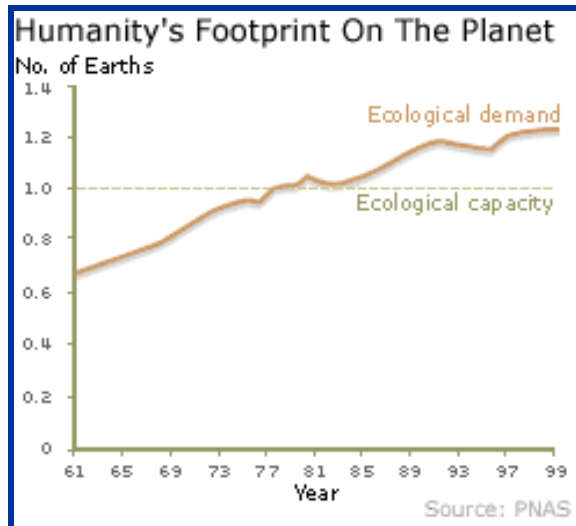
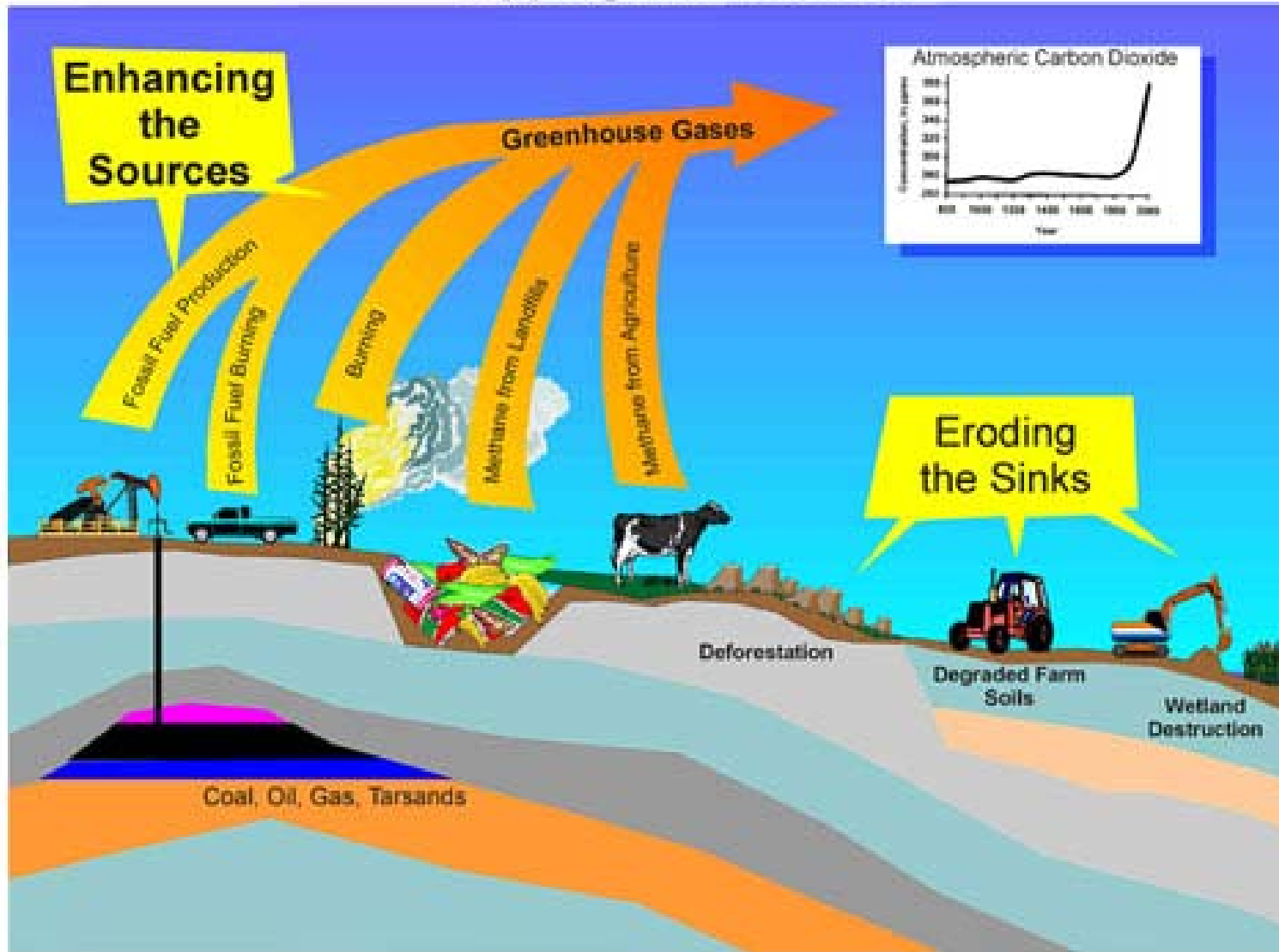


Climatic change risks and responses

Aim: to understand the risks of climatic change and possible responses.



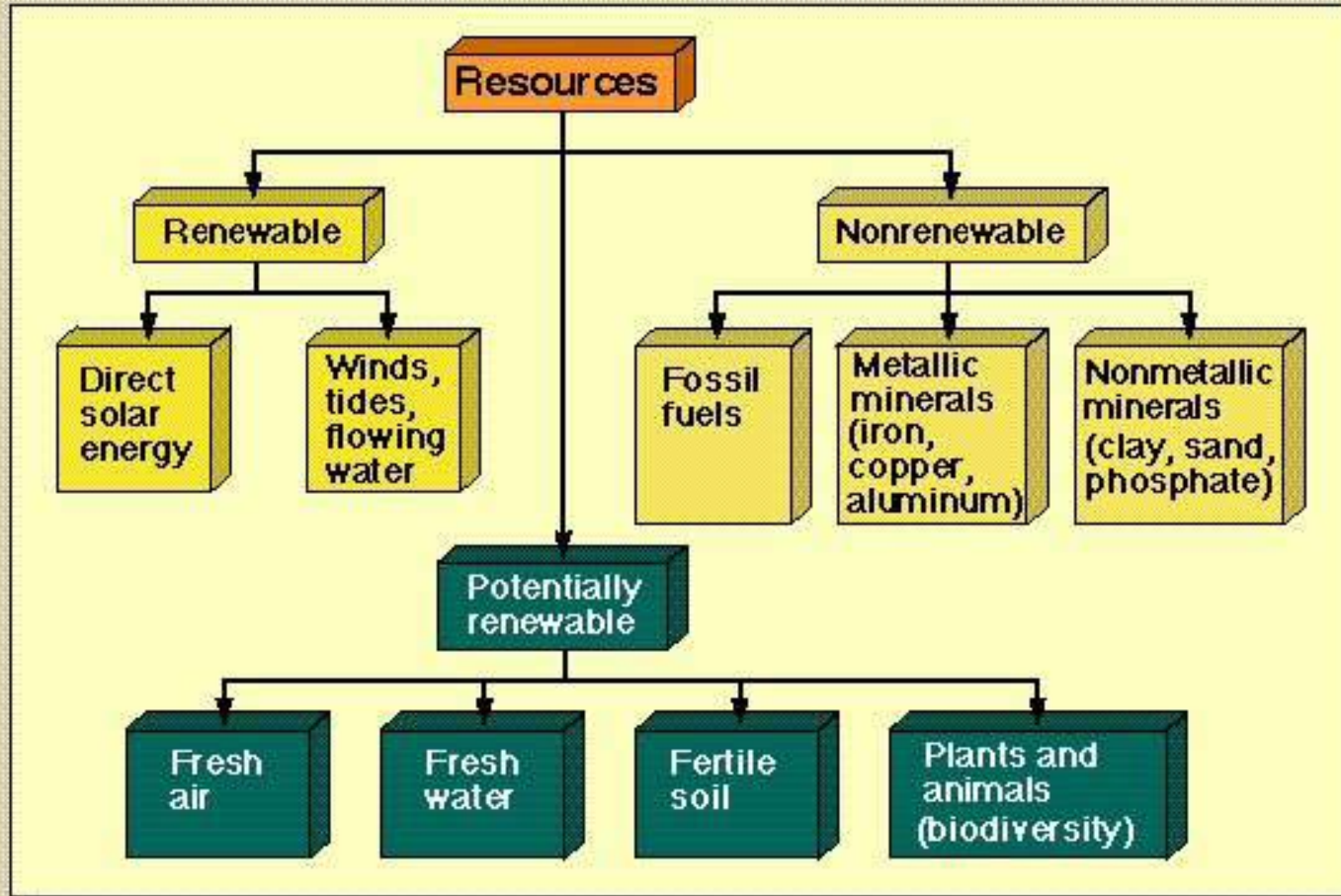
Tipping the Balance



Summarise the problems as shown above



Major Types of Material Resources



Outline the differences between renewable and non-renewable resources.

Explain the term “potentially renewable”.



