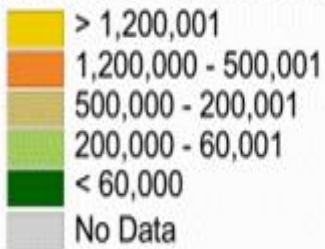
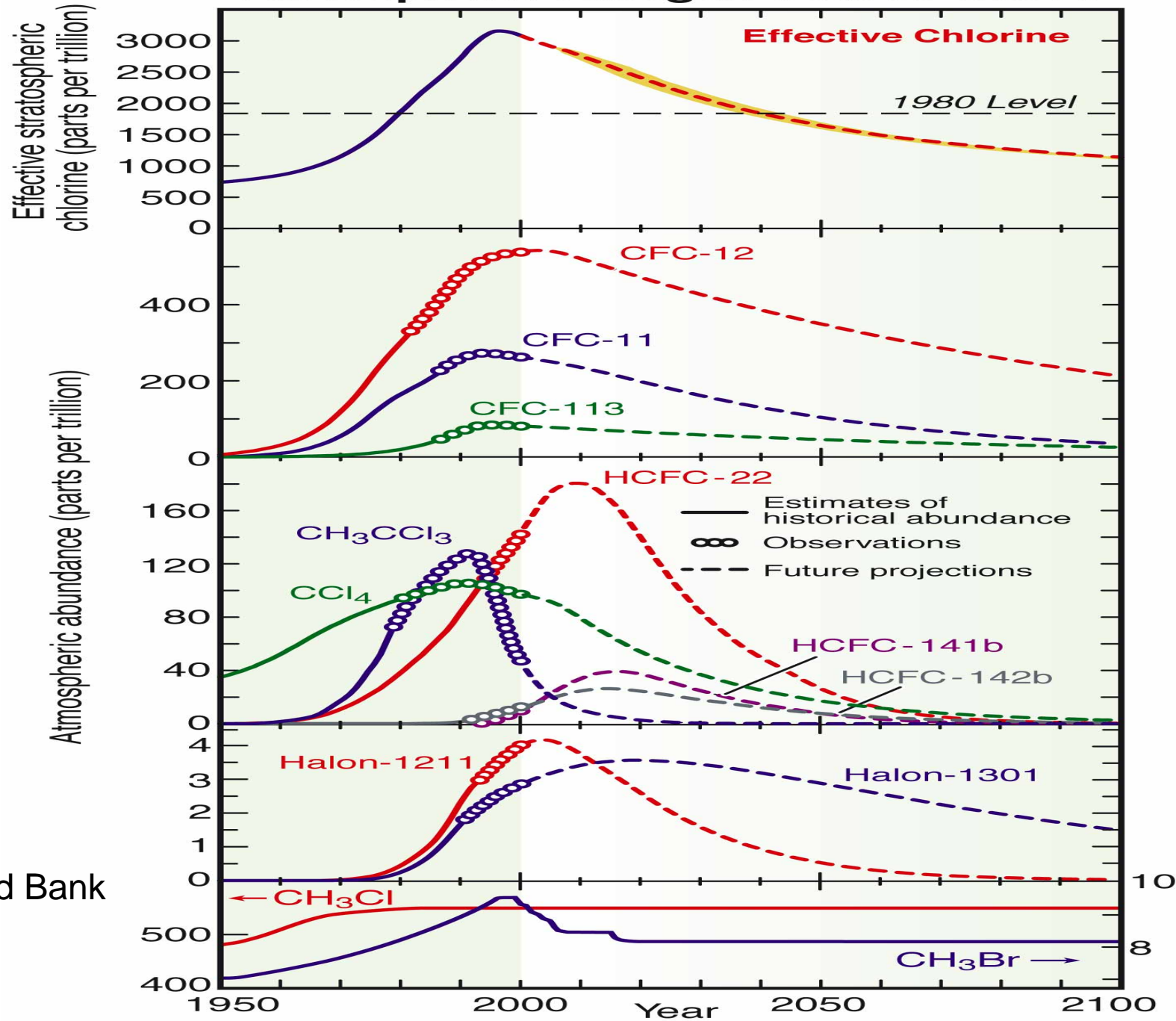


**Total CO2 Emissions**  
(thousands of tons of carbon dioxide)



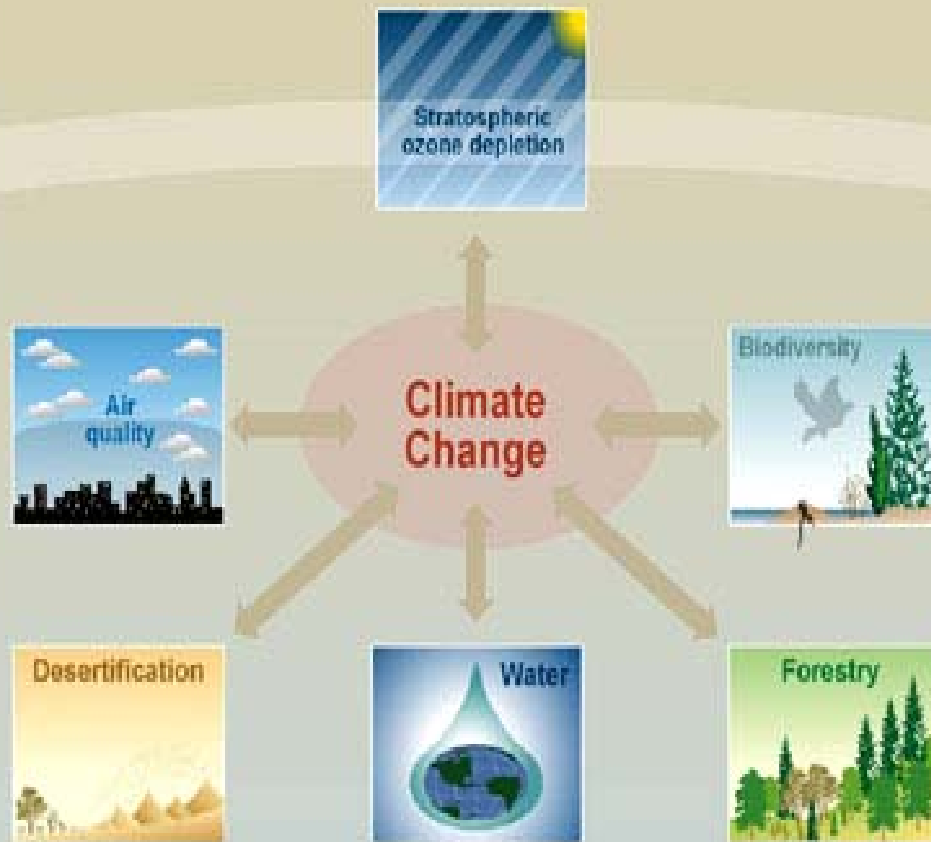
# Past and Future Abundance of Atmospheric Halogen Source Gases



# Climate Change

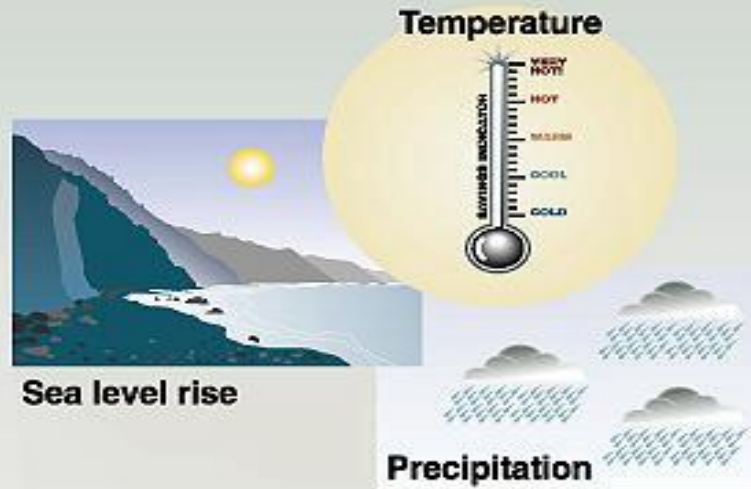
- Greenhouse gases exist naturally in the atmosphere – water vapour, carbon dioxide, methane, nitrous oxide
- Since industrialisation some gases have increased significantly creating an imbalance between emissions and earth's ability to absorb them.

