Climate Change
What We Can Do To Improve The Current Situation

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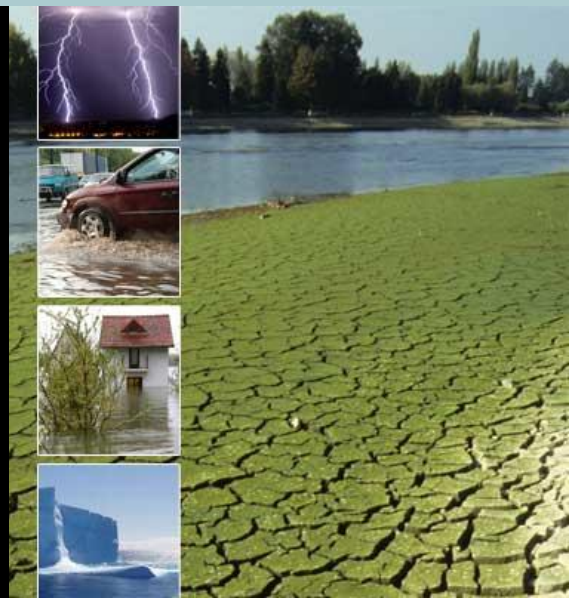
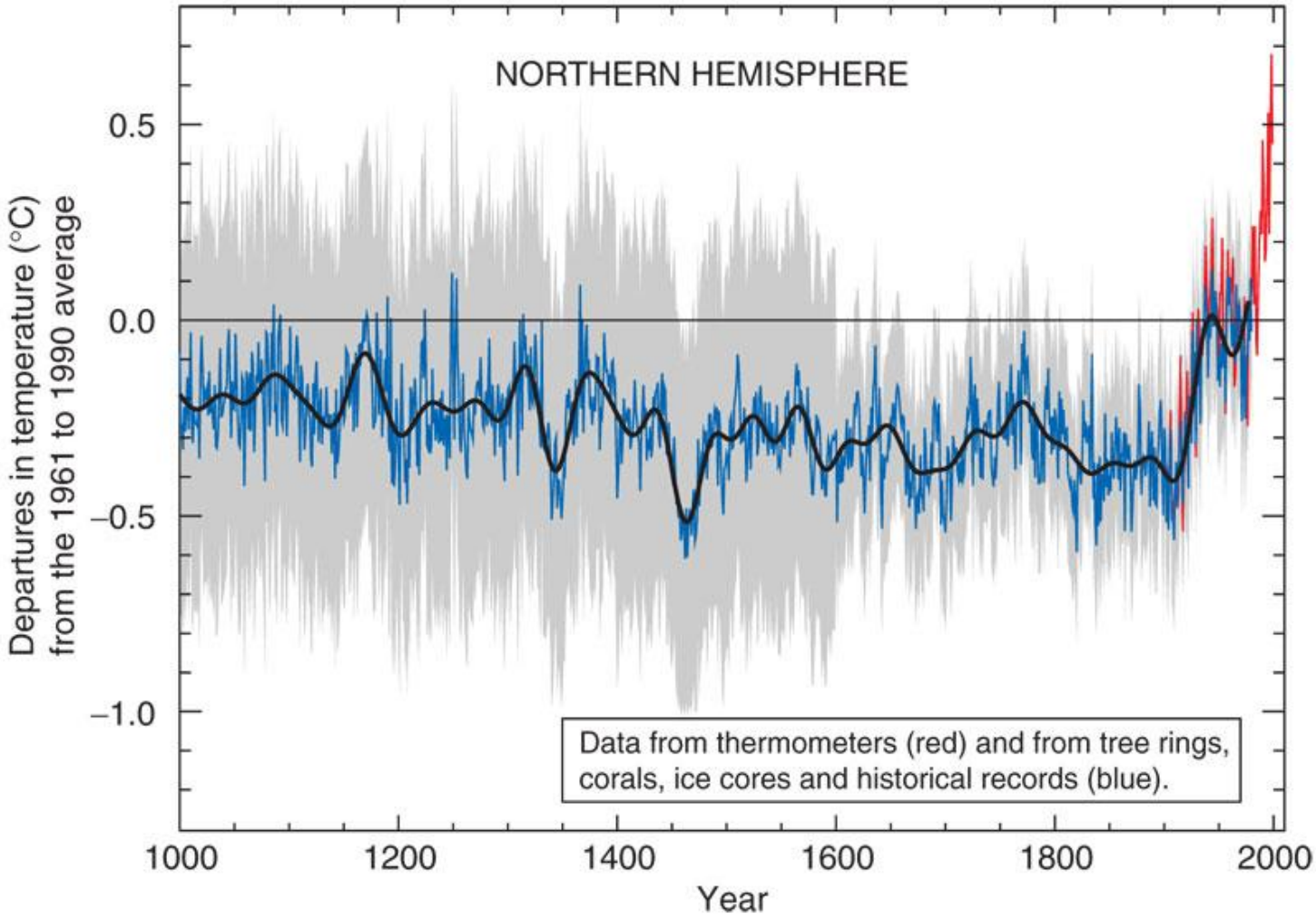
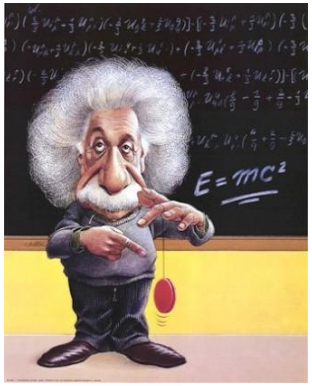
Green Buildings: Better Quality of Life, 6/11/2010