Climatic change - possible risks

- Changes in temperature, precipitation, seasonality, climatic belts
- Greater frequency of extreme weather events e.g. floods, droughts, gales, hurricanes, tornadoes
- Oceanic e.g. circulations, ecology
- Land degradation e.g. soil erosion, landslides
- Melting ice e.g. sea-level change, tourism
- Economic e.g. food, production, communication
- Political e.g. competition for land and resources
- Social e.g. health

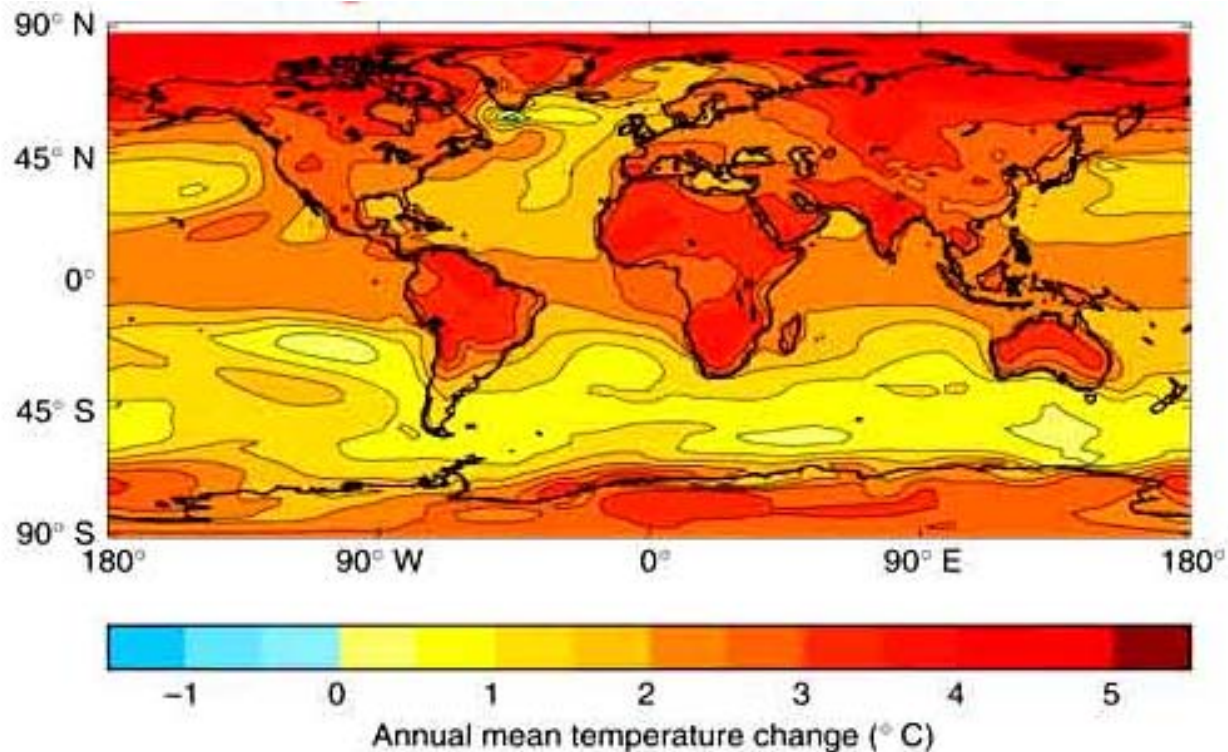


How certain are the predictions?

There is uncertainty in the basic prediction 'what is the temperature going to do over the next 100 years'. Given this uncertainty it is even harder to say what might happen to secondary features.



Global temperatures by 2050

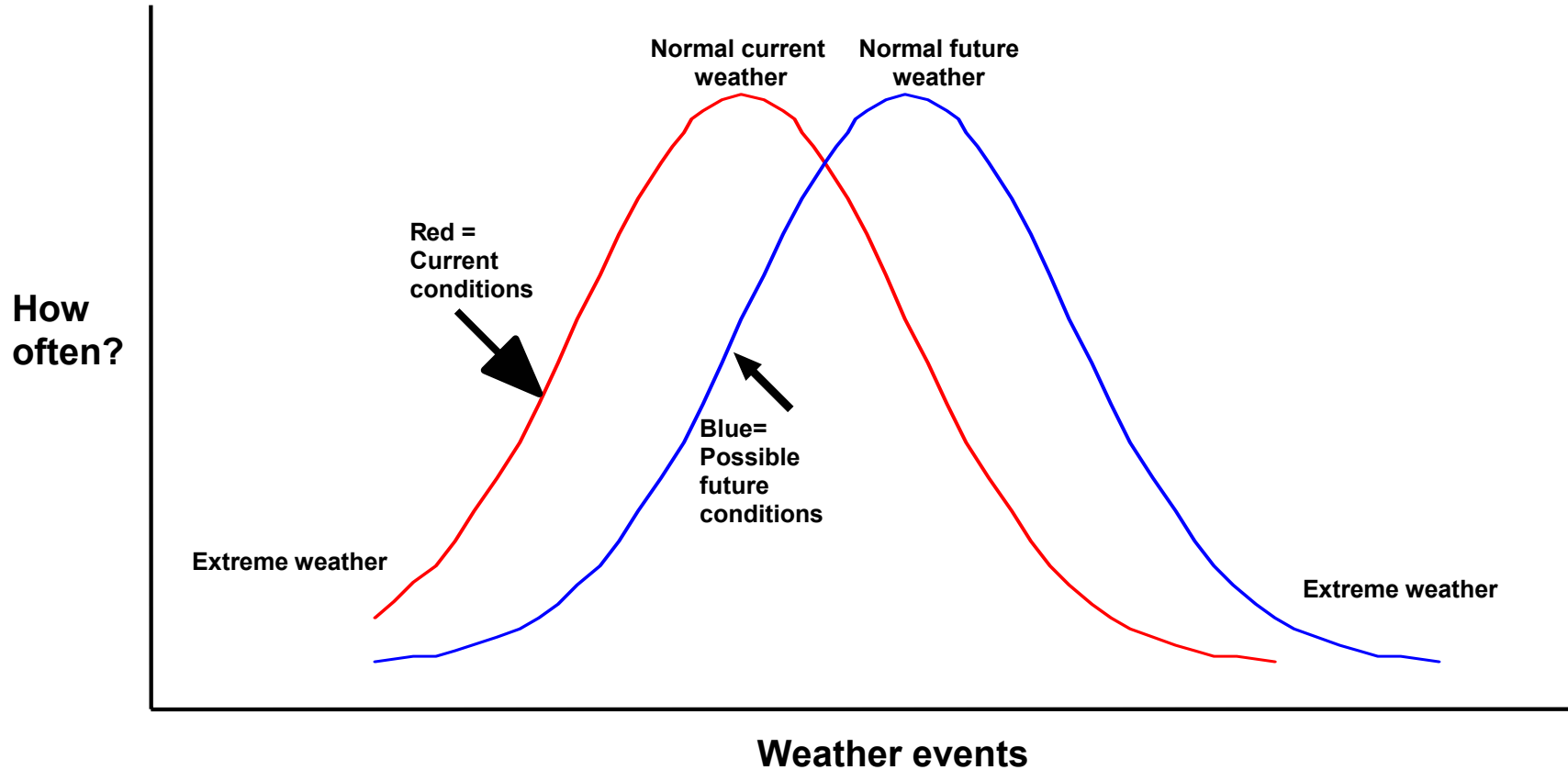


The map shows projected change in annual temperatures for the 2050's compared to present day, when the climate model is driven by an increase in greenhouse gas concentrations equivalent to about a 1% increase per year in CO₂ levels (source Hadley Centre).

Suggest what problems could result from these predicted changes.



Simplified model of possible future world climate and weather extremes

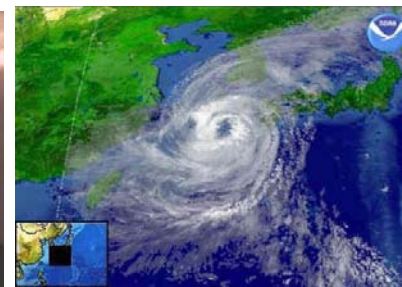


The graph shows that global climatic change could not only lead to a change in “normal” weather but also to a change in weather extremes.

It is not possible to directly attribute a single extreme weather event (hurricane, flood, drought) to global climatic change. However global warming could lead to more frequent extreme weather events.



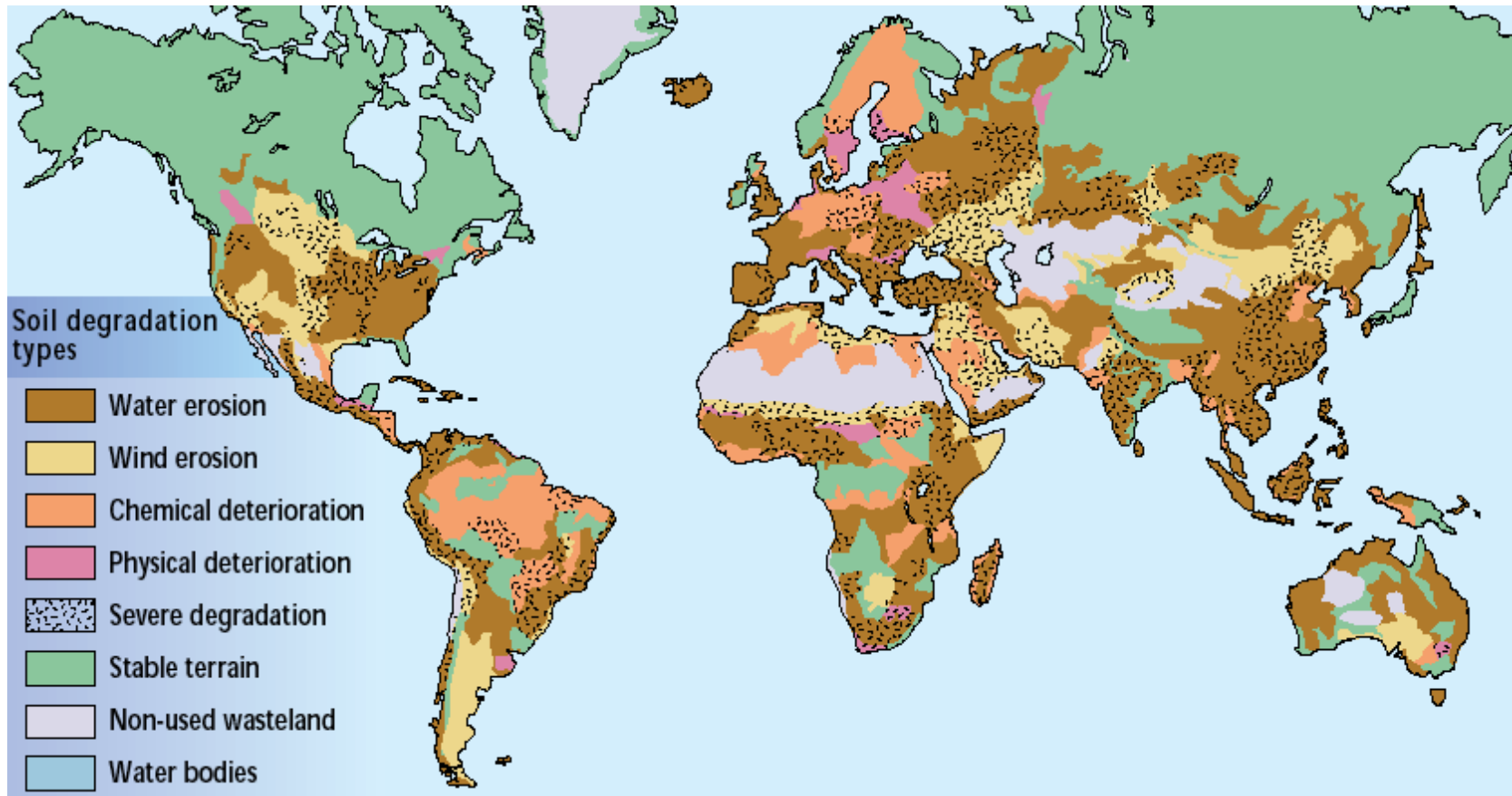
Find recent examples of extreme weather events ...



