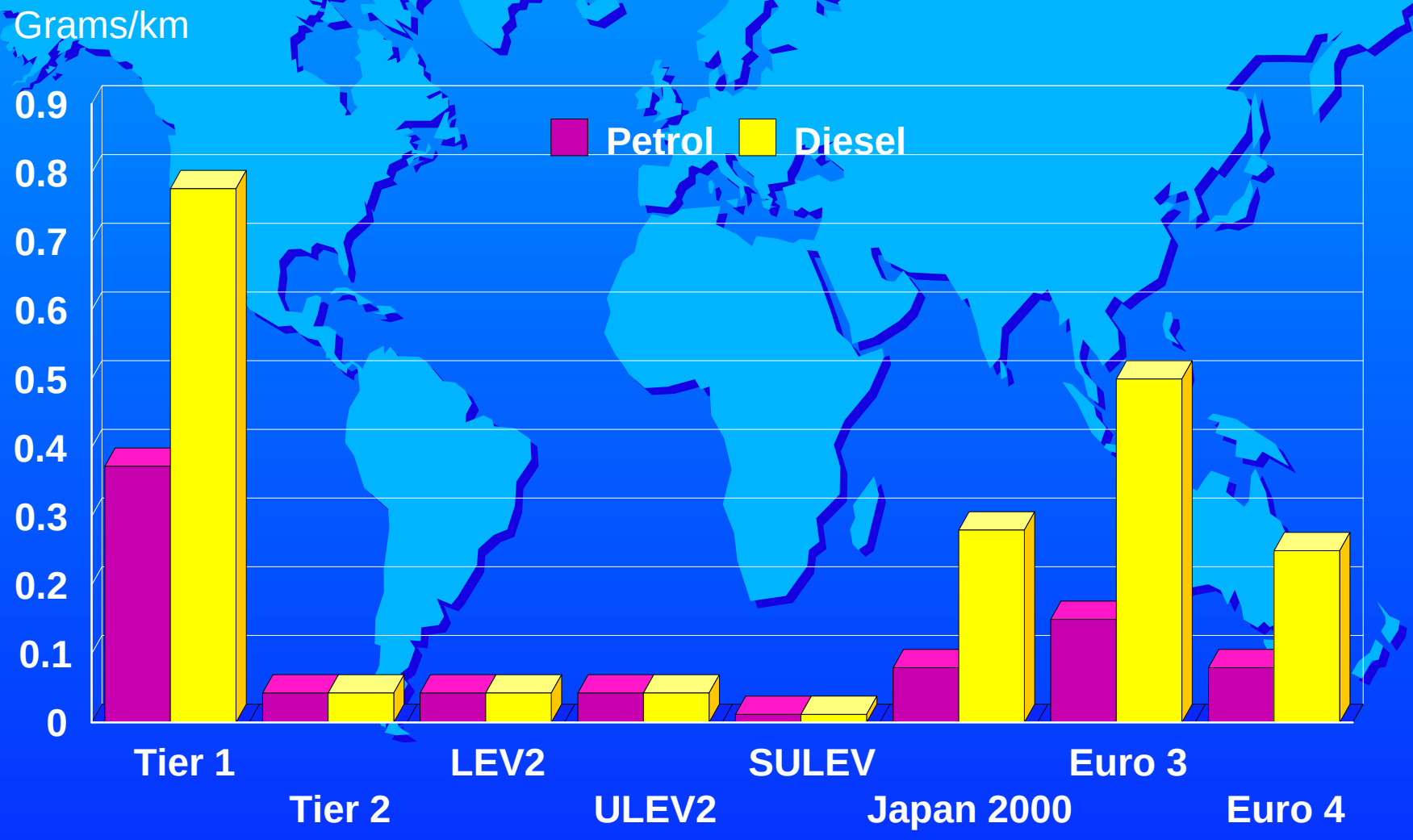


Source: IPCC

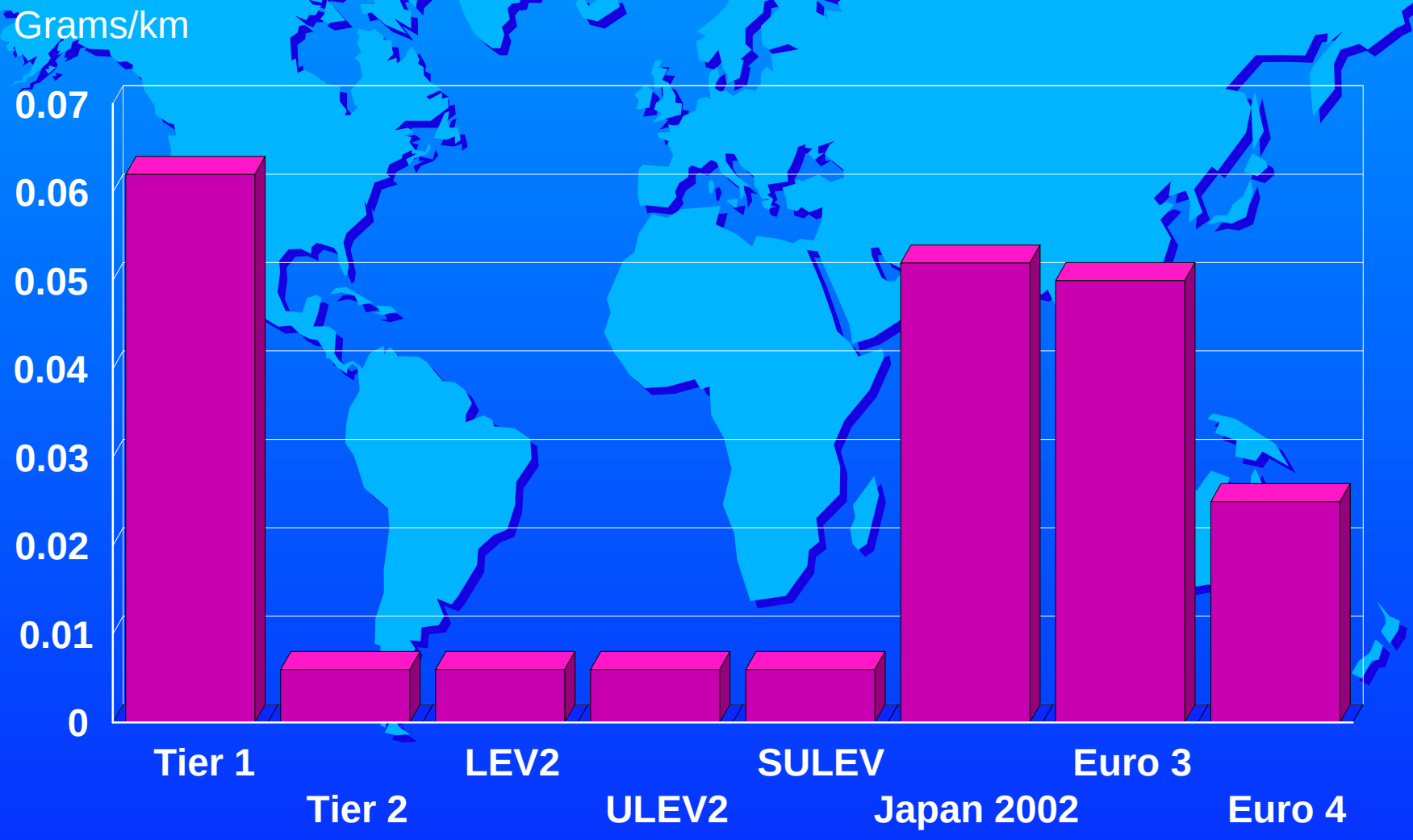
Global Warming Concerns

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