## Linkages between climate change and other environmental issues



SYR - FIGURE 8-1

# Potential climate changes impact



## Impacts on...

### Health



Weather-related mortality  
Infectious diseases  
Air-quality respiratory illnesses

### Agriculture



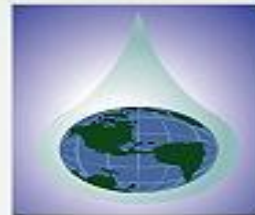
Crop yields  
Irrigation demands

### Forest



Forest composition  
Geographic range of forest  
Forest health and productivity

### Water resources



Water supply  
Water quality  
Competition for water

### coastal areas



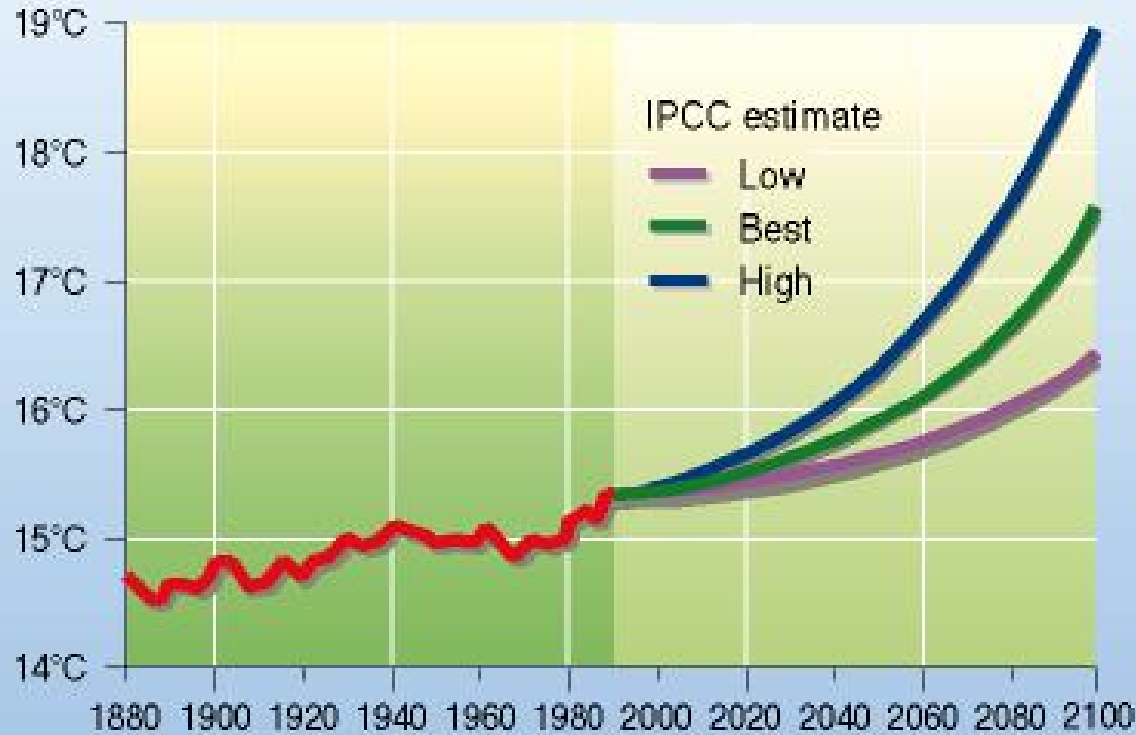
Erosion of beaches  
Inundation of coastal lands  
additional costs to protect coastal communities

### Species and natural areas



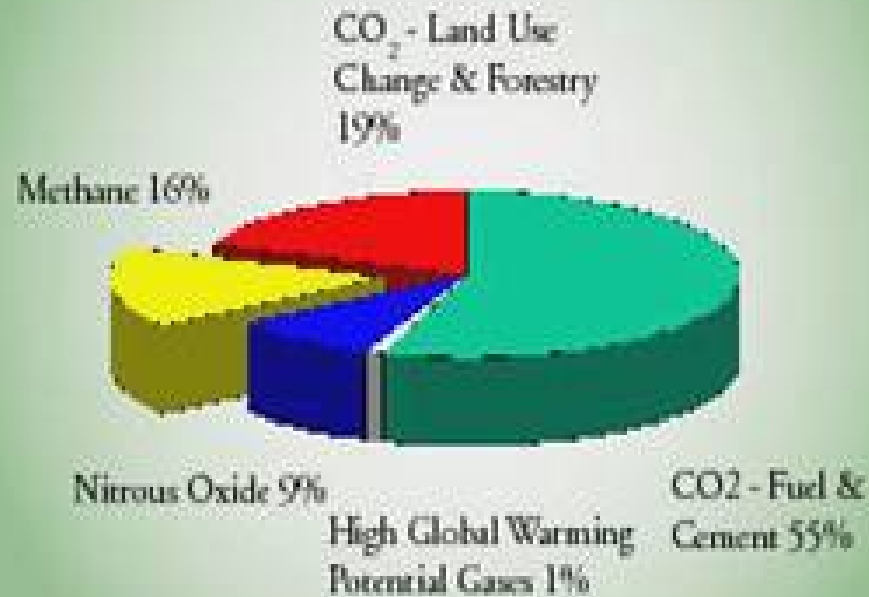
Loss of habitat and species  
Cryosphere:  
diminishing glaciers

# Projection of Global Average Temperature to 2100



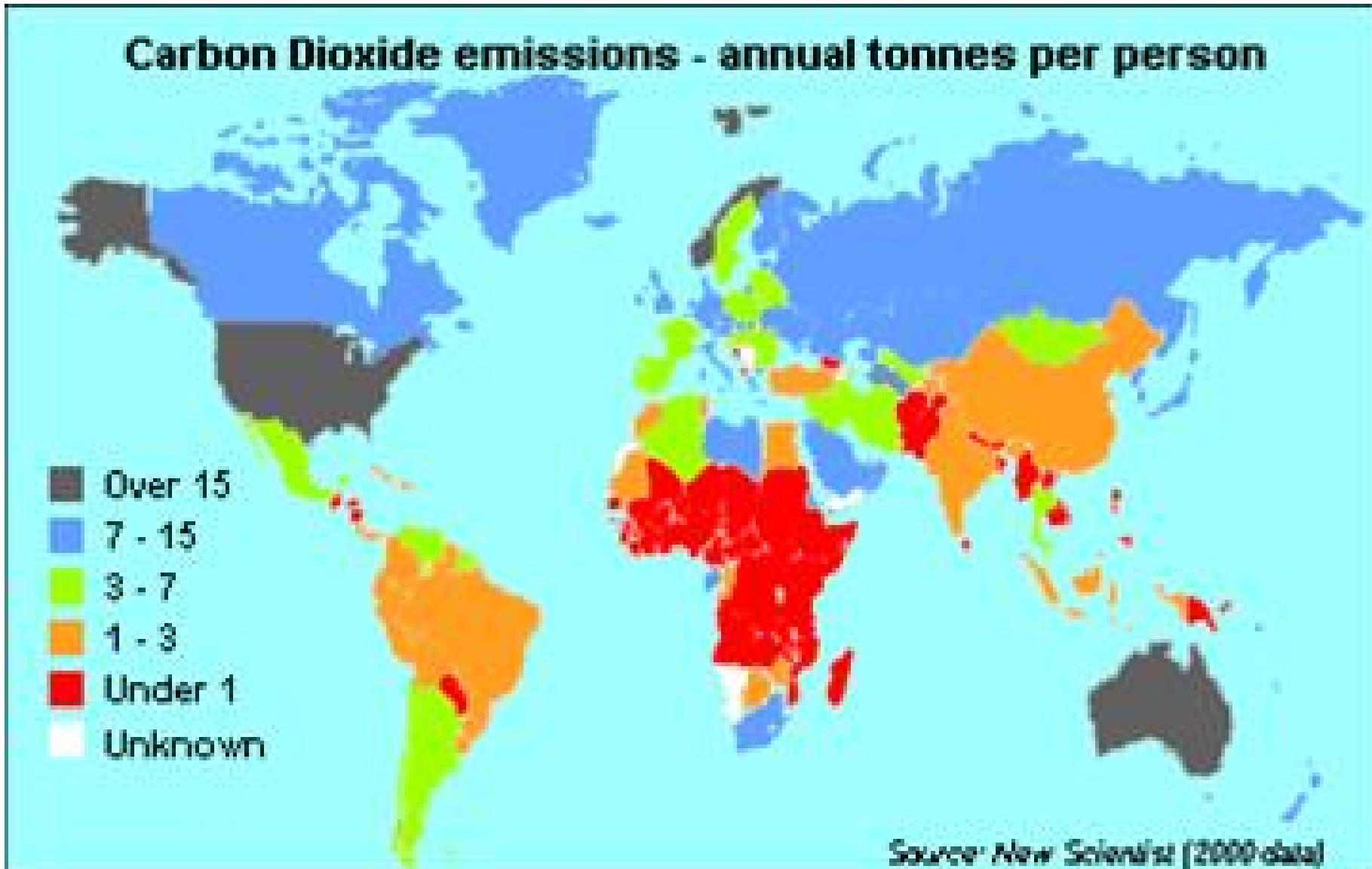
Source: UNEP, 1996.