Has there been a measurable increase in extreme weather events in the last 20 years? If so, can this be directly attributed to global climatic change?



Human induced soil degradation

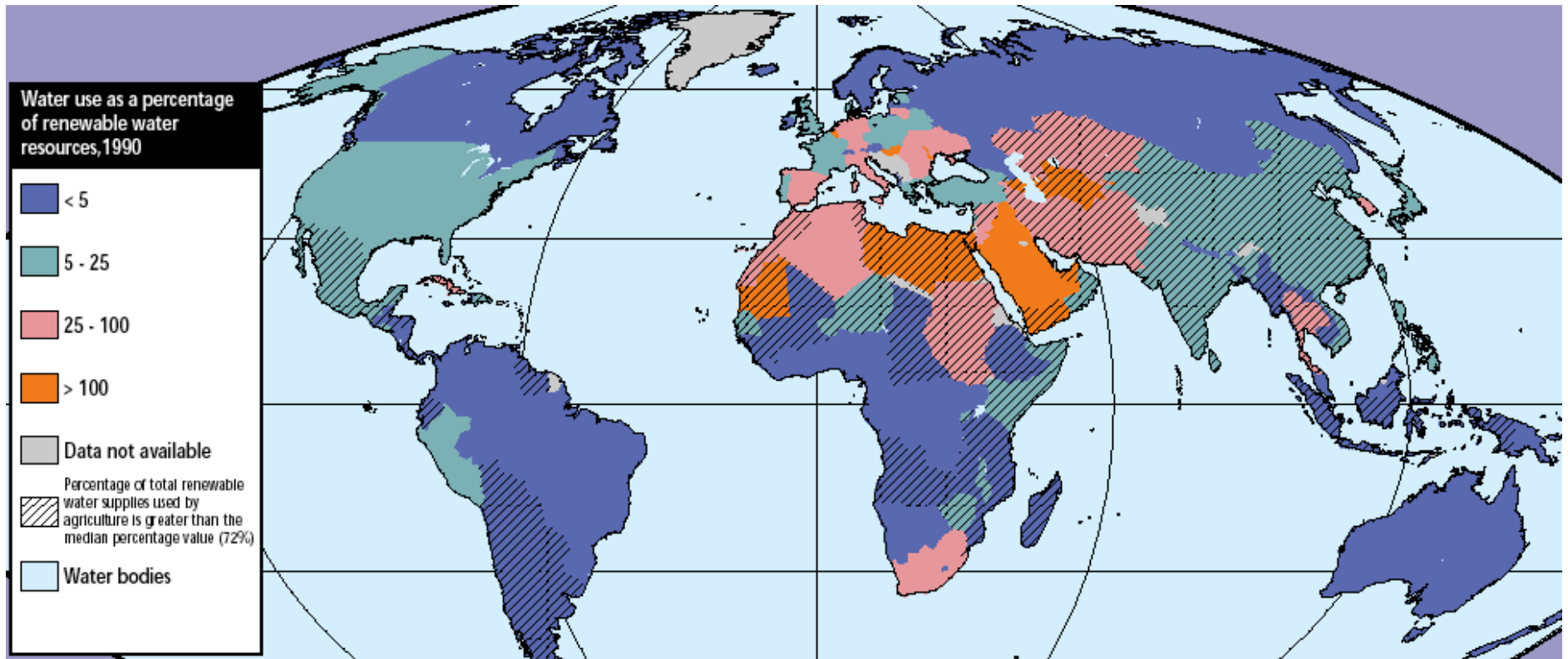


How might possible global climatic change affect the pattern, type and rate of soil degradation?

(Source FAO)



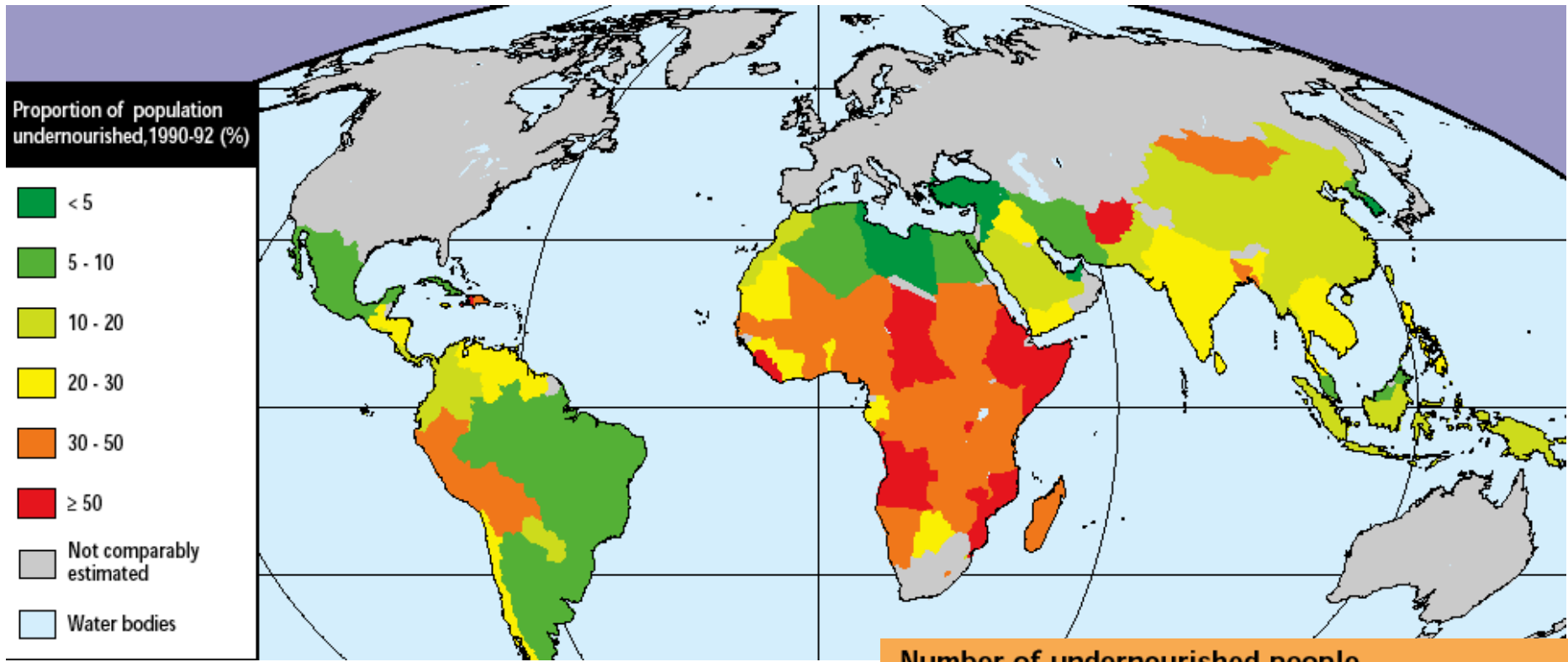
Water utilisation intensity



Which parts of the world could be particularly vulnerable if global climatic change leads to less rainfall (Source FAO)

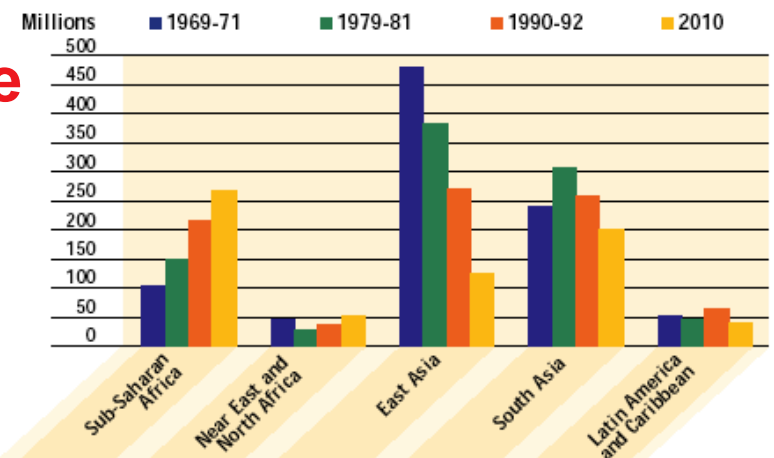


Chronic undernutrition



Why does chronic undernutrition affect certain countries? How is the situation predicted to change by 2010? (Source FAO)

