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Vehicle Emissions, Greenhouse Gases and Climate Change

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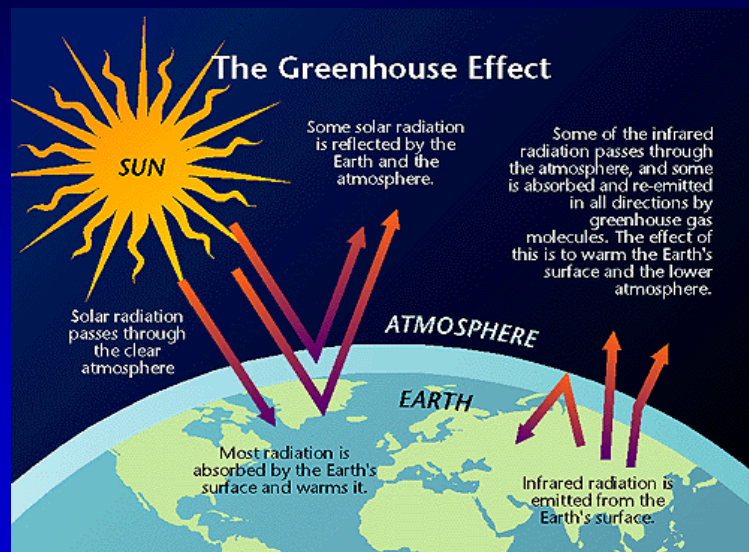
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Asian Development Bank
Manila, October 2002

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The Greenhouse effect

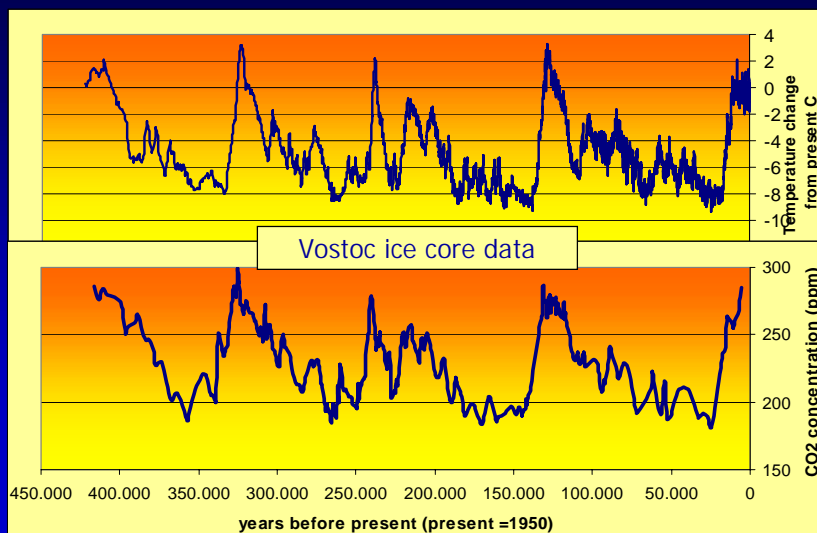


Main greenhouse gases and characteristics

Greenhouse gases	formula	Pre-industrial concentration	1995 concentration	Global warming potential (TH 100 years)
Carbon dioxide	CO ₂	278 ppm	360 ppm	1
Methane	CH ₄	700 ppb	1721 ppb	23
Nitrous oxide	N ₂ O	275 ppb	315 ppb	296
CFC-12	CCl ₂ F ₂	0	0.5 ppb	6200-7100
HCFC-22	CHClF ₂	0	0.1 ppb	1300-1400
Perfluoro-methane	CF ₄	0	0.07 ppb	6500
Sulfur hexa-fluoride	SF ₆	0	0.03 ppb	23900

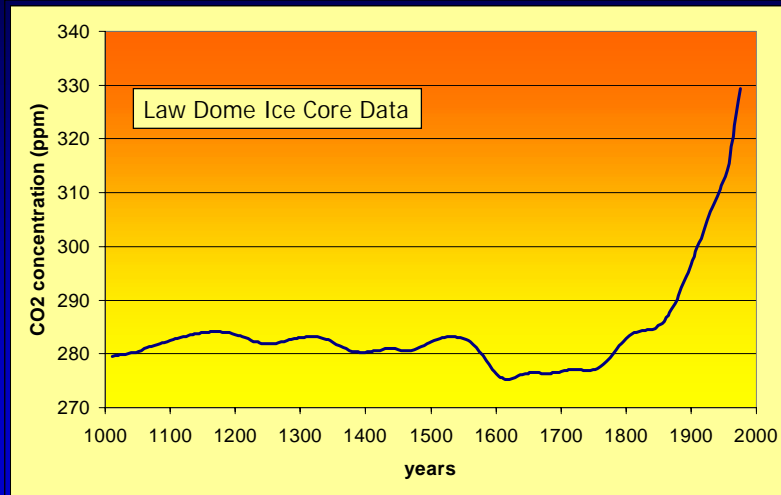
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T and CO₂ concentrations over the last 400,000 years