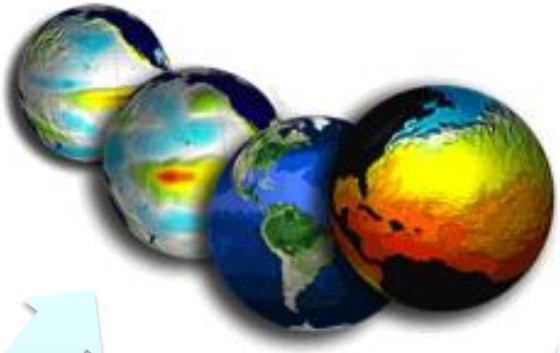
Climate Change Controversy

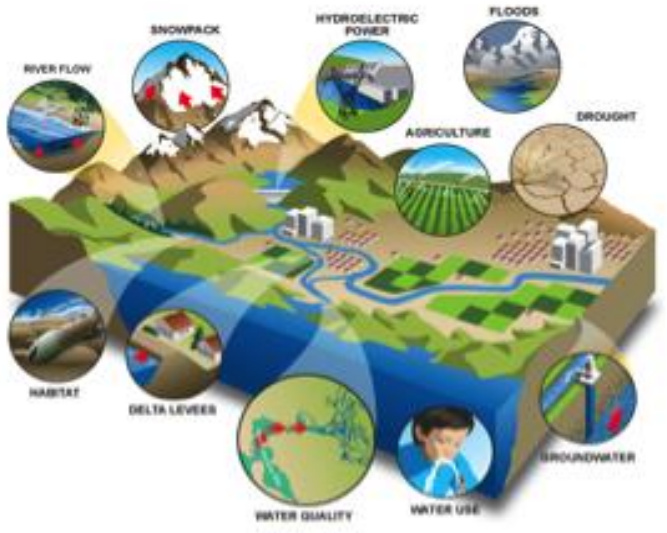




From IPCC TAR 2001 adapted from Mann 1999

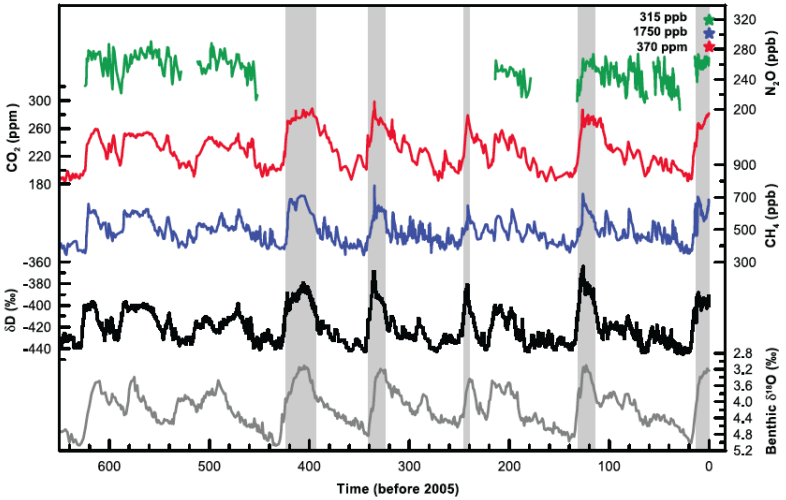
Climate Change, Environment, And Developments

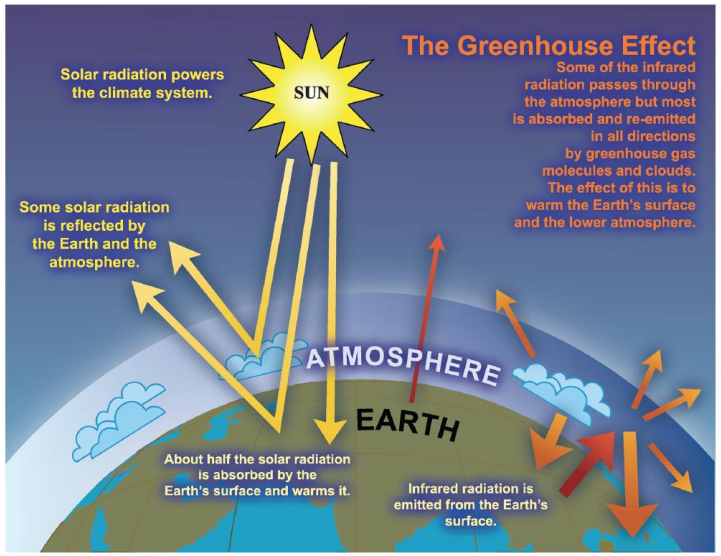




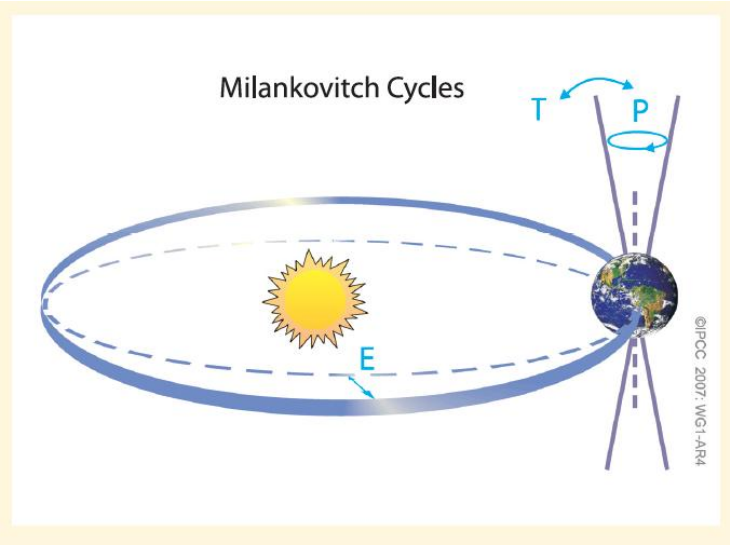
Historical Climate Pattern

- Geomorphology and paleontology evidence
  - Warmer and colder climatic oscillations
  - Repeating abrupt climate changes
- Astronomical driver as ‘pacemaker’
  - ~20,000, 40,000, 100,000 years cycles
  - Directly caused small temperature rise
- GHG influence
  - Lagging positive feedback



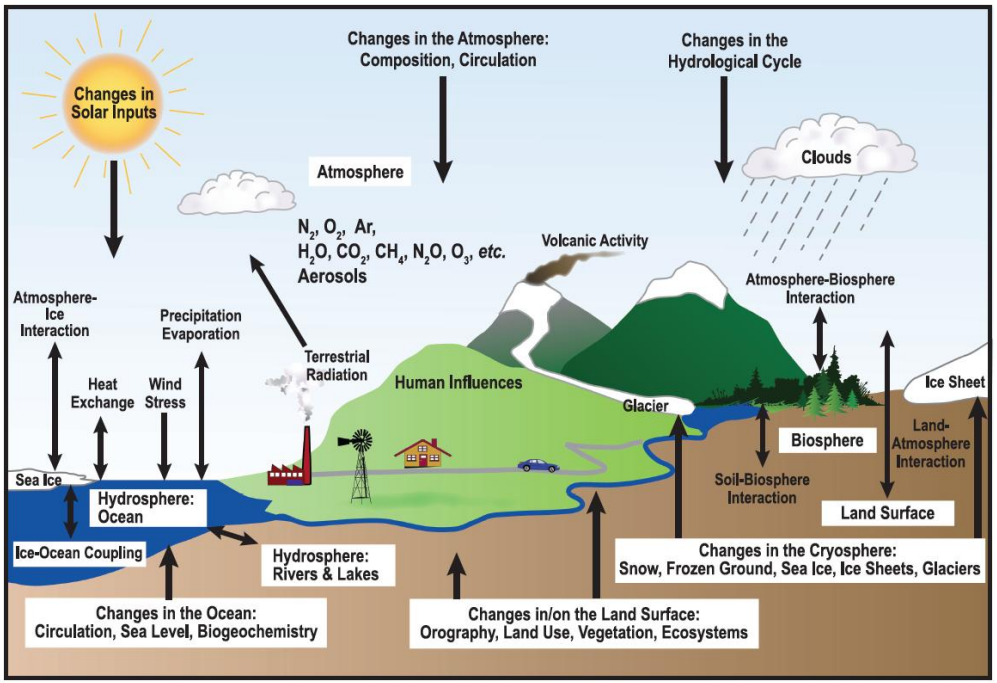


FAQ 1.3, Figure 1. *An idealised model of the natural greenhouse effect. See text for explanation.*