## Global GHG Emissions – 2000



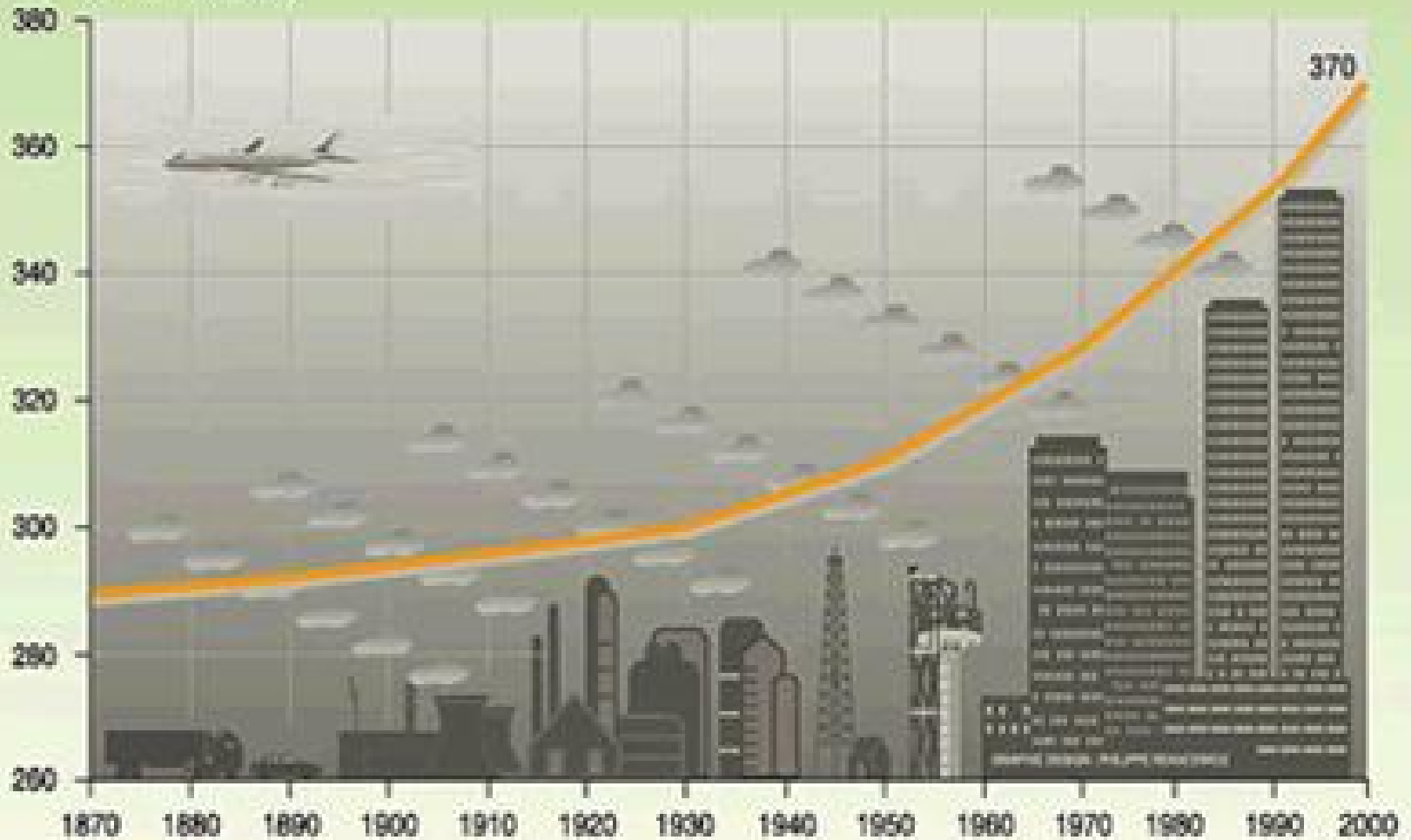
Source: U.S. Environmental Protection Agency

# Global Emissions



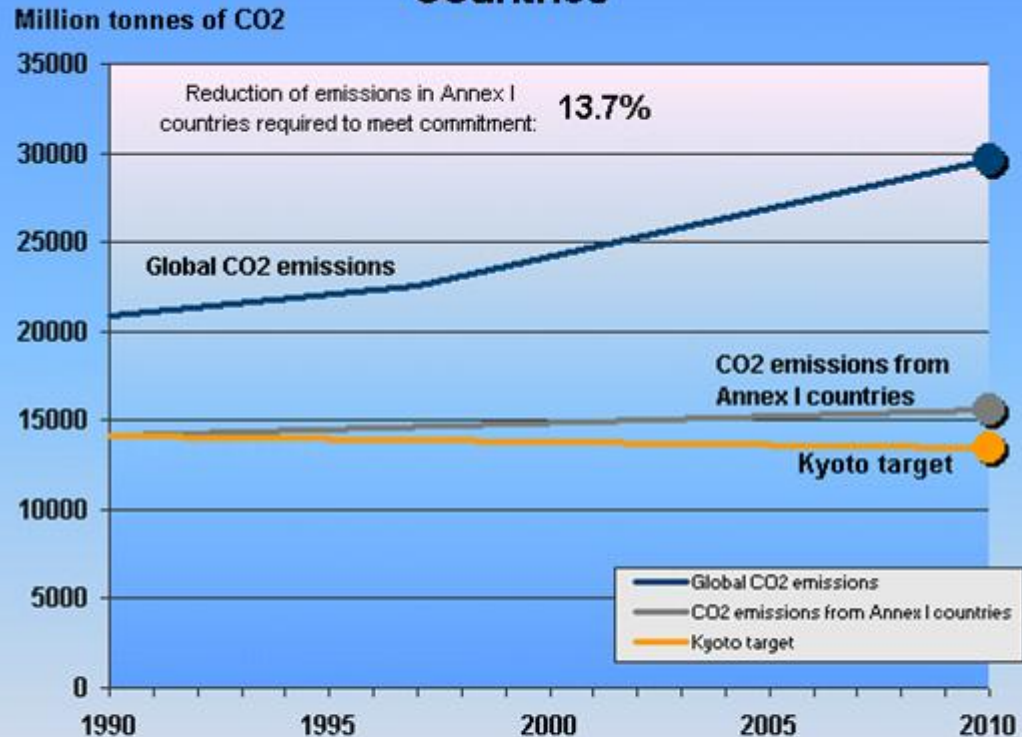
# Global atmospheric concentration of CO<sub>2</sub>

Parts per million (ppm)



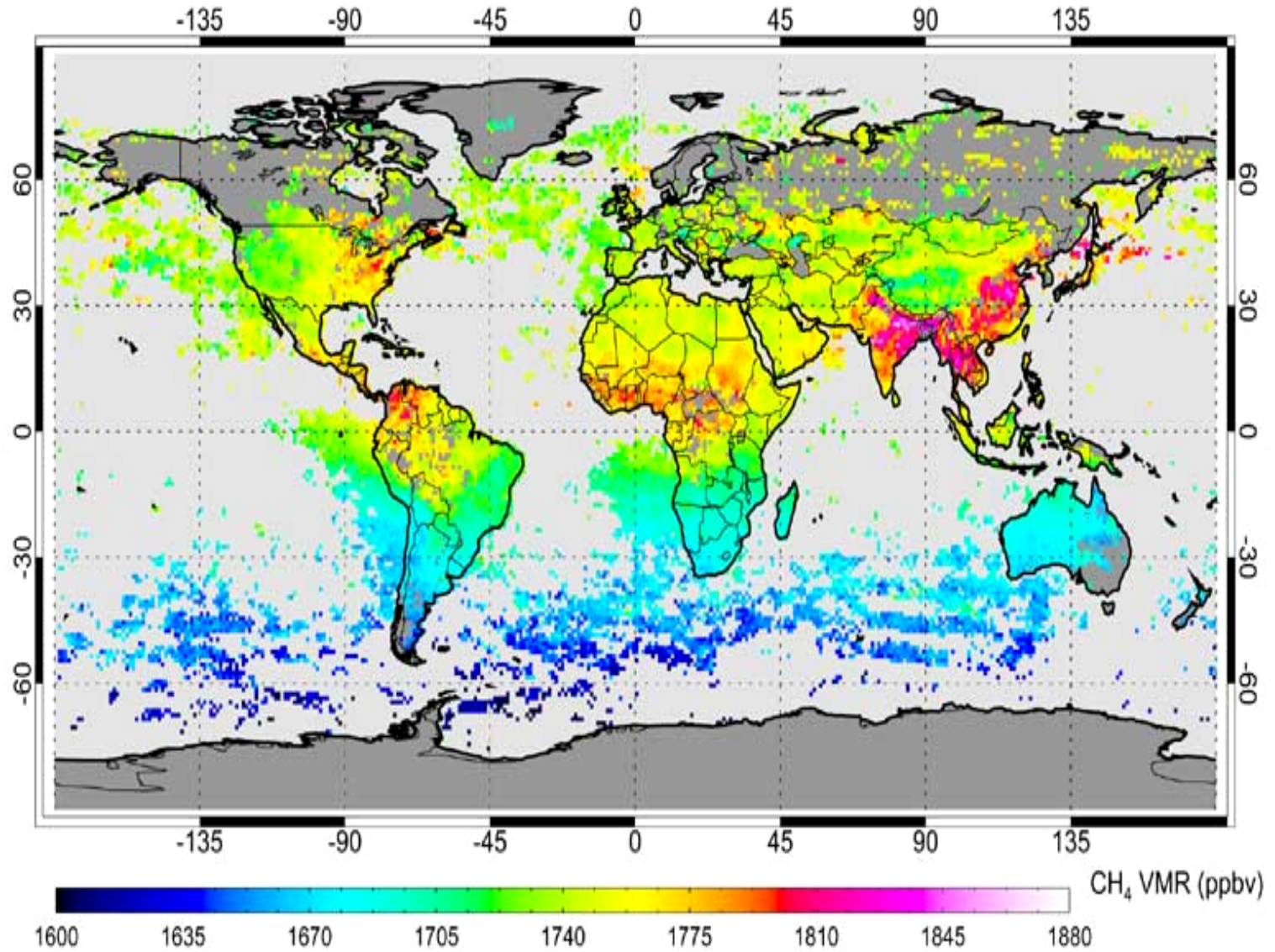
GRID  
Arendal CO<sub>2</sub>

## Carbon Dioxide Emissions Globally and from Annex I Countries



The Annex I countries must reduce their CO<sub>2</sub>-emissions by 13.7% to fulfill their commitments according to the Kyoto protocol. To achieve a stabilisation of the CO<sub>2</sub> contents in the atmosphere at 550 ppmv, the IPCC recommends a global reduction in GHG emissions of more than 50%.