Number of undernourished people



Disruption to ocean currents

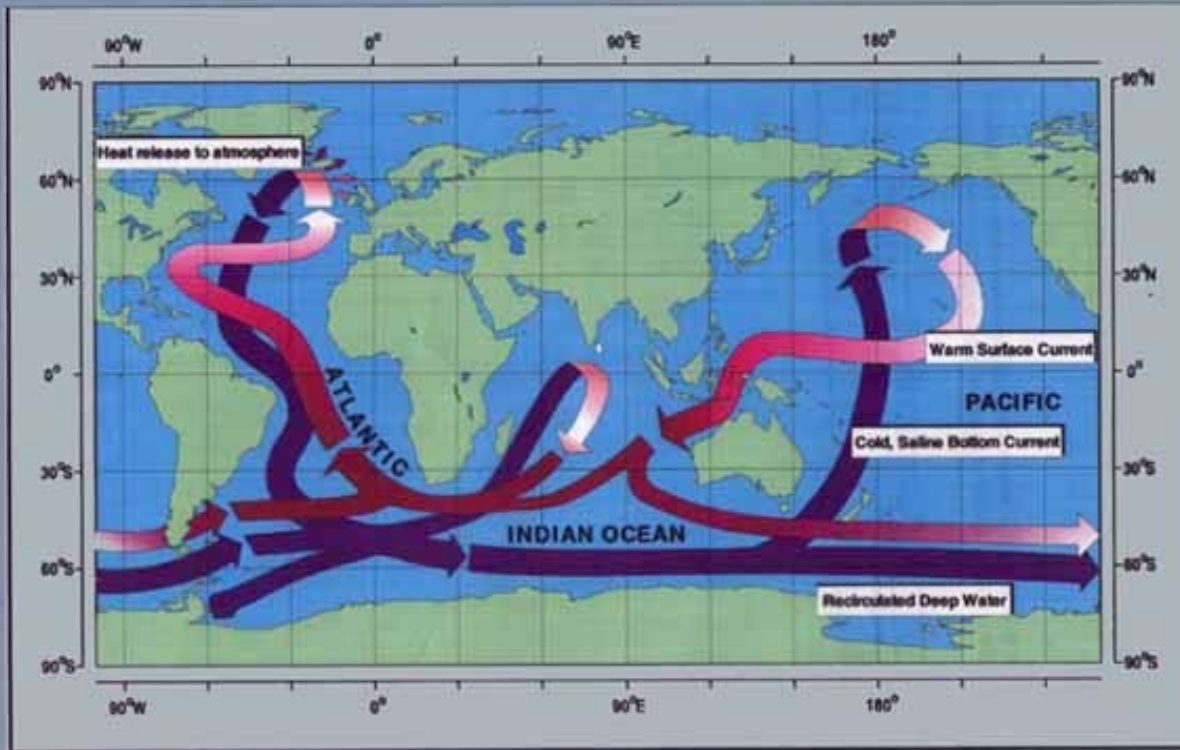


What is the Gulf Stream? Why is it so important for people living on the east coast of the USA and in Western Europe?



The Atlantic Thermohaline Circulation

- A key Element of the Global Oceanic Circulation -



Schematic diagram of the global ocean circulation pathways, the 'conveyor' belt (after W. Broecker, modified by E. Maier-Reimer).

AV/D3/99-2



Warm, salty surface water is chilled and sinks in the North Atlantic to flow south towards Antarctica. There, it is cooled further to flow outward at the bottom of the oceans into the Atlantic, Indian, and Pacific basins. After upwelling the water returns as surface flow to the North Atlantic. While travelling deep in the ocean the originally nutrient-depleted water becomes increasingly enriched by organic matter and dissolved CO₂

- **What is the thermohaline conveyor?**
- **Why is it important?**
- **Why may it be disrupted by global climatic change?**



Possible effects of global warming as predicted by the IPCC

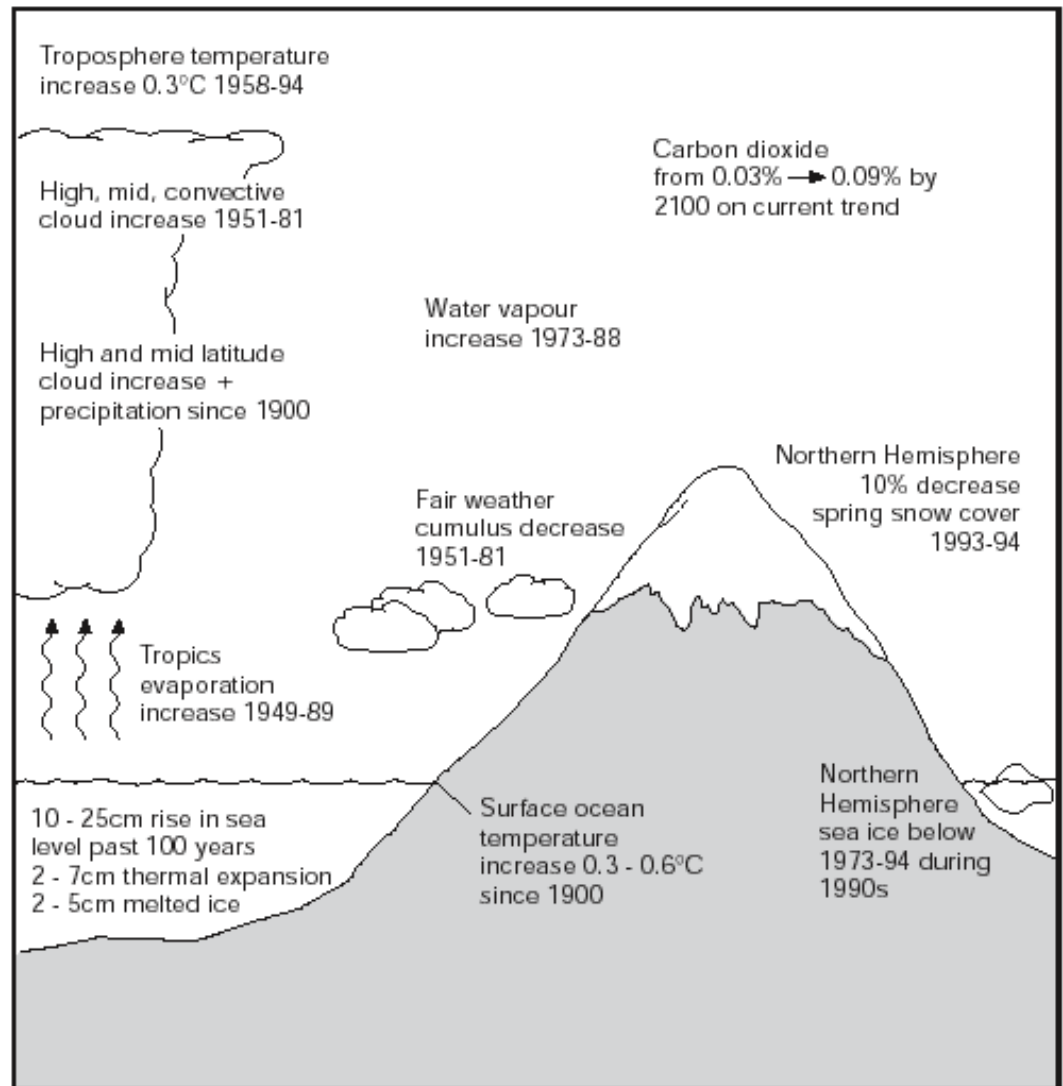
EUROPE	ASIA
<ul style="list-style-type: none">• Melting of many Alpine glaciers and areas of permafrost• Increased river flooding• Droughts more common in southern Europe• More deaths from heat stroke in cities during the summer months• Spread of malaria	<ul style="list-style-type: none">• Decrease in agricultural output in South Asia• More powerful storms during the monsoon season• The swamping of mangrove forests that protect coasts and river banks, especially in Bangladesh• The melting of glaciers in the Himalayas could trigger massive floods, affecting over half a billion people
AFRICA	THE AMERICAS
<ul style="list-style-type: none">• Decrease in crop and plant yields• Spread of desert margins• Increased risk of flooding and coastal erosion in Senegal, Gambia and Egypt	<ul style="list-style-type: none">• An increase in crop output in some parts of North America, but a decrease due to drought in the Canadian Prairies and Great Plains• An increased risk from storm surges, particularly in Florida and on the north-eastern seaboard
AUSTRALIA	
<ul style="list-style-type: none">• More intense rainstorms and cyclones• Droughts become more common	

Make a list of the possible effects of global warming using the following sub-headings: physical, human, economic.