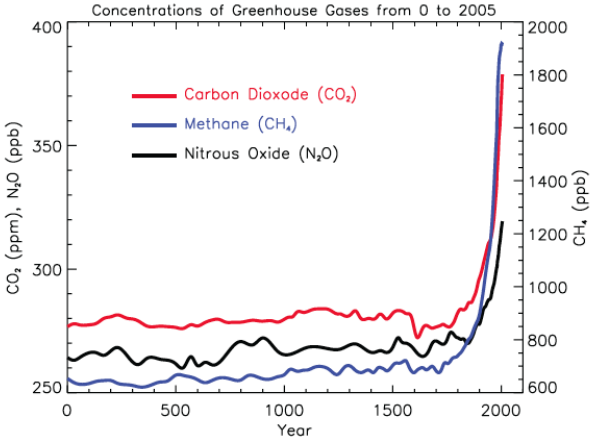


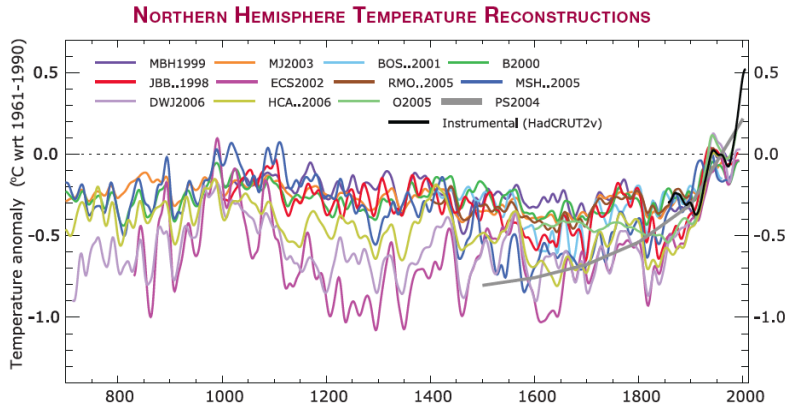
From IPCC AR4 2007

Anthropogenic Influence Controversy



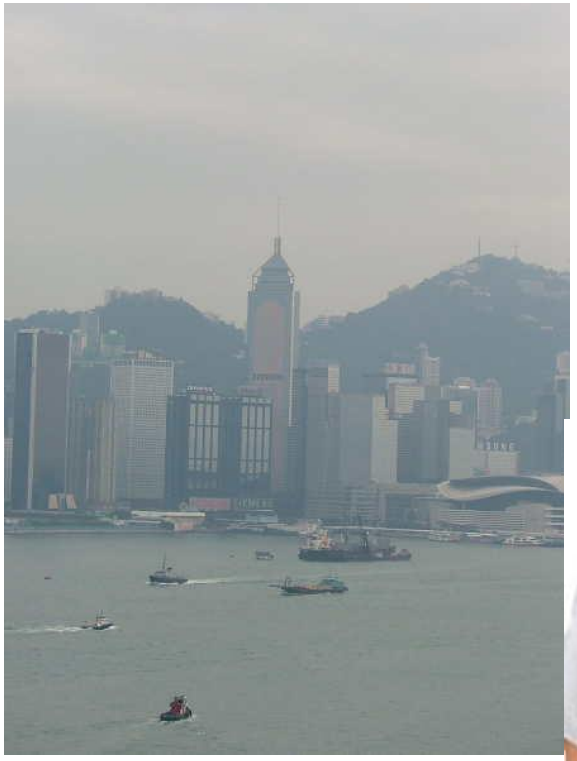
FAQ 1.2, Figure 1. *Schematic view of the components of the climate system, their processes and interactions.*

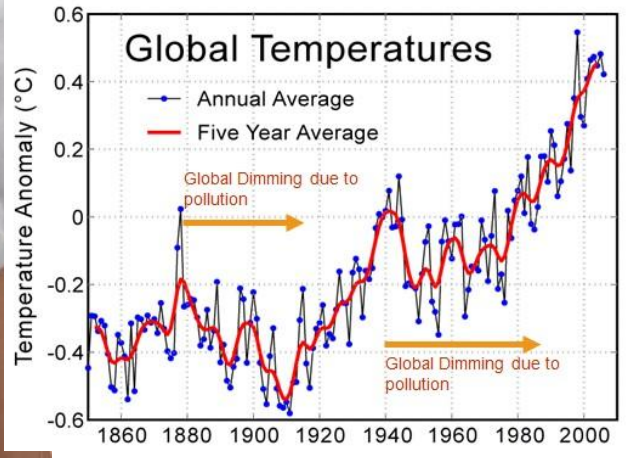




From IPCC AR4

Global Dimming ???





