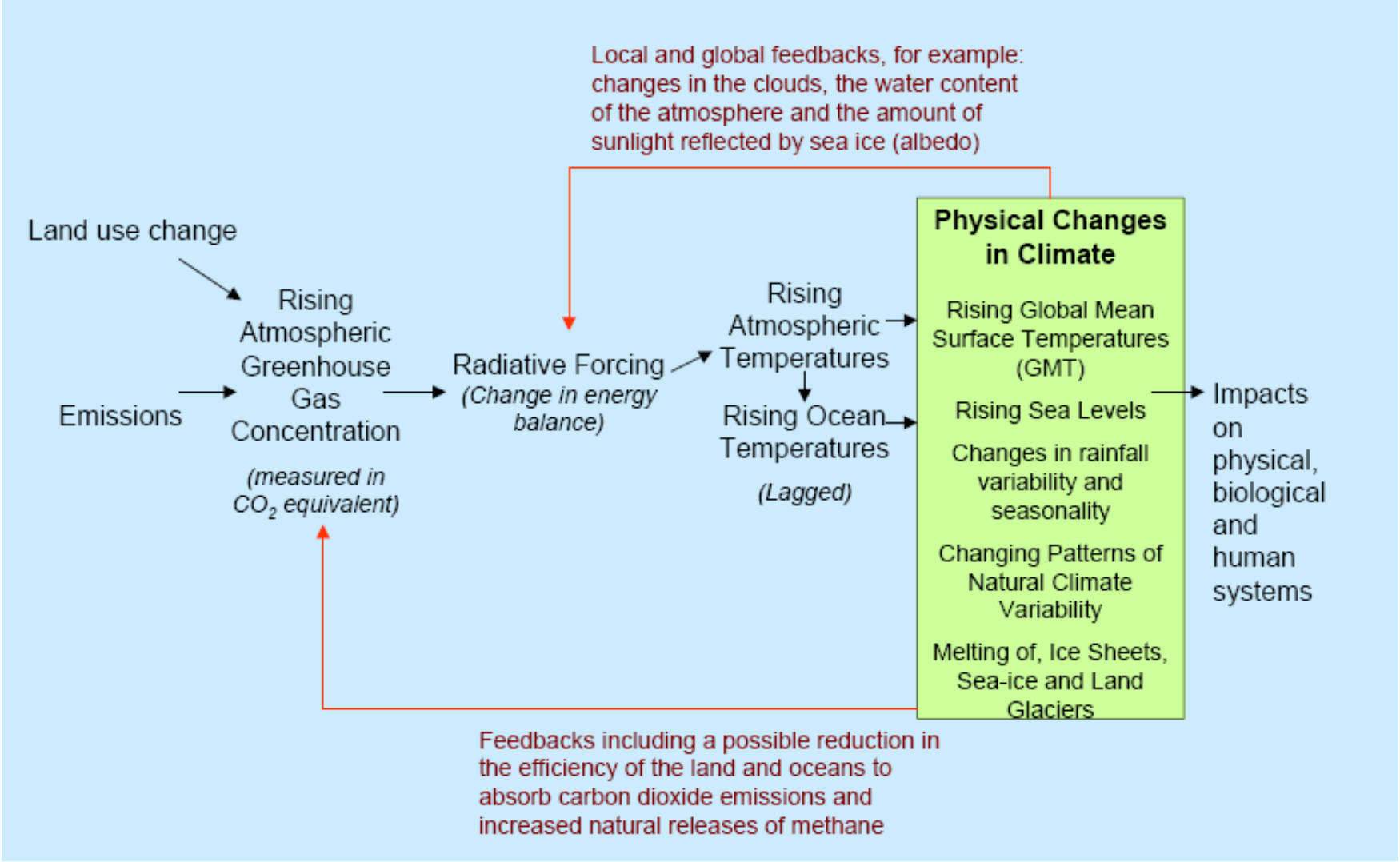
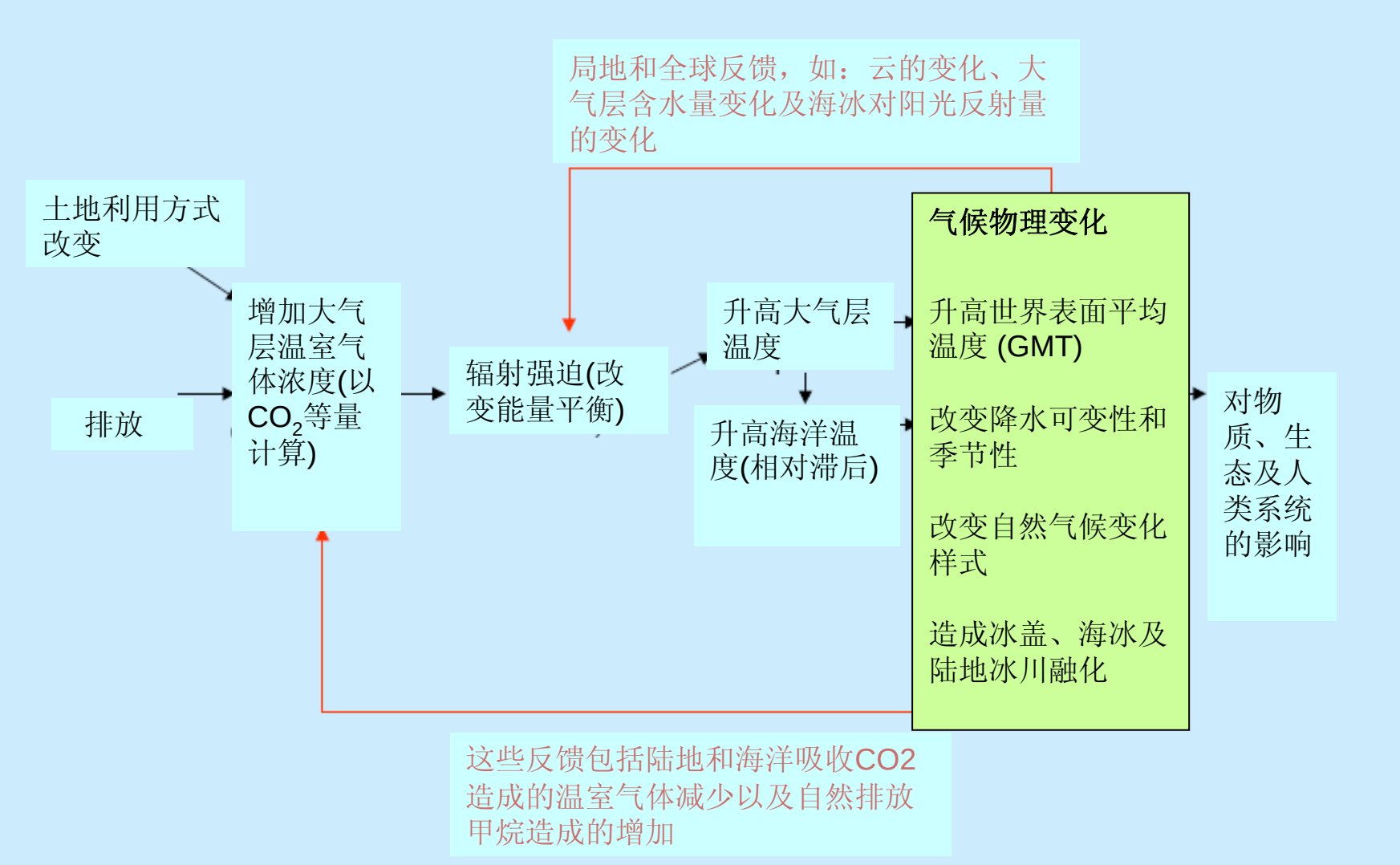
GHGs and Climate Change
温室气体和气候变化