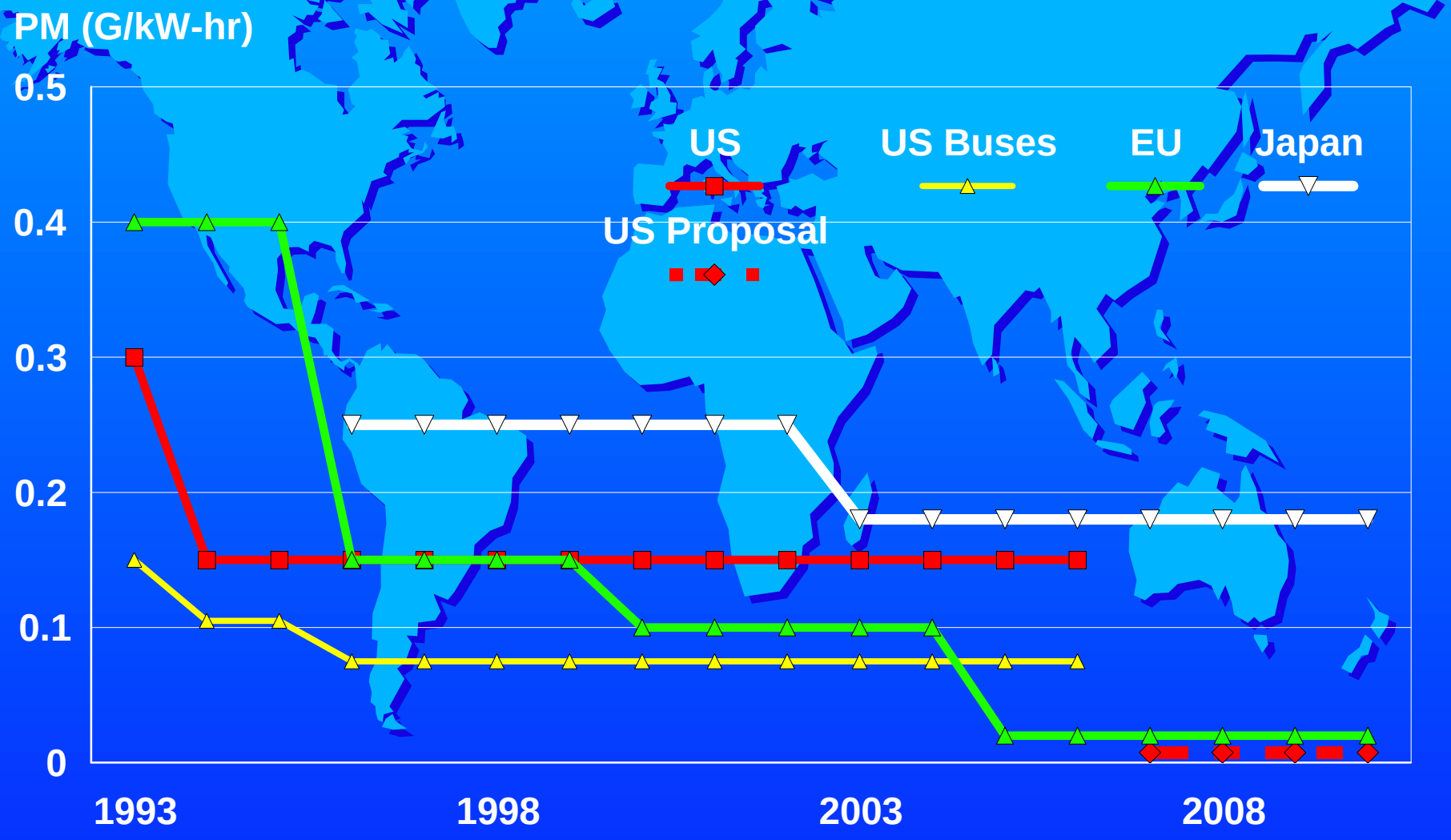
Global Trend in Light Duty NOx Control



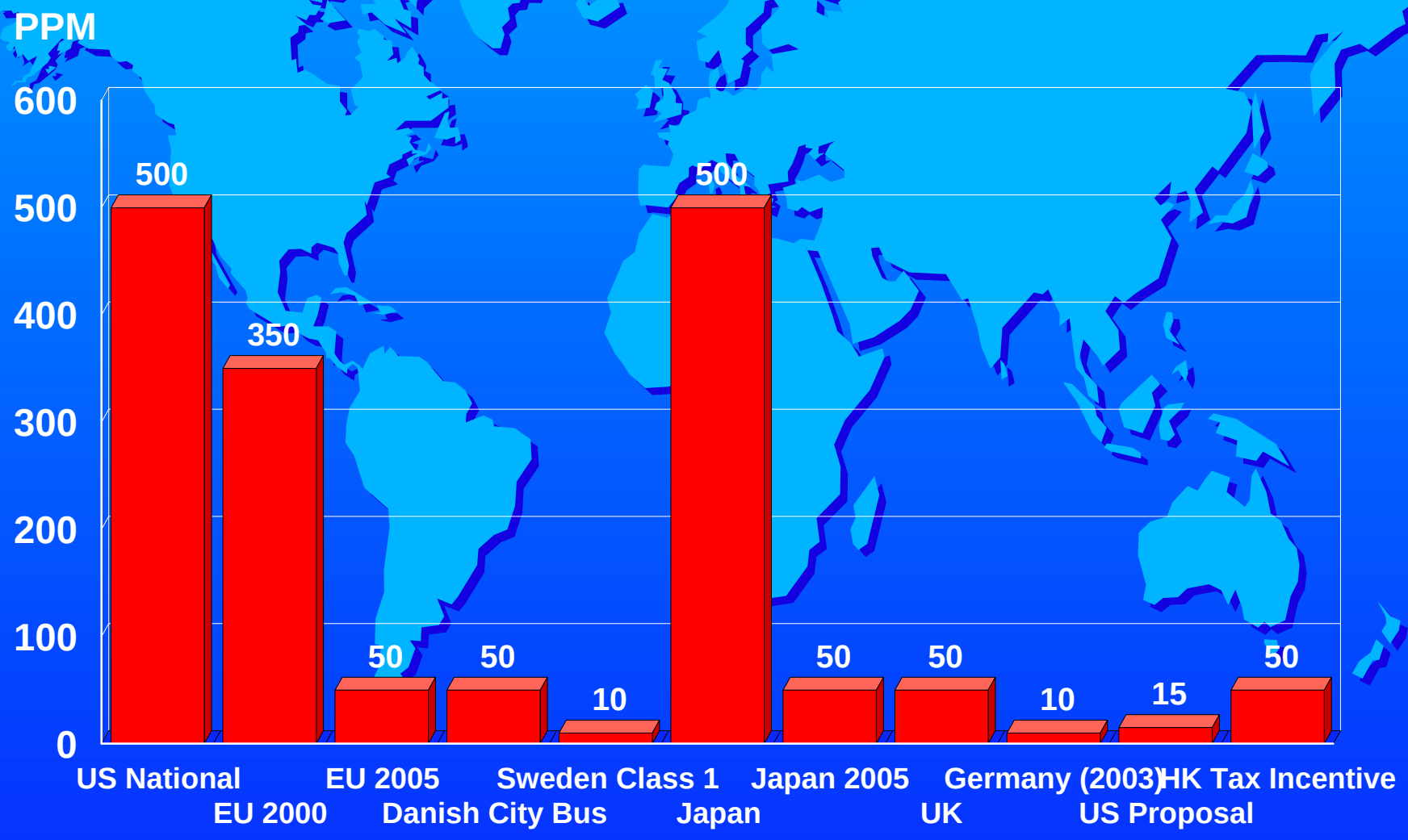
Global Trend in Light Duty Diesel PM Control