Possible impacts on atmosphere and hydrosphere

- The diagram shows changes (identified by the IPCC) in atmospheric and hydrological characteristics resulting from global warming
- **What changes have been identified in the following:**
- Ocean temperature
- Sea-level rise
- Cloud type and amount
- Snow cover
- CO₂ levels

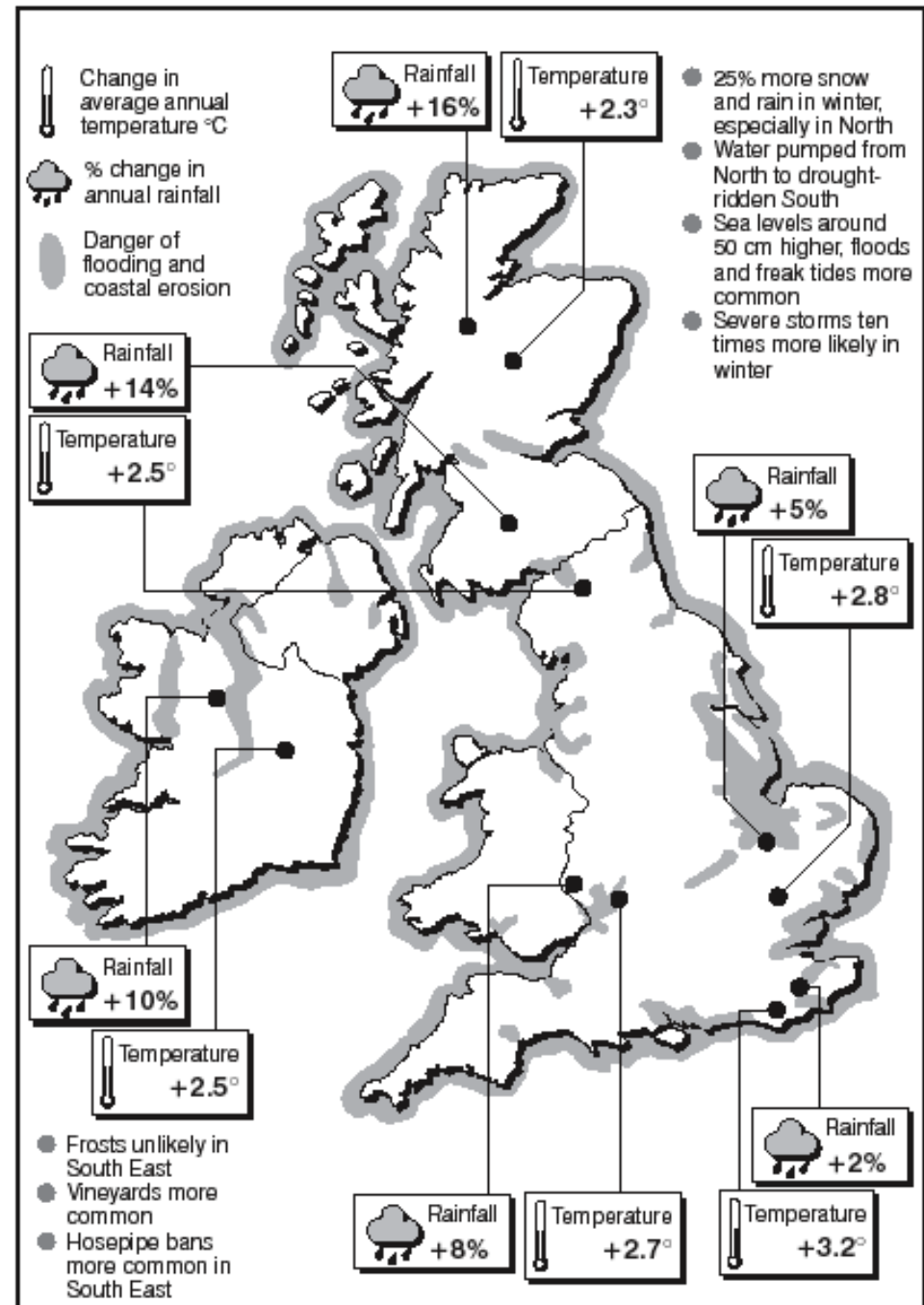


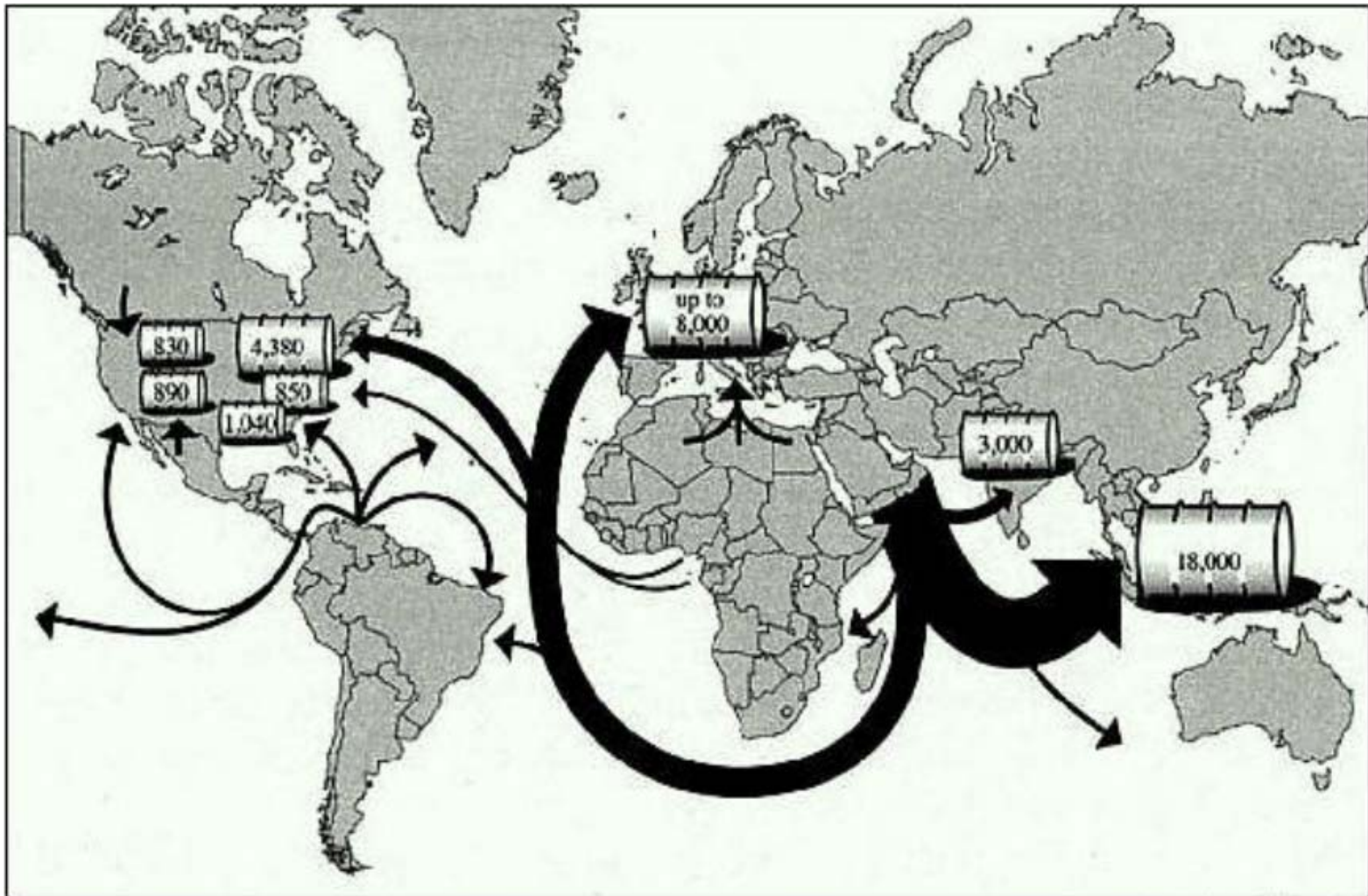
Source: Adapted from IPCC *Climate Change* (1995)



Possible climatic impacts at a national scale

- The map shows possible weather changes in the UK by the year 2080
- What impact could these predicted changes have in the following areas:
- South-East England
- Coastal areas
- Consider some of the positive and negative impacts
- What management plans may be needed to cope with these possible impacts.





Source: Rens and Horkay, 1997.

The maps show a forecast for the flow of Gulf Oil supplies in 2010. **Outline the possible risks of this pattern of oil production and distribution.**





Oil transport is not without hazard



Oil supply is unpredictable

Some clues.....?



Climatic change - responses

- Social e.g. education, conservation, recycling
- Political e.g. international protocols, legislation
- Technological e.g. renewable energy
- Ecological e.g. tree planting



Recycling and conservation

- what materials do you recycle?
- How does this help reduce levels of CO₂?
- What else could you do to increase the amount of recycling?
- How else can energy be conserved?