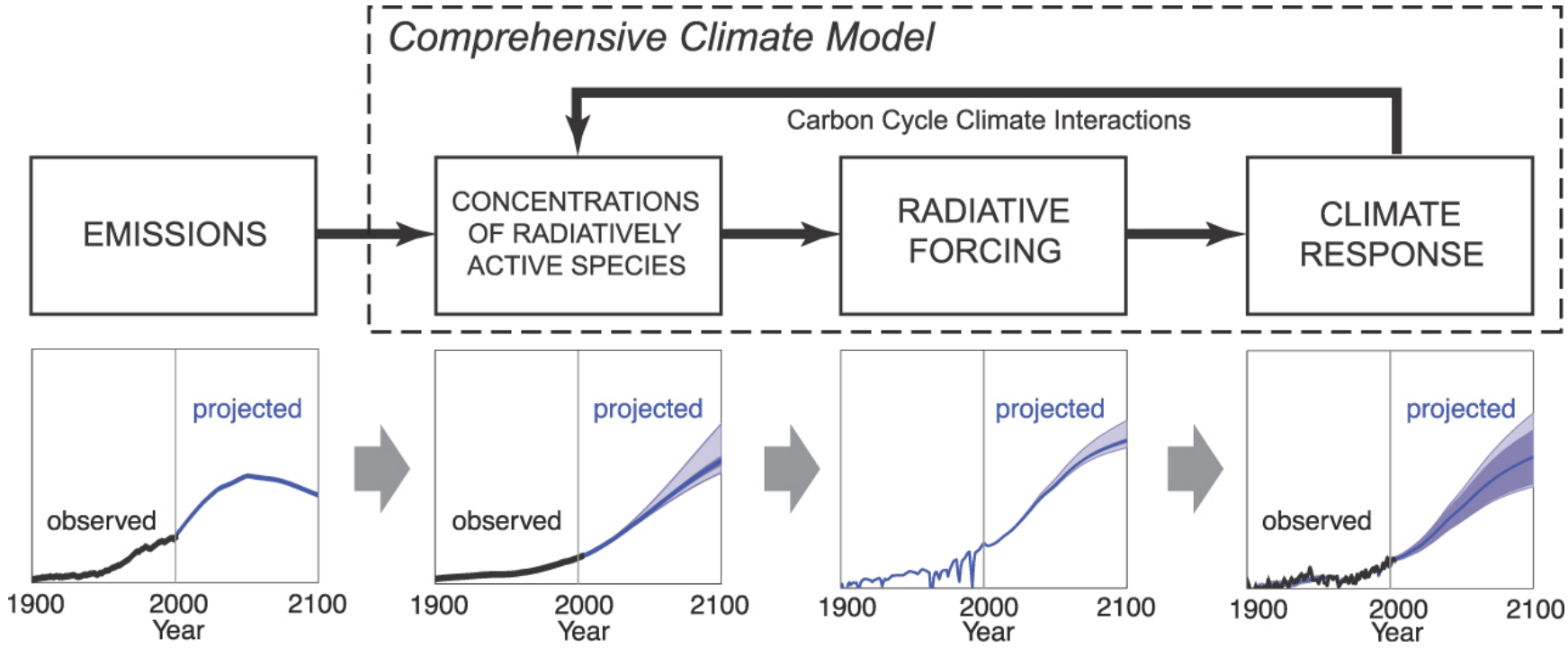


Source: The Stern Review

温室气体和气候变化

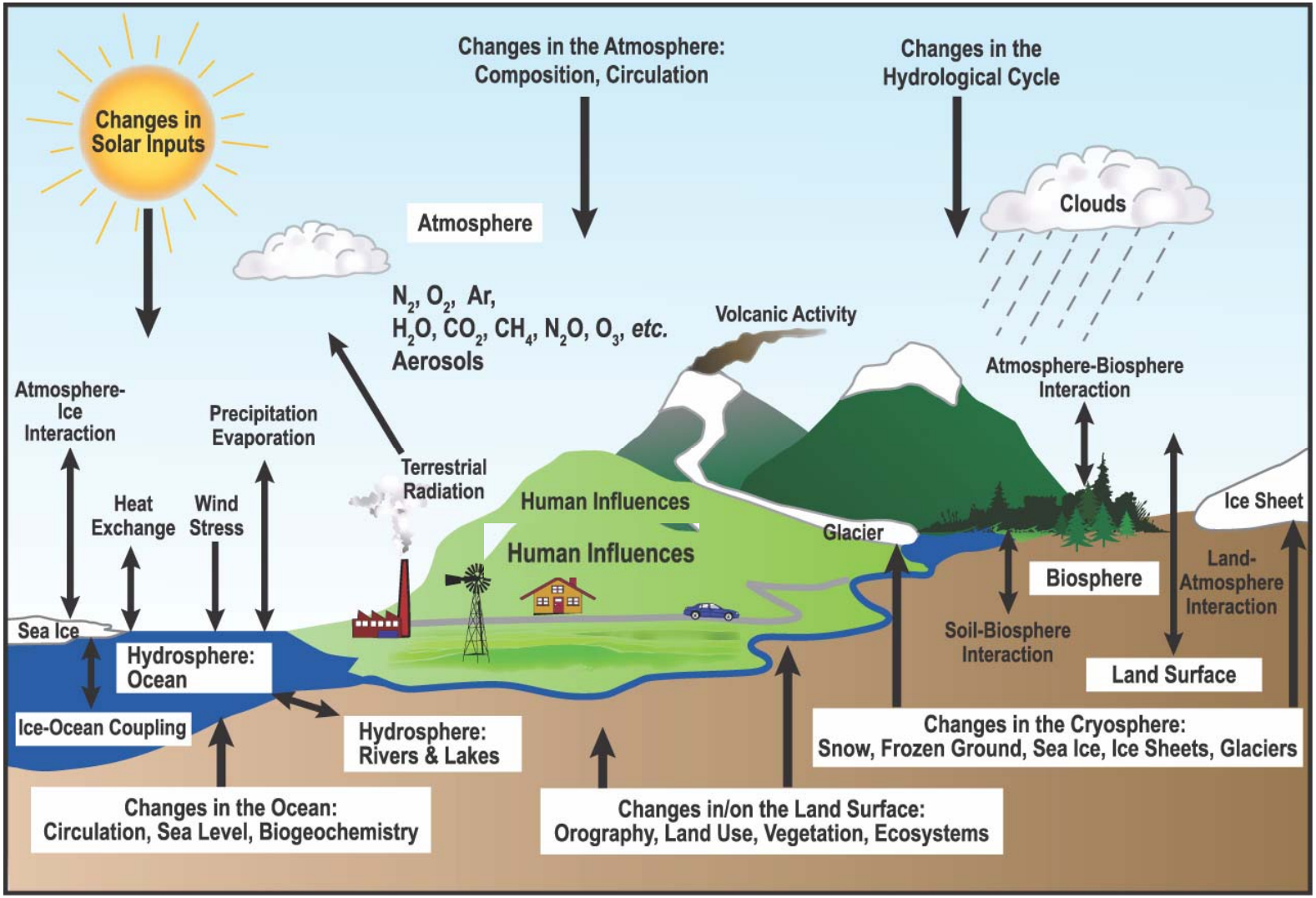


Source: The Stern Review


Comprehensive Climate Model
Carbon Cycle Climate Interactions
EMISSIONS
CONCENTRATIONS OF RADIATIVELY ACTIVE SPECIES
RADIATIVE FORCING
CLIMATE RESPONSE
observed
projected
1900
2000
2100
Year

AR4 WG I (2007)

Factors Influencing Climate
影响气候的因素



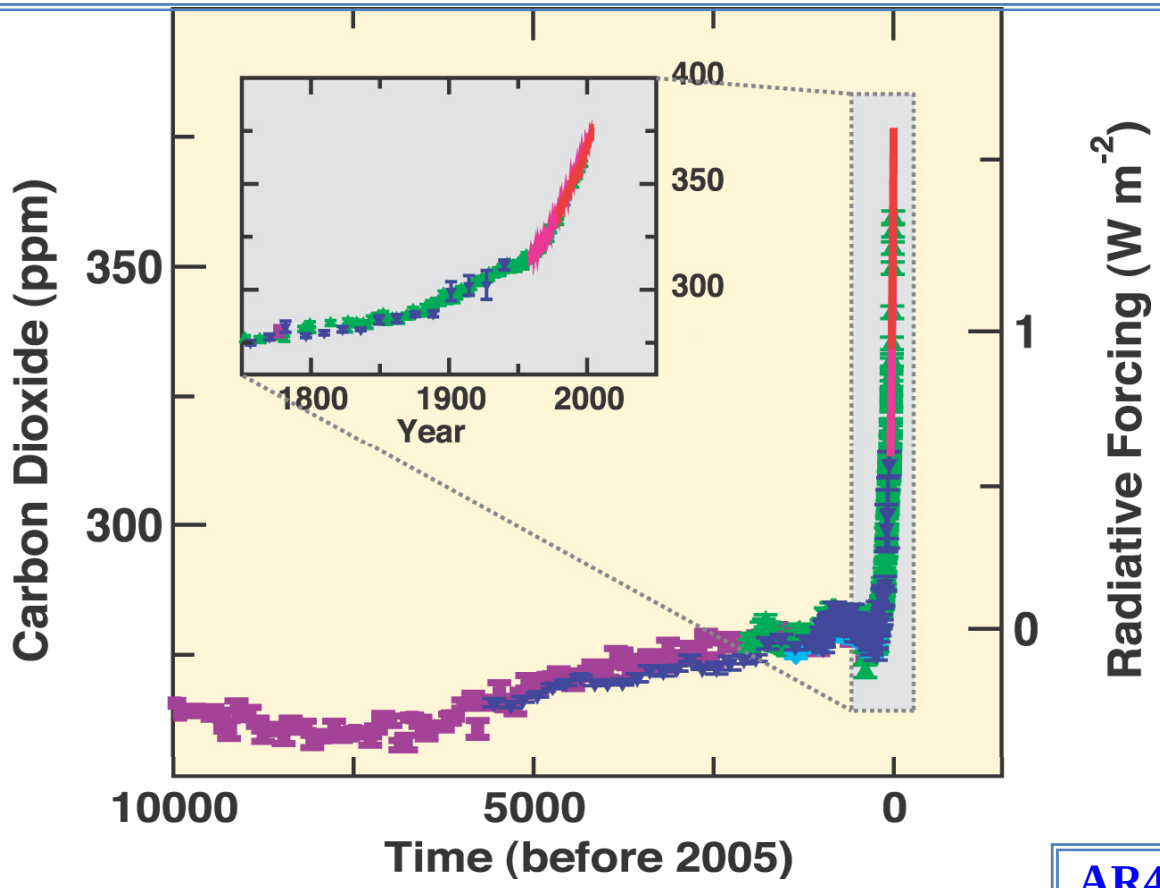
AR4 WG I (2007)

Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years (see Figure SPM.1). The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land use change, while those of methane and nitrous oxide are primarily due to agriculture. {2.3, 6.4, 7.3}

AR4 WG I (2007)

CO_2, CH_4 and N_2O Concentrations

- far exceed pre-industrial values
- increased markedly since 1750 due to human activities



