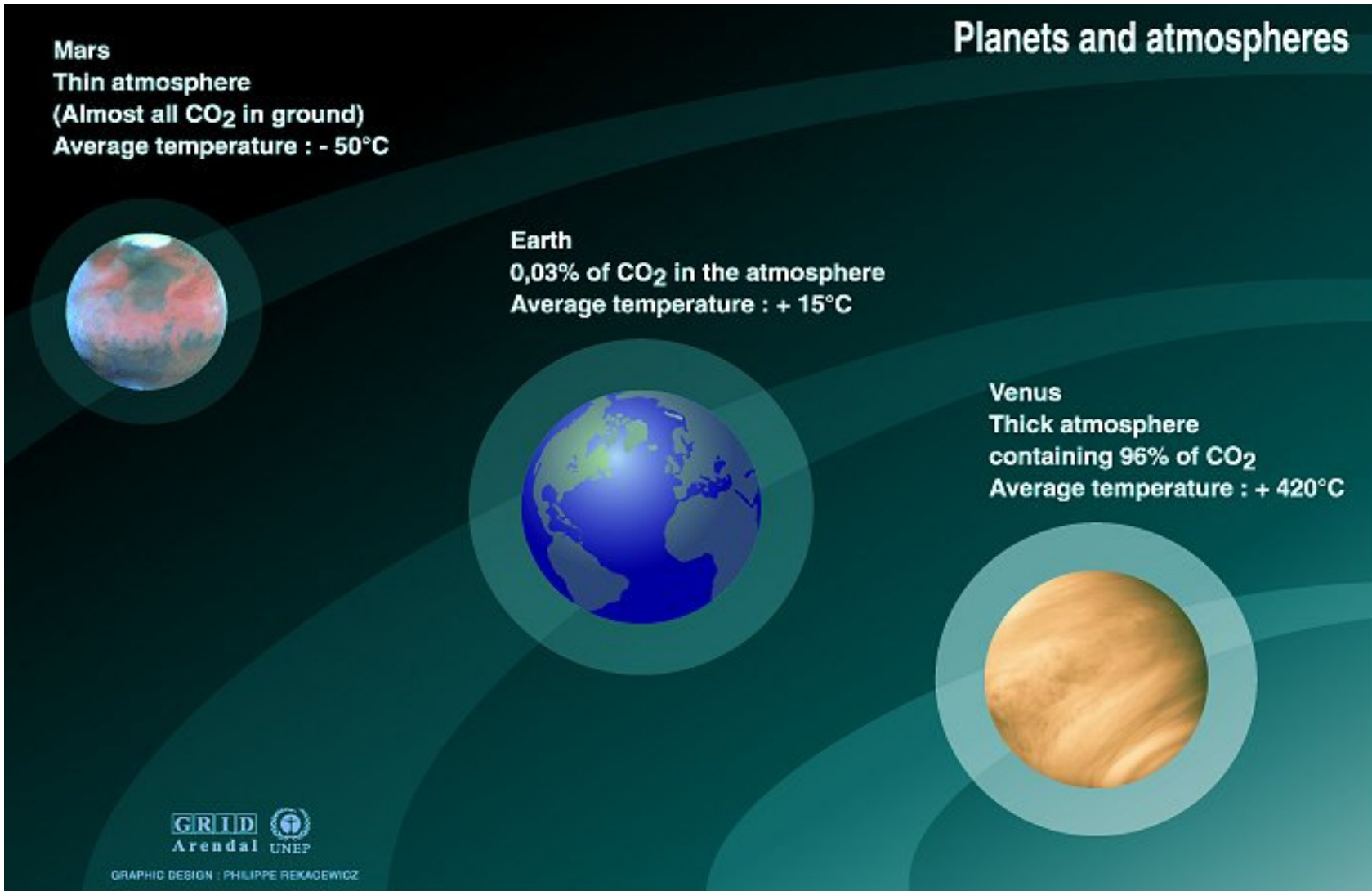


THE SCIENCE OF CLIMATE CHANGE

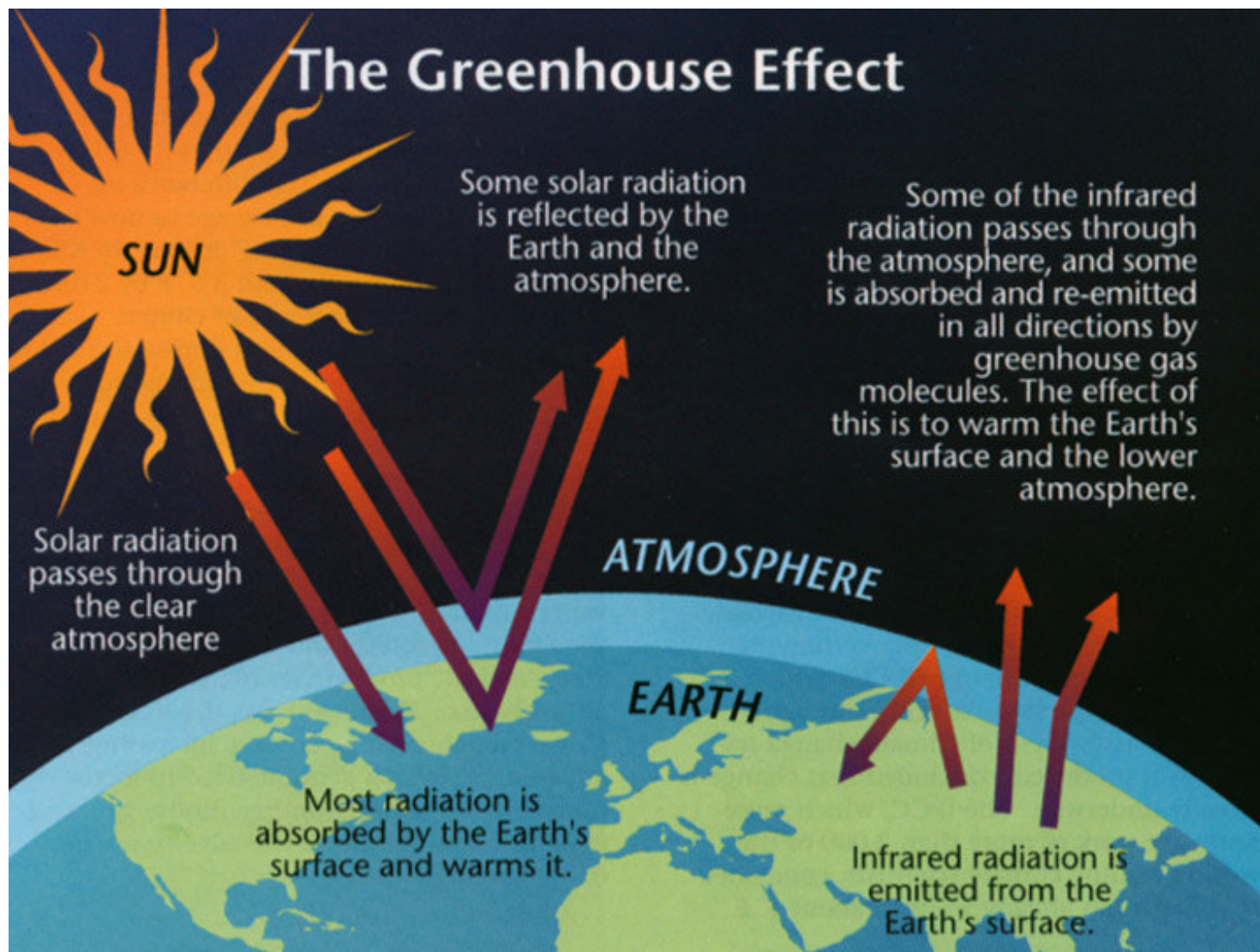


THE EARTH – A BEACON OF LIFE



Sources: Calvin J. Hamilton, Views of the solar system, www.planetscapes.com; Bill Arnett, The nine planets, a multimedia tour of the solar system, www.seds.org/billa/tnp/nineplanets.html

THE GREENHOUSE EFFECT



A BRIEF HISTORY OF EARTH'S CLIMATE

100 MYA – greenhouse, dinosaurs present, continental drift

2.5 MYA – changes in earth's orbit, the ice age begins, advance of ice sheets in NH

20,000 YA – LGM, permanent ice covers most of NH; sea levels 6 m lower

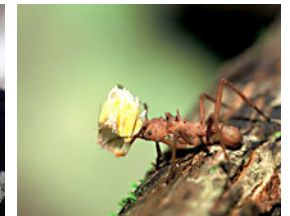
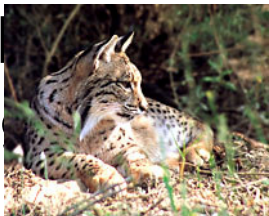
10,000 YA – End of the glacial period; earth warms up, Holocene extinction begins

2000 AD – The earth begins to warm up at a rapid rate



FROM DISCOVERY TO DISTRESS...

- 1824 – Joseph Fourier discovers the Greenhouse effect
- 1896 – Savante Arrhenius explains the science of GHE
- 1924 – Thomas Chamberlain explains
- 1960's – Roger Revelle and Charles Keeling study effects of atmospheric CO2 levels on the Greenhouse effect
- 1985 – The BGS discovers the Antarctic Ozone Hole
- 1994 – The UNFCCC is formed to combat climate



THE GREENHOUSE GASES...

- Carbon Dioxide CO_2
- Methane CH_4
- Nitrous Oxide N_2O
- Hydrofluorocarbon HFCs
- Perfluorocarbon PFCs
- Sulphur hexafluoride SF_6