# Methane



# Global Methane Emissions



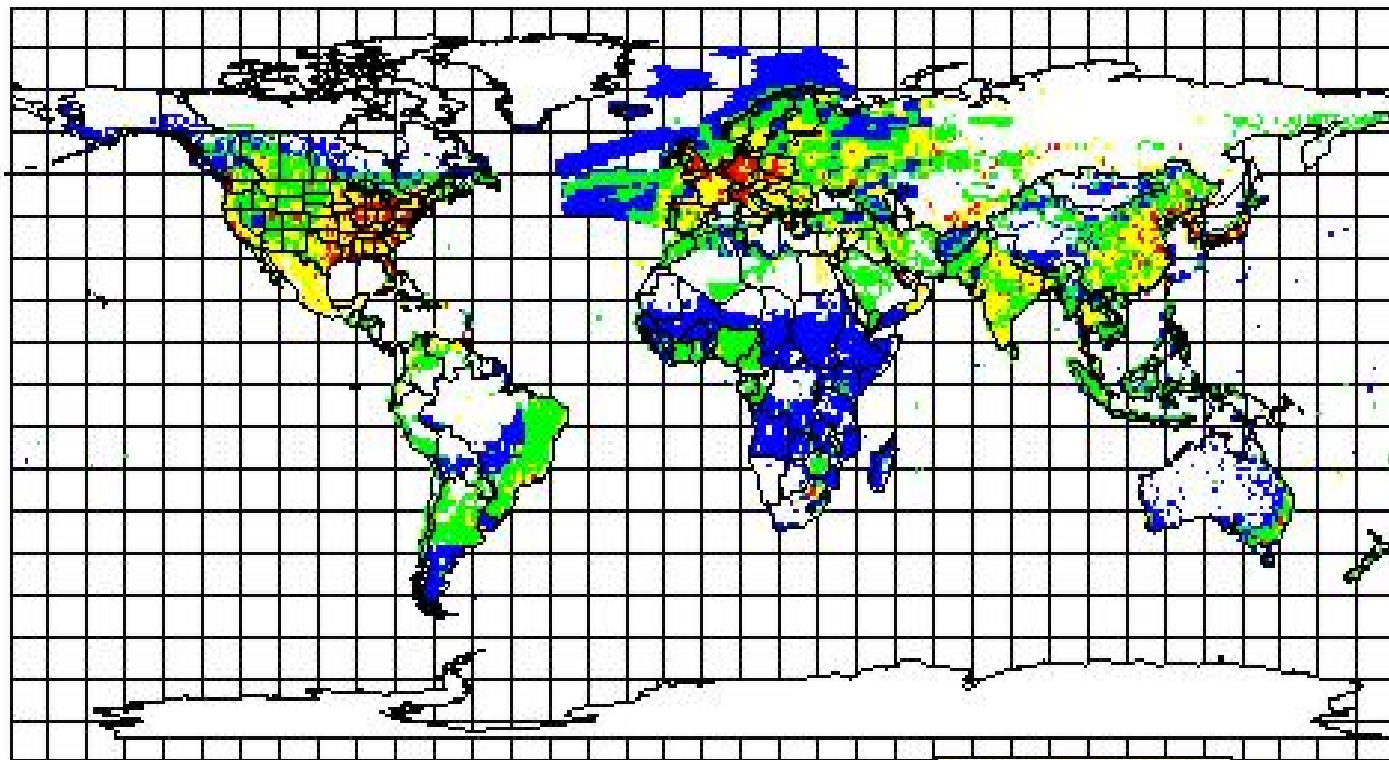
## Note:

Enteric fermentation accounts for the largest amount of global methane emissions at 28%, solid waste accounts for 13% while fuel, both stationary and mobile, account for 13%.

Source: US Environmental Protection Agency

# Annual Nitrogen Oxide Emissions as Nitrogen

1 deg x 1 deg latitude/longitude grid (1,000 kg/yr.), Click on continental regions for detailed map:

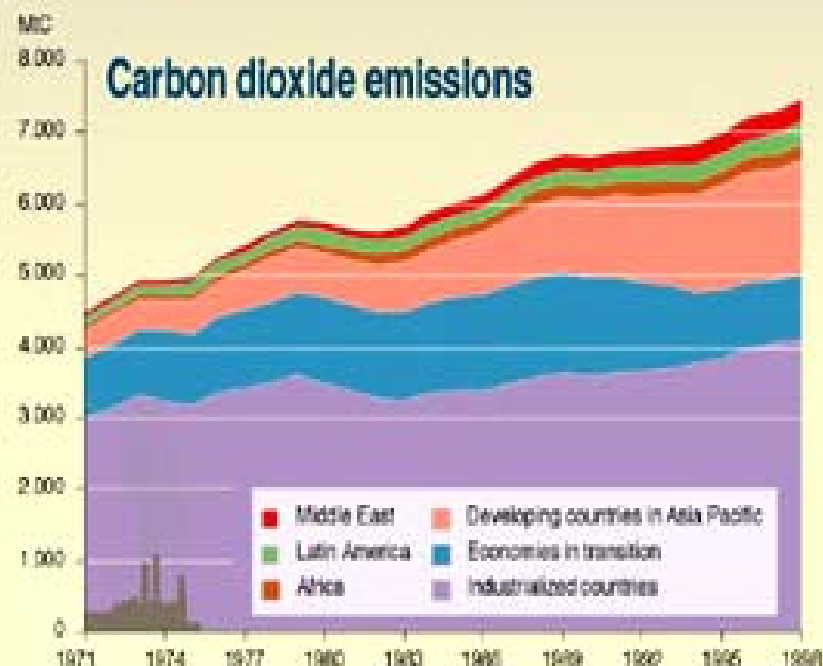
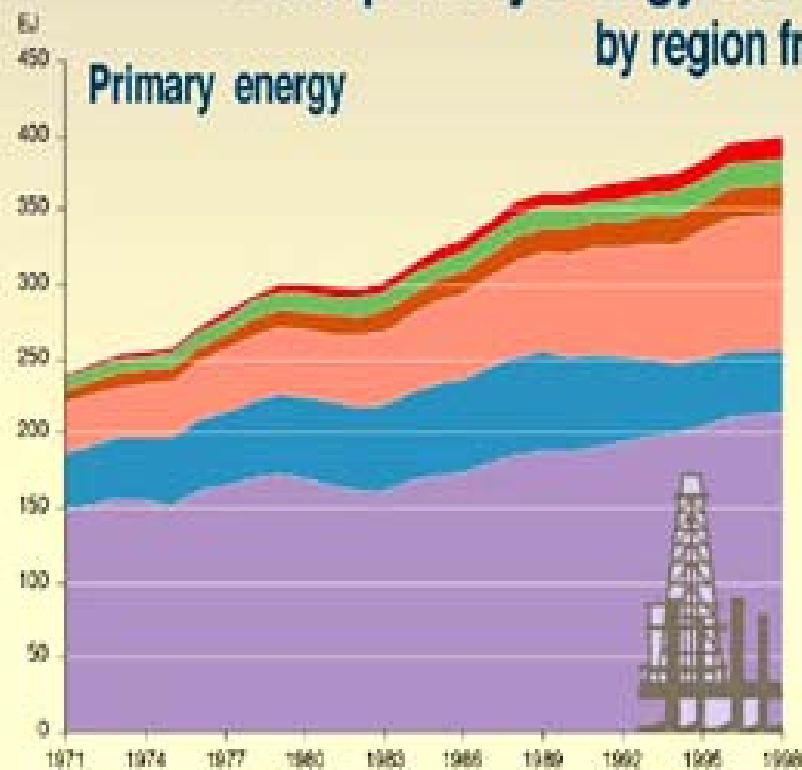


[clickable imagemap](#)