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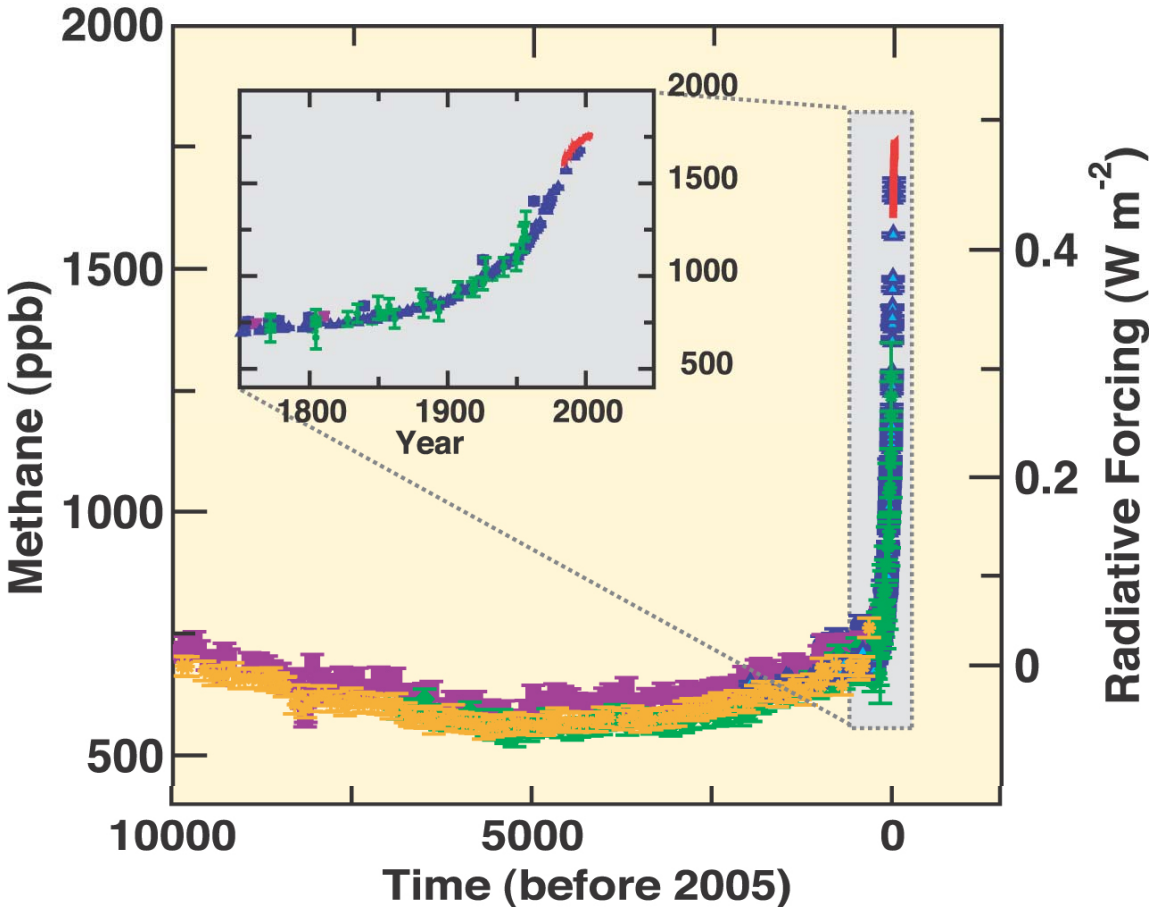
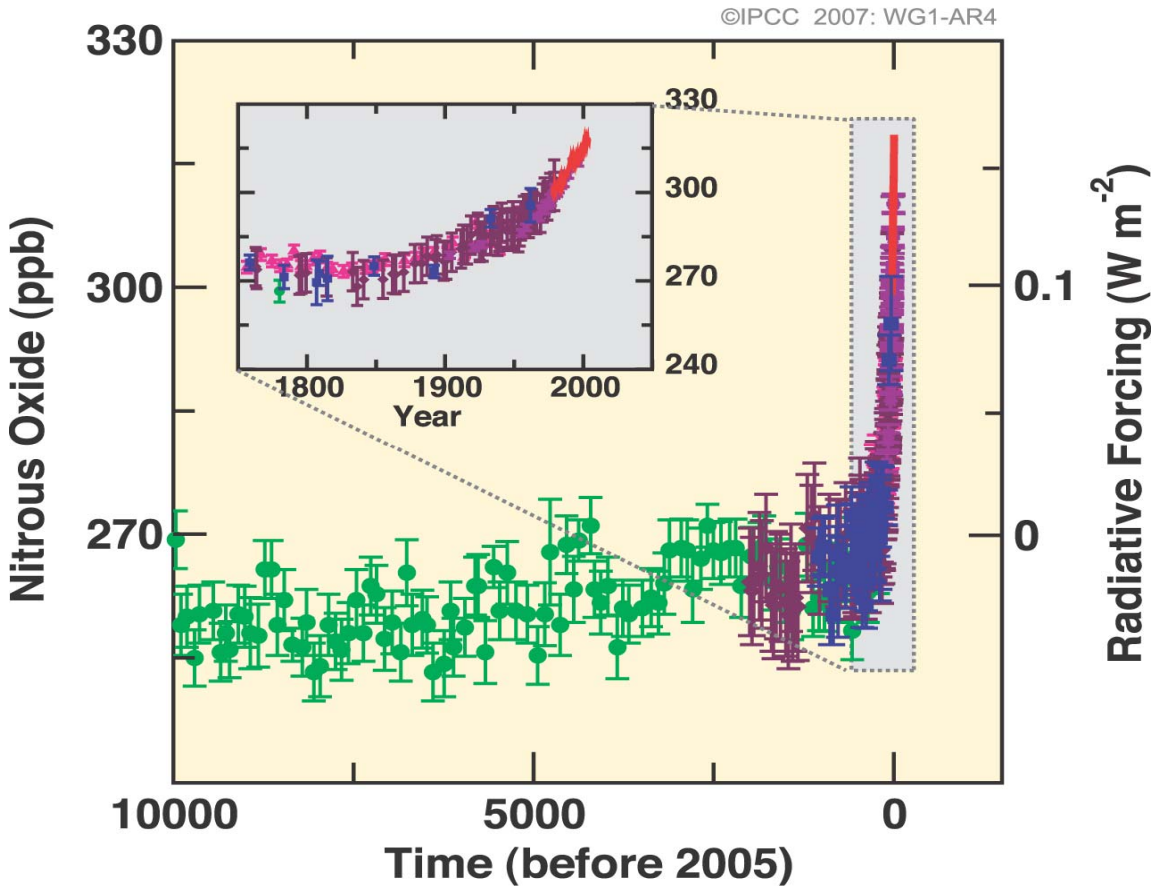
Human and Natural Drivers of Climate Change
气候变化的人和自然驱动因子



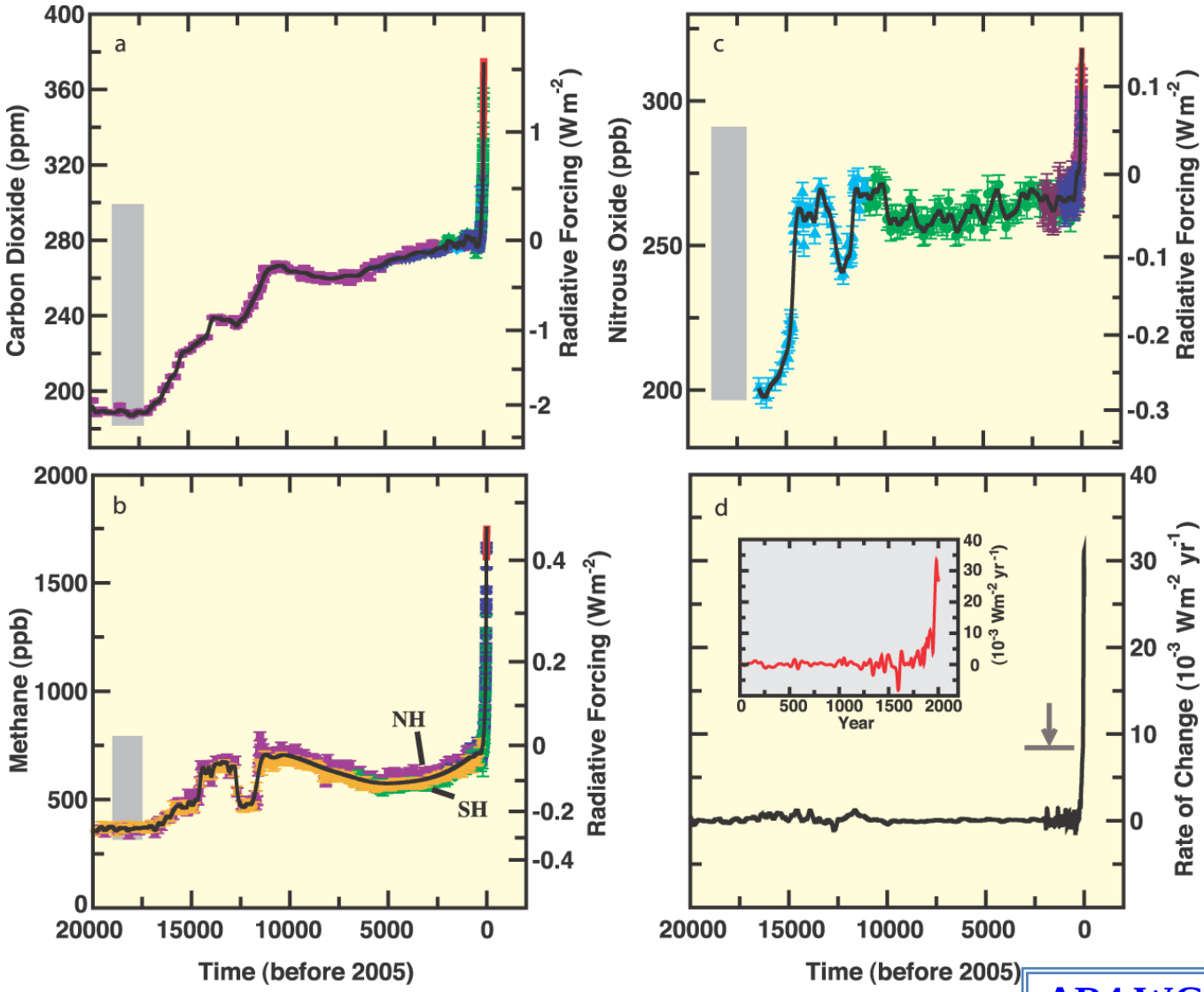
AR4 WG I (2007)

