



GHG Emissions Accounting, Scenarios and Reporting

GRIP (Greenhouse Gas Regional Inventory Protocol)

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Agenda



- Establishing - Where We Are....
- Deciphering - Where Do We Want to Be..
- Working out- How We Get There..

Emissions Inventory



- IPCC (*international panel for climate change*)
UNFCCC – National Reporting
- Included GHGs
 - Carbon Dioxide (CO₂)
 - Methane (CH₄)
 - Nitrous Oxide (N₂O)
 - HFCs
 - PFCs
 - Sulphur Hexafluoride (SF₆)
- Sectors
 - Energy
 - Industrial Processes
 - Waste
 - Agriculture
 - Land Use change.
- Uncertainty
 - Data
 - Measurement
- Approaches & overcoming limitations
 - Bottom up
 - Top down

An Emissions Inventory

Tells Us:

- What energy is being consumed
 - Who is consuming it.
 - Waste, data (e.g landfill)
 - Agriculture, data (e.g animals)
 - Non-combustion chemical processes
- According to the approach used.....
and the emissions of each gas



Inventory Approaches



- Three approaches:
 - Source,
 - End user and
 - Carbon footprinting

GRIP – Greenhouse Gas Regional Inventory Protocol



- GRIP is primarily a source approach
 - Except for electricity and distributed heat
 - Why?
- Three levels – for data purposes
 - Level 1 – Best data
 - Level 2 – Medium data
 - Level 3 – low level data
 - What is the alternative to not using Level 3?
- Potential for wide scale comparison
- On-Line tool

Inventory Tool

The screenshot shows the 'The Greenhouse Gas Regional Inventory Project' web application. The interface includes a top navigation bar with 'Local', 'Data', and 'grip' icons. Below this is a menu structure with 'General', 'Sector', 'Industrial Processes', 'Waste', and 'Agriculture' tabs. The 'General' tab is active, showing a 'Demographics & Economy' section. This section contains several data entry rows for 'Region' and 'National' categories, each with a corresponding unit. The rows are color-coded: red for Level 3 methods, orange for Level 2 methods, and green for Level 1 methods. A progress bar at the bottom indicates the completion status of each row. Callouts provide additional context: 'Menu Options' points to the top navigation; 'This allows you to load and save your progress' points to the 'Local', 'Data', and 'grip' icons; 'The red boxes are for the Level 3 methods, these must be completed' points to the red input boxes; 'The orange boxes are for the Level 2 methods' points to the orange input boxes; 'The green boxes are for the Level 1 methods, completing these will yield more accurate results' points to the green input boxes; and 'This tells you how far through the inventory programme you have progressed' points to the progress bar.

Menu Options

This allows you to load and save your progress

The red boxes are for the Level 3 methods, these must be completed

The orange boxes are for the Level 2 methods

The green boxes are for the Level 1 methods, completing these will yield more accurate results

This tells you how far through the inventory programme you have progressed

Category	Region	National	Unit
Total GDP or GVA	<input type="text"/>	<input type="text"/>	GDP
Population	<input type="text"/>	<input type="text"/>	POP
Household	<input type="text"/>	<input type="text"/>	HH
Cars Registered	<input type="text"/>	<input type="text"/>	CAR
Flight take off	<input type="text"/>	<input type="text"/>	FLT
GVA by Sector	<input type="text"/>	<input type="text"/>	GDP
Iron and Steel	<input type="text"/>	<input type="text"/>	MT
Non-Ferrous Metals	<input type="text"/>	<input type="text"/>	MT
Chemicals	<input type="text"/>	<input type="text"/>	CH20
Paper, Pulp & Print	<input type="text"/>	<input type="text"/>	PP
Food & Beverages	<input type="text"/>	<input type="text"/>	FO
Other	<input type="text"/>	<input type="text"/>	OTH
Agriculture	<input type="text"/>	<input type="text"/>	AG
Services (commercial / institutional)	<input type="text"/>	<input type="text"/>	SER
Expenditure on Fuels per HH	<input type="text"/>	<input type="text"/>	EXP
Miles or Km Travelled per person	<input type="text"/>	<input type="text"/>	MP
Car	<input type="text"/>	<input type="text"/>	MP
Train	<input type="text"/>	<input type="text"/>	MP
Plane	<input type="text"/>	<input type="text"/>	MP
Tonnes of Waste per Household	<input type="text"/>	<input type="text"/>	THW
Waste	<input type="text"/>	<input type="text"/>	
% Landfilled	<input type="text"/>	<input type="text"/>	
% Incinerated	<input type="text"/>	<input type="text"/>	
% Recycled	<input type="text"/>	<input type="text"/>	

Agenda



-Where We Are....