## Emissions (1,000 kg/yr.)

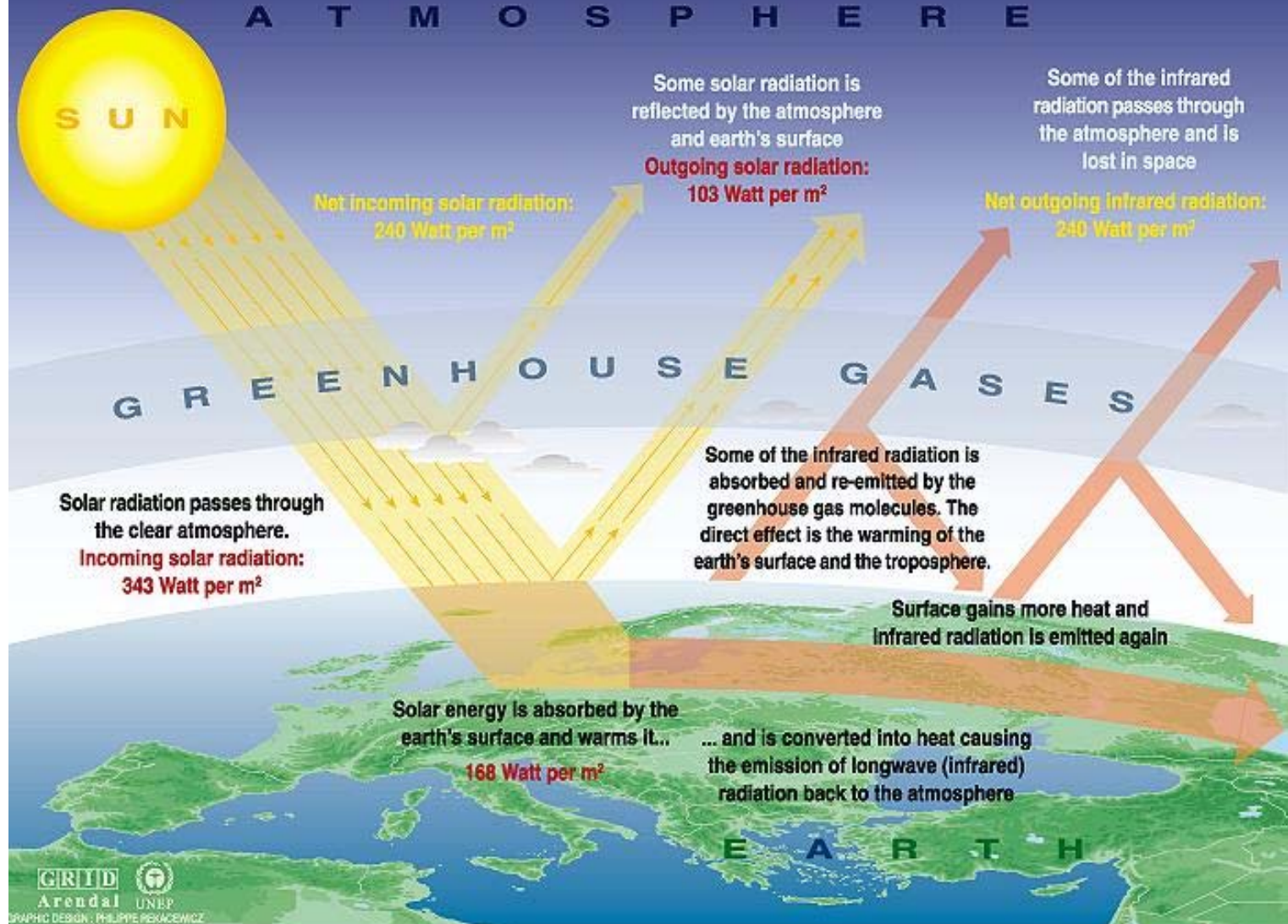


# World primary energy use and carbon dioxide emissions by region from 1971 to 1998

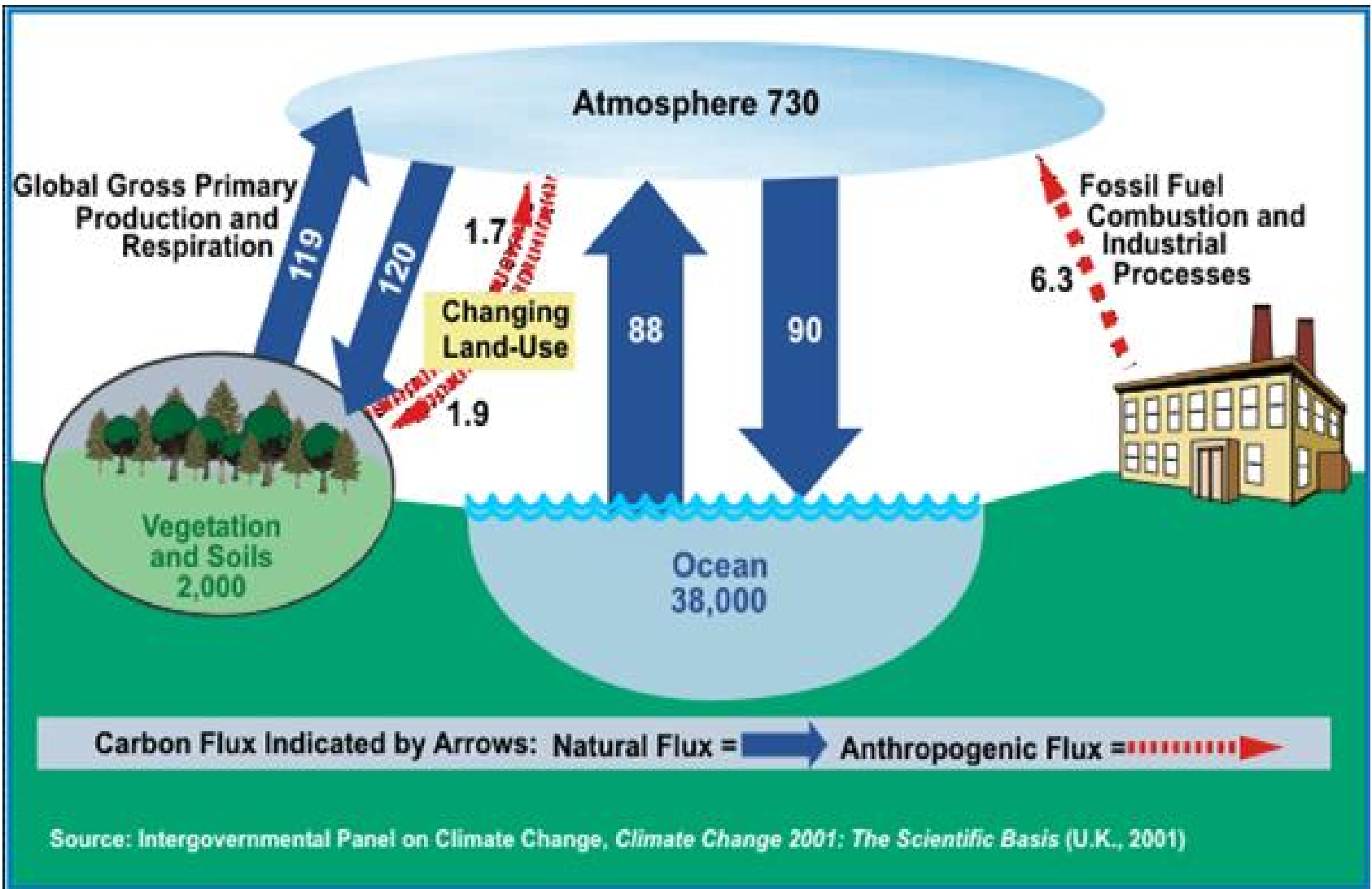


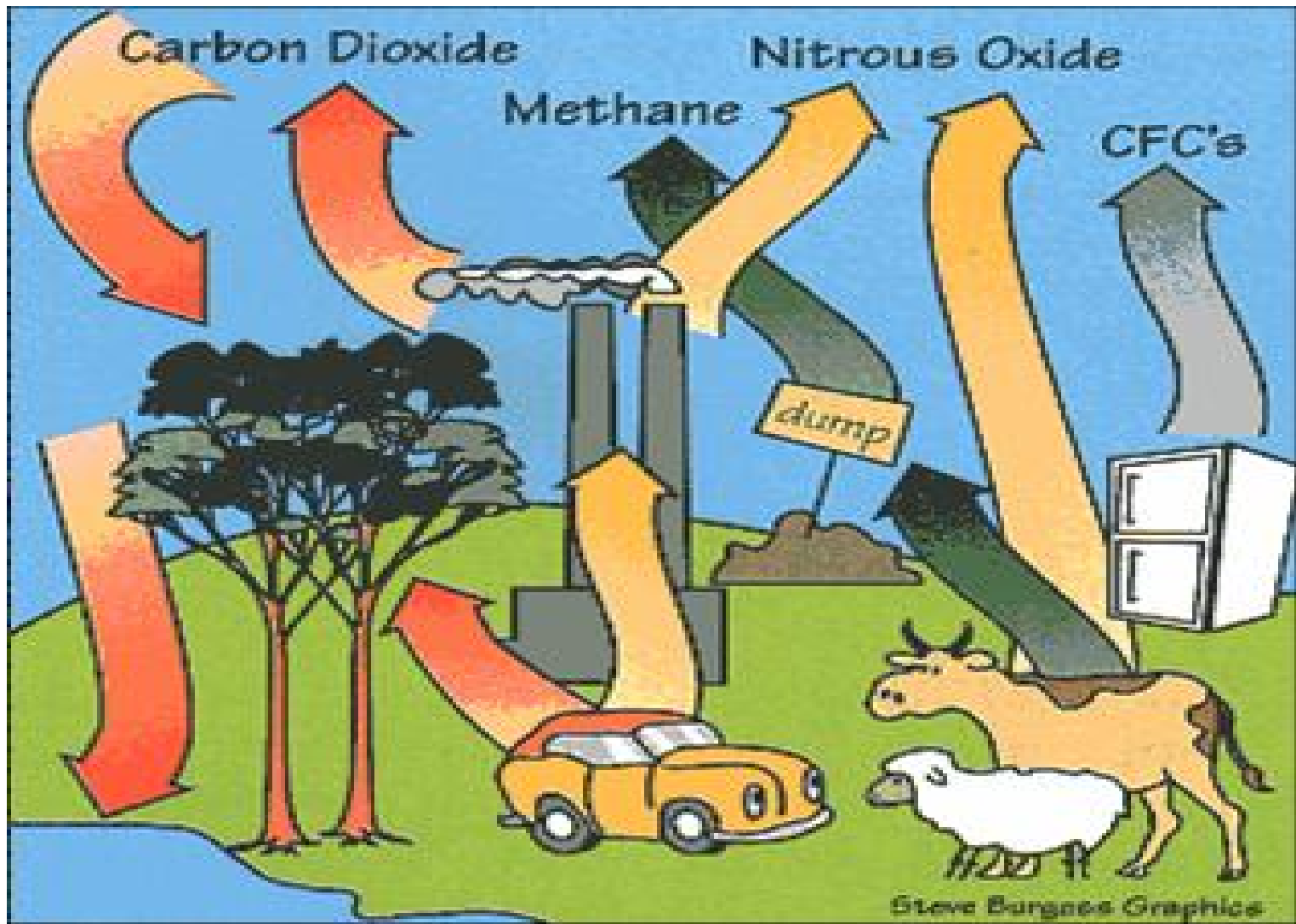
WG3 - FIGURE TS-3 and 4

# The Greenhouse effect



Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.