...CONTD

The main greenhouse gases

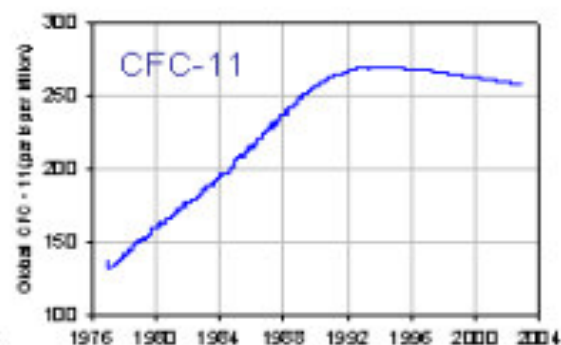
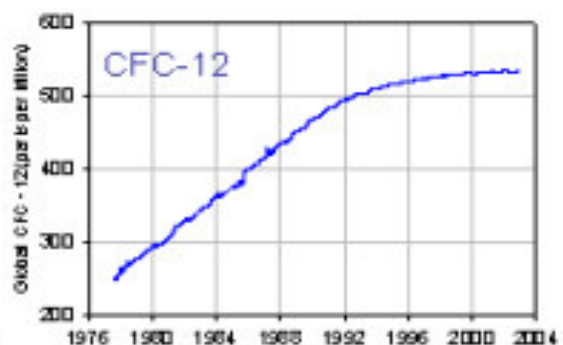
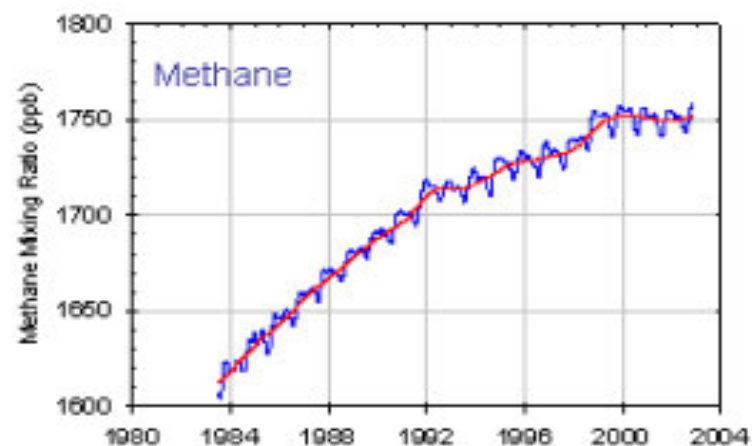
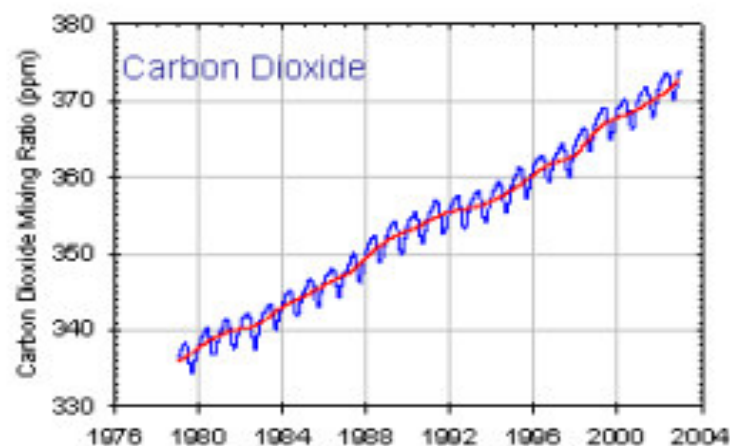
Greenhouse gases	Chemical formula	Pre-industrial concentration	Concentration in 1994	Atmospheric lifetime (years) ^{***}	Anthropogenic sources	Global warming potential (GWP) [*]
Carbon-dioxide	CO ₂	278 000 ppbv	358 000 ppbv	Variable	Fossil fuel combustion Land use conversion Cement production	1
Methane	CH ₄	700 ppbv	1721 ppbv	12,2 +/- 3	Fossil fuels Rice paddies Waste dumps Livestock	21 **
Nitrous oxide	N ₂ O	275 ppbv	311 ppbv	120	Fertilizer industrial processes combustion	310
CFC-12	CCl ₂ F ₂	0	0,503 ppbv	102	Liquid coolants. Foams	6200-7100 ****
HCFC-22	CHClF ₂	0	0,105 ppbv	12,1	Liquid coolants	1300-1400 ****
Perfluoromethane	CF ₄	0	0,070 ppbv	50 000	Production of aluminium	6 500
Sulphur hexa-fluoride	SF ₆	0	0,032 ppbv	3 200	Dielectric fluid	23 900

Note : pptv= 1 part per trillion by volume; ppbv= 1 part per billion by volume, ppm v= 1 part per million by volume

* GWP for 100 year time horizon. ** Includes indirect effects of tropospheric ozone production and stratospheric water vapour production. *** On page 15 of the IPCC SAR. No single lifetime for CO₂ can be defined because of the different rates of uptake by different sink processes.**** Net global warming potential (i.e., including the indirect effect due to ozone depletion).