Global Trend in Heavy Duty Vehicle Emissions

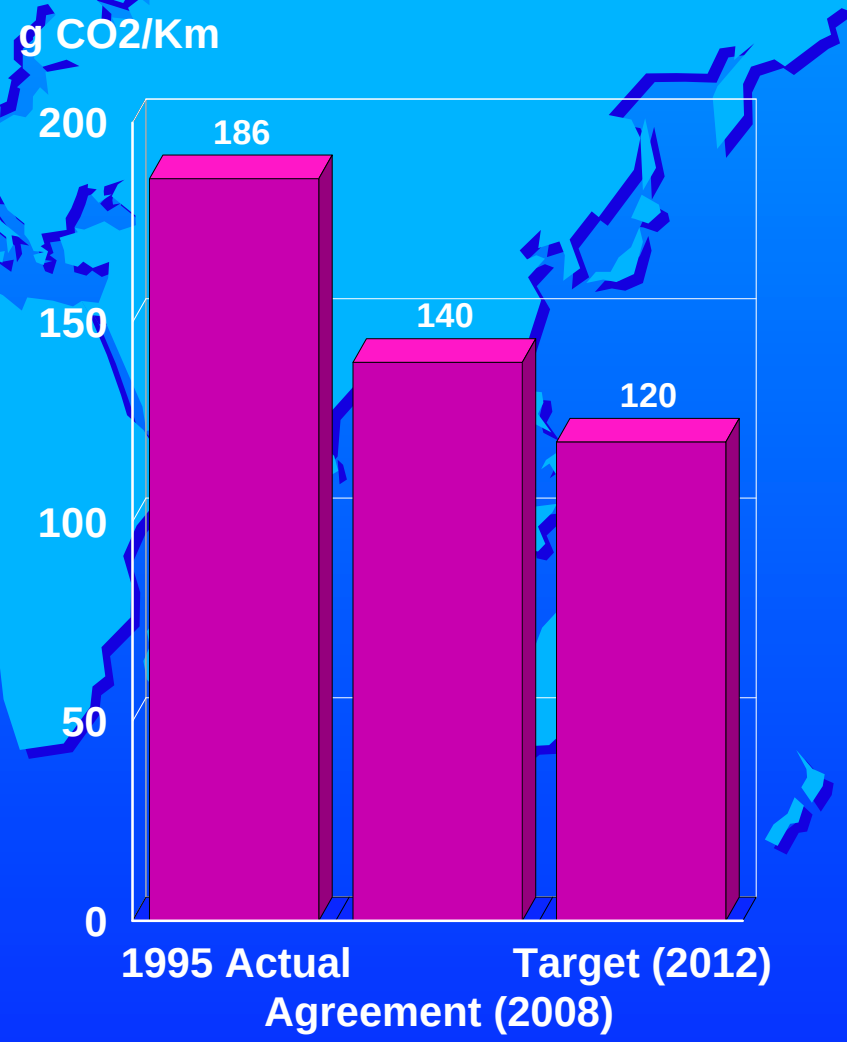


Diesel Fuel Sulfur Specifications

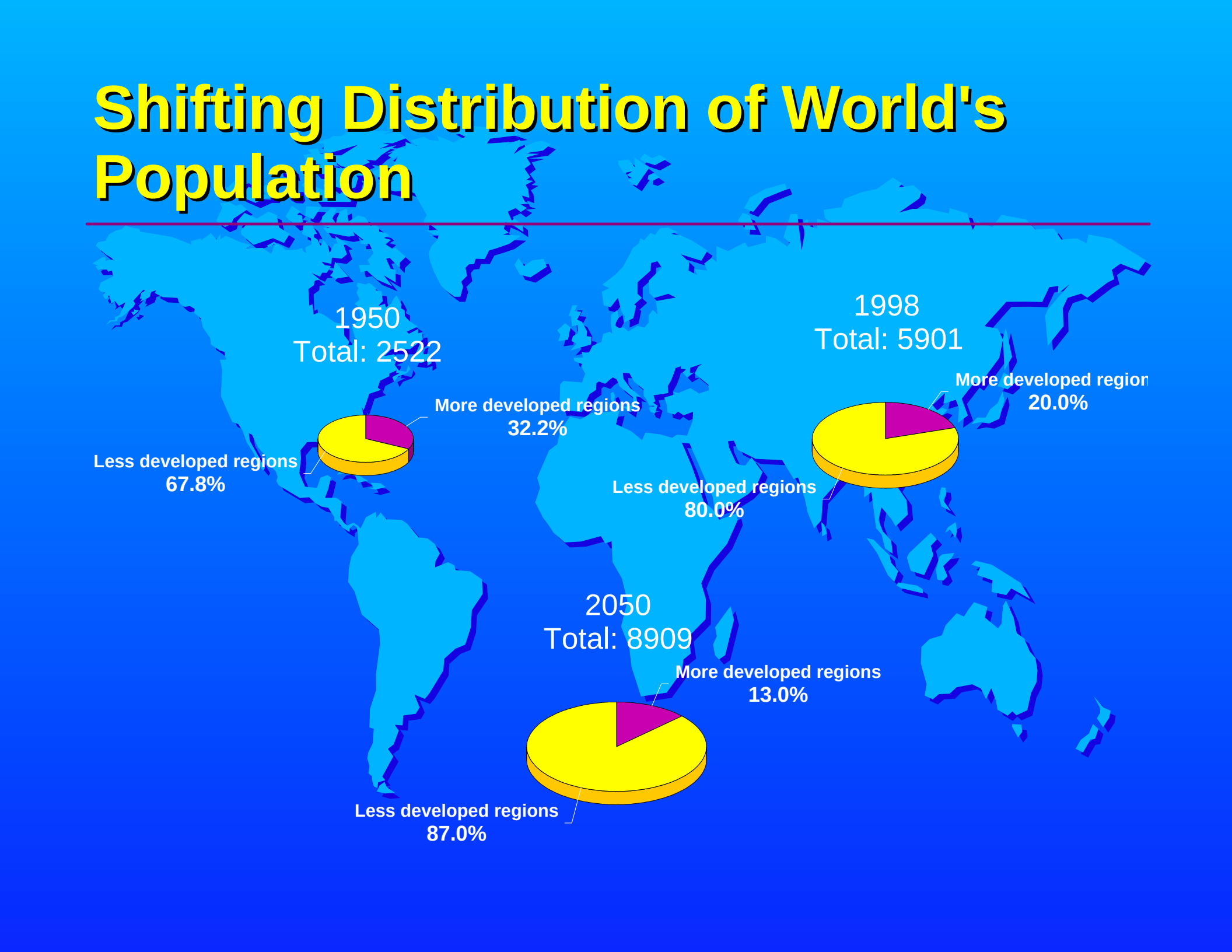


European Agreement to Lower CO2 Emissions

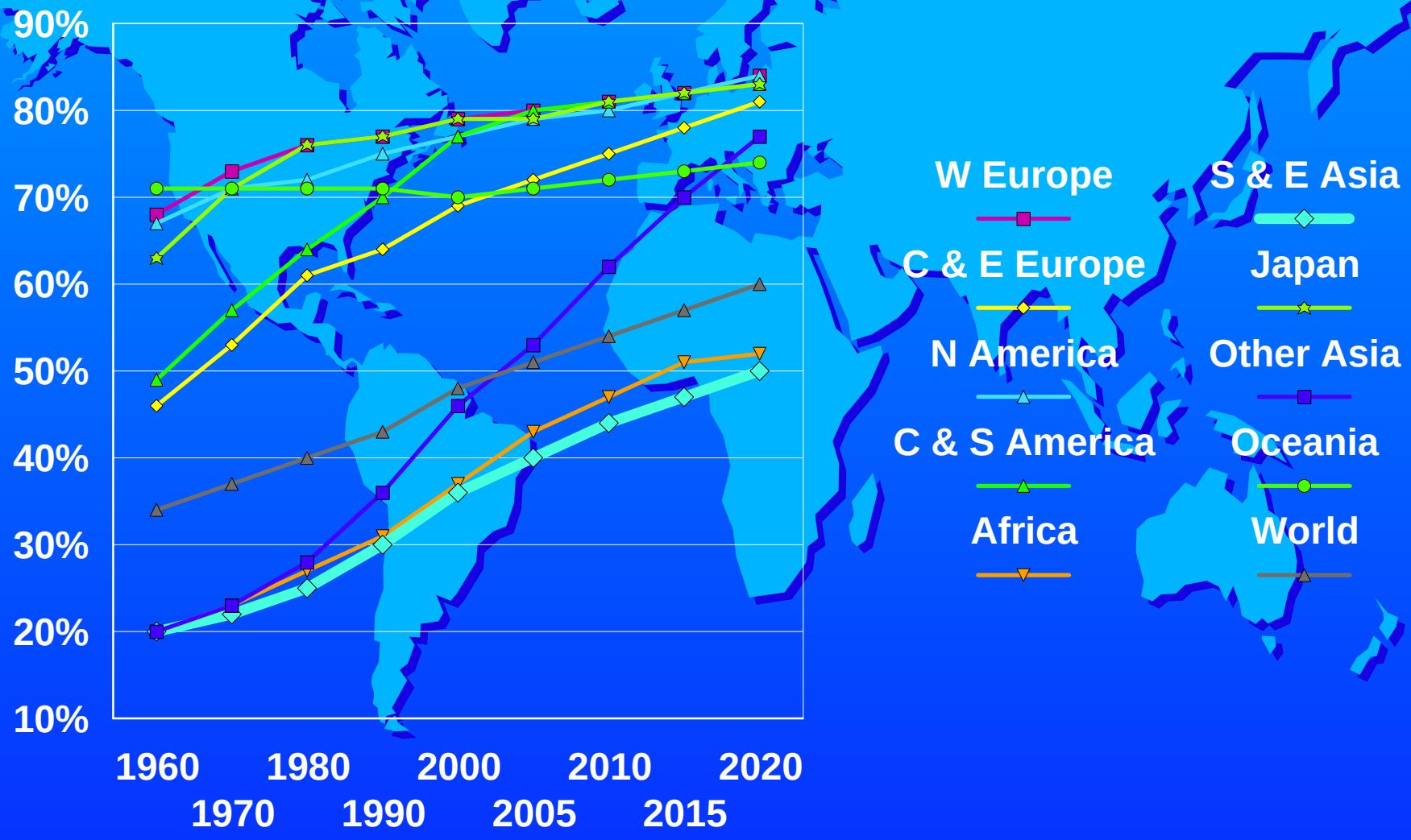
- Some 120 g/km cars in 2000
- Target Range of 165-170 g/km in 2003
- Review Feasibility of 120 g/km for Average car by 2012 in 2003