Global Anthropogenic GHG Emissions

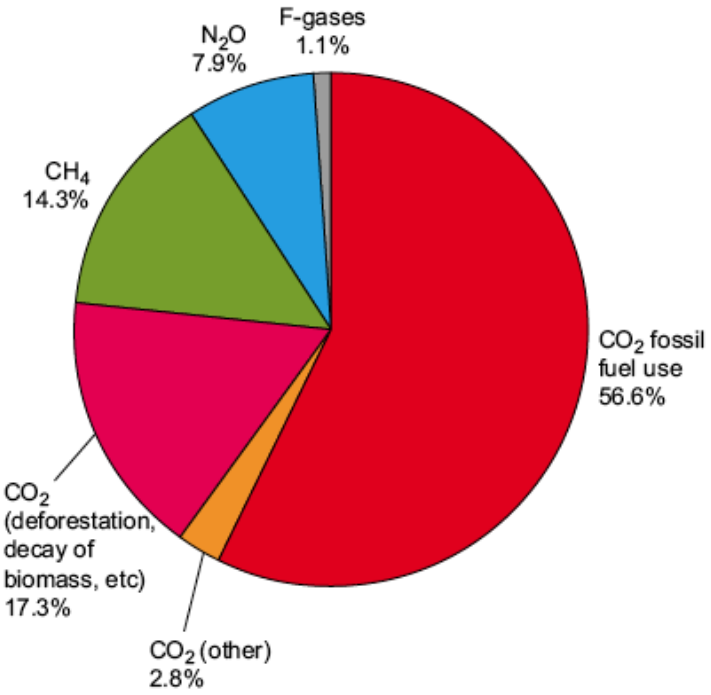


Figure TS.1b: *Global anthropogenic greenhousegas emissions in 2004*

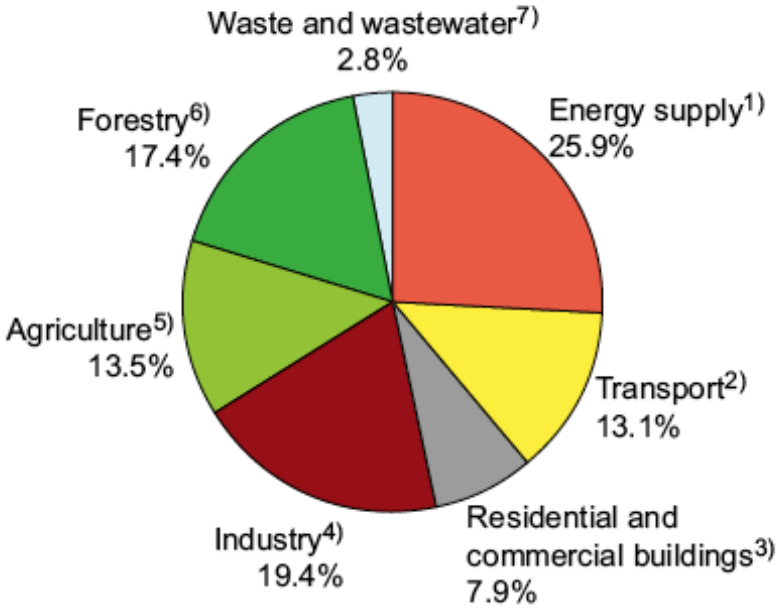


Figure TS.2b: *GHG emissions by sector in 2004 [Figure 1.3b].*

From IPCC AR4 2007

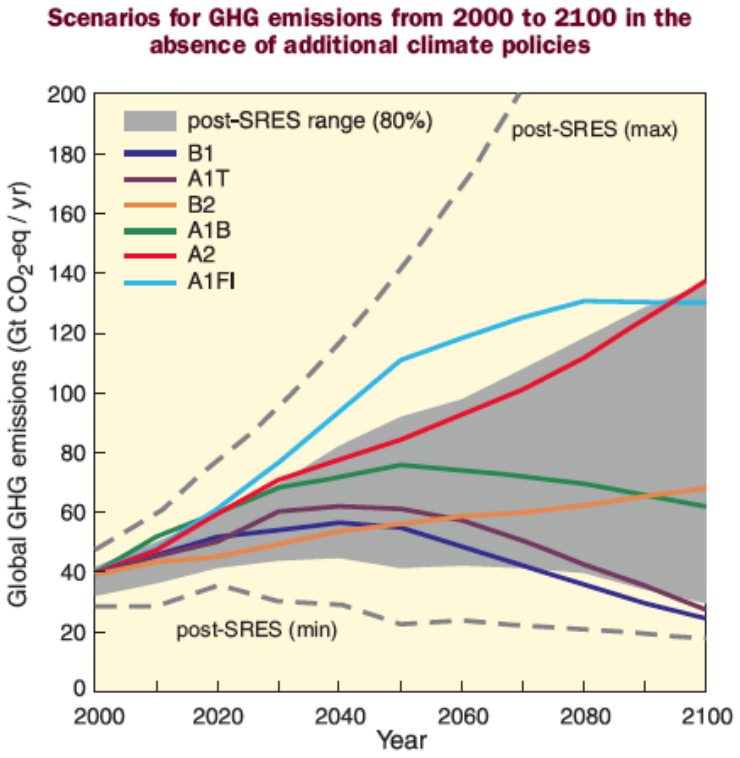
Future Emission Scenarios

Economic emphasis →

A1 storyline	A2 storyline
World: market-oriented Economy: fastest per capita growth Population: 2050 peak, then decline Governance: strong regional interactions; income convergence Technology: three scenario groups: • **A1FI**: fossil intensive • **A1T**: non-fossil energy sources • **A1B**: balanced across all sources	World: differentiated Economy: regionally oriented; lowest per capita growth Population: continuously increasing Governance: self-reliance with preservation of local identities Technology: slowest and most fragmented development
B1 storyline	**B2 storyline**
World: convergent Economy: service and information based; lower growth than A1 Population: same as A1 Governance: global solutions to economic, social and environmental sustainability Technology: clean and resource-efficient	World: local solutions Economy: intermediate growth Population: continuously increasing at lower rate than A2 Governance: local and regional solutions to environmental protection and social equity Technology: more rapid than A2; less rapid, more diverse than A1/B1

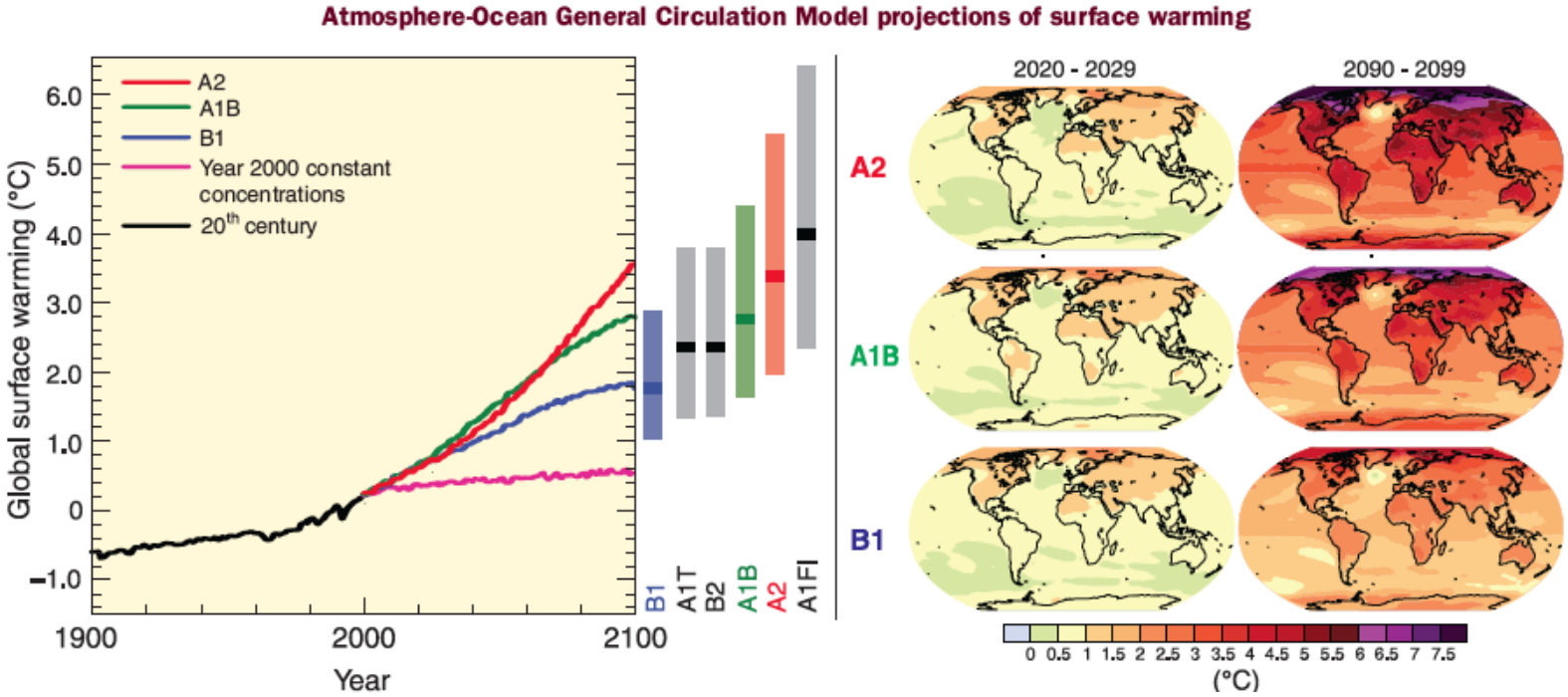
Global integration ↑ Regional emphasis ↓