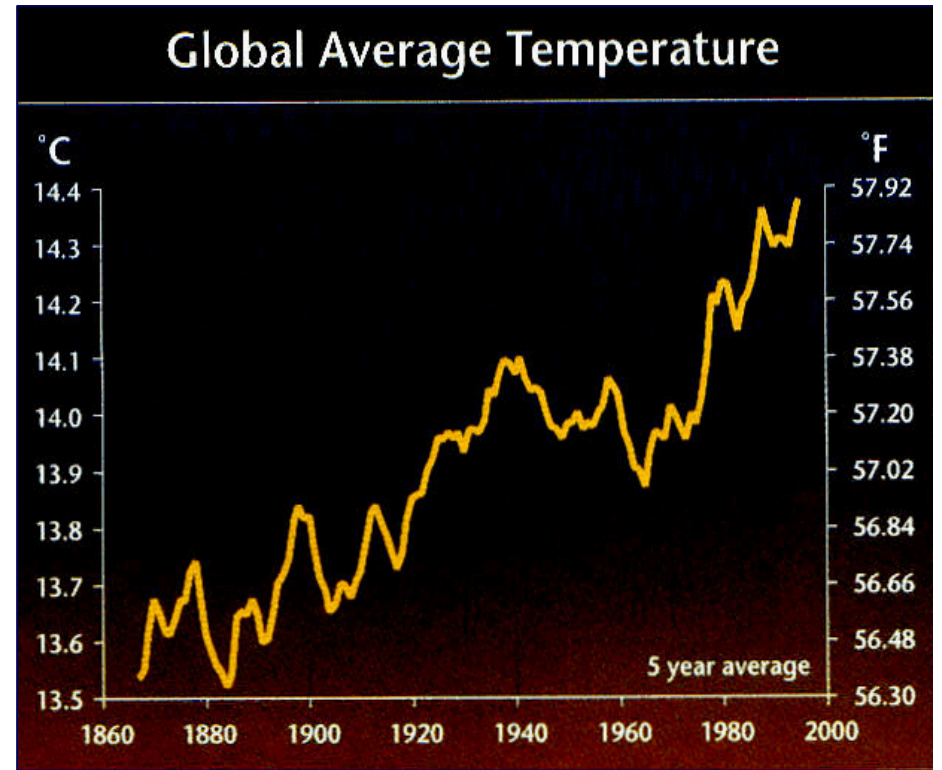
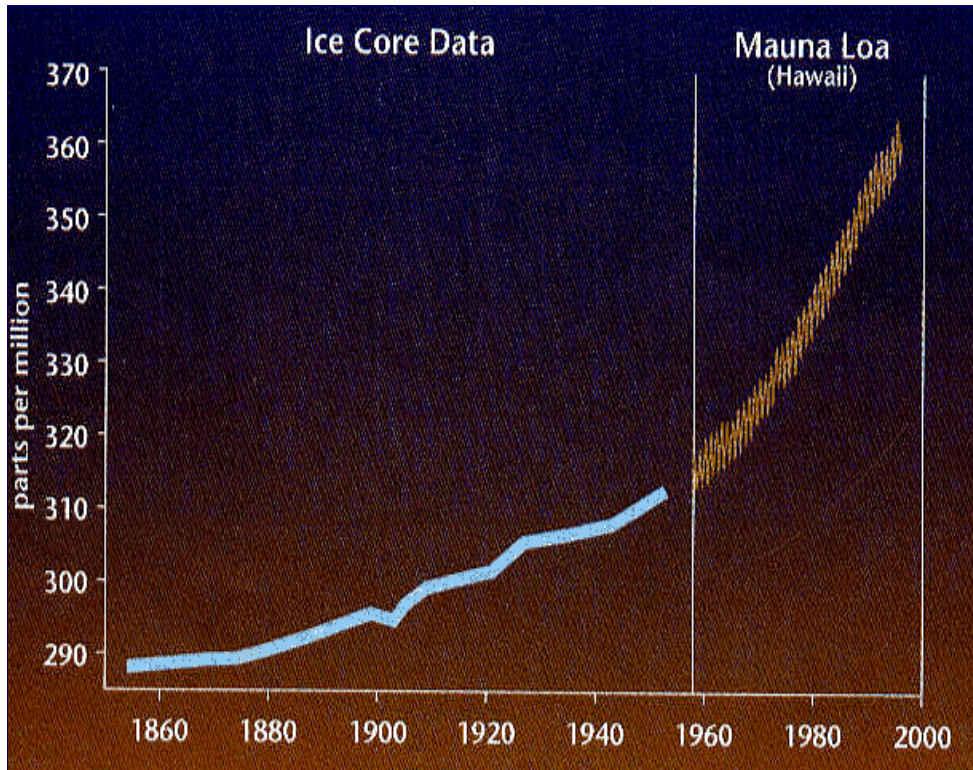


Global Trends in Major Greenhouse Gases to 1/2003



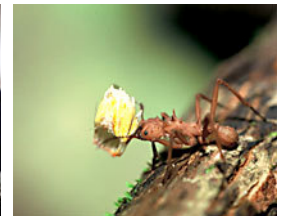
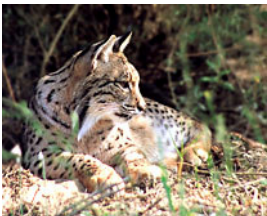
Global trends in major long-lived greenhouse gases through the year 2002. These five gases account for about 97% of the direct climate forcing by long-lived greenhouse gas increases since 1750. The remaining 3% is contributed by an assortment of 10 minor halogen gases, mainly HCFC-22, CFC-113 and CCl_4 .