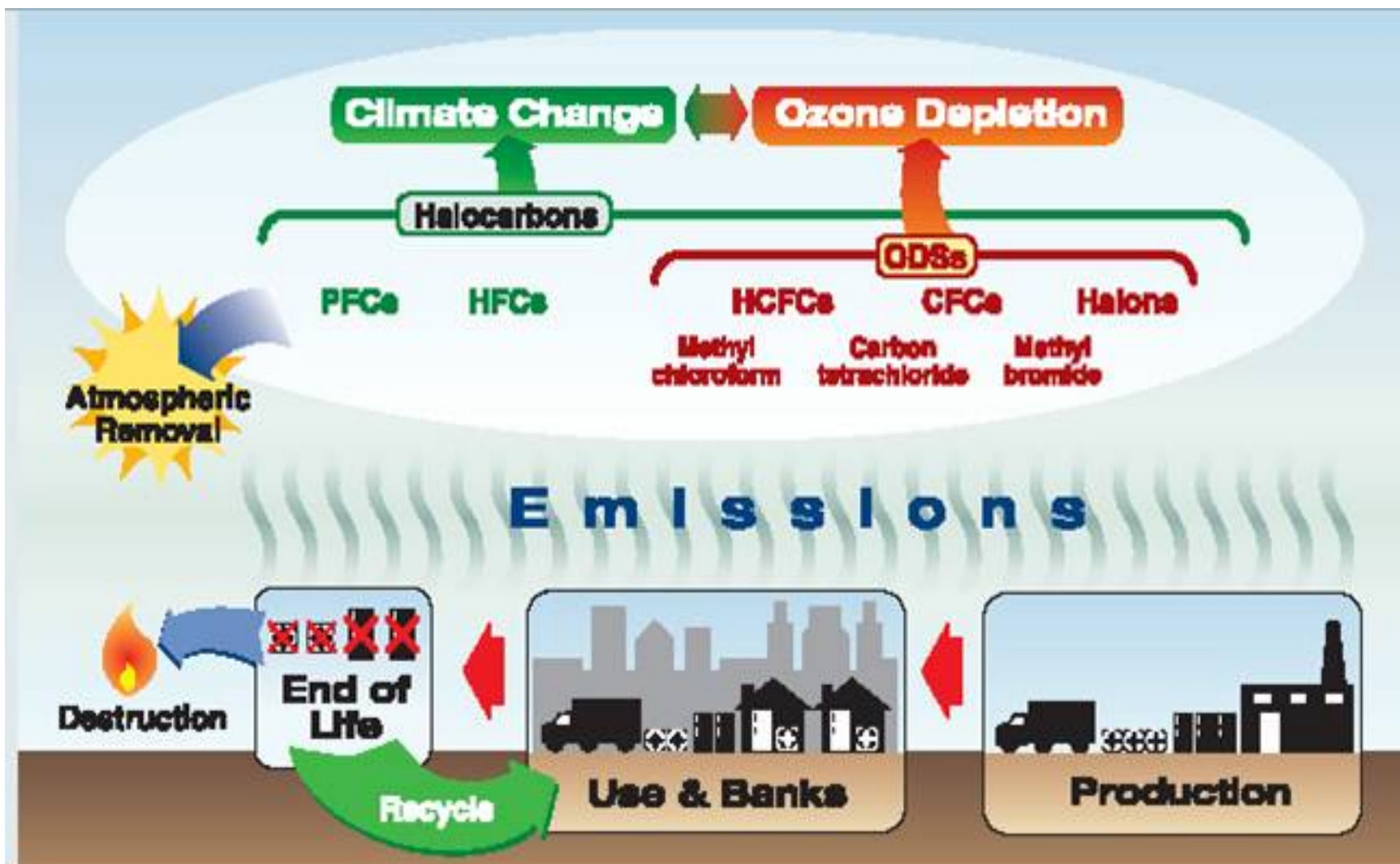


Figure SPM-1. Schematic diagram of major issues addressed by this report. Chlorofluorocarbons (CFCs), halons and hydrochlorofluorocarbons (HCFCs) contribute to ozone depletion and climate change, while hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) contribute only to climate change and are among possible non-ozone depleting alternatives for ODSs. Red denotes gases included under the Montreal Protocol and its amendments and adjustments<sup>4</sup> while green denotes those included under the UNFCCC and its Kyoto Protocol. Options considered in this report for reducing halocarbon emissions include improved containment, recovery, recycling, destruction of byproducts and existing banks<sup>5</sup>, and use of alternative processes, or substances with reduced or negligible global warming potentials.

# Global Habitats

- forests - over 30% of land
- surface freshwater – 20% in Lake Baikal, 20% in Great Lakes
- marine - 70% of planet
- mountains - 24% of land
- polar - 8.9% of land
- deserts - app. 30% of land
- grasslands – app. 40% of land
- wetlands -

# Habitats

- **Desert - Sahara, Namib, Atacama**
- **Forest – Amazon, Siberia**
- **Inland Waters – Lake Victoria, Amazon River, Great Lakes**
- **Island – Jamaica, Mauritius**
- **Marine – Pacific Ocean, Mediterranean Sea**
- **Wetlands – Sundarbans wetlands**
- **Mountain – Himalayas**
- **Grassland – Pampas, Prairies, Savannah, Veldt**

# Habitat Loss and Fragmentation

- 17 million hectares of tropical forests cleared every year (IUCN)
- Wetlands destroyed for aquaculture
- 5.8 million hectares of land = annual rate of desertification (UNEP, 1997)
- Water pollution – rivers, lakes, coastal areas
- Urbanisation – worldwide cities are growing by 180,000/day; by 2030 60% of the world's population will live in urban areas – Africa has the fastest rate of urbanisation (OneWorld.net)
- Desertification -

# Upsetting the balance

## Activities that can disrupt ecosystem balance:

- Commercial fishing
- Mining
- Logging
- River damming and training
- Agriculture (the largest single cause of habitat conversion)
- Construction
- Burning fossil fuels
- Introducing new species
- Land draining

# Interdependence

- When one component of an ecosystem is compromised there is a knock on effect on the rest of the system

Example: Pandas eat bamboo shoots – if bamboo forests are removed the population is drastically reduced or disappears

Dynamiting coral reefs to get fish – kills the coral, encourages algal growth, reduces species variety, reduces protection to beaches, disrupts production of sand and food, reduces shelter from predators