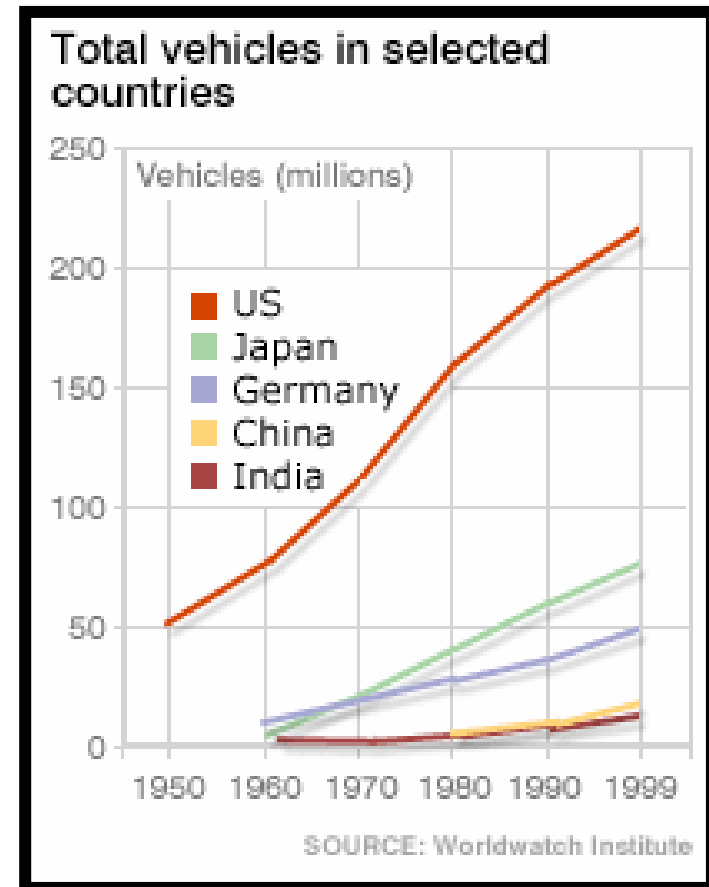


Transport

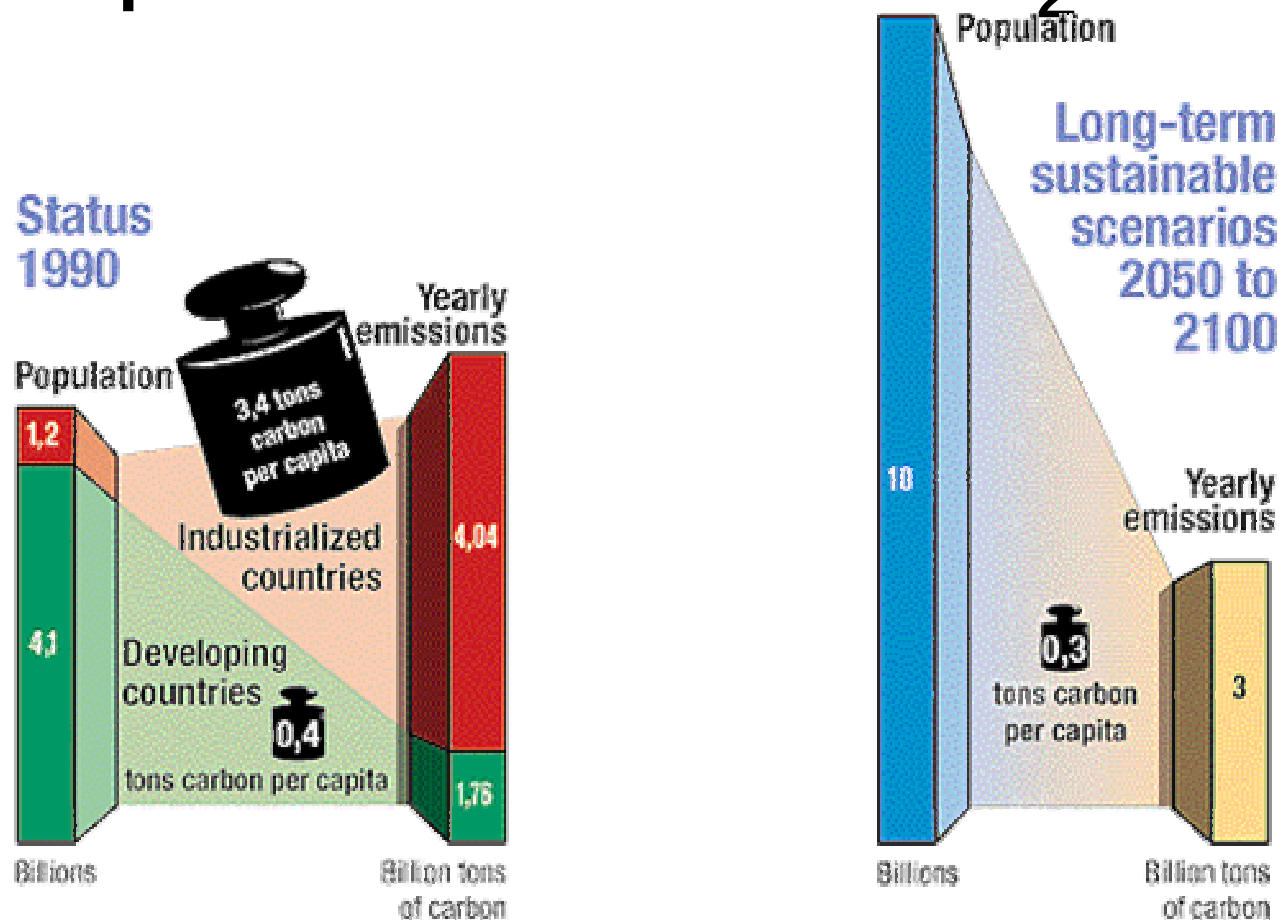
Transport uses 95% of world oil

How many cars are there in your household?

How do you travel to work? To shop? To school?



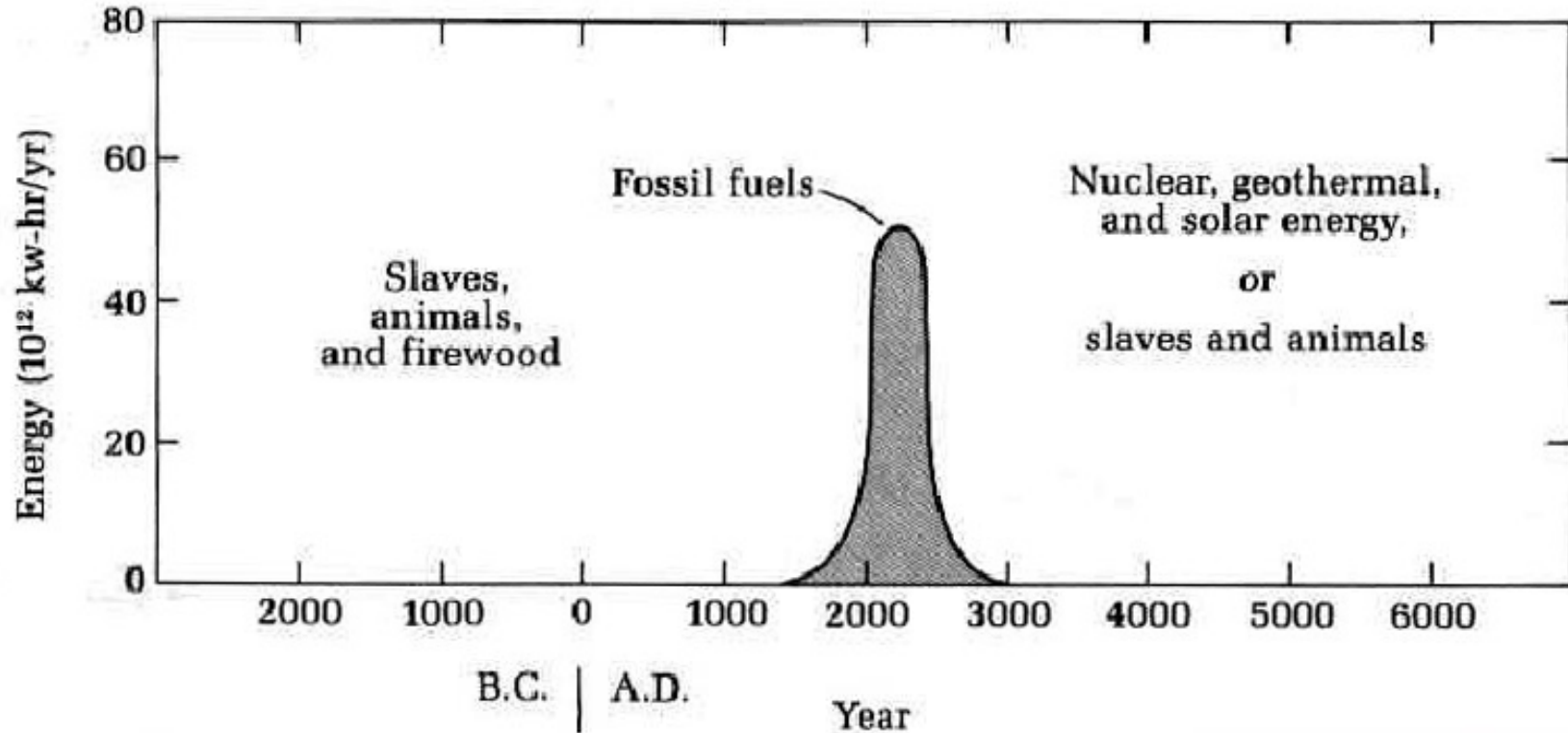
Industrialised countries produce most CO₂



Comment on the situation in 1990. What is proposed to ensure a sustainable future?



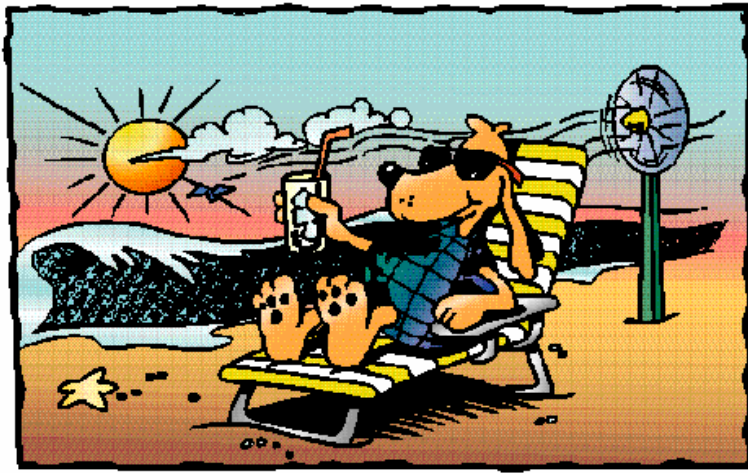
The fossil fuel era....