ATMOSPHERIC CO2 INCREASE AND GLOBAL WARMING

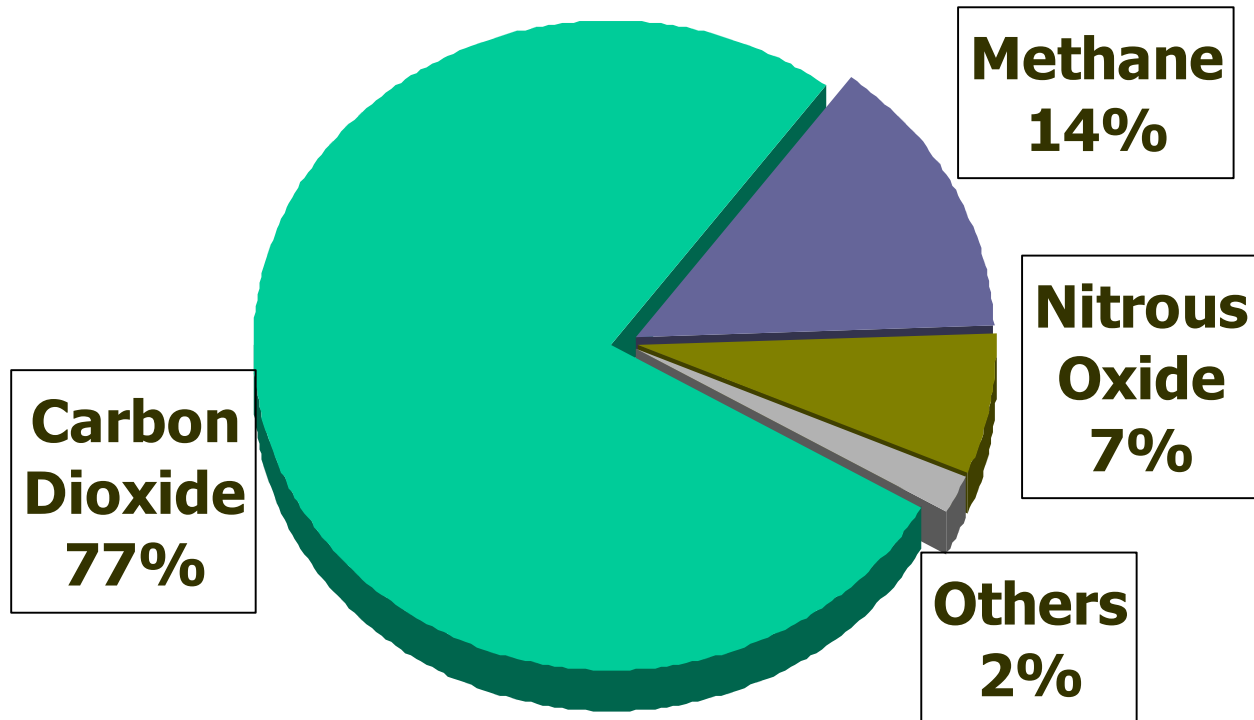


INCREASE IN GHG CONCENTRATIONS

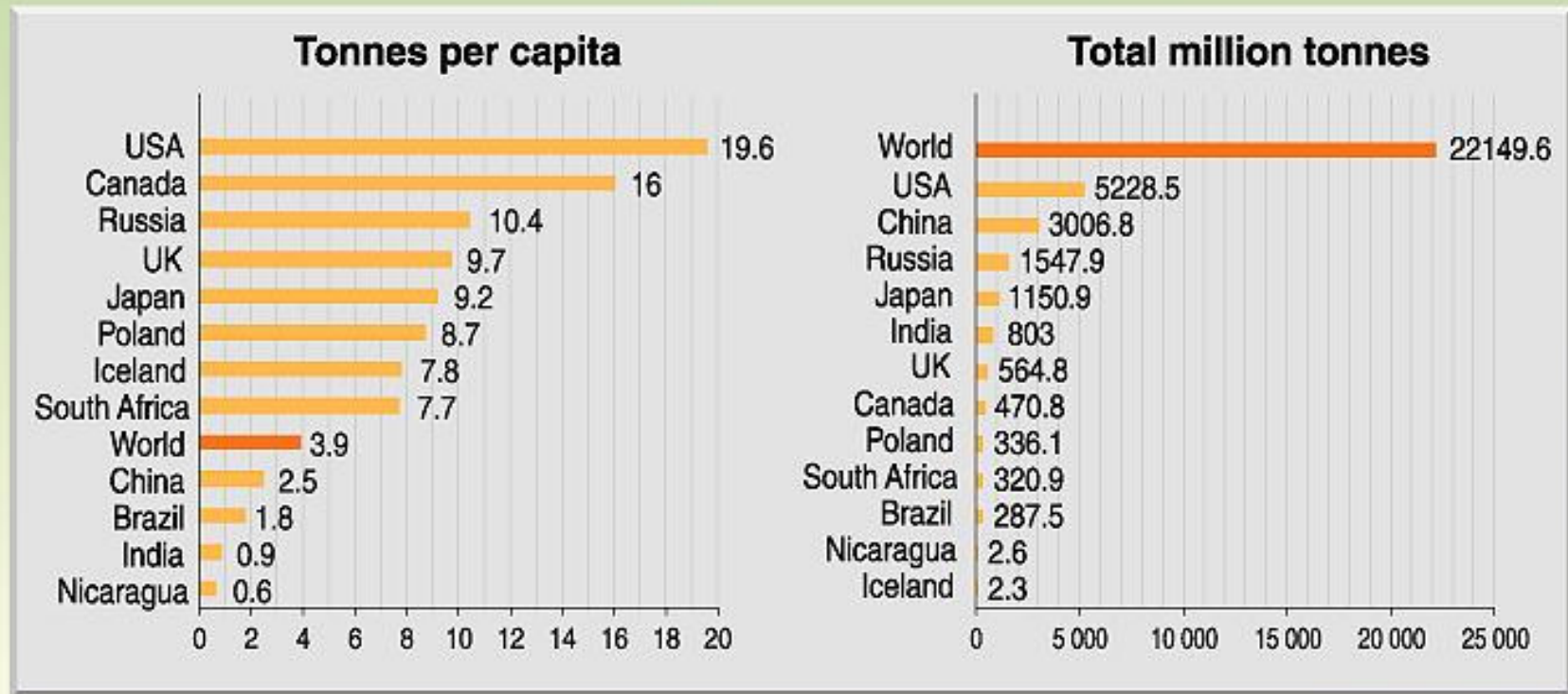
- Atmospheric concentration of GHGs has increased significantly since the industrial revolution of 1850
- CO₂ 30% increase from 280 to 379 ppmv (Natural range 180-300 ppm)
- CH₄ 100% increase from 700 to 1774 ppbv
- NO₂ 15% increase from 270 to 319 ppbv
- Since 1970, concentration of GHGs has risen by 80% and CO₂ has contributed to 70% of this increase
- CO₂ accounts for 77% of all GHG emissions
- Rise is attributed to increase in fossil fuel consumption and intense land use