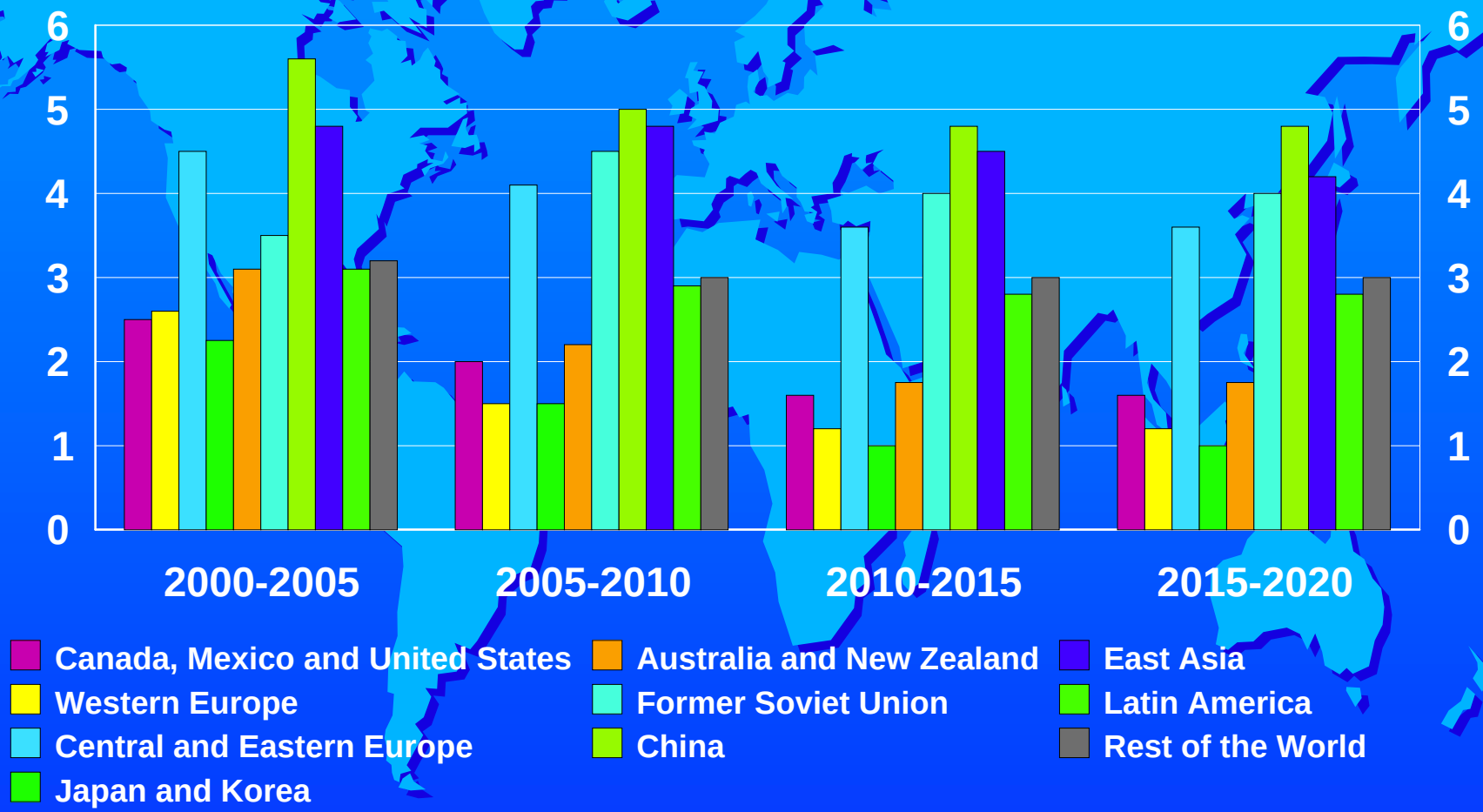
Shifting Distribution of World's Population



Global Urbanization is Occurring

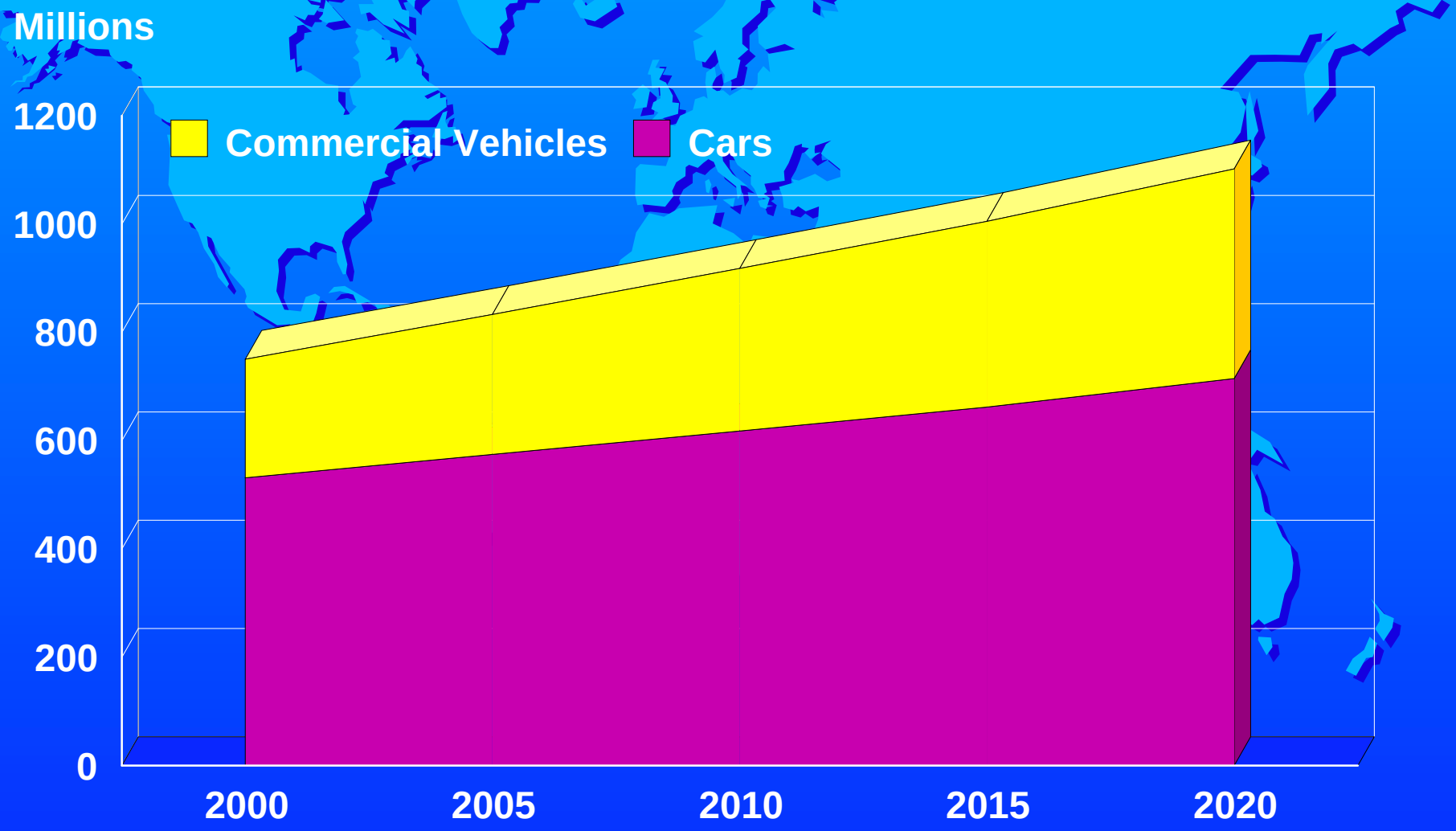


Projected GDP Growth Rates



Source: OECD

Global Trends in the Total Vehicle Population (Excluding Motorcycles)