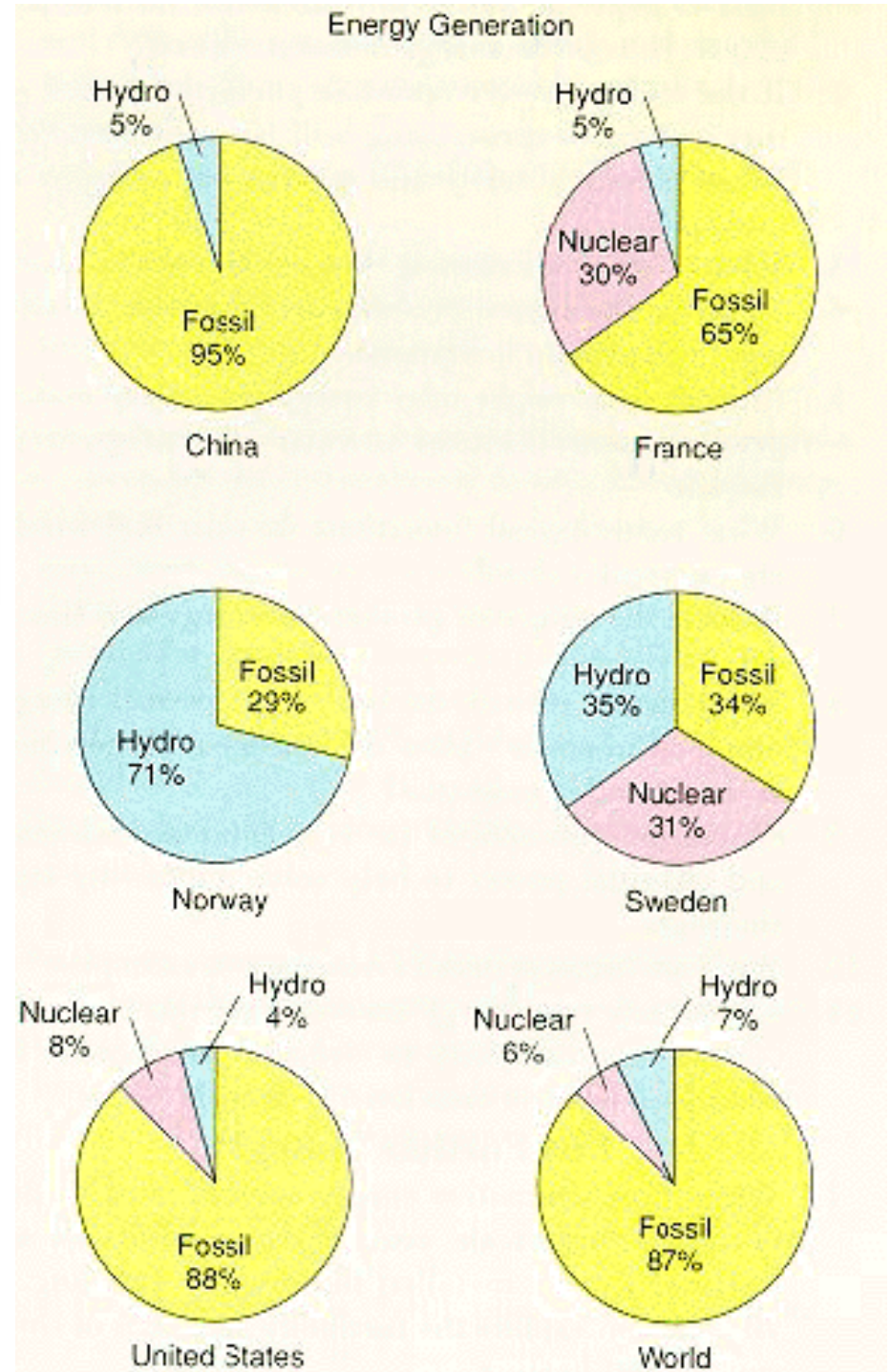
And now for the future?



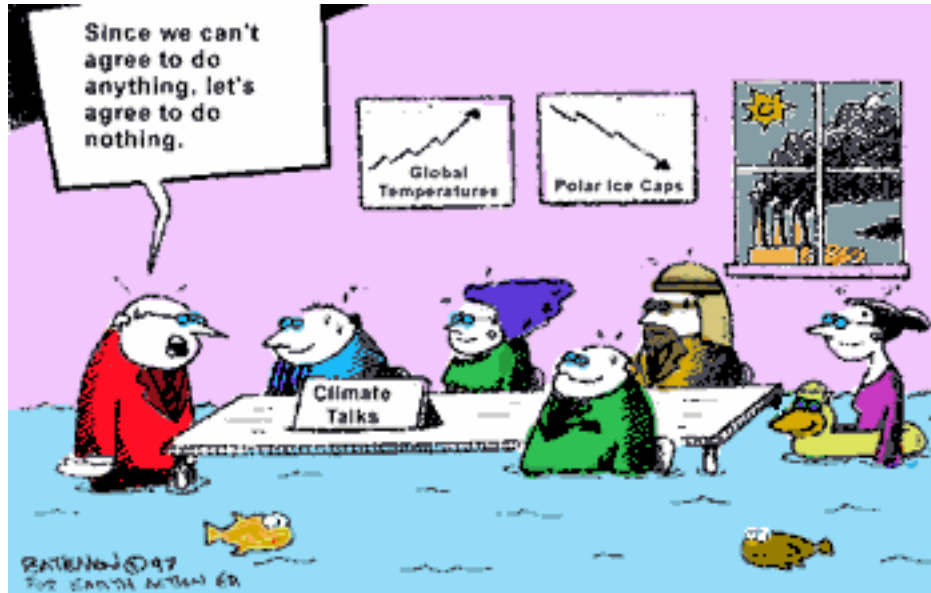
Alternatives?



- **What are the possible problems of relying on fossil fuels?**
- **List some alternative/renewable sources of energy.**
- **Why are these not currently contributing a great deal to overall energy production?**
- **What could be done to increase the use of alternative sources?**



Kyoto Protocol 1997

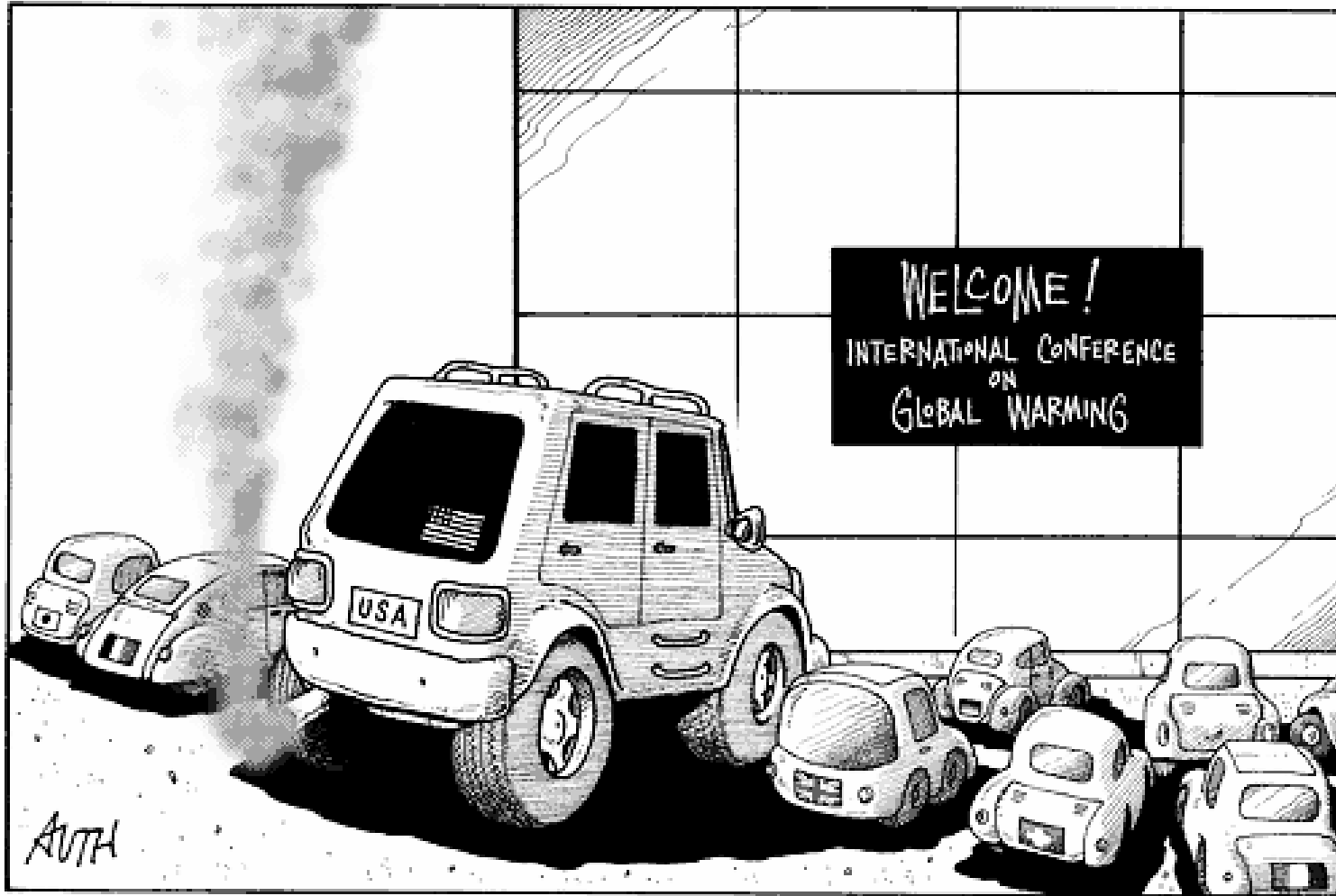


In an accord reached at a United Nations meeting in Kyoto, Japan, in December 1997, 84 countries agreed on the need for an average 5.2 per cent reduction in industrialized countries' 1990 emissions by the year 2012, to slow global warming due to the greenhouse effect. The reductions are not the same for all countries but depend on the degree of economic development, population, climate and size. Canada committed to cut its 1990 emissions by 6 per cent, Britain by 12.5 per cent, Germany by 21 per cent and the United States by 7 per cent. Developing countries face no immediate reduction target. The Protocol will become international law when governments representing 55 countries emitting 55 per cent of the industrialized world's emissions ratify it. The Kyoto Protocol's guiding principles are economic efficiency, environmental integrity and support for sustainable development.