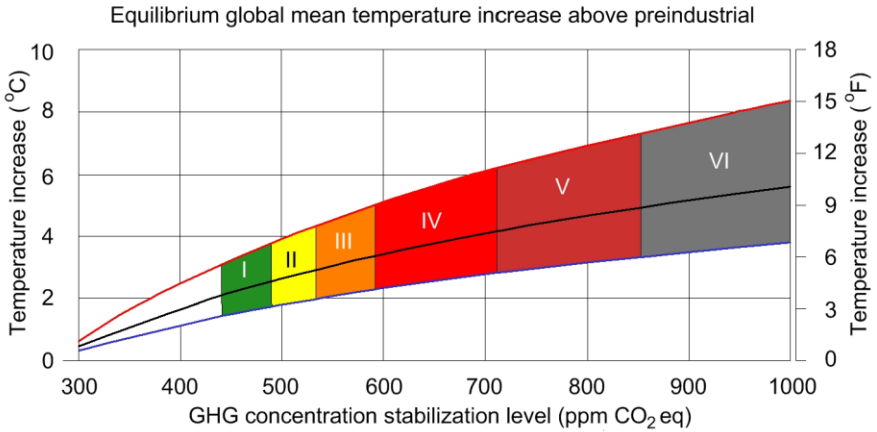
← Environmental emphasis



From IPCC AR4

Future Climate Prediction





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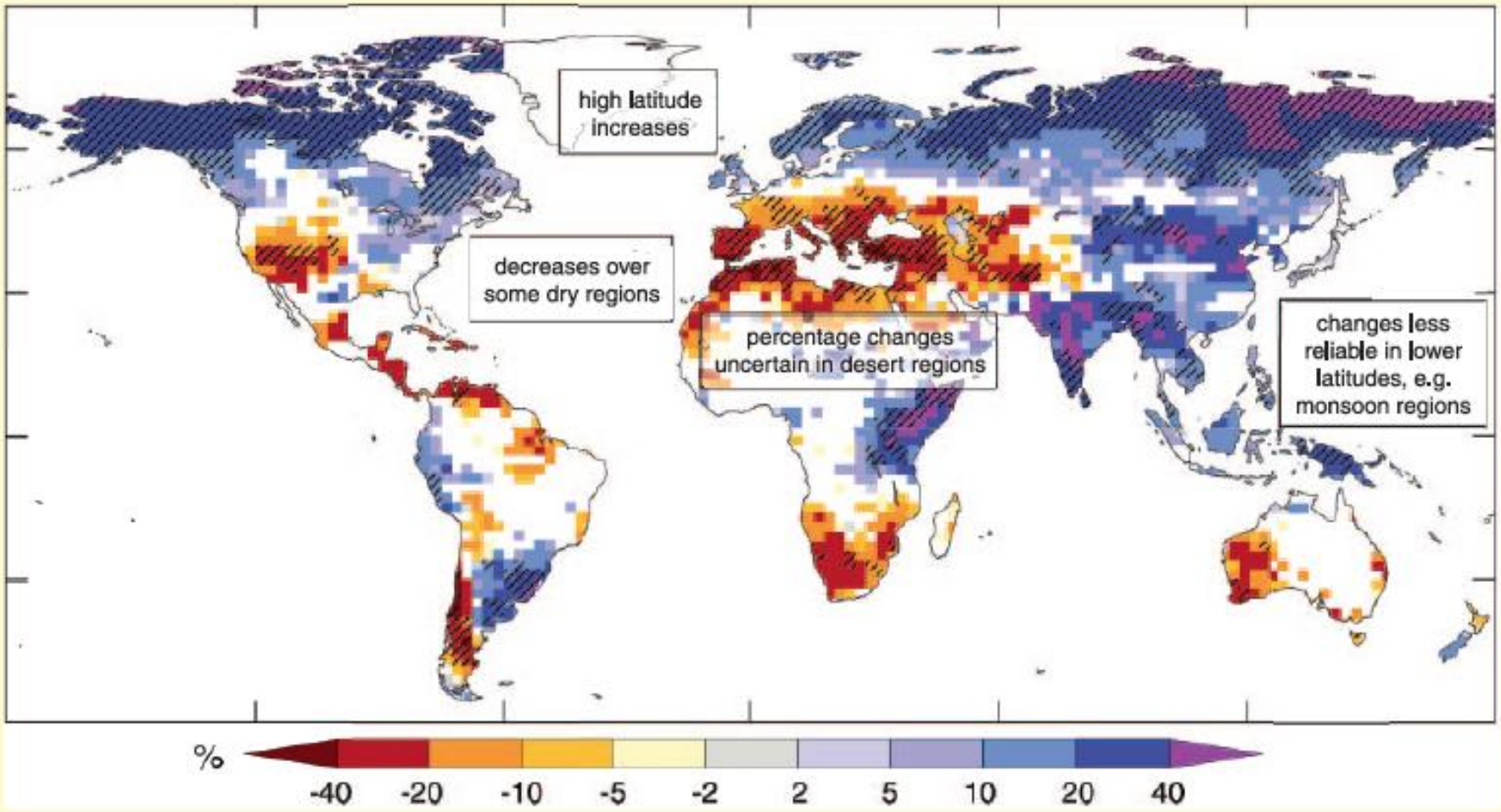
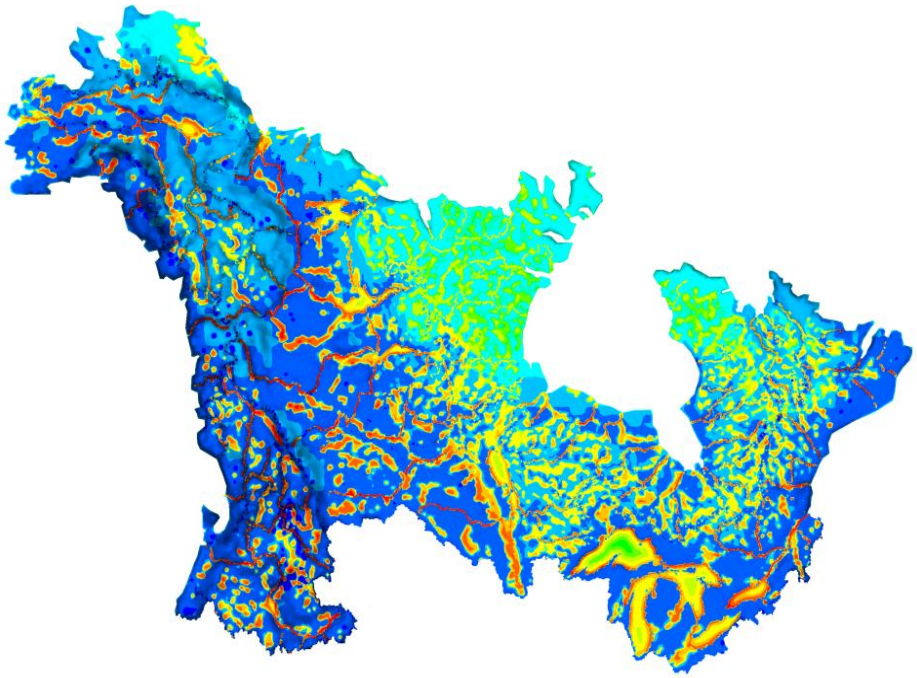
Climate Change and Water Resources