Human and Natural Drivers of Climate Change
气候变化的人和自然驱动因子



AR4 WG I (2007)

Human and Natural Drivers of Climate Change
气候变化的人和自然驱动因子



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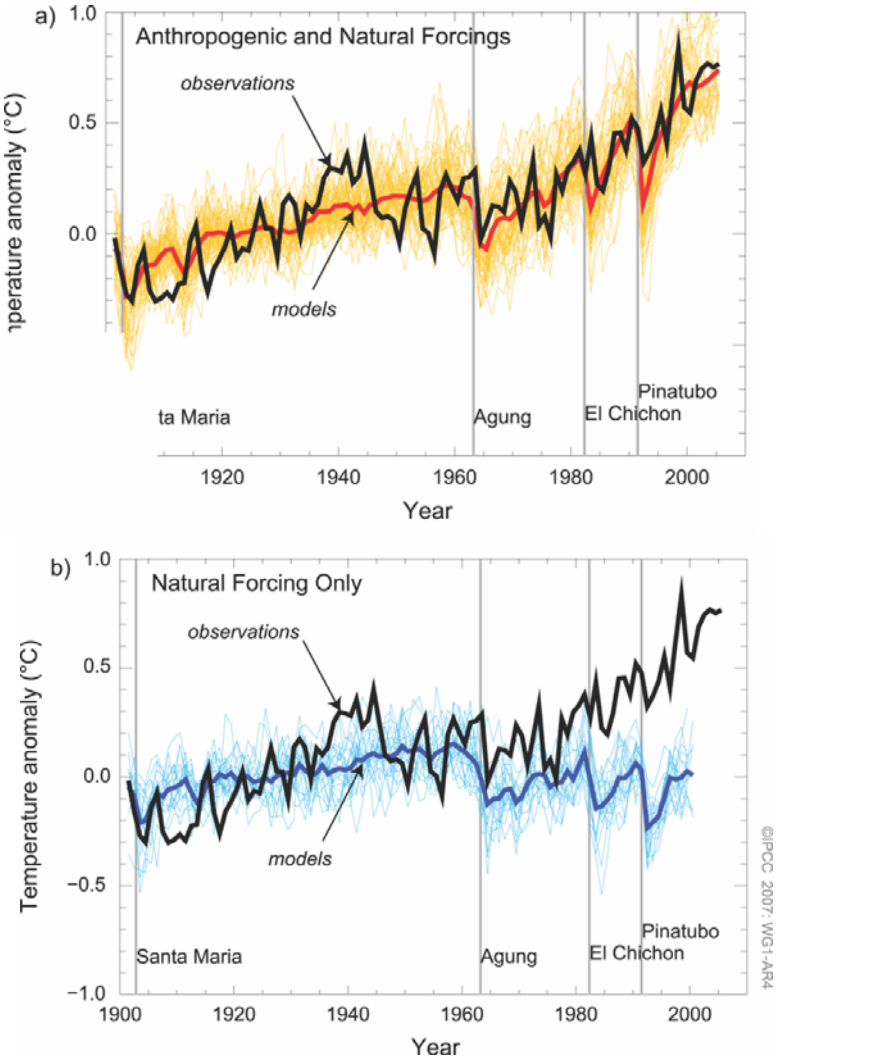
Anthropogenic Warming
人为升温

- Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations.
- It is likely that there has been significant anthropogenic warming over the past 50 years averaged over each continent

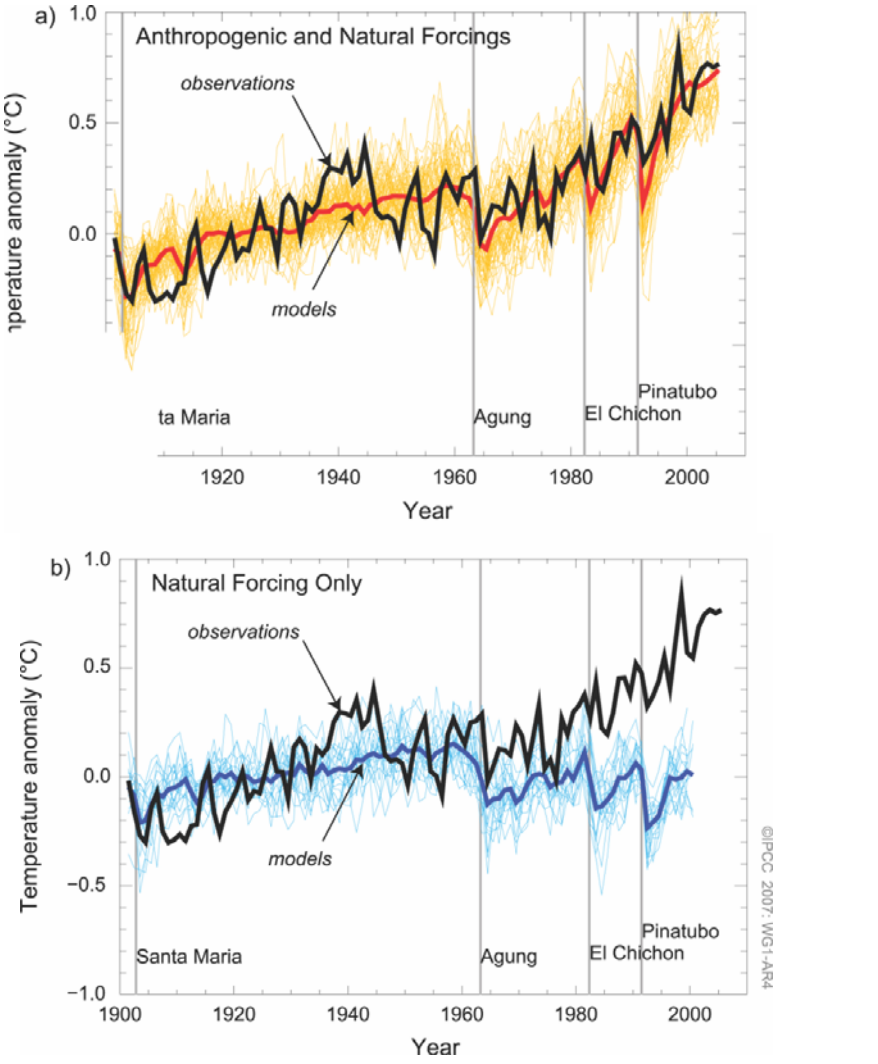


AR4 WG I (2007)

- **Most of the observed increase in global average temperatures since the**

  Virtually certain **> 99% probability of occurrence,**
  Extremely likely **>95%,**
  Very likely **> 90%,**
  Likely **> 66%,**
  More likely than not **> 50%,**
  Unlikely **< 33%,**
  Very unlikely **< 10%,**
  Extremely unlikely **< 5%**

  over the past 50 years averaged over each continent



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Greenhouse Gases (GHGs)
温室气体