-Where Do We Want to Be..

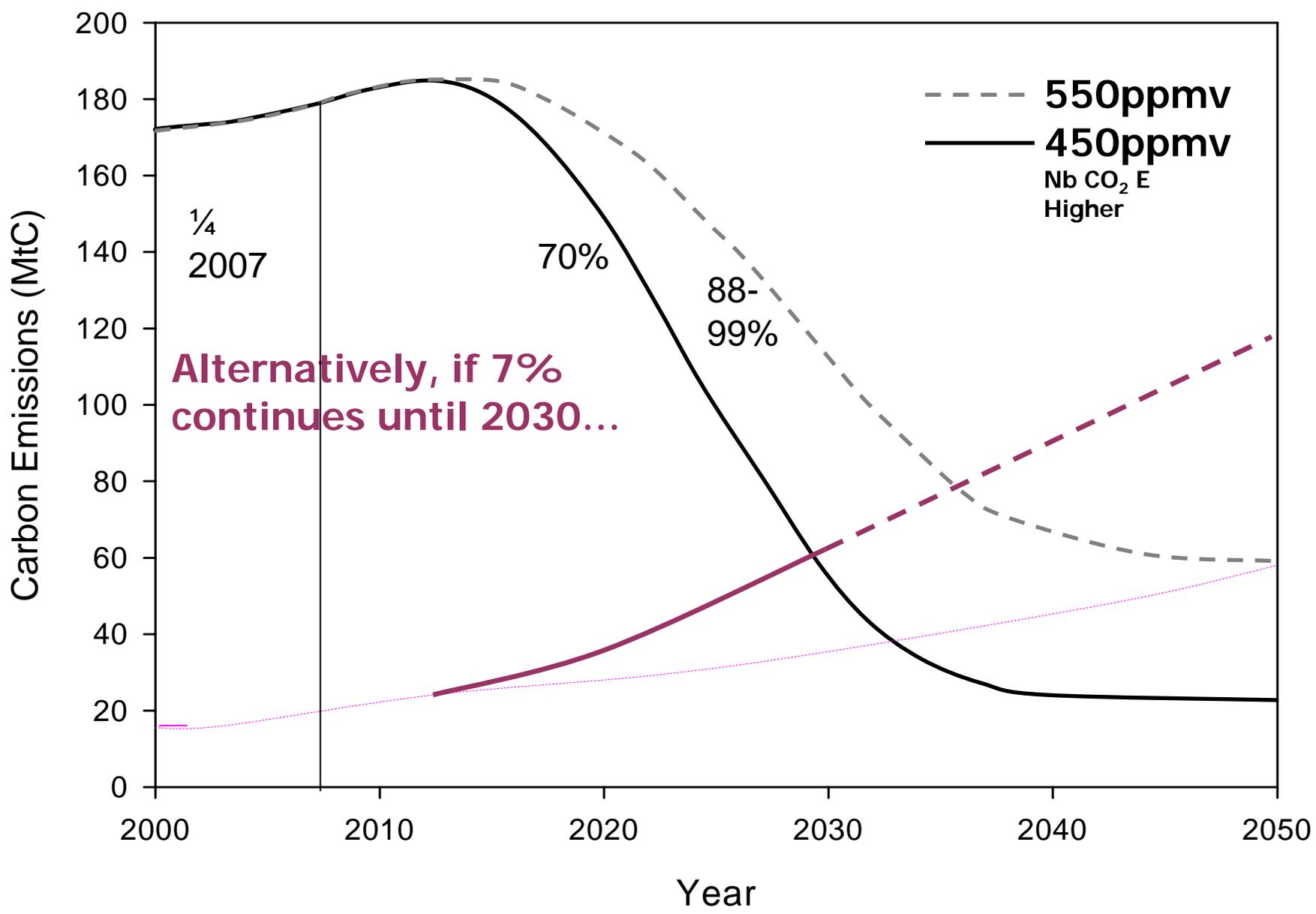
-How Do We Get There..