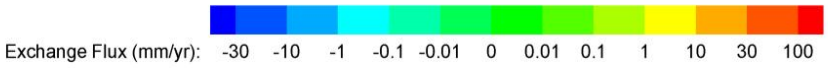


From IPCC AR4

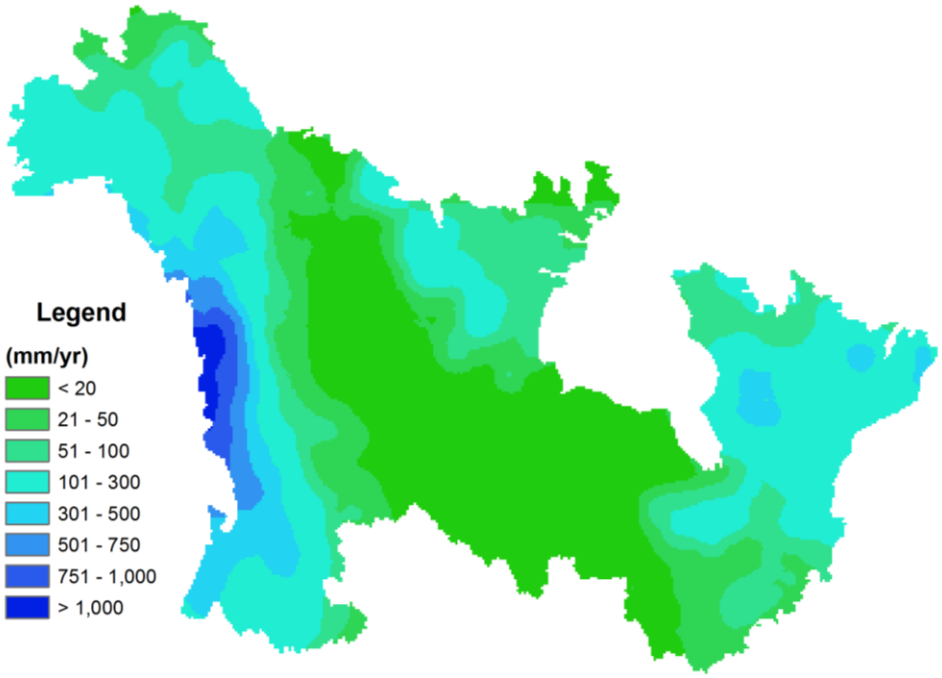
Hydrologic-Climate Models

Exchange Flux by HGS





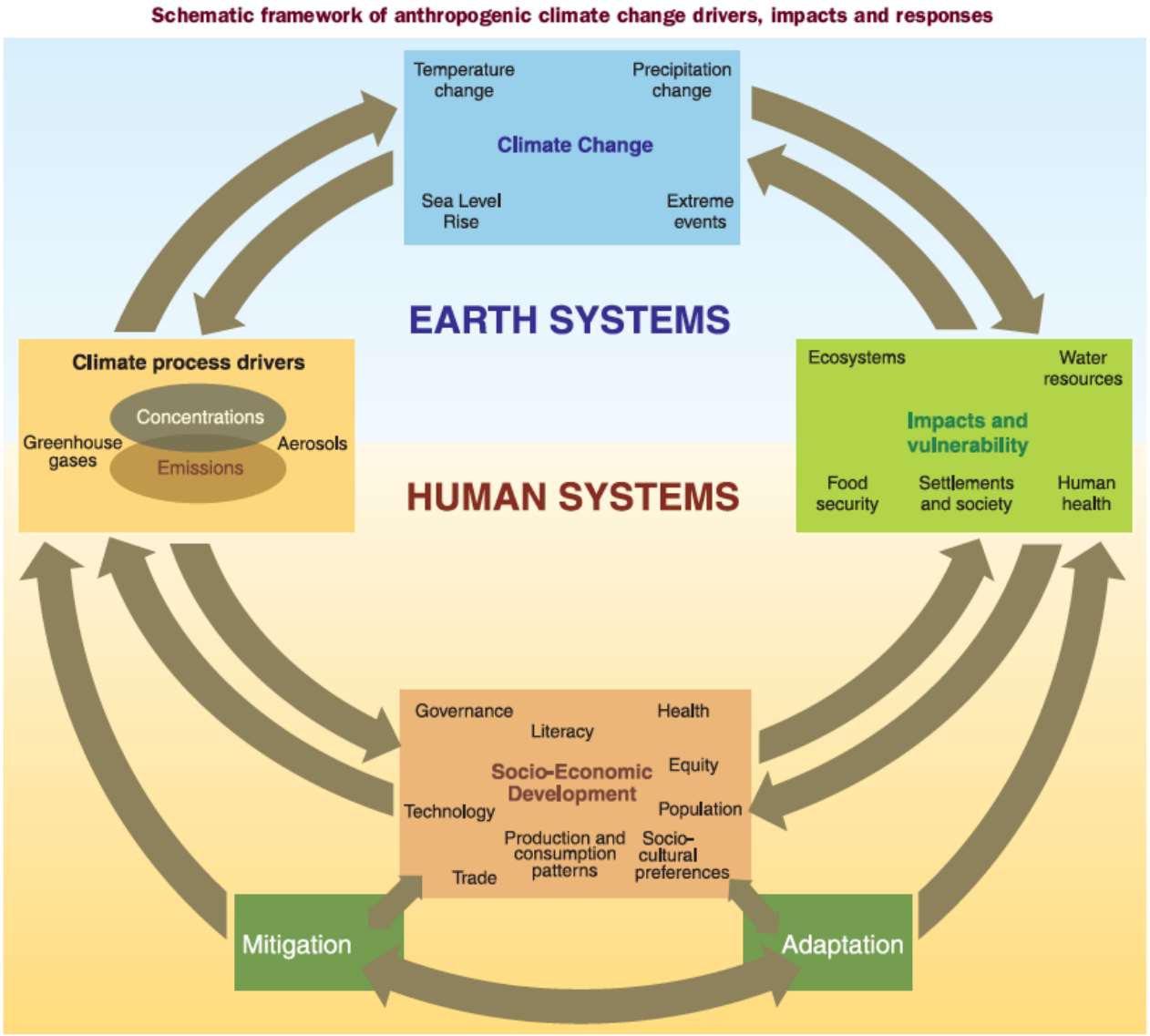
Infiltration Flux by CCSM3.0



- Infiltration + Discharge

From University of Waterloo

Anthropogenic Climate Change Drivers, Impacts, and Responses



From IPCC AR4 2007

Mitigation and Adaptation Concepts

- Reduce GHG
  - Capture and storage
    - Carbon dioxide sequestration
    - Heat sinks
  - Decrease emissions
    - Cut back consumption of products and operations that emit GHG
    - Use products and operations that emit less GHG
- Adapt to climate change
  - Global warming and more extreme weather
  - Lead to higher evaporation, large instantaneous runoff, reduce groundwater recharge, sea water level rise, salinity and acidity change
  - Affect freshwater systems, ecosystems, food, coastal systems, health
  - Adaptation at multiple levels