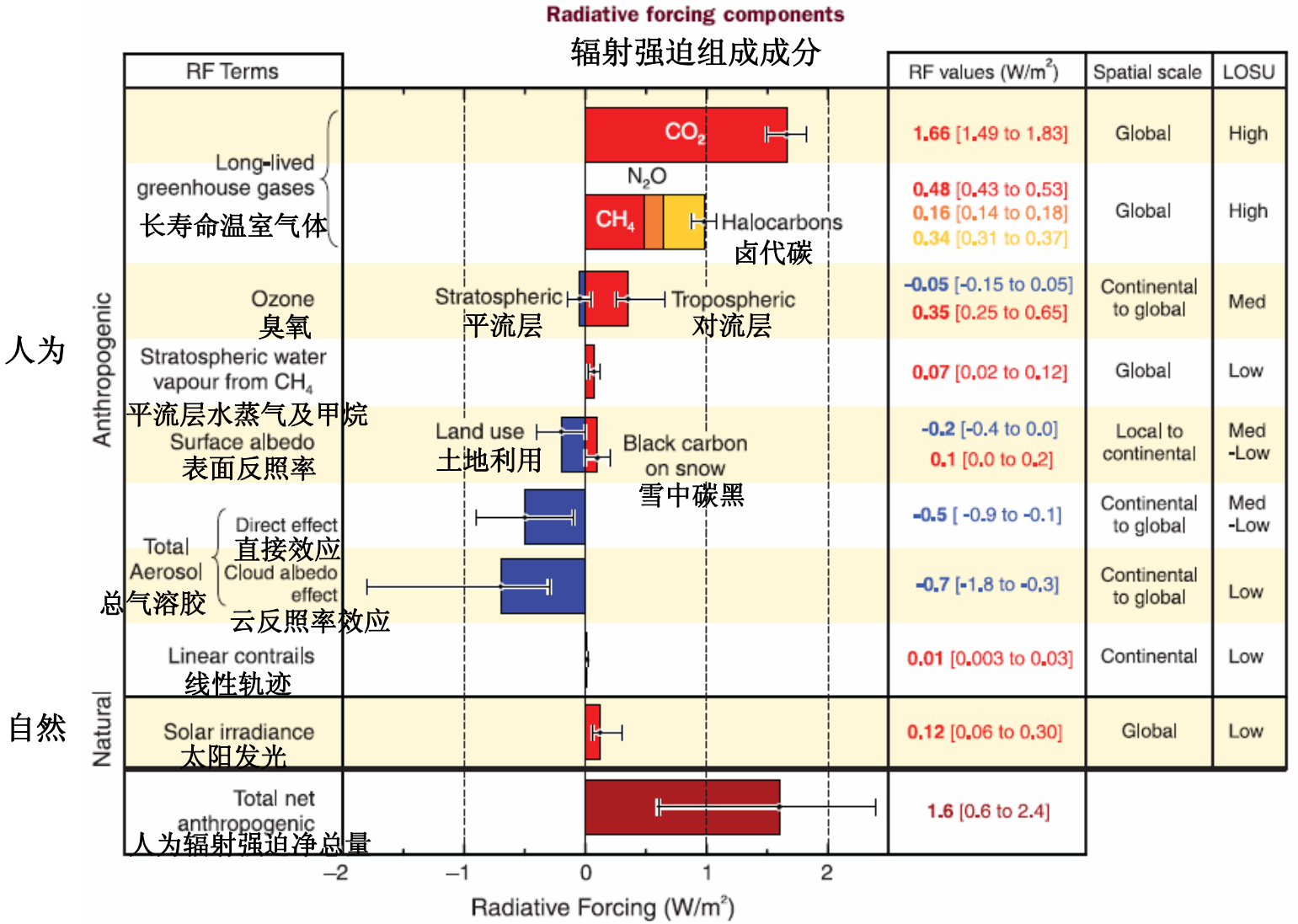
Name	Pre-industrial concentration (ppmv *)	Concentration in 1998 (ppmv)	Atmospheric lifetime (years)	Main human activity source	GWP **
Water vapour	1 to 3	1 to 3	a few days	-	-
Carbon dioxide (CO_2)	280	365	variable	fossil fuels, cement production, land use change	1
Methane (CH_4)	0,7	1,75	12	fossil fuels, rice paddies waste dumps, livestock	23
Nitrous oxide (N_2O)	0,27	0,31	114	fertilizers, combustion industrial processes	296
HFC 23 (CHF_3)	0	0,000014	260	electronics, refrigerants	12 000
HFC 134 a (CF_3CH_2F)	0	0,0000075	13,8	refrigerants	1 300
HFC 152 a (CH_3CHF_2)	0	0,0000005	1,4	industrial processes	120
Perfluoromethane (CF_4)	0,00004	0,00008	> 50 000	aluminium production	5 700
Perfluoroethane (C_2F_6)	0	0,000003	10 000	aluminium production	11 900
Sulphur hexafluoride (SF_6)	0	0,0000042	3 200	dielectric fluid	22 200

* ppmv = parts per million by volume, ** GWP = Global warming potential (for 100 year time horizon).

UNEP | GRID Arendal

United Nations Environment Programme / GRID-Arendal

Global Mean Radiative Forcing
全球平均辐射强迫



AR4 WG I (2007)

Global Mean Radiative Forcing
全球平均辐射强迫

☑ Annual fossil CO_2 emissions increased from an average of 6.4 GtC per year in the 1990s, to 7.2 GtC per year in 2000-2005

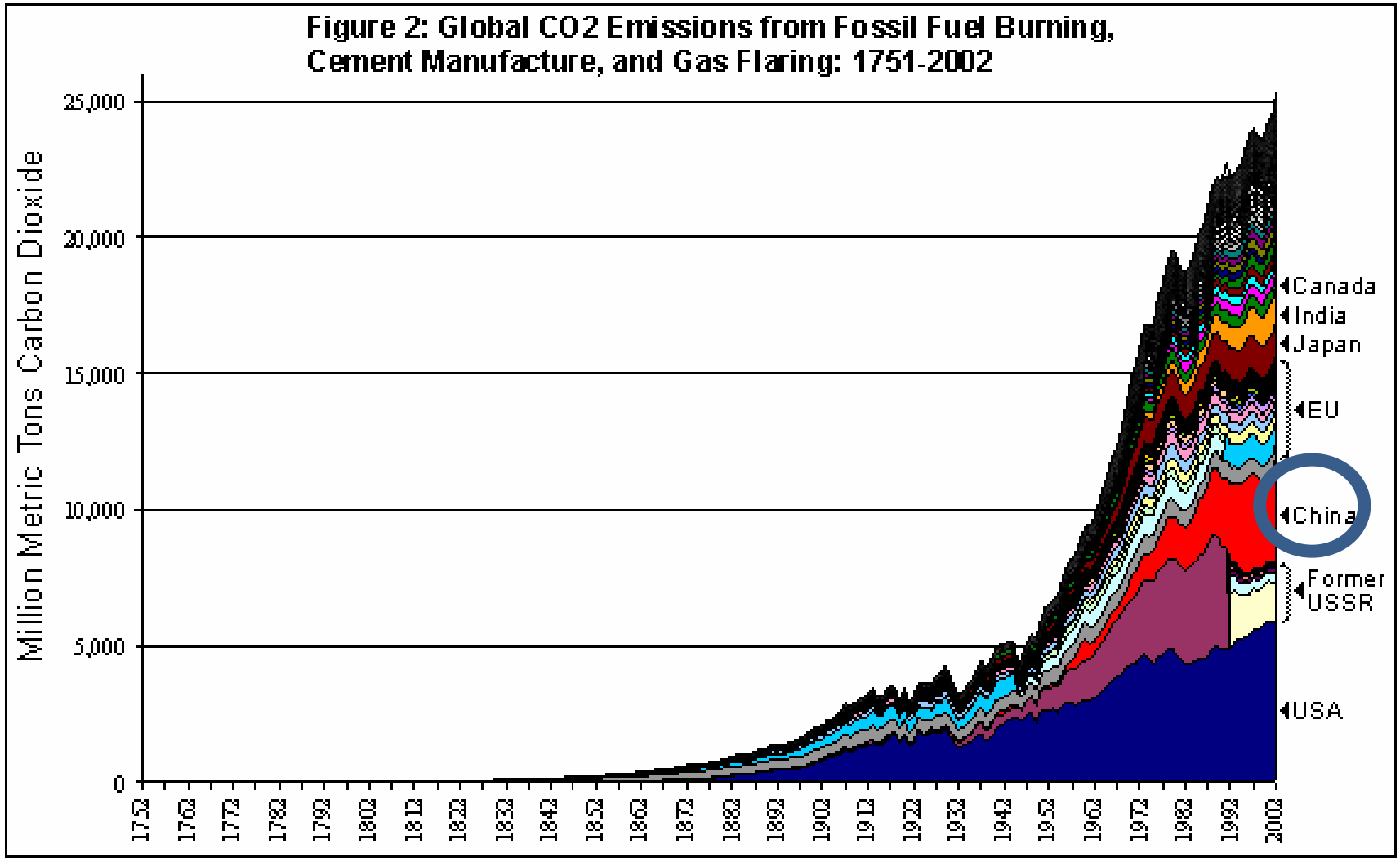
☑ CO_2 radiative forcing increased by 20% from 1995 to 2005, the largest in any decade in at least the last 200 years

☑ Changes in solar irradiance since 1750 are estimated to have caused a radiative forcing of +0.12 [+0.06 to +0.30] Wm^{-2}

☑ **The understanding of anthropogenic warming and cooling influences on climate has improved since the Third Assessment Report (TAR), leading to *very high confidence* that the globally averaged net effect of human activities since 1750 has been one of warming, with a radiative forcing of +1.6 [+0.6 to +2.4] W m^{-2}.**