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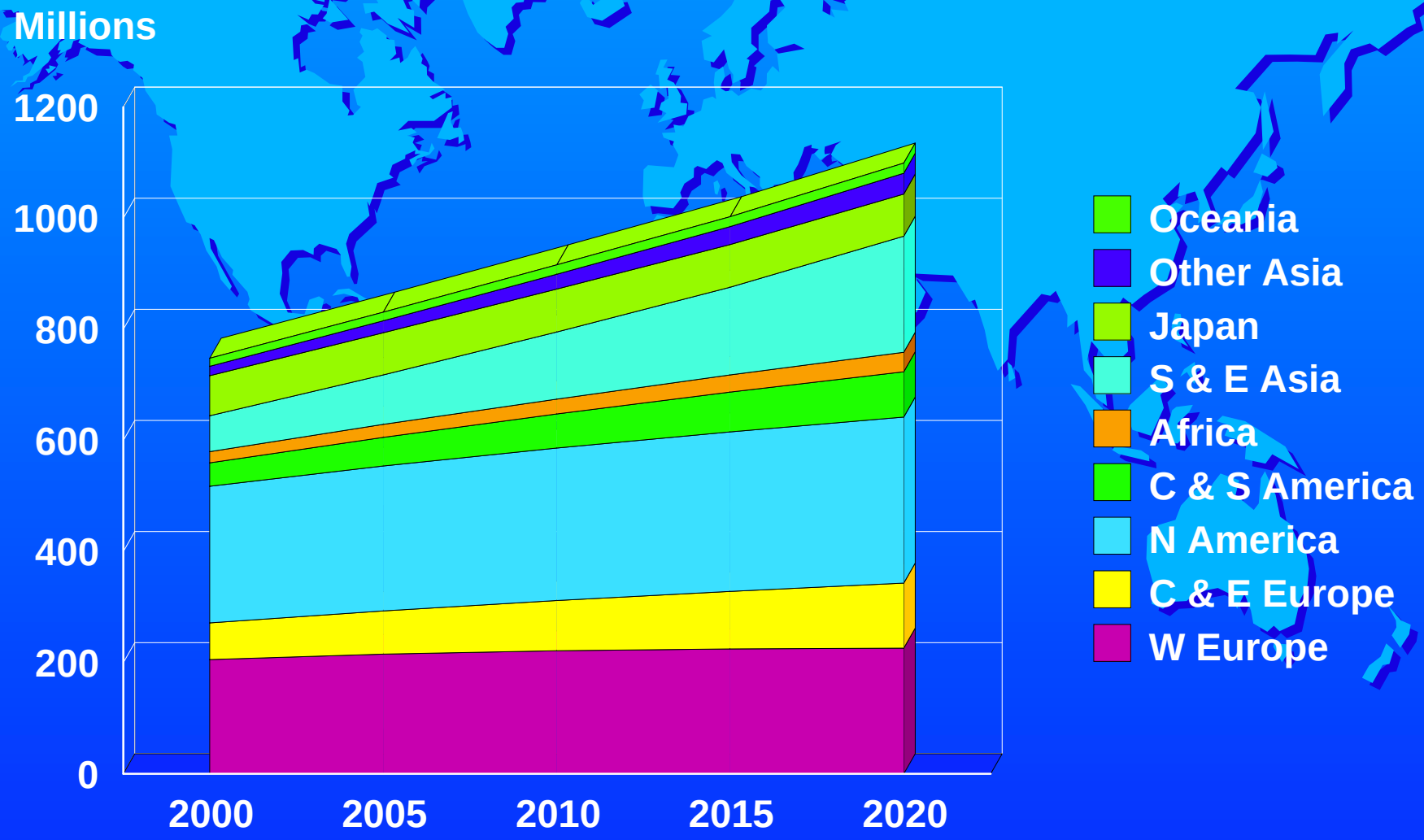
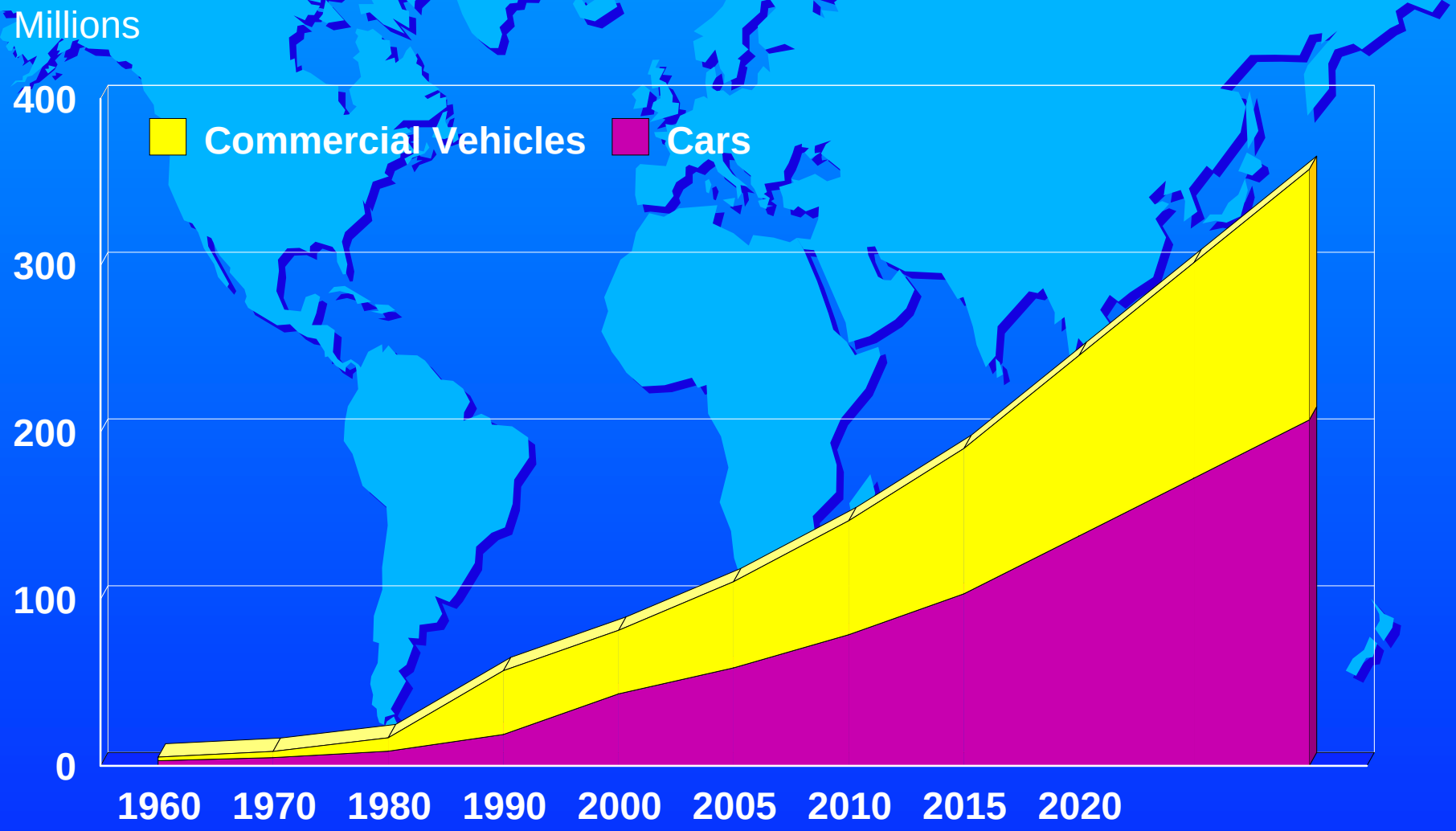
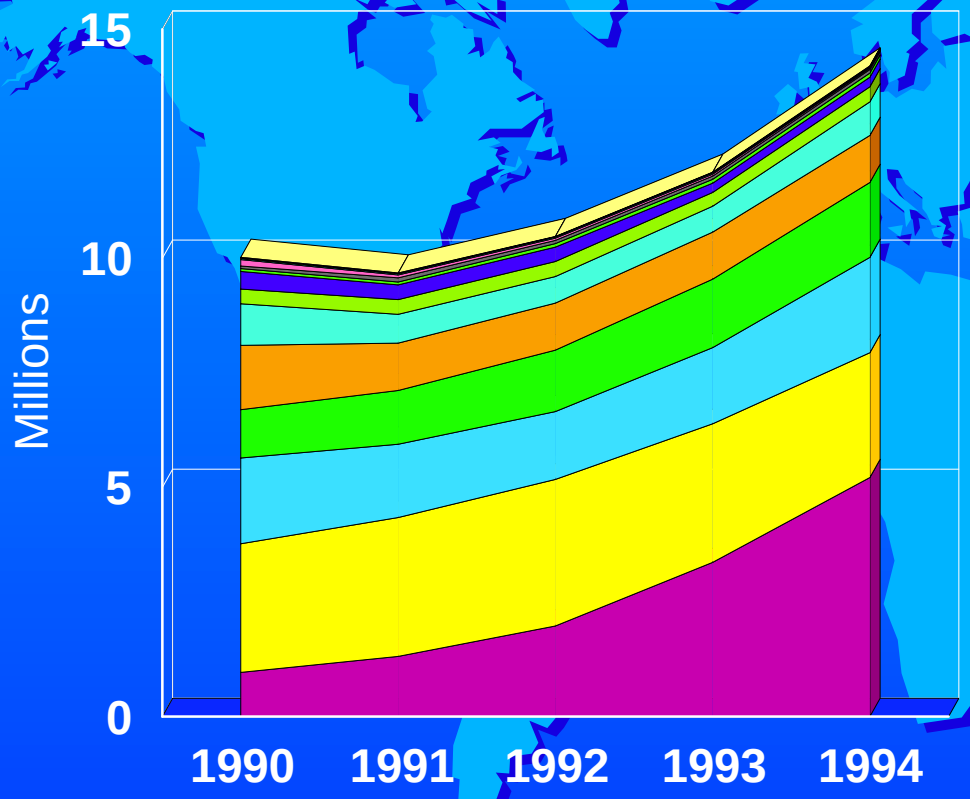