Where do you want to be..

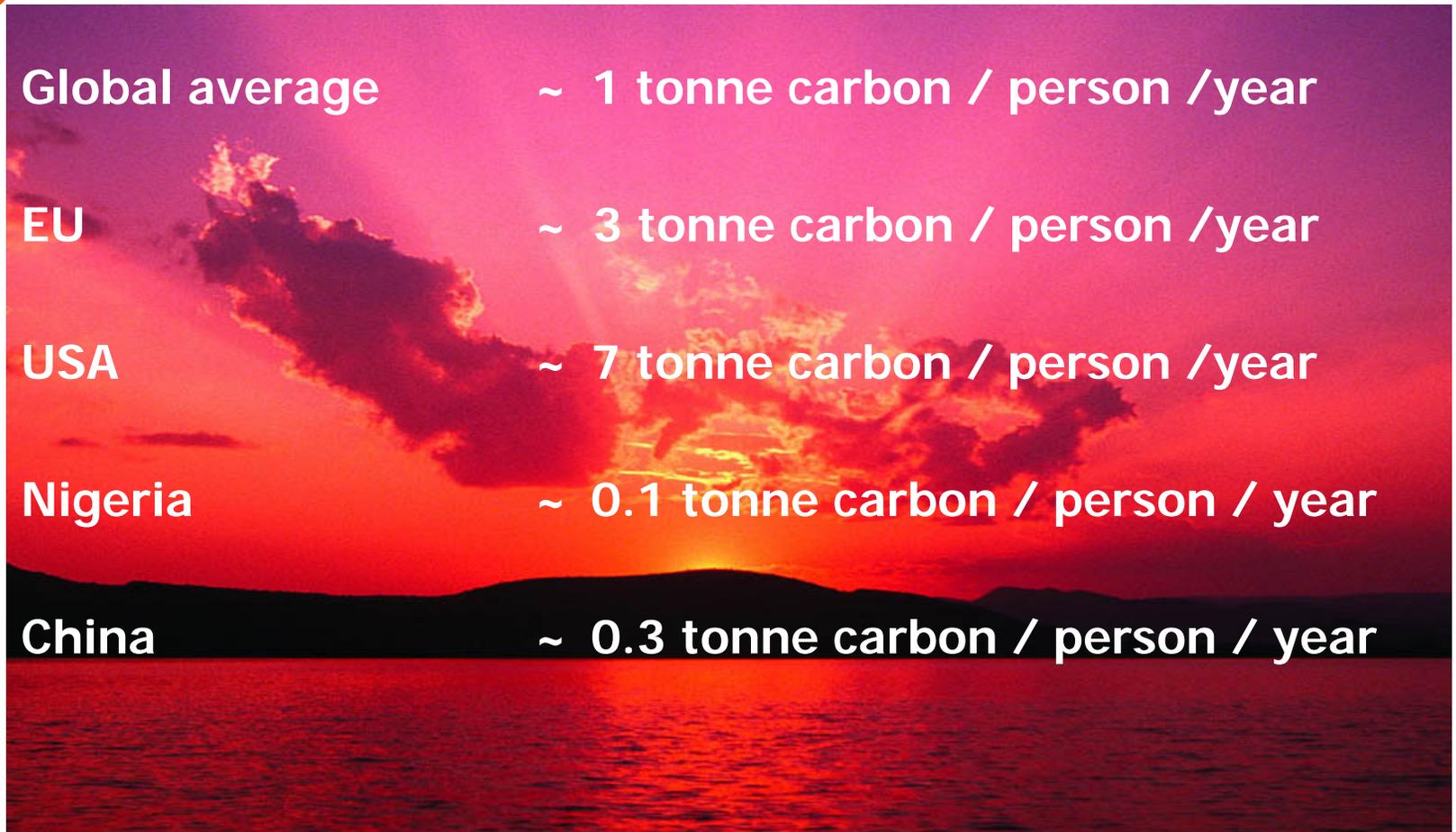


- 80% Reduction...
- Why?
- Link to a 450ppmv future?

450 and 550ppmv for UK Carbon Emissions Bows, 2007



Who's responsible for the world's emissions? (Bows, 2007)



Agenda



-Where We Are....

-Where Do We Want to Be..

-How Do We Get There..