Carbon Dioxide Capture and Storage (CCS)

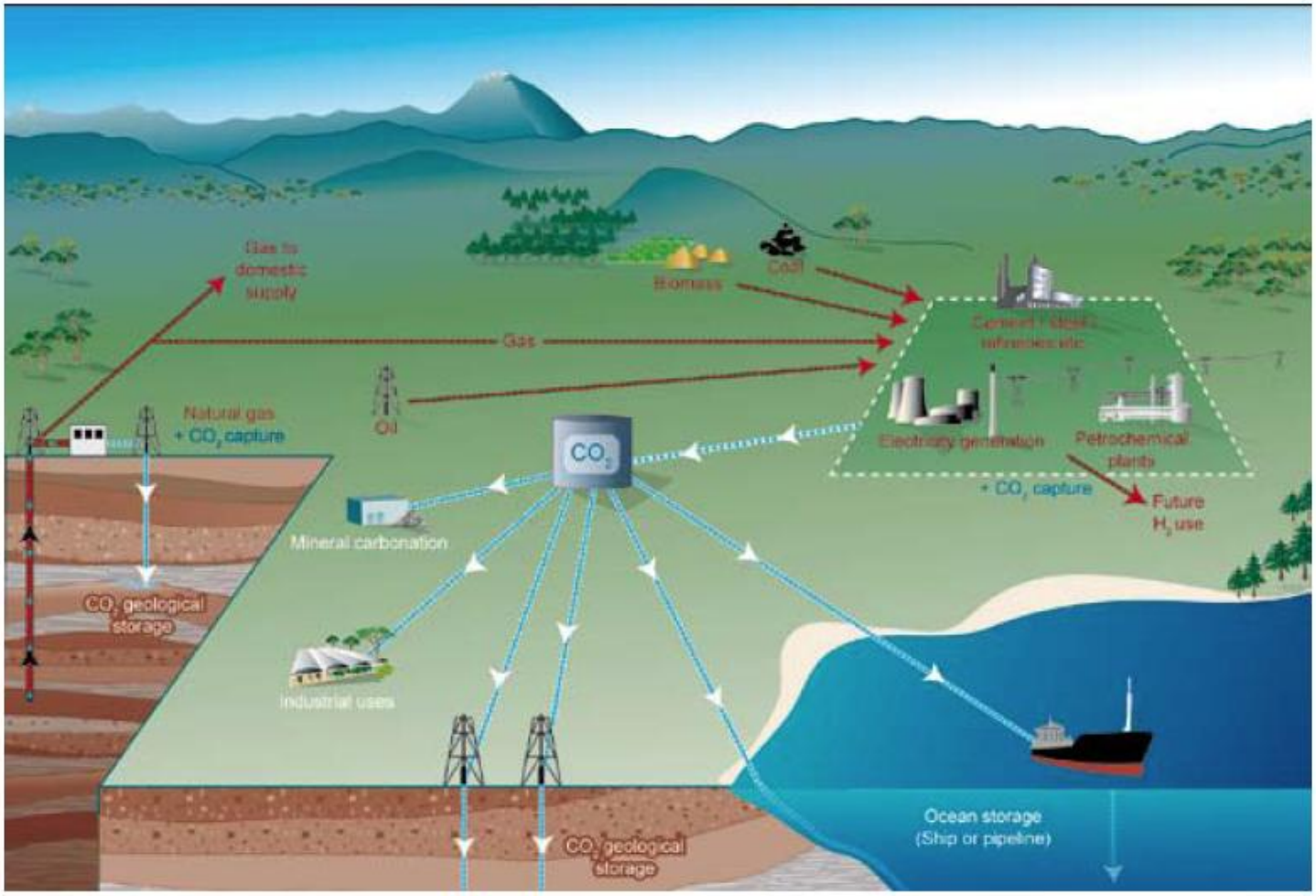
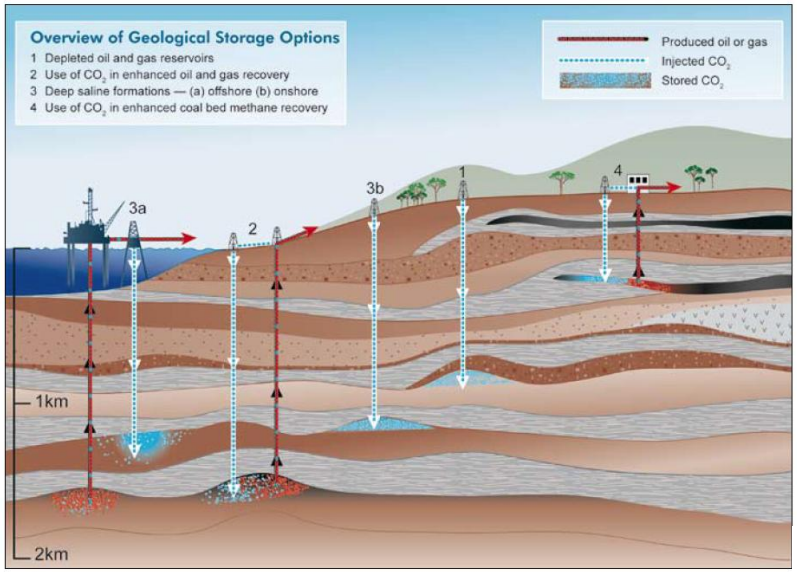
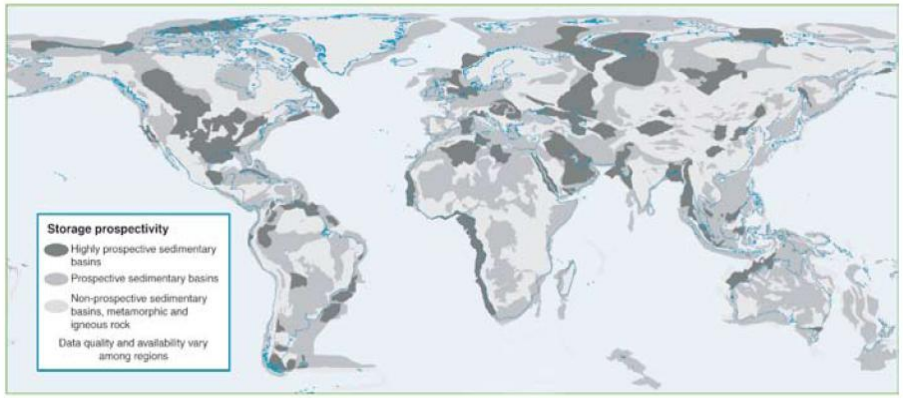


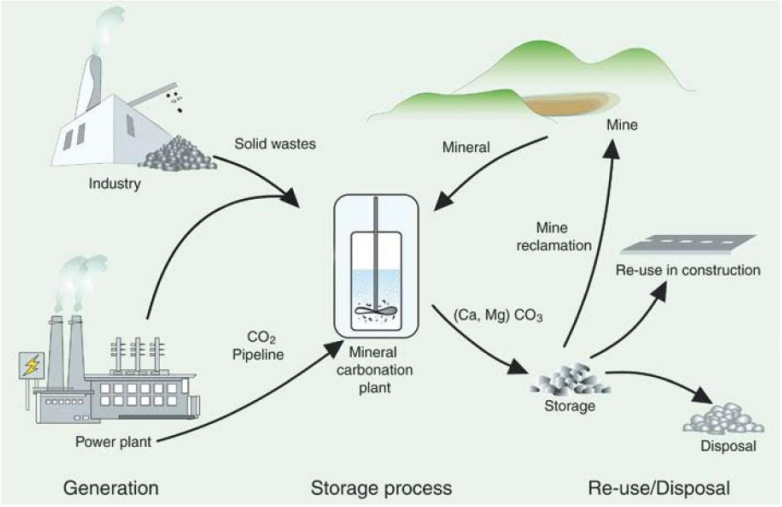
Figure TS.1. Schematic diagram of possible CCS systems. It shows the sources for which CCS might be relevant, as well as CO_2 transport and storage options (Courtesy CO2CRC).