- **How else could countries be encouraged to reduce their output of CO₂?**



Political action? Inaction?



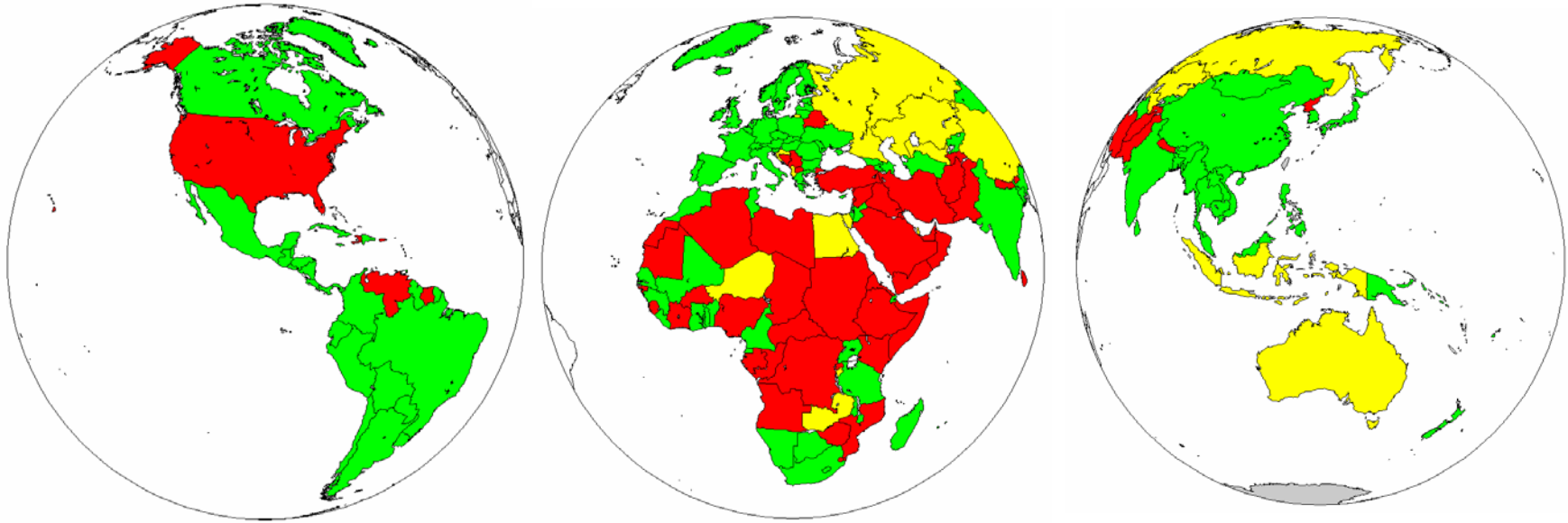
10-24-97 THE PHILADELPHIA INQUIRER. UNIVERSAL PRESS SYNDICATE.



climateprediction.net

Comment on the situation shown above....

Kyoto protocol - who has ratified?



<http://www.worldpolicy.org/globalrights/environment/maps-Kyoto.html>

■ no action
■ signed
■ ratified
■ not UN member

- Describe the maps
- Why have some countries refused to ratify the Kyoto protocol?



Technological solutions



- How can technology help to reduce the level of CO₂ emissions?
- Why is such technology not used more widely?



Ecological solutions



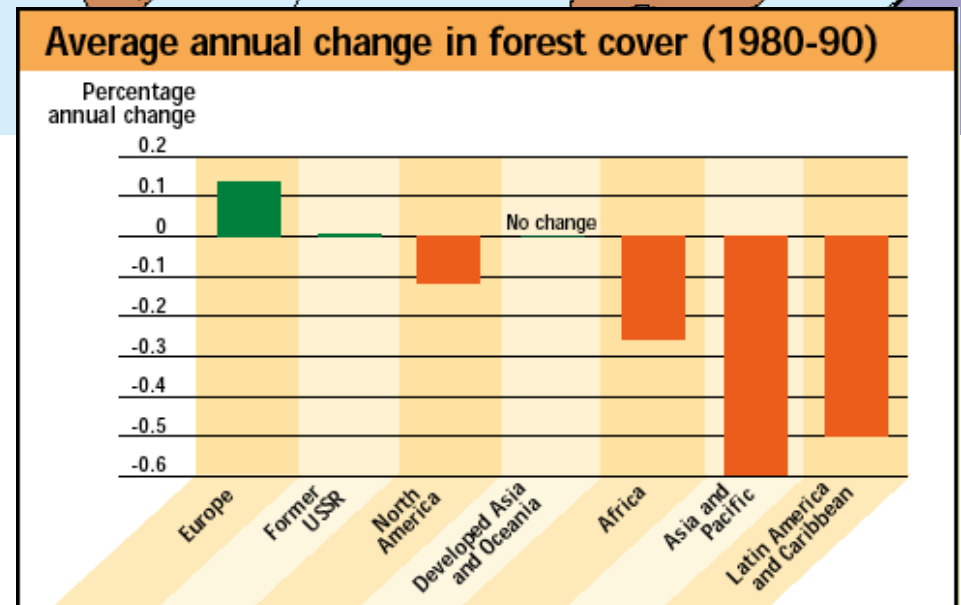
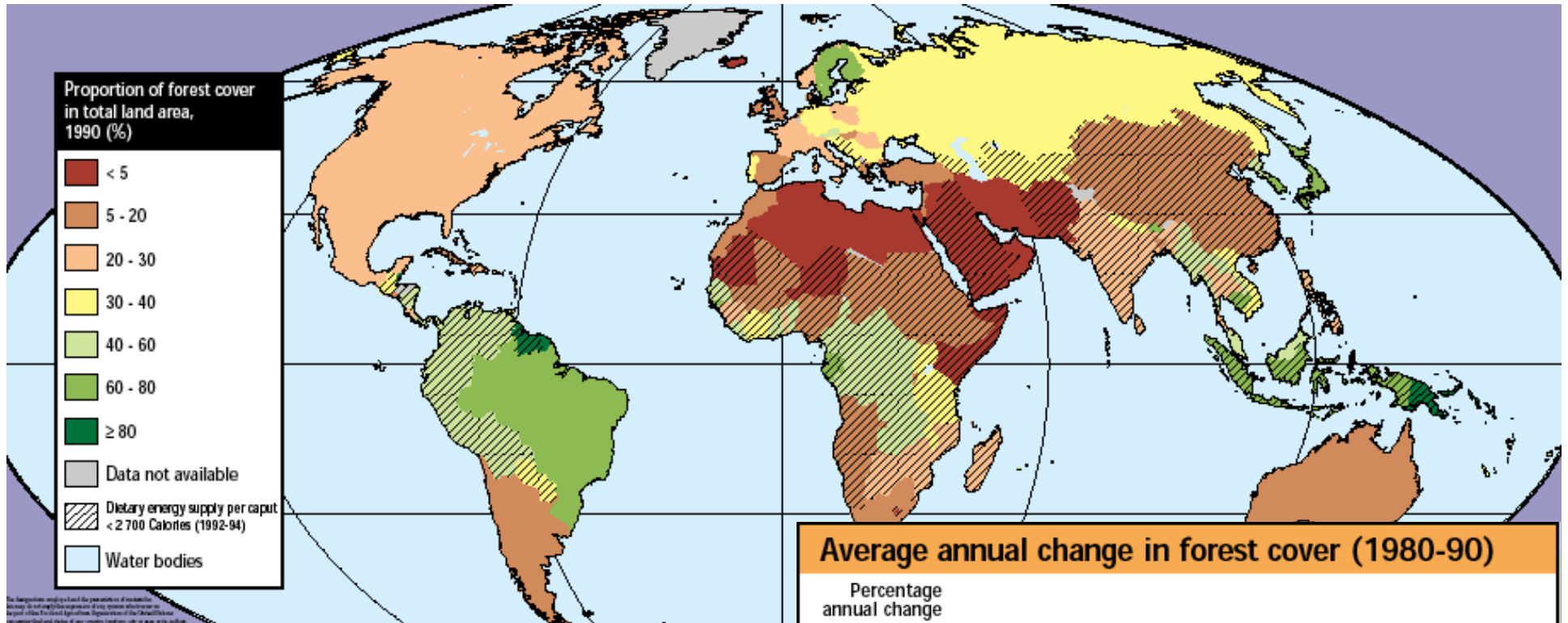
Three actions to reduce global warming

- * Use fossil fuels more efficiently
- * Save old-growth forests, cut sustainably
- * Plant trees when you travel
- * 1 tree every 2,000 miles (3200 km) by car
- * 1 tree every 1300 miles (2000 km) by plane
- * 1 tree every 100 gallons (375 litres) of gasoline
- 1 tree every 1000 kilowatt-hours
- (one kwhr \approx 1.9 pounds CO₂)

- **How could tree planting help to reduce the level of atmospheric CO₂?**



World forest cover



Which parts of the world have i) the greatest and ii) the lowest proportion of forest cover as % of total land area?

Comment on the annual change in forest cover.



Find out more?

- [BBC weather](#)
- [climateprediction.net](#)
- [DEFRA](#)
- [Earthlink.net](#)
- [Environment.about.com](#)
- [Global cooling](#)
- [UNEP](#)
- [World Food Summit 1997](#)