GHG CONCENTRATIONS



Emissions of CO₂ - selected countries (1995)



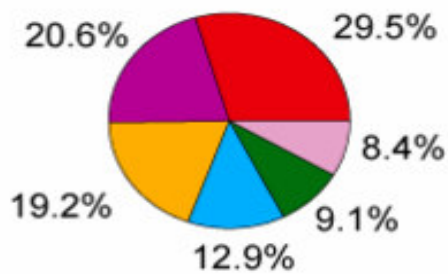
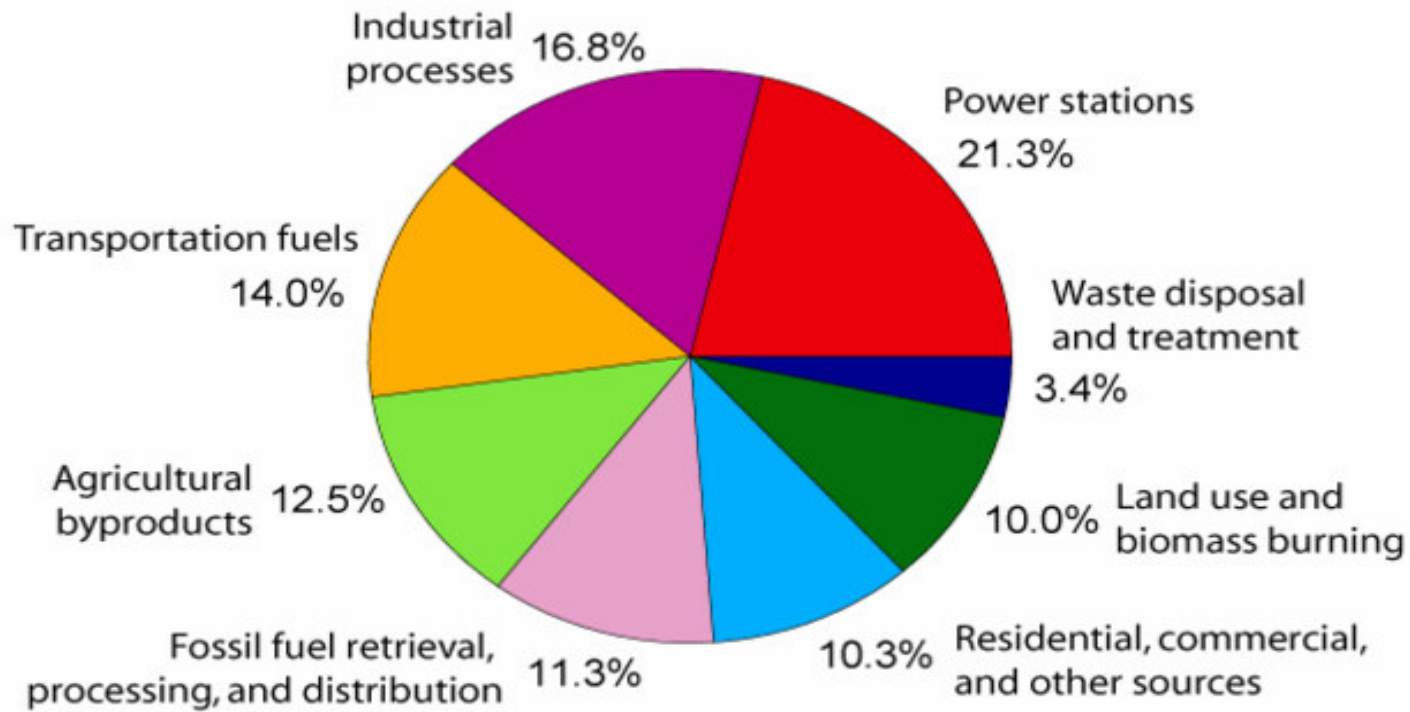
GRAPHIC DESIGN : PHILIPPE REKACEWICZ