The Rapid Growth in Vehicle Registrations in Asia (Excluding Japan)



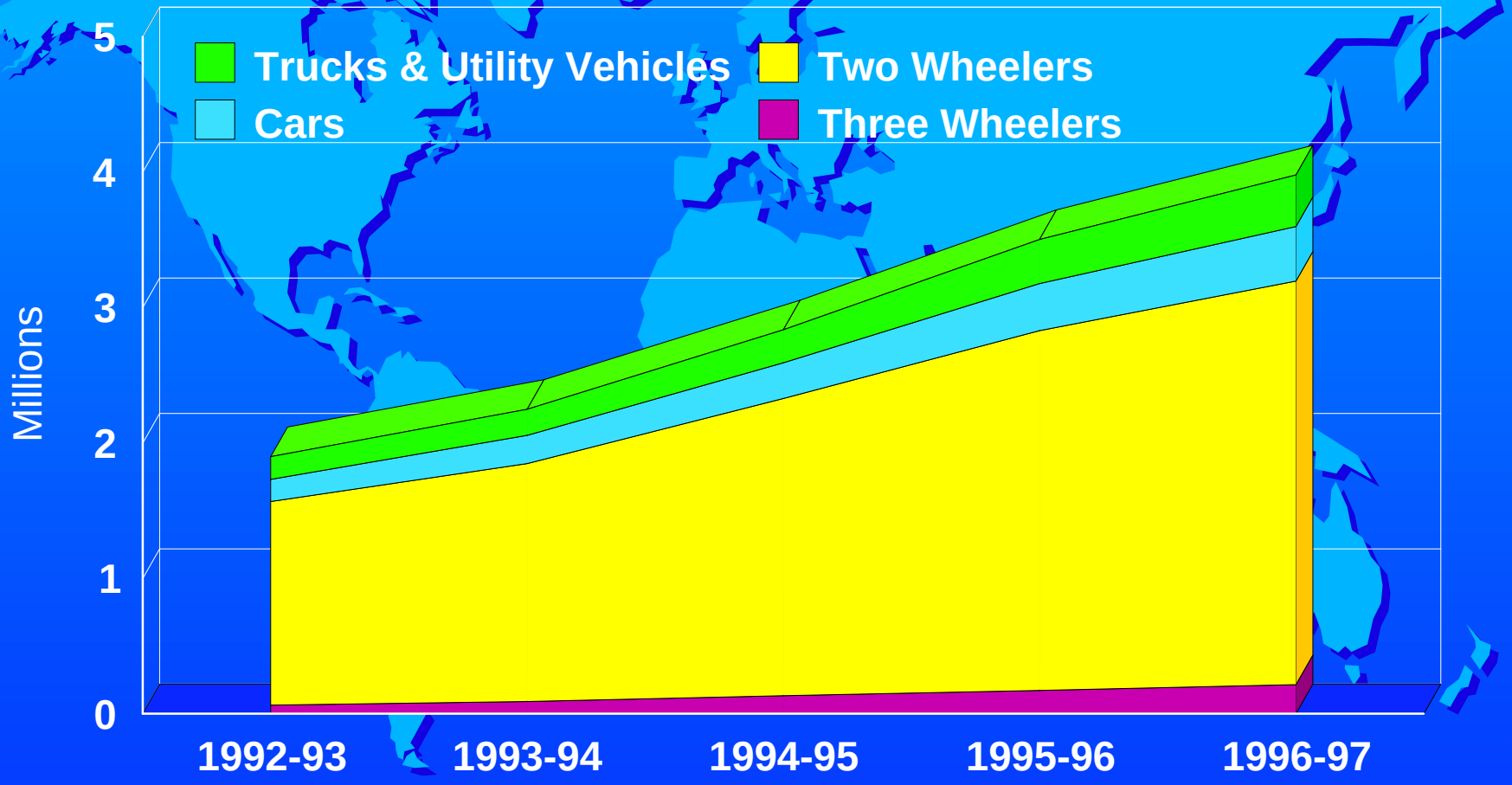
Motorcycle Production in Selected Countries



- Austria
- UK
- Netherlands
- Czech&Slovak
- Germany
- USA
- Spain
- France
- Italy
- CIS
- Taiwan
- India
- Japan
- China

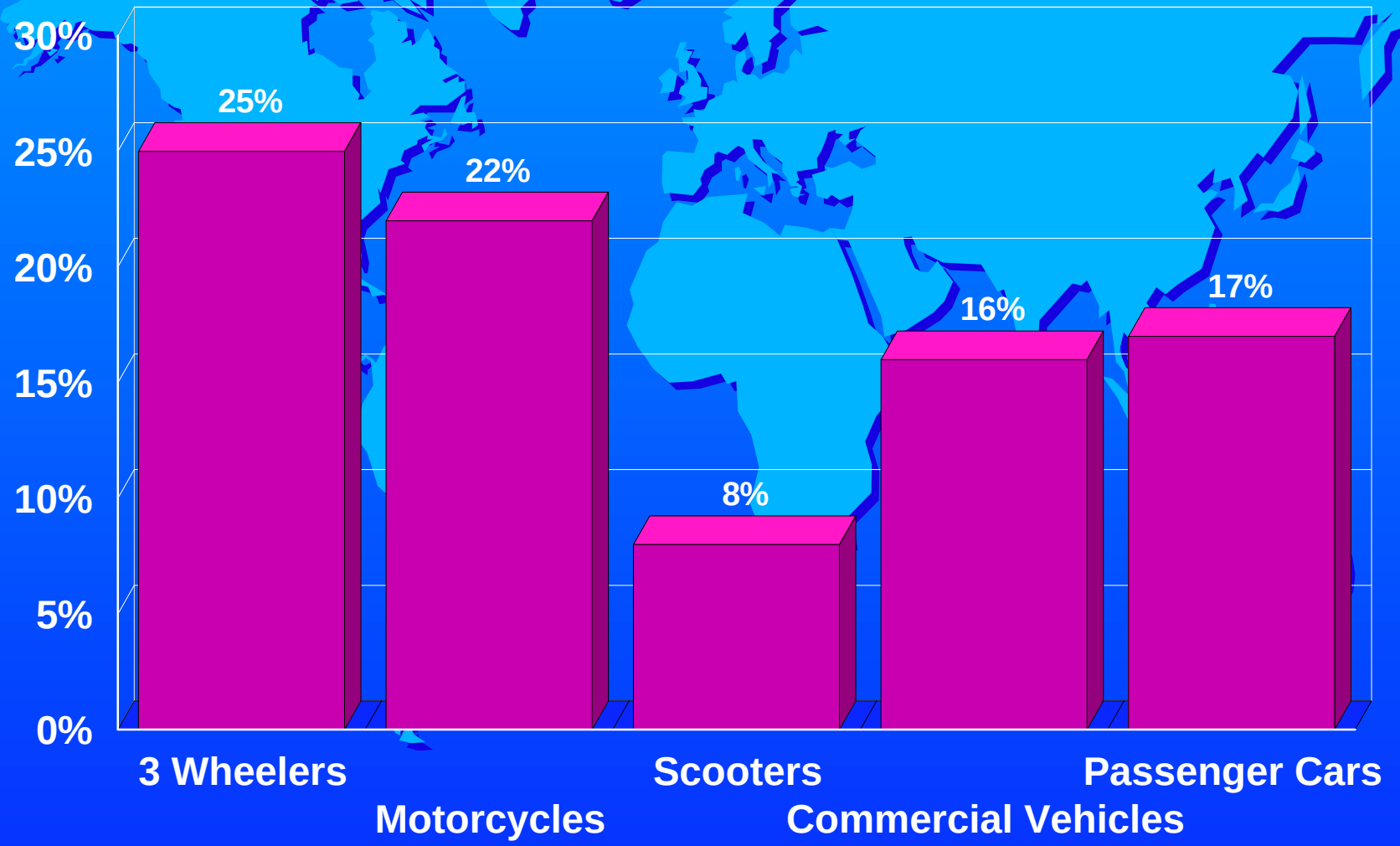
In '99 China Produced 11,269,136
50% of World Total
28% Increase From '98