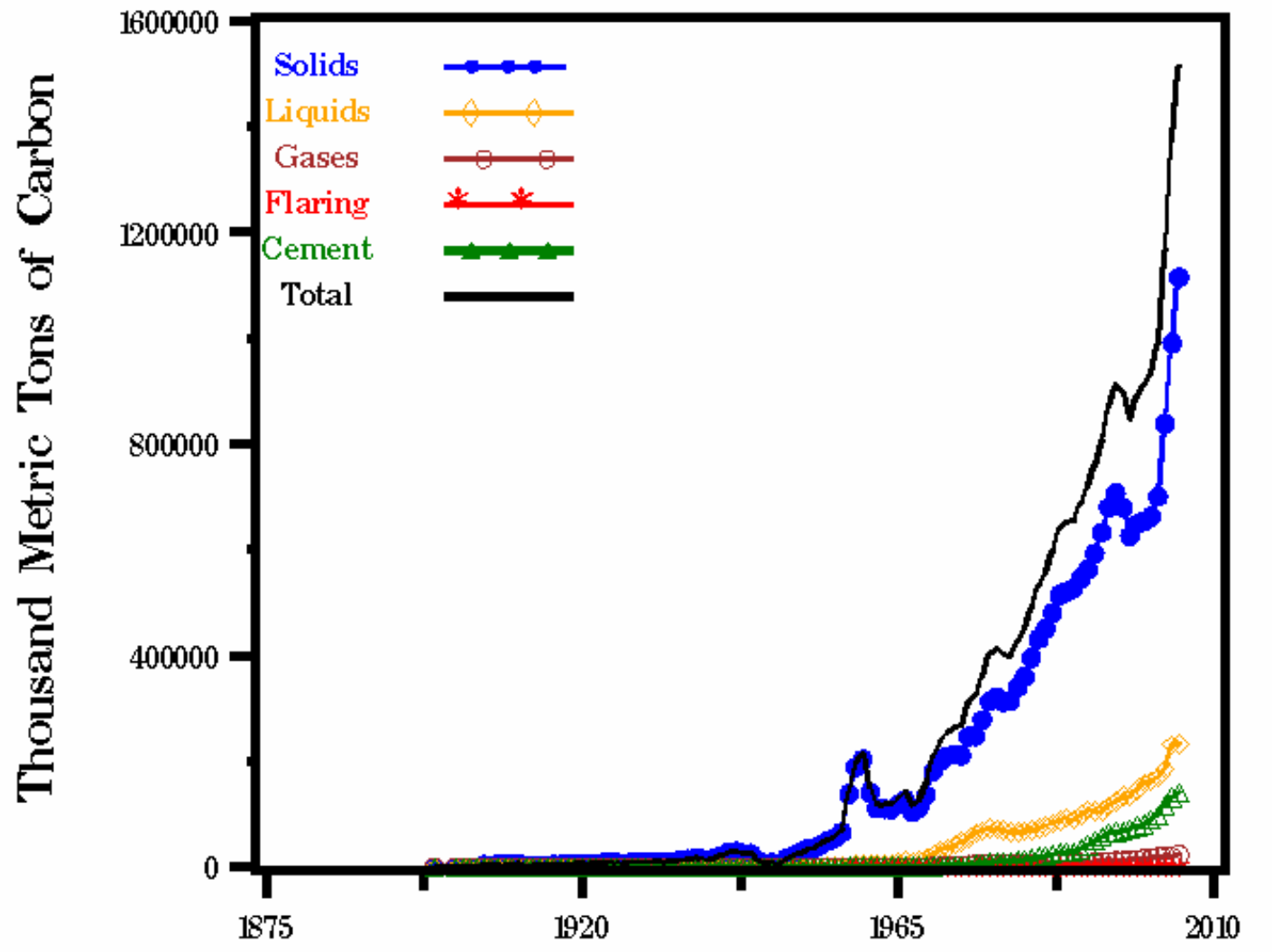
Source: IPCC Fourth Assessment Report

Historical Trends: Fossil Fuel CO_2
历史趋势：化石燃料中的CO_2



Reference: Carbon Dioxide Information Analysis Center

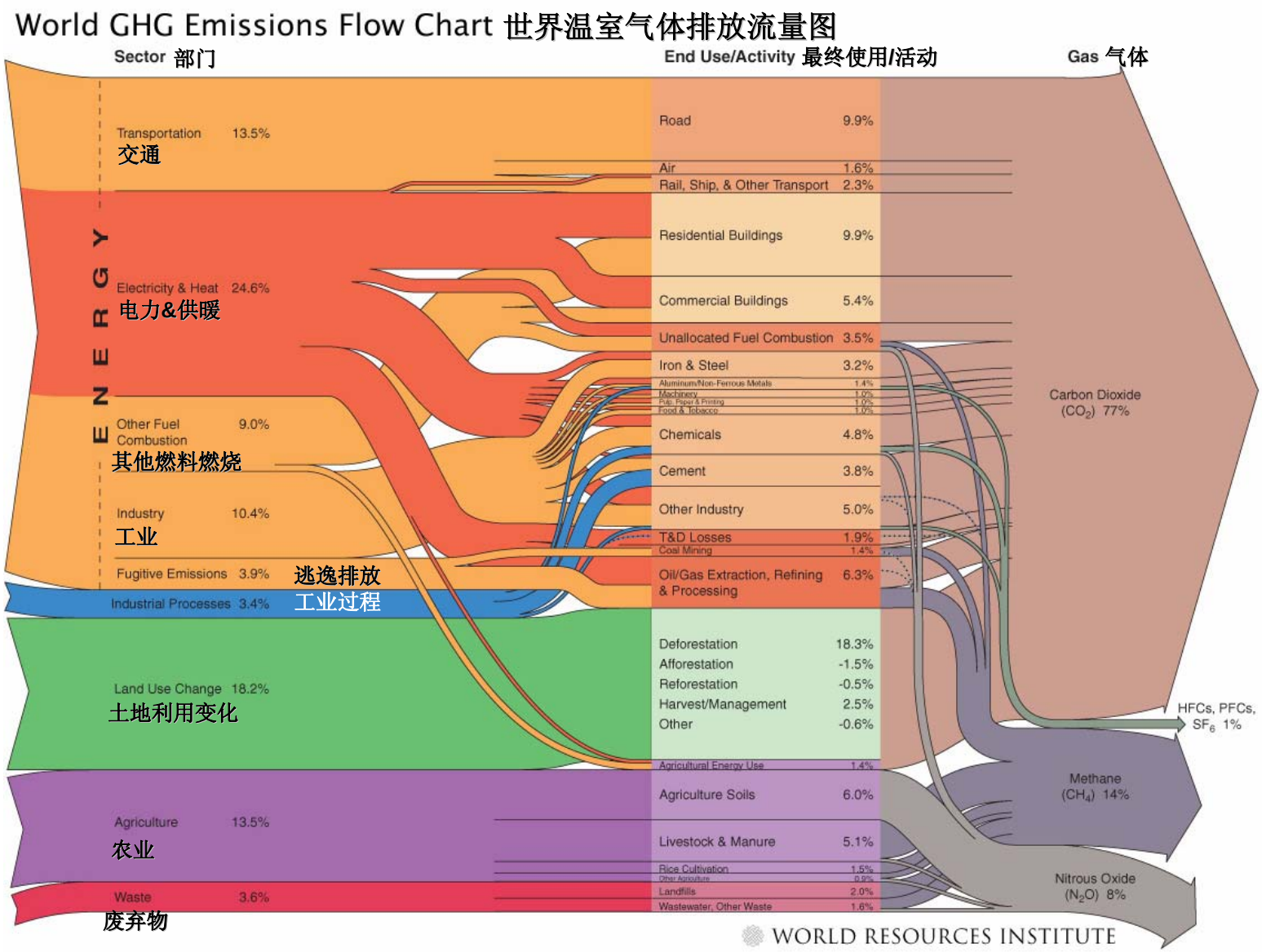
Fossil-Fuel CO_2 Emissions: PRC
中国化石燃料CO_2 排放



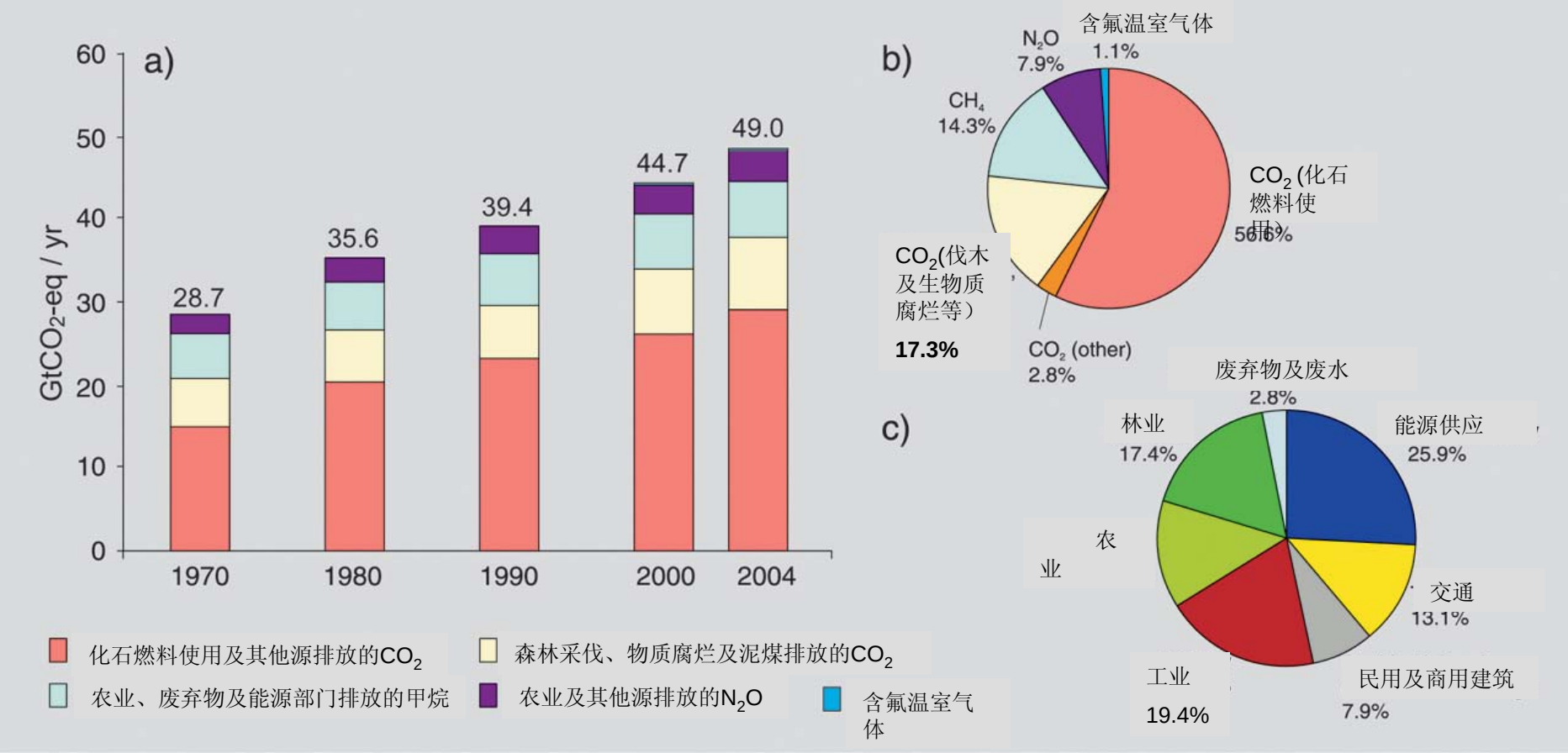
Source: CDIAC. http://cdiac.ornl.gov/trends/emis/prc.html