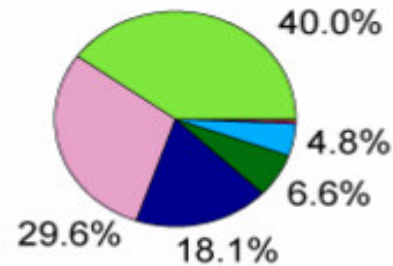
Source : International Energy Agency, 1996.



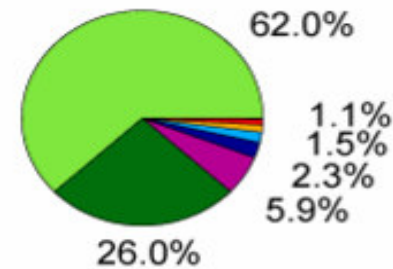
Annual Greenhouse Gas Emissions by Sector



Carbon Dioxide
(72% of total)



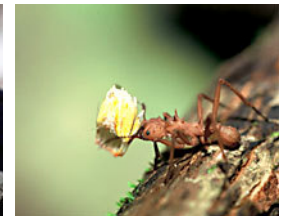
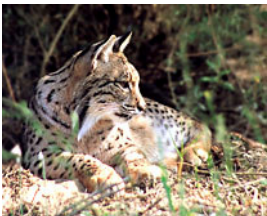
Methane
(18% of total)



Nitrous Oxide
(9% of total)