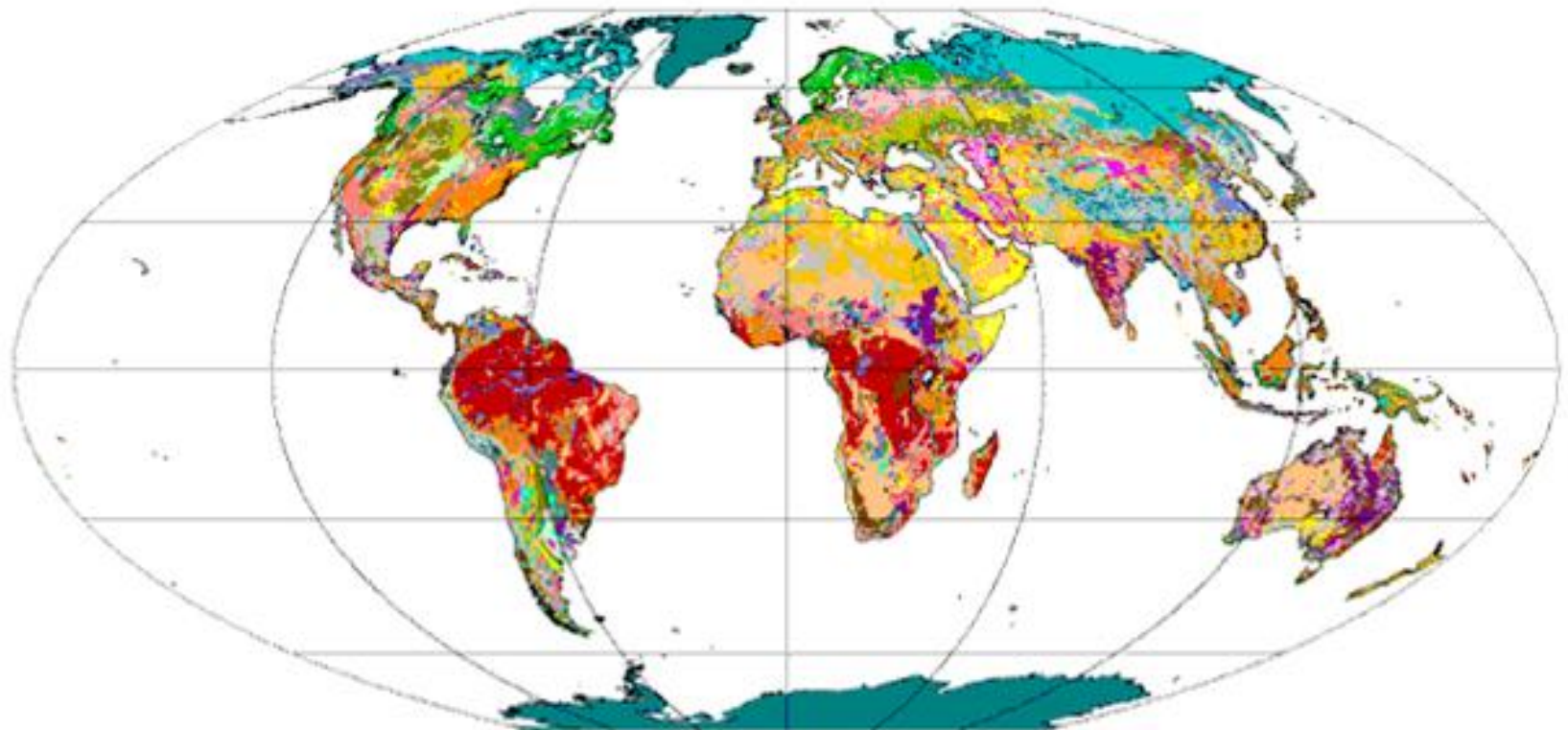
# Consequences

- Reduction of fish stocks, destruction of reefs, loss of bycatch e.g turtles, dolphin
- Soil degradation
- Habitat loss
- Floodplain loss
- Water pollution
- Air Pollution
- Loss of traditional food sources
- Loss of nurseries
- Species extinction
- Loss of traditional lifestyles

# Soil Degradation

- Soil is the loose material covering bedrock – mixture of organic matter, sand, silt, clay
- Formed by climate, base material, flora and fauna, terrain and time
- Provides foothold for plant roots, holds nutrients, filters and regulates discharge of rainwater, prevents flooding, stores organic carbon, buffers against pollutants

## DOMINANT SOILS OF THE WORLD

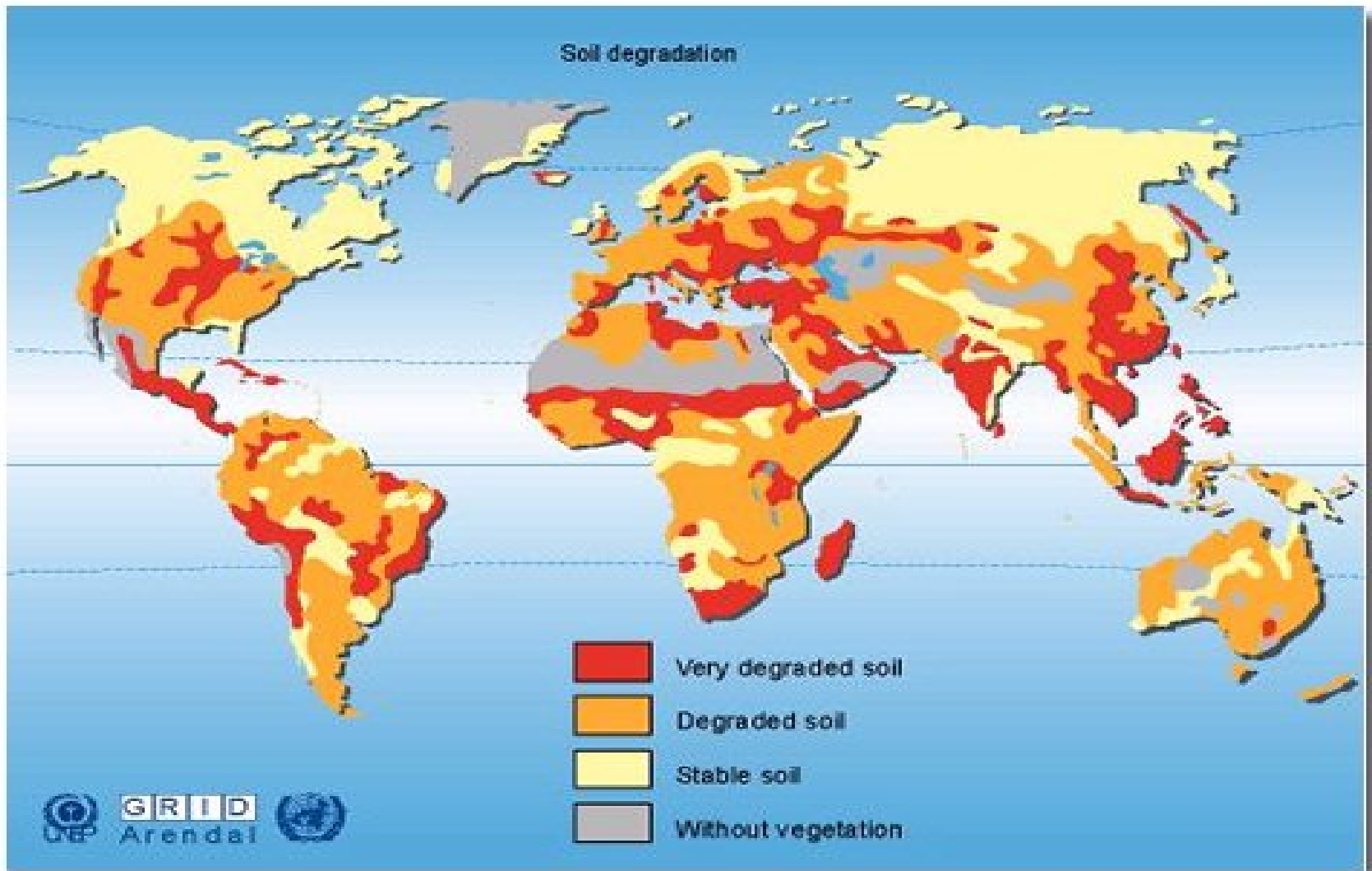


Flat Polar Quartic Projection

FAO-GIS, February 1998

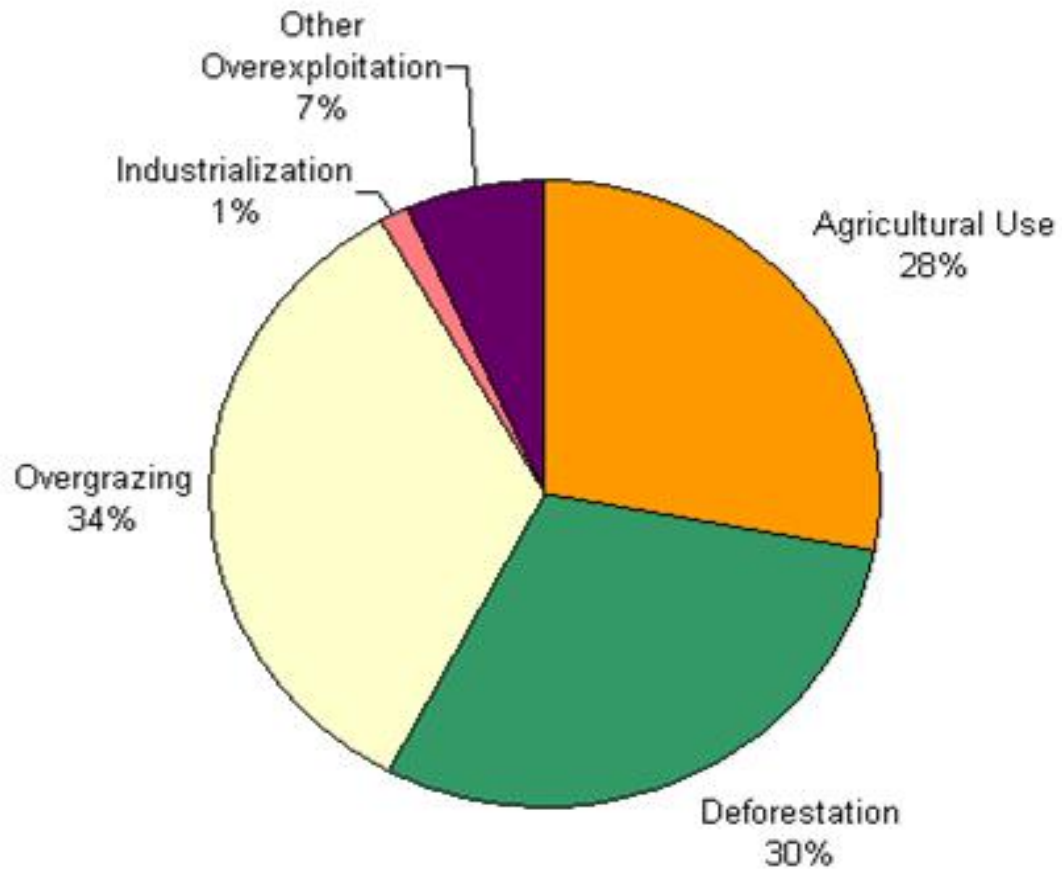
- Over 17% of land surface is strongly degraded (ISRIC – 2003)
- Threat to agriculture and agrarian populations
- Many forms:
  - Salination – overpumping of aquifers
  - Erosion – water, wind, human activities
  - Physical - Soil Compaction and waterlogging
  - Nutrient depletion
  - Natural phenomena

# Global Soil Degradation



# Causes of Human-Induced Soil Degradation

Source: Mohan K. Wali et al.