Sources of GHG Emissions
温室气体的主要排放源

GHGs Emissions Flow
温室气体排放流量



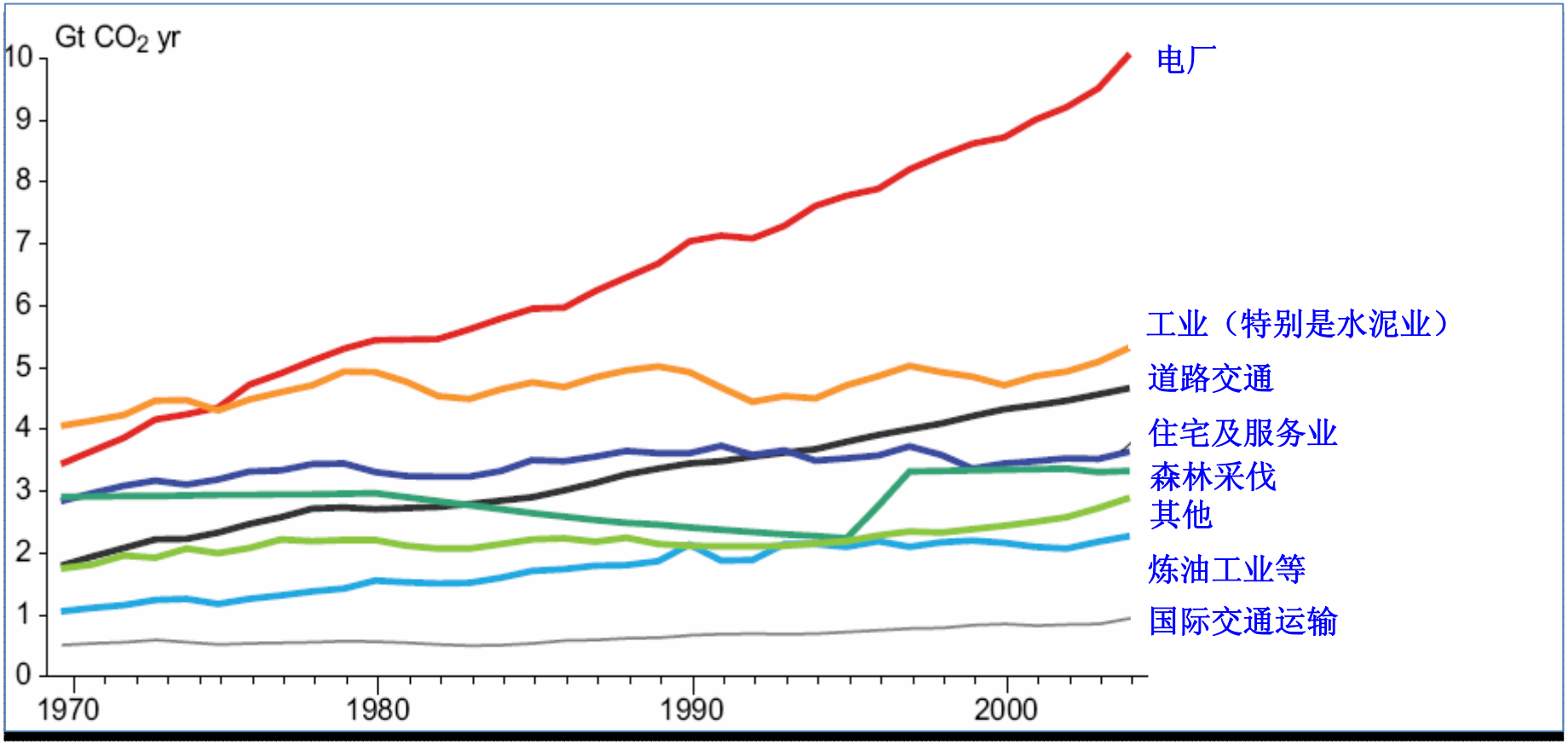
GHGs from Major Sources
温室气体主要源



AR4 WG I (2007)

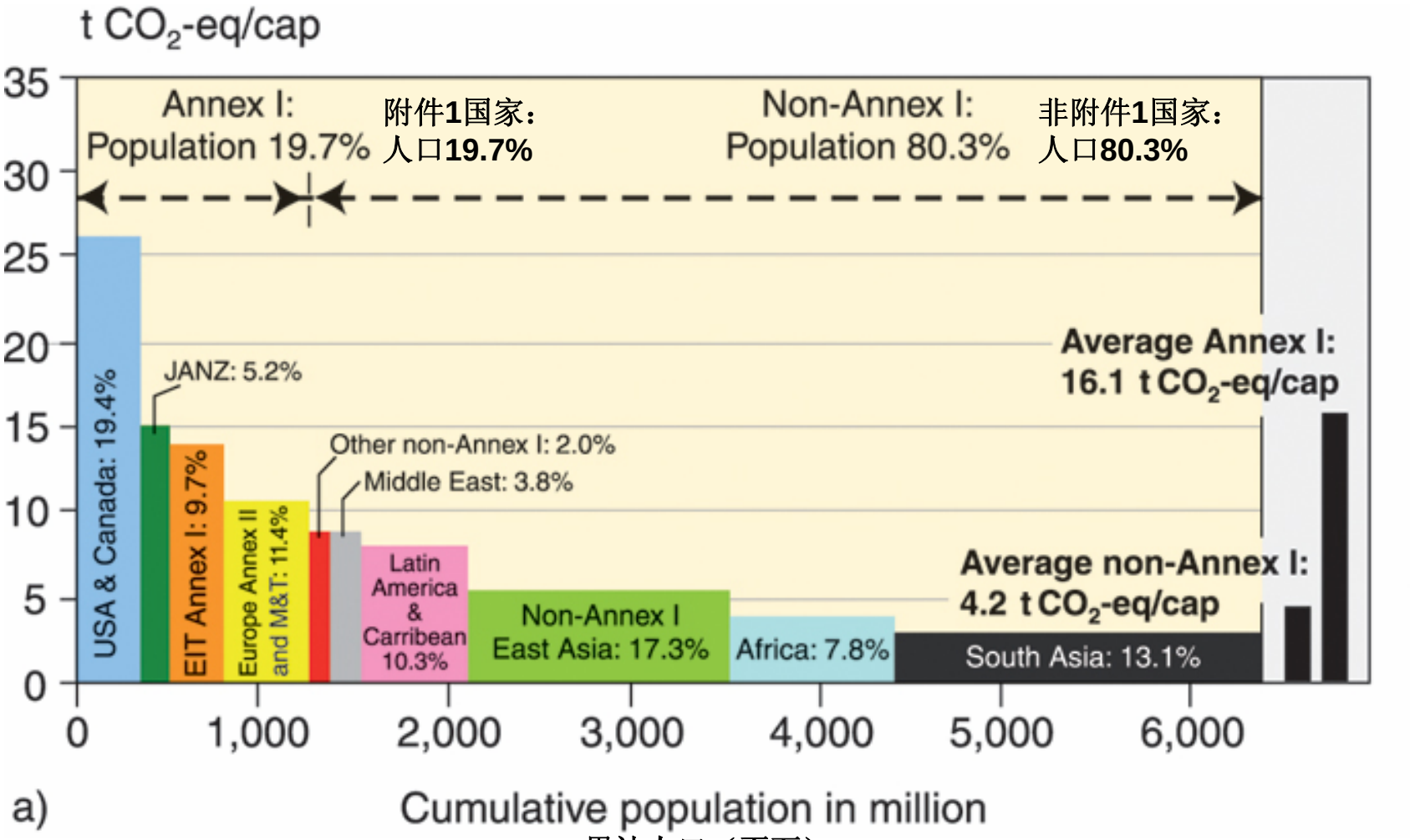
GHGs Sector Trends
各行业的温室气体排放趋势

不同源排放的温室气体
都在增加!!



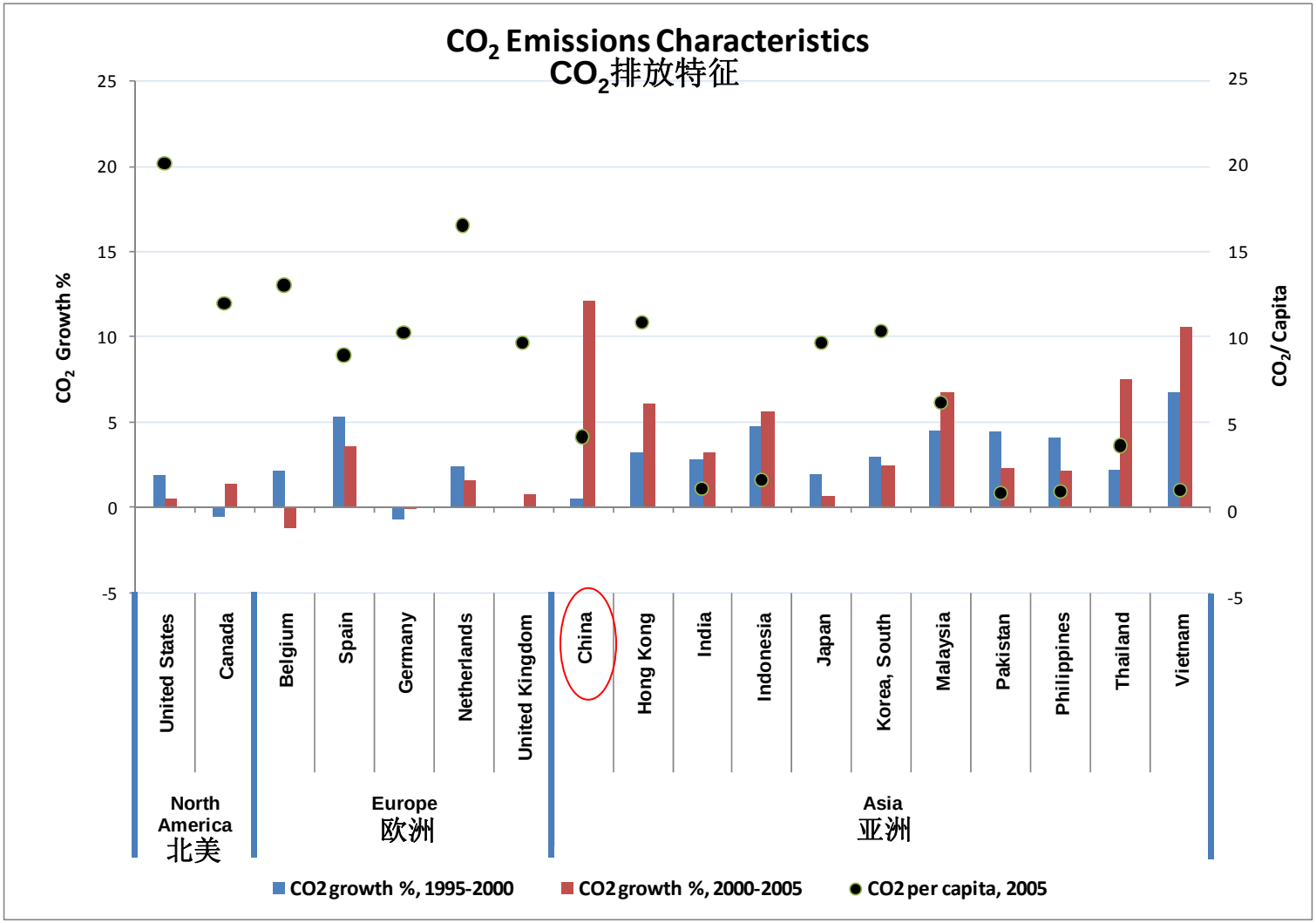
AR4 WG I (2007)