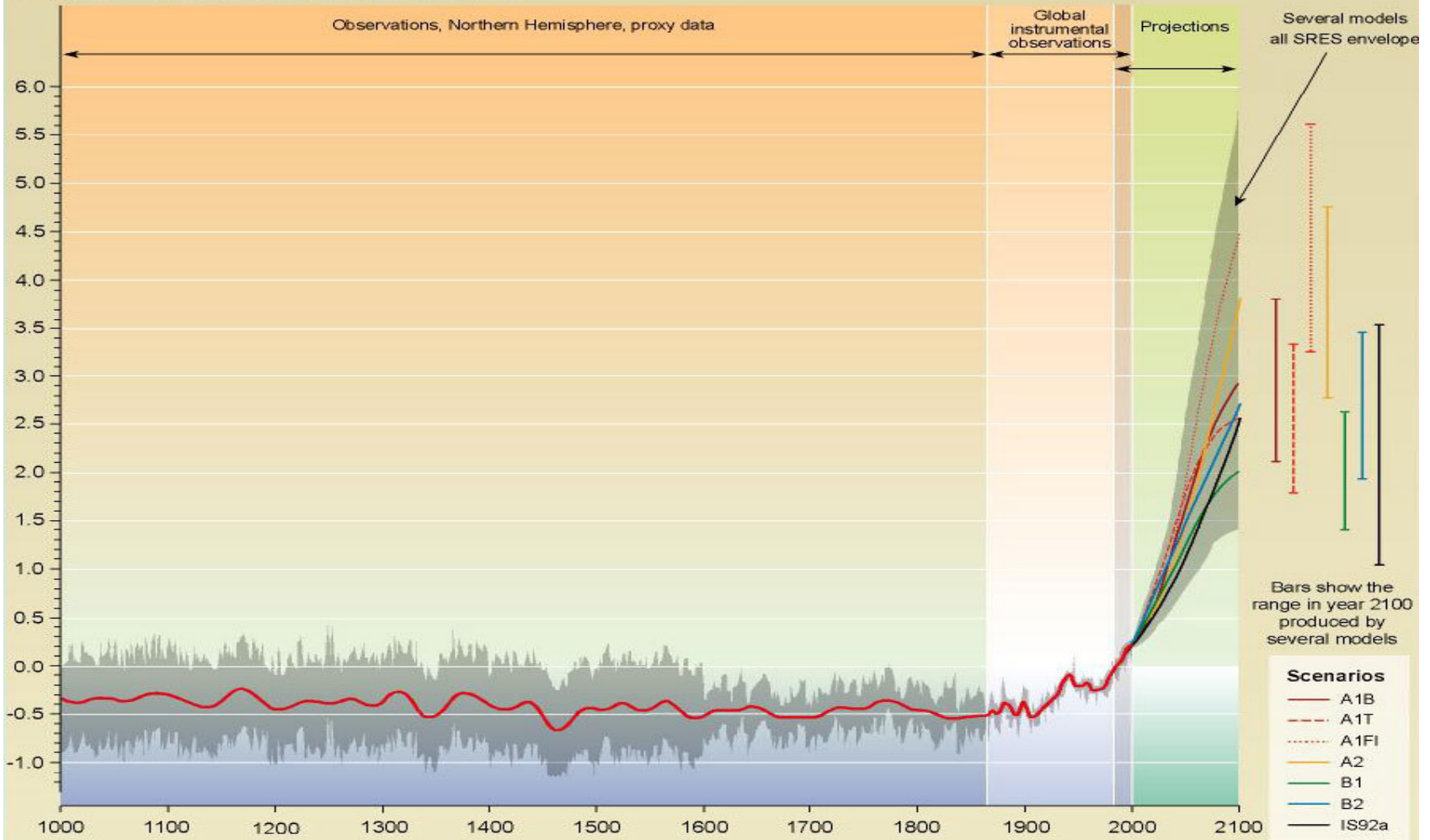
SOME DISTURBING FACTS

- Climate has changed over the past century
 - Global mean temperature has increased .5-1° F
 - Global sea level has risen 4-10 inches
 - Global precipitation over land has increased 1%
- Climate is expected to continue to change in future
 - Projected temperature increase of 3.6°F by 2100 (1.8-6.3°F)
 - Projected sea level rise of 20 inches by 2100 (6-38 inches)
 - Likely increase in precipitation intensity

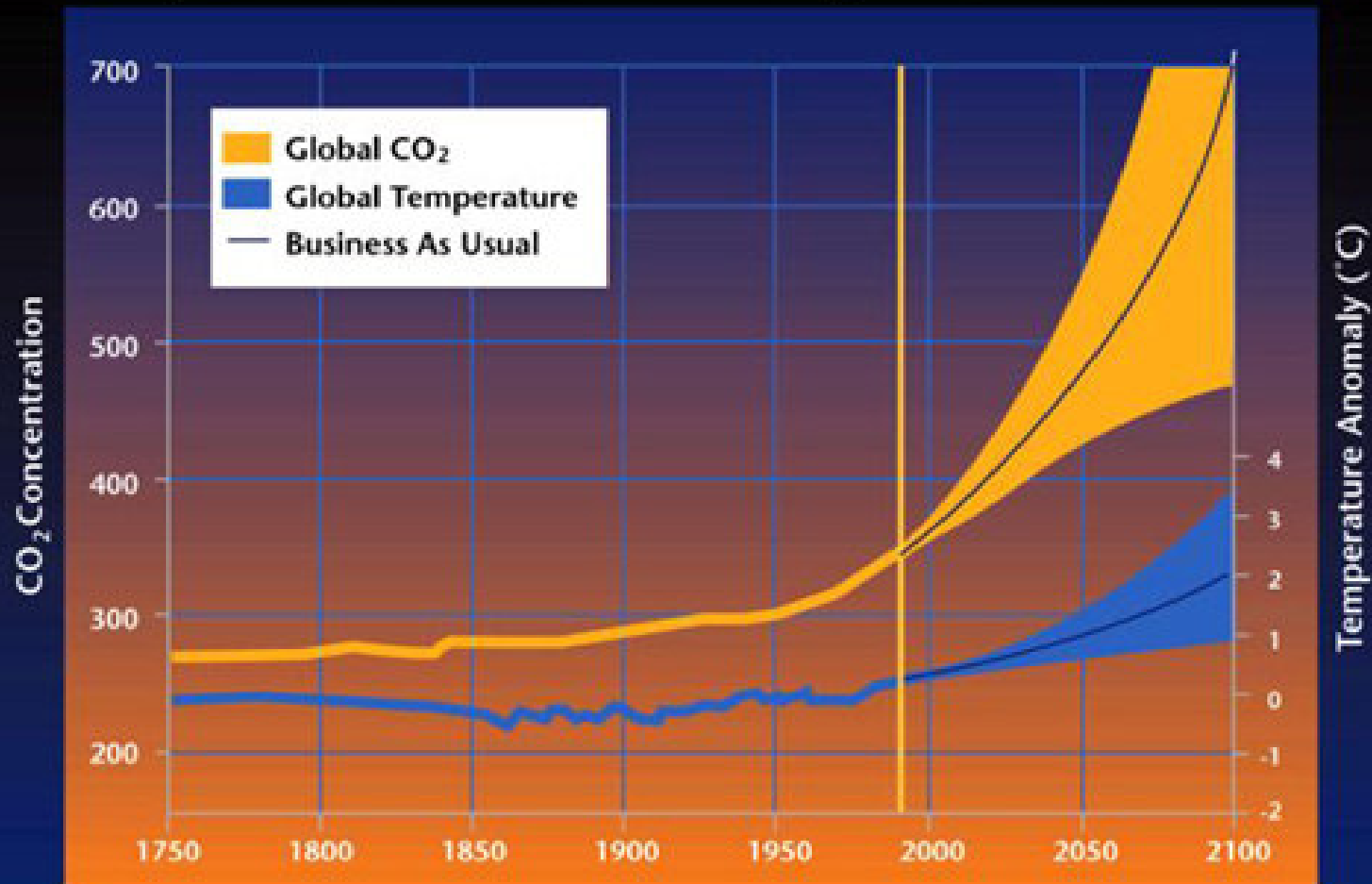


Variations of the Earth's surface temperature: year 1000 to year 2100

Departures in temperature in °C (from the 1990 value)



Projection of CO₂ and Temperature to 2100



THANK YOU!

BY

BABY JYOTHI SREE

Panchavati Rural Development society,
Hyderabad.