Vehicle Production Trends in India

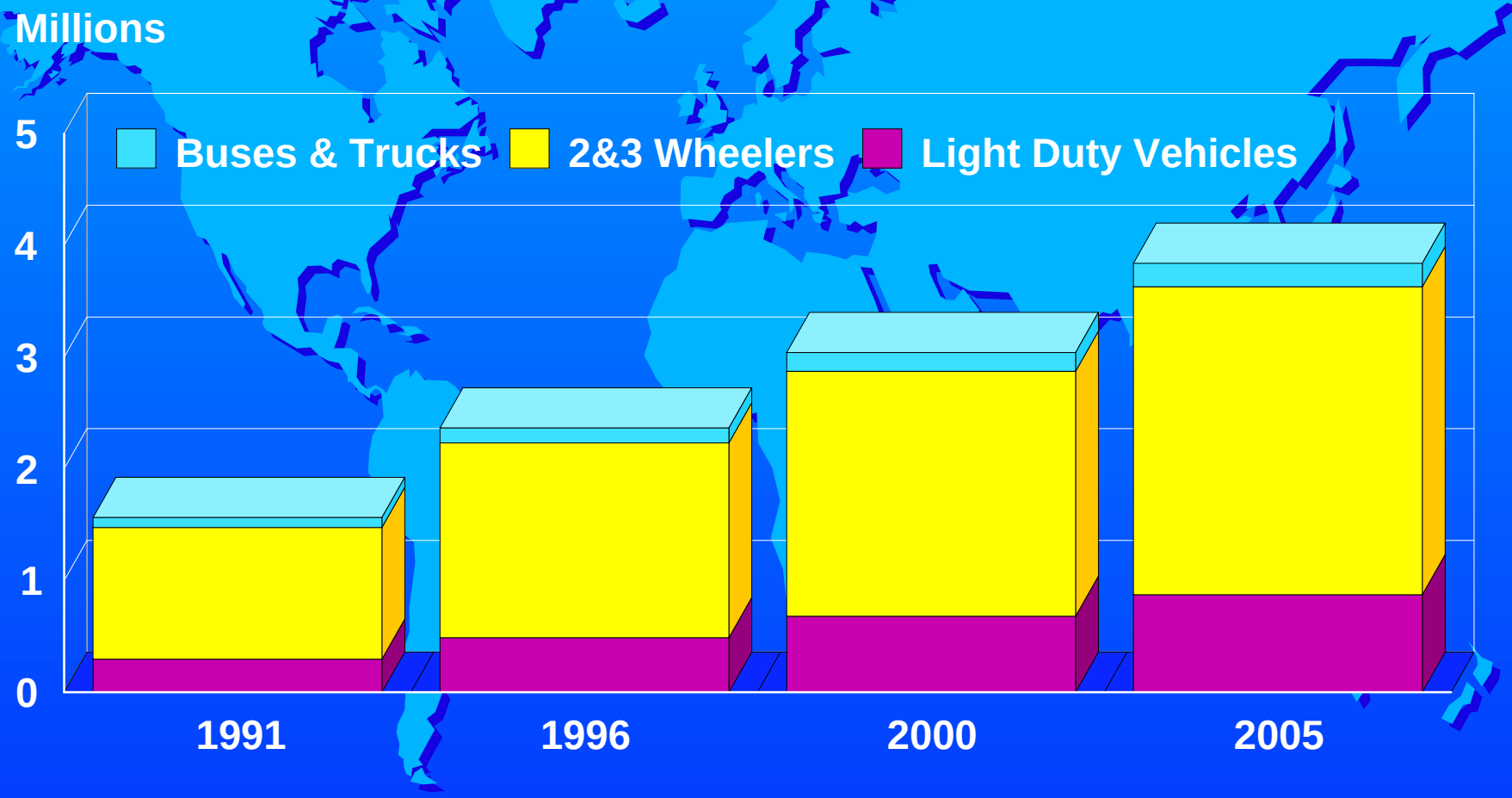


Source: AIAM 37th Annual Report

Annual Average Growth in Vehicle Production- India



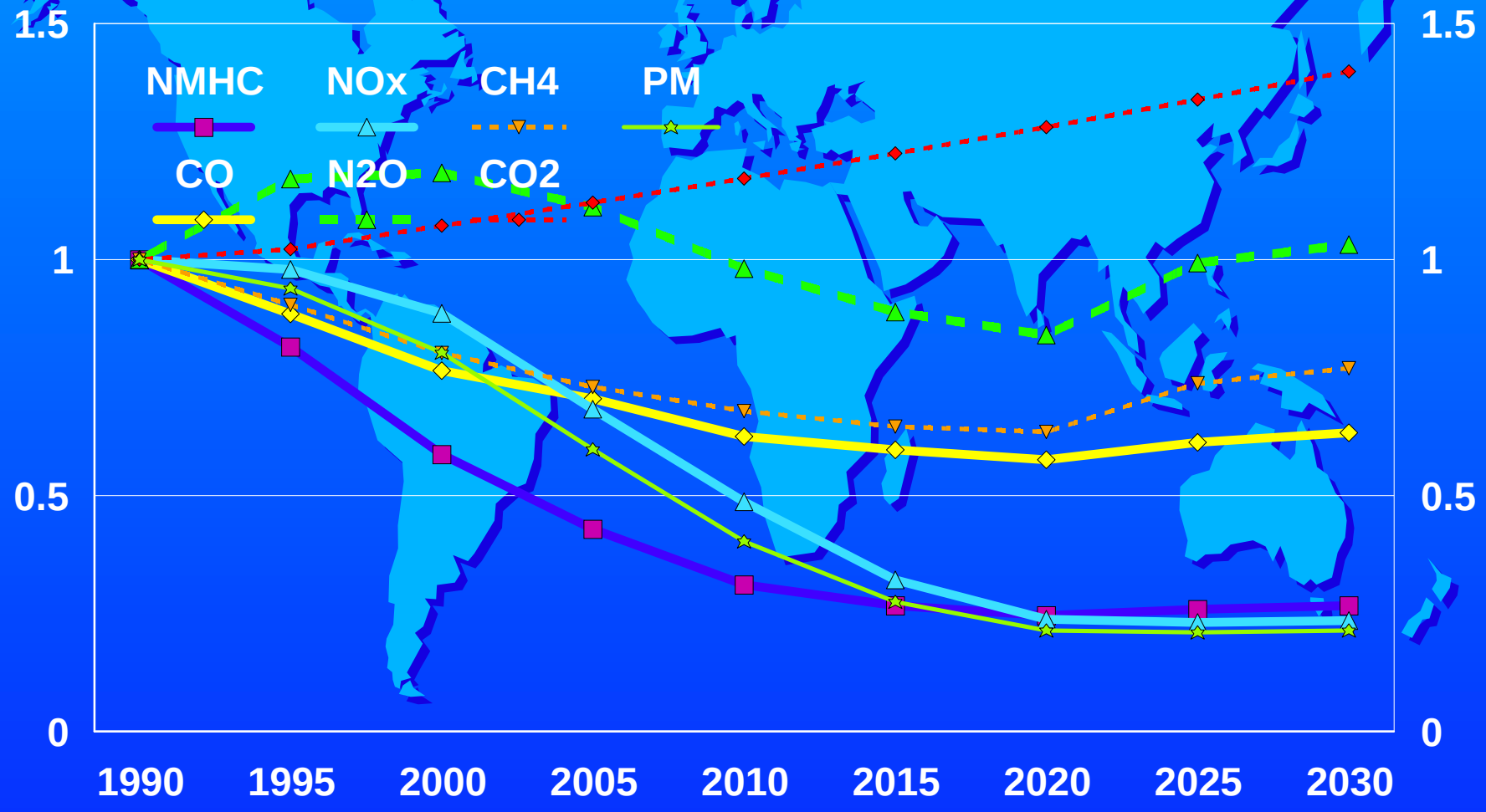
Vehicle Population in Delhi



Source: Dutta & Sengupta,
Central Pollution Control Board

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