CO_2 Emissions/Capita by Region
按地区的CO_2人均排放量



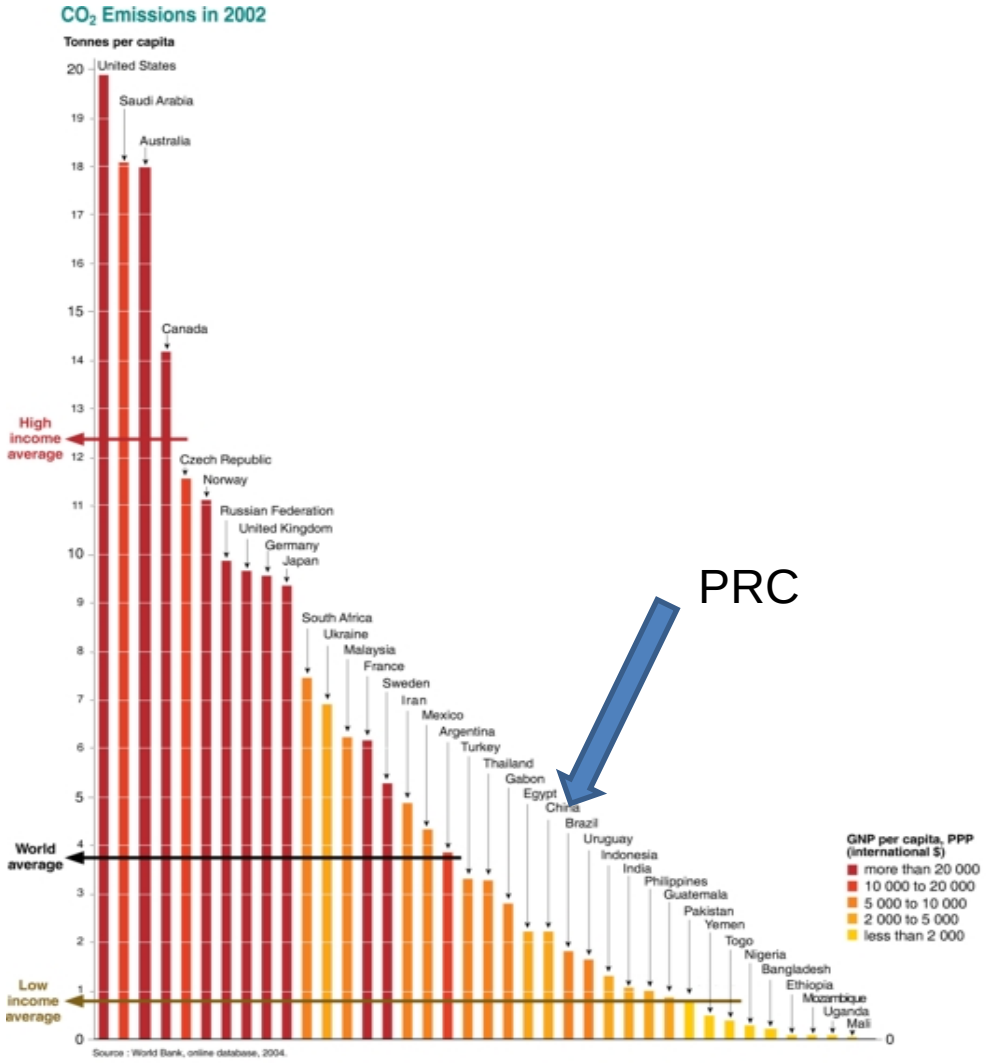
AR4 WG I (2007)

CO_2 Emission Characteristics of Selected Countries
不同国家CO_2排放特征



Source: World Bank. 2008. Towards a Strategic Framework on Climate Change and Development for the World Bank Group: Consultation Draft

Trends – CO_2 emissions
CO_2排放趋势



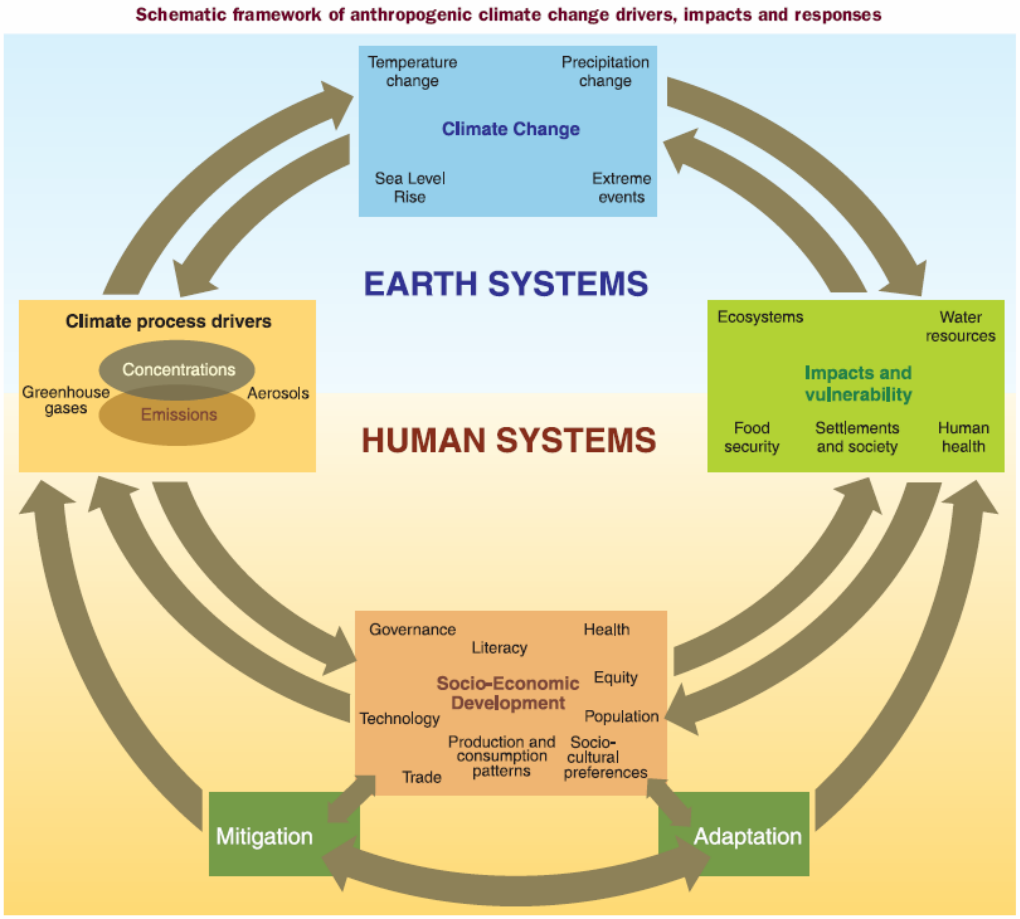
	Tons per capita	
	2004	2030
PRC	3.6	7.8
India	1.0	1.5
Other non-OECD	1.7	2.4
OECD-Europe	8.2	8.3
US	20.1	21.8

	人均（吨）	
	2004	2030
中国	3.6	7.8
印度	1.0	1.5
非经合组织国家	1.7	2.4
欧洲经合组织	8.2	8.3
美国	20.1	21.8

http://www.eia.doe.gov/oiaf/ieo/emissions.html

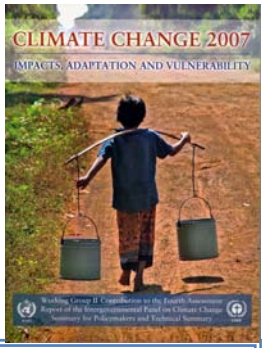
http://maps.grida.no/library/files/web_national_carbon_dioxide_co2_emissions_per_capita.jpg

Impacts of Climate Change
气候变化的影响



☑ 各大洲的许多自然系统受到区域气候变化和温度升高的影响

☑ 人类活动造成的升温已经对全球水平的物理和生态系统造成了影响。



AR4 WG II (2007)