Total Degraded Land Area = 1,966 Million Hectares

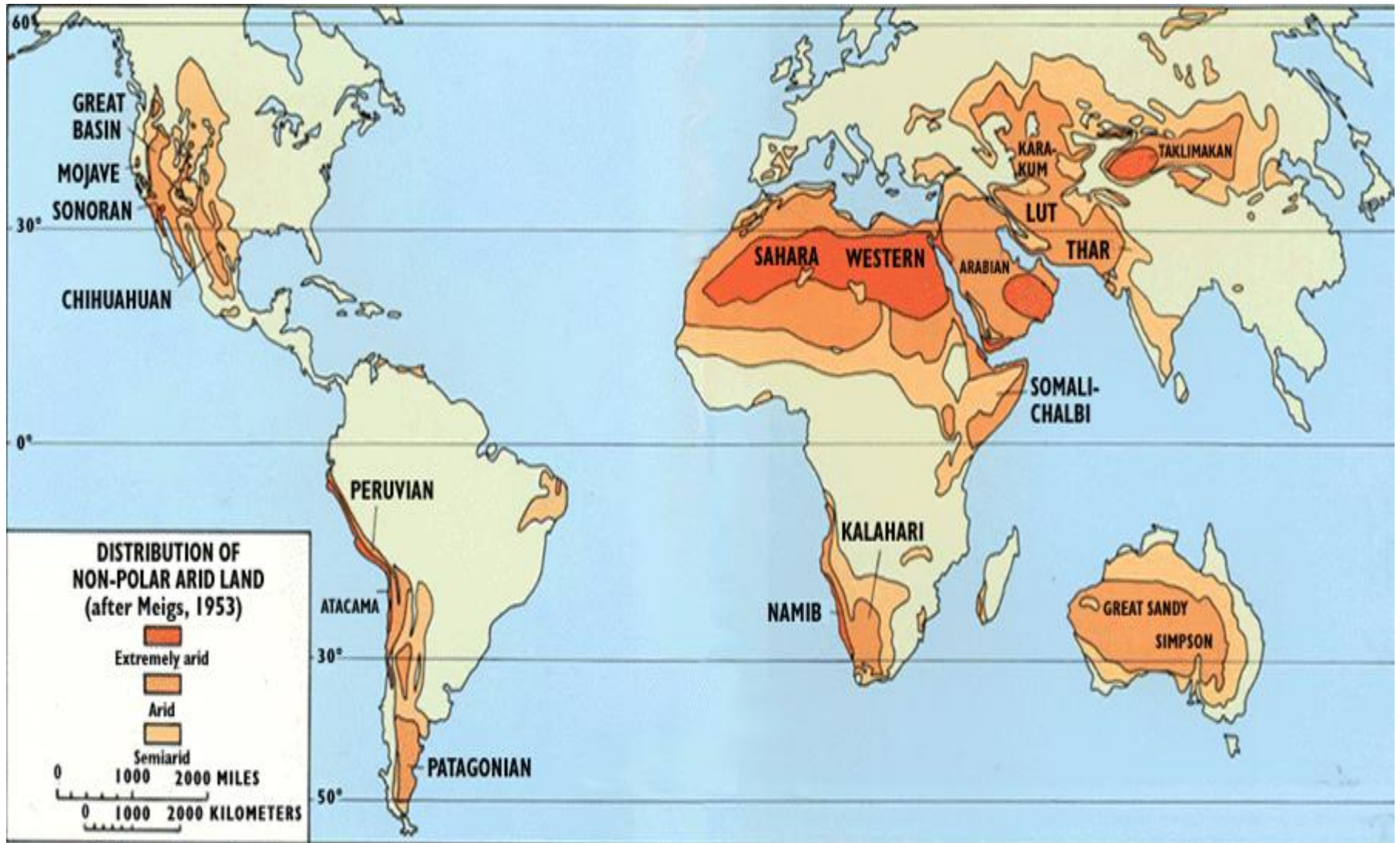
## Dust Storm – Texas 1935; Great Depression



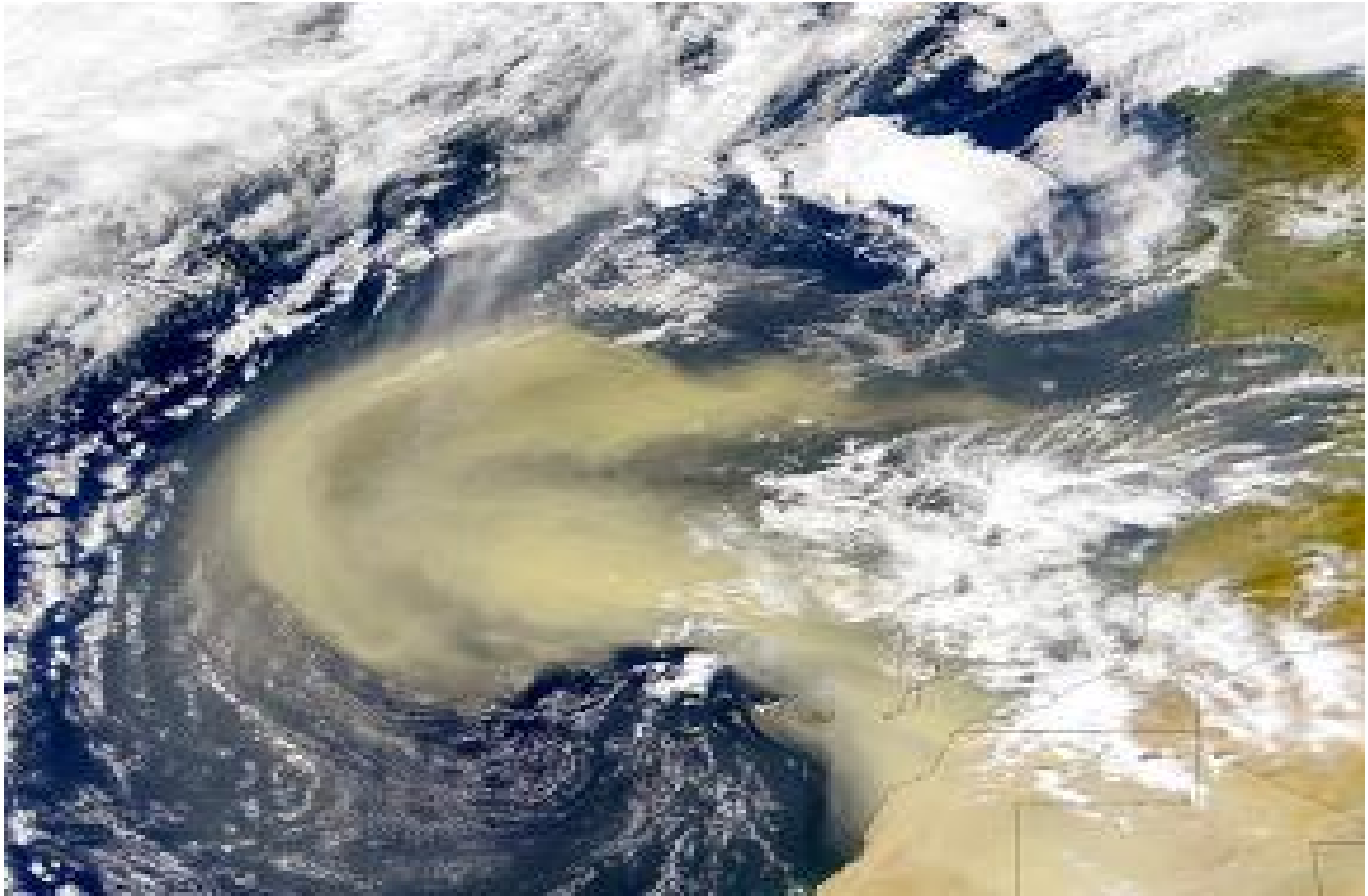
# Deserts

- Receive less than 200mm of rainfall/year
- Types:
  - Trade wind ~ Sahara
  - Coastal ~ Atacama, Namib
  - Rain shadow ~ Mojave
  - Montane ~ Gobi
  - Cold ~ Dry Valleys of Antarctica

# Deserts of the World



# Sahara sandstorm over the Atlantic



# Loss of Nurseries

- Coastal and marine environments provide nurseries for birds, fish, crustaceans, reptiles and plankton
  - Many migratory bird species make annual trips to the same breeding grounds which provide ample food for rearing their young
  - Many fish species move toward shore to spawn and young to develop before moving further out to sea

# Healthy populations depend on inputs such as:

- Food – plankton, algae, grasses, small organisms, fish
- Unpolluted water – e.g. fish kills from oil spills
- Sufficient young surviving to maturity
- Coral reefs, mangroves for shelter and food