OECD Countries Only



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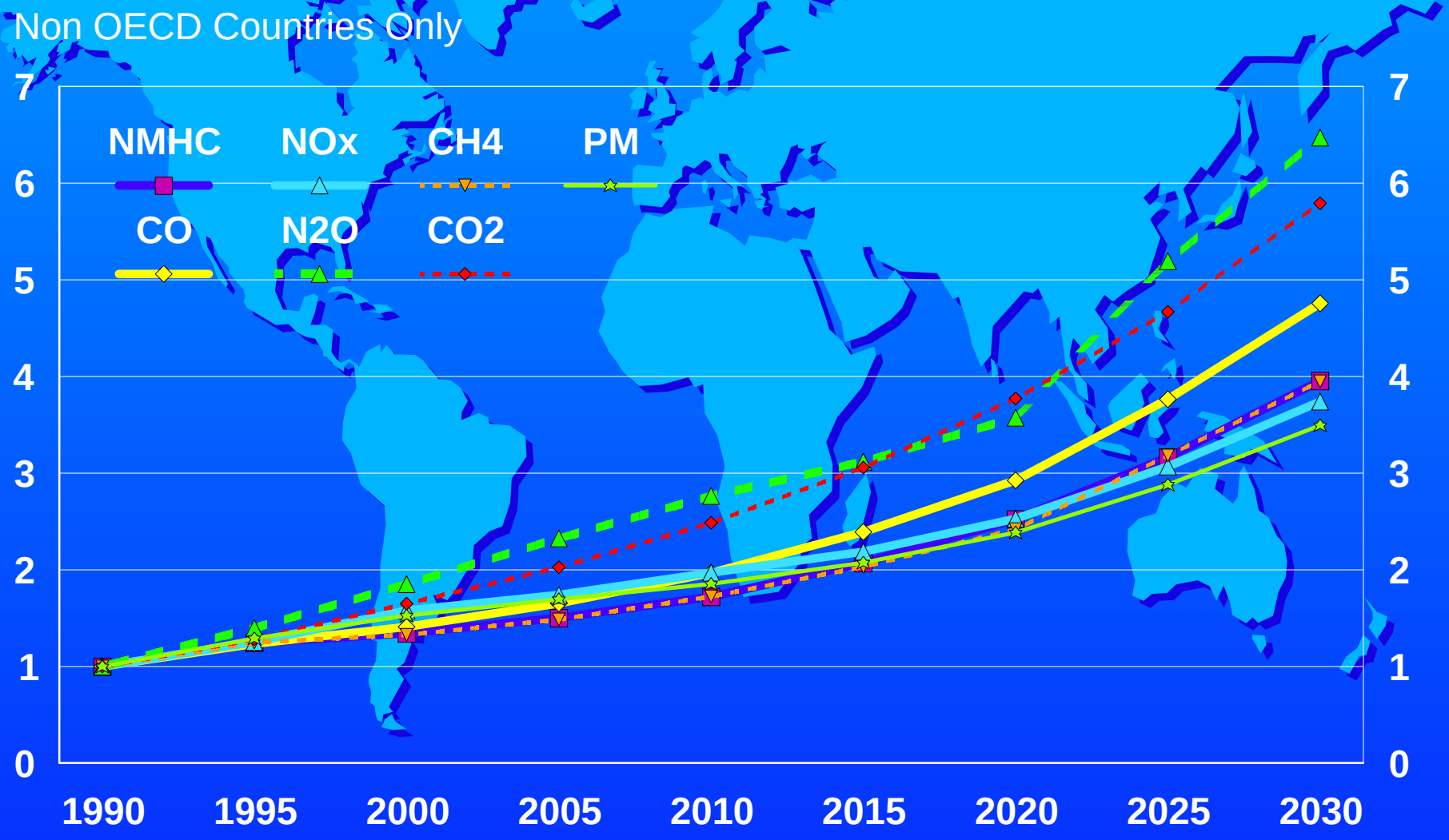

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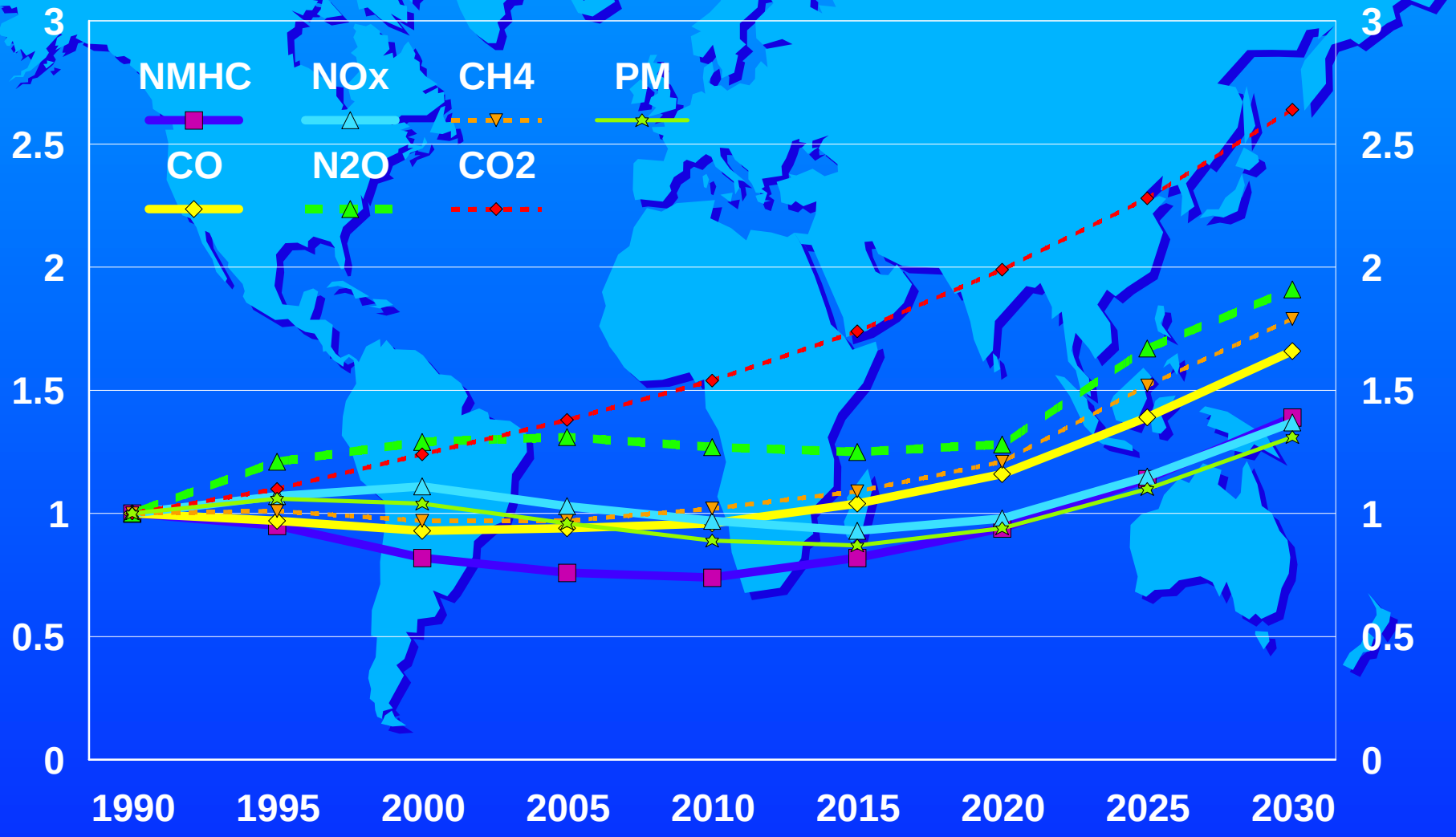

Challenges Ahead For An Increasingly Mobile World

- 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

Alternatives To Private Cars