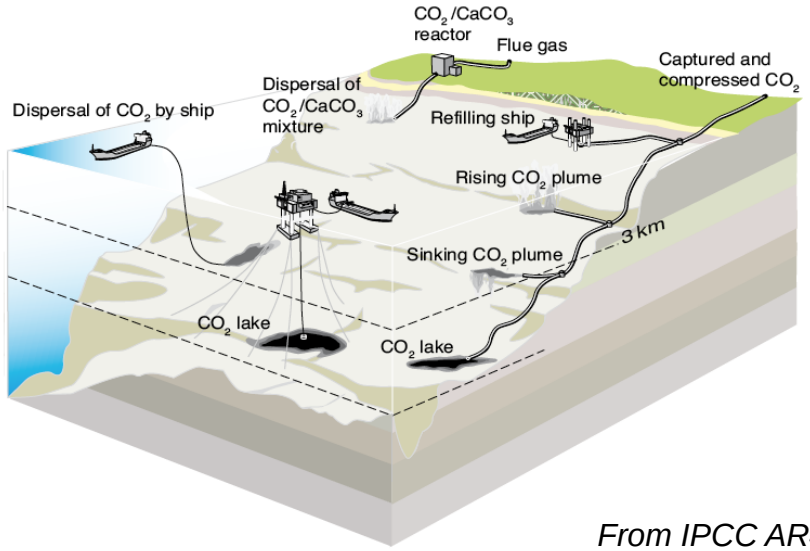
From IPCC AR4 2007

Carbon Dioxide Sequestration



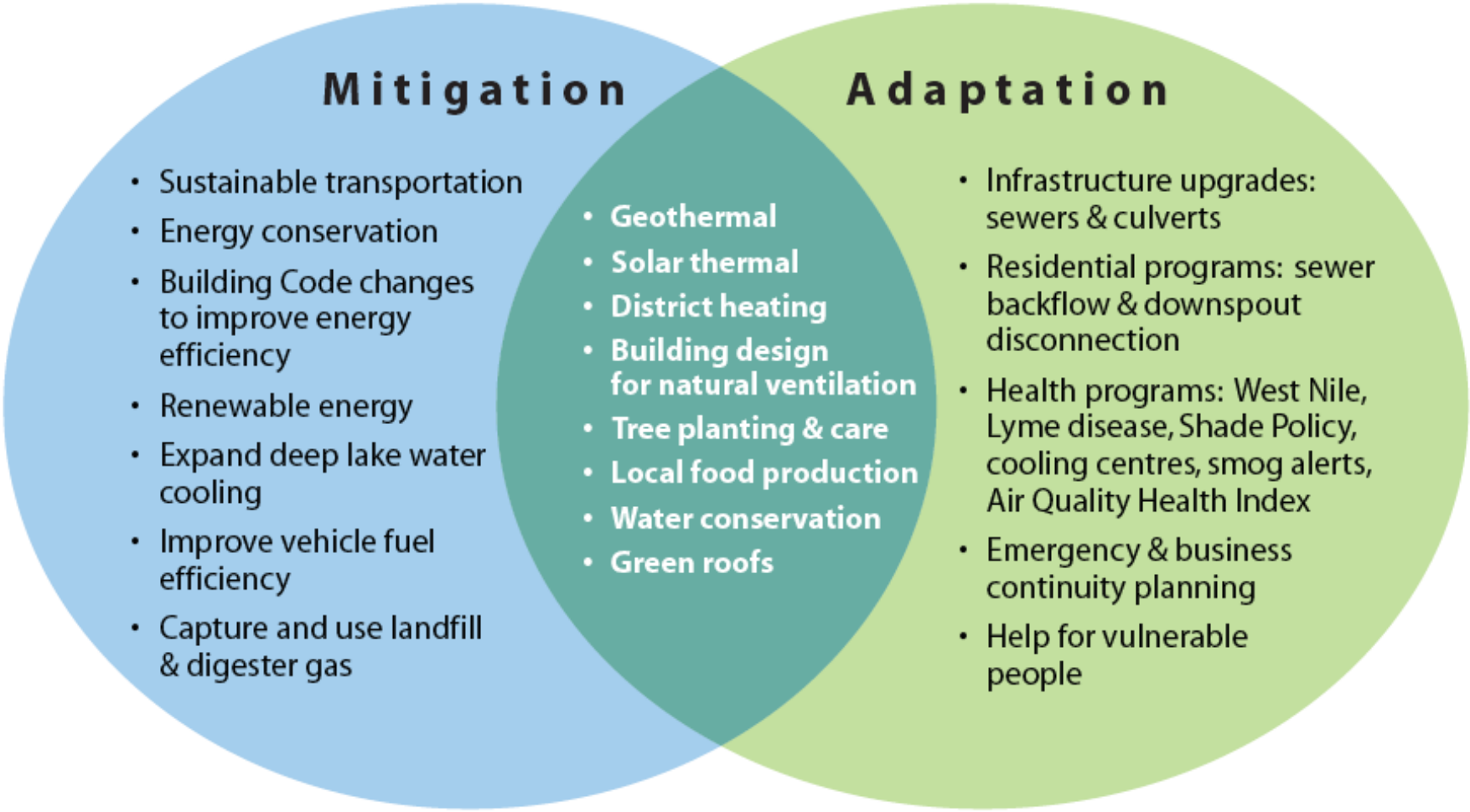






From IPCC AR4 2007

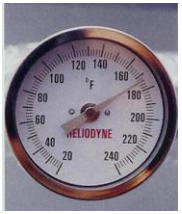
Example Mitigation and Adaptation Components



From City of Toronto

Green Buildings

- Energy
  - Heat
    - Alternative energy
    - Energy efficient facilities
    - Control use
    - Floor heating
    - Insulation-fabric lint
    - Double-paned windows with reflectors
  - Light
    - Natural light
    - Energy efficient facilities
    - Control use
  - Building services



Green Buildings

- Water
  - Reduce volume
  - Reuse
- Materials
  - Recycled
  - Sustainable
  - Environmentally friendly
  - Re-use
- Waste
- Health
- Socio-economics

Clean Development Mechanism