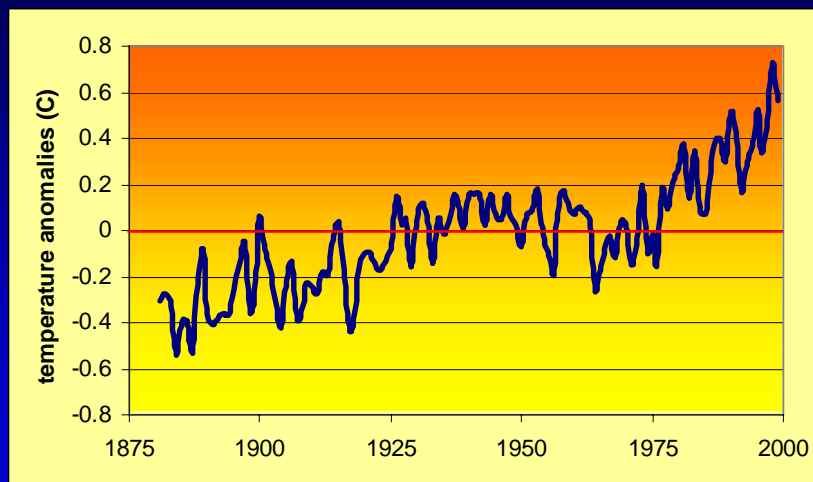


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CO₂ concentration trend



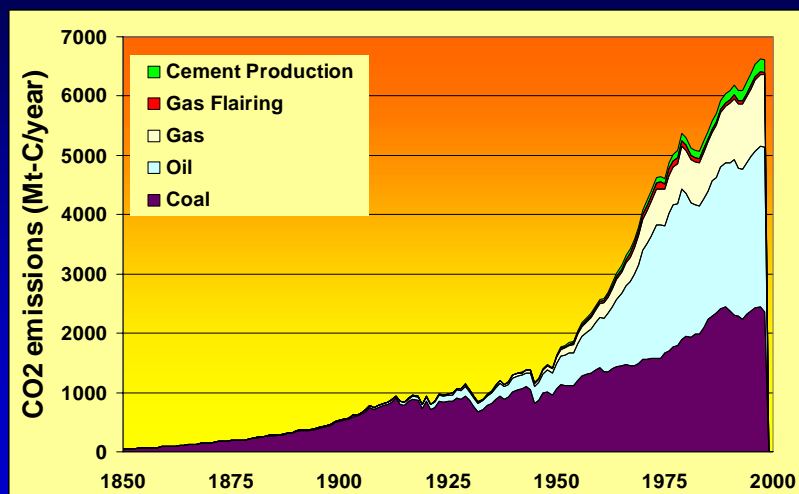
Surface temperature trend



Sources of GHGs

Gas	Formula	Sources
Carbon Dioxide	CO ₂	<ul style="list-style-type: none"> fossil fuel combustion, gas flaring, cement production, land use change
Methane	CH ₄	<ul style="list-style-type: none"> fossil fuel rice paddies waste dumps livestock
Nitrous oxide	N ₂ O	<ul style="list-style-type: none"> fertilizer industrial process (nylon) combustion
CFC-12	CCl ₂ F ₂	<ul style="list-style-type: none"> liquid coolants
HCFC-22	CHClF ₂	<ul style="list-style-type: none"> production of aluminum
Sulpher hexa-fluoride	SF ₆	<ul style="list-style-type: none"> dielectric fluid

CO₂ Emission trend



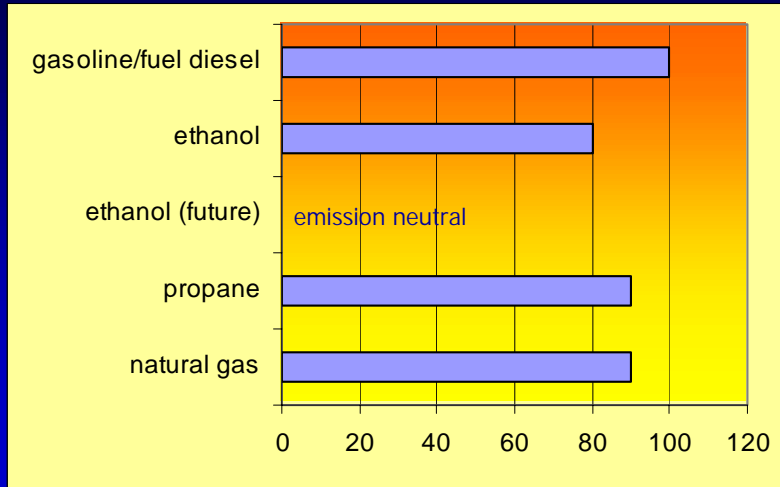
- In 1999 transport sector 24% of the global energy related carbon dioxide emissions
- Absolute increase since 1990 of 1017 million tons CO₂ and a share gain of 2.4 %
- CO₂ emissions from transport sector are projected to grow at the rate of 2.5% each year through 2020
- In developing countries even higher 4.0 %

- Five elements that can be changed to reduce emissions:
 - Increasing vehicle efficiency (e.g. technology, traffic management)
 - Change of fuel used (from petrol to LPG)
 - Reduce of transport activity (e.g. town planning, road tolls)
 - Switch mode of transport (increase public transport as light rail)
 - Increase capacity per vehicle (e.g. load factor freight sector, car sharing)

Advantage	Disadvantage
Low Emissions	Few Typical Refueling Stations
Good Performance	Many Potential Places to Refuel
Cost Similar to Gasoline	Higher Vehicle Cost

Advantage	Disadvantage
Very Low Emissions	Limited range
Good Performance	Few Refueling Stations
Lower Cost Fuel	Higher Vehicle Cost

Relative emission GHGs



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- CNG and LPG as vehicle fuel is better for the *local environment* compared to gasoline and diesel
- GHG emissions of CNG and LPG fueled engines are lower than that of gasoline and diesel fueled engines
- However, bad maintenance, wrong filling habits and system leakages (production, transport, use) can reduce the advantage
- Can result - from a *global warming* perspective- in negative impacts

Thank you