So why account emissions



- Numbers are important
- People make decisions
- Individual understanding is important
- Undershooting.....

Were do you want to be..



- UK is likely to be.. 80% Reduction...
- Why is this the target
 - Per Capita...
 - Should targets be per Sector...?
 - E.g. Domestic, Services, Industry, Road Transport
 - Could / should there be differences, in targets and procedures at the Local, Regional, Scottish, UK, EU, International levels?

Consider a sector...



Domestic Emissions

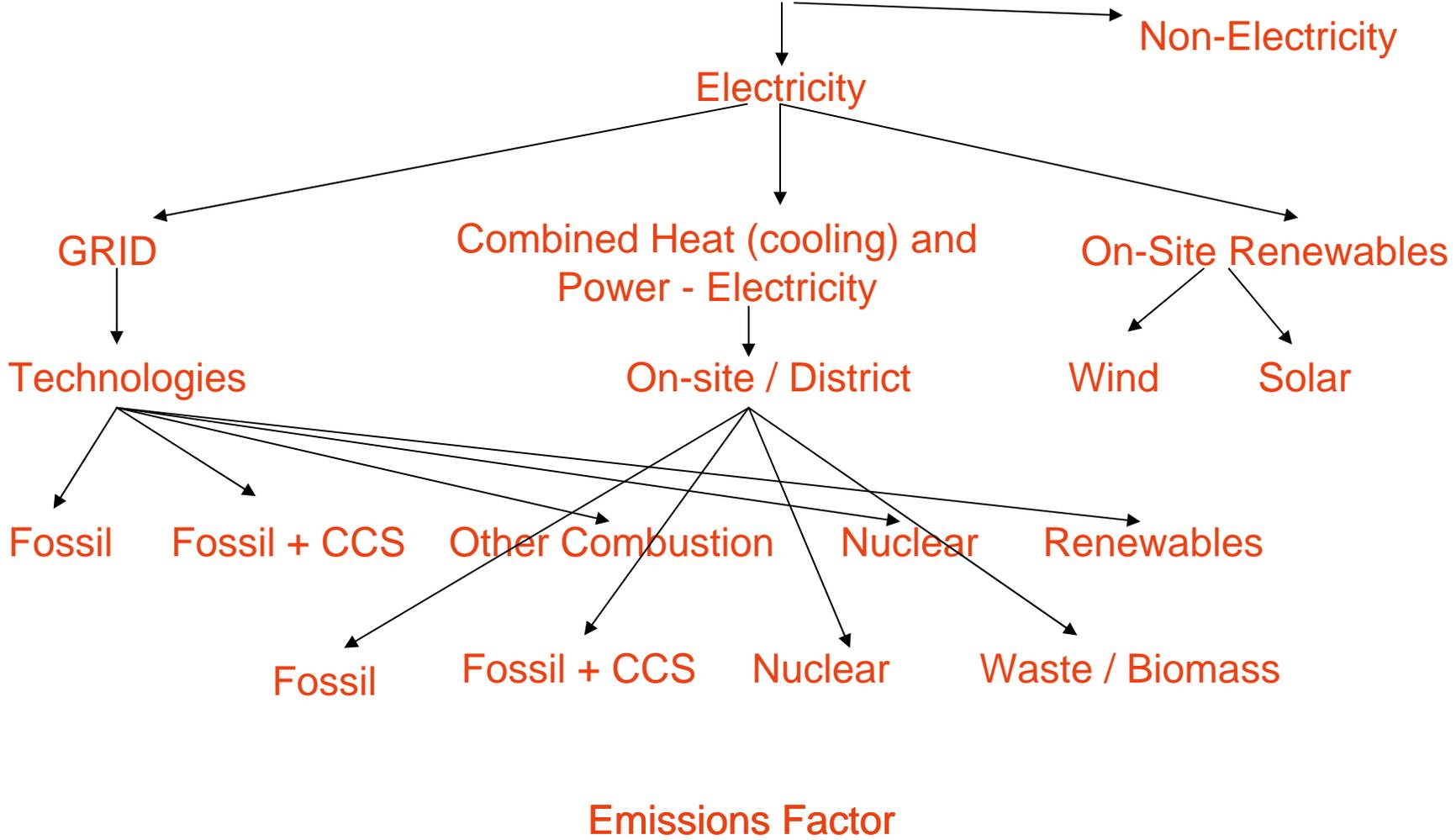
=

Direct & Indirect Emissions from
Electricity

+

Emissions from Non-Electrical
Combustion and Use

Domestic



Domestic

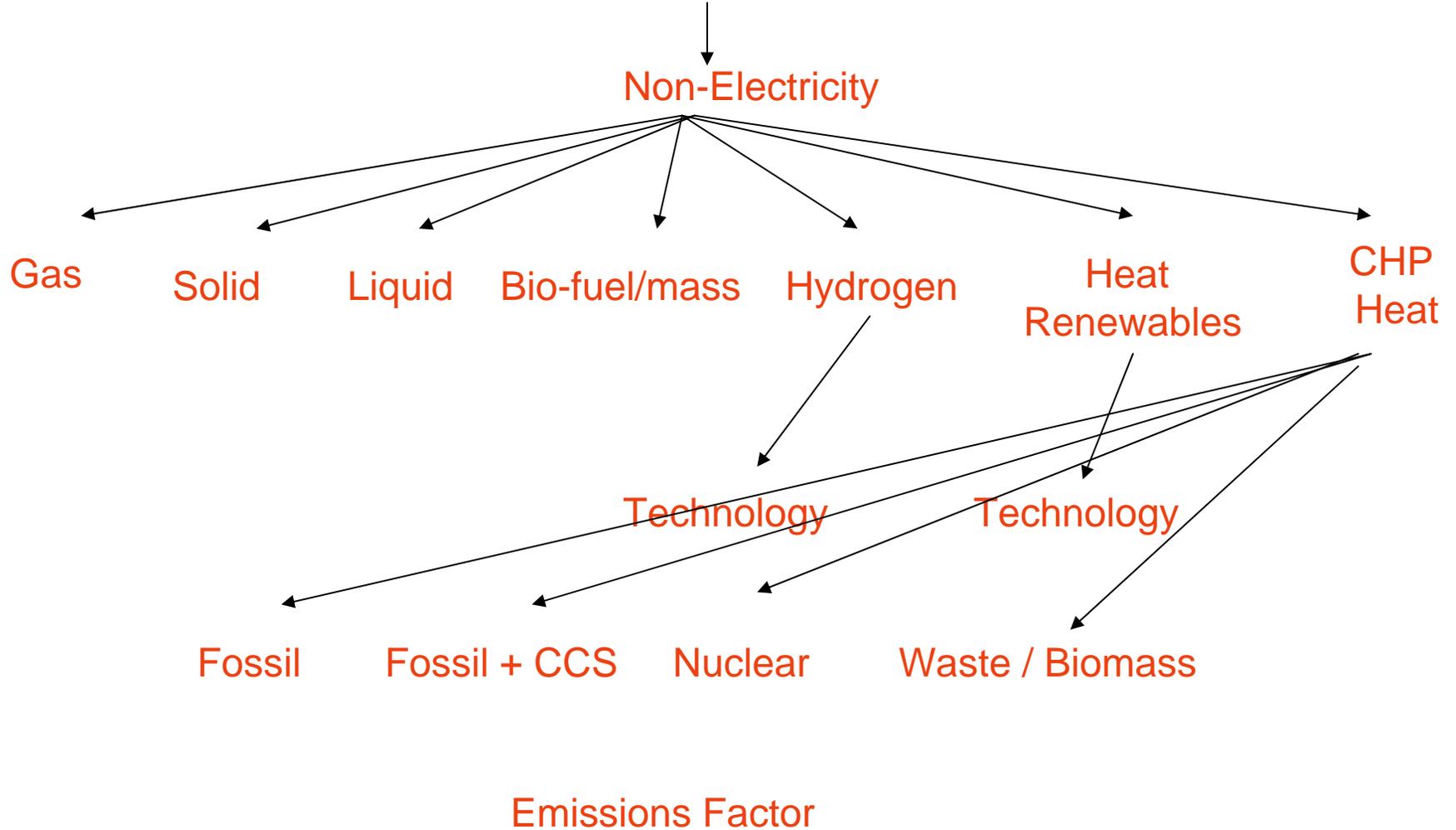
Non-Electricity

Gas Solid Liquid Bio-fuel/mass Hydrogen Heat
Renewables CHP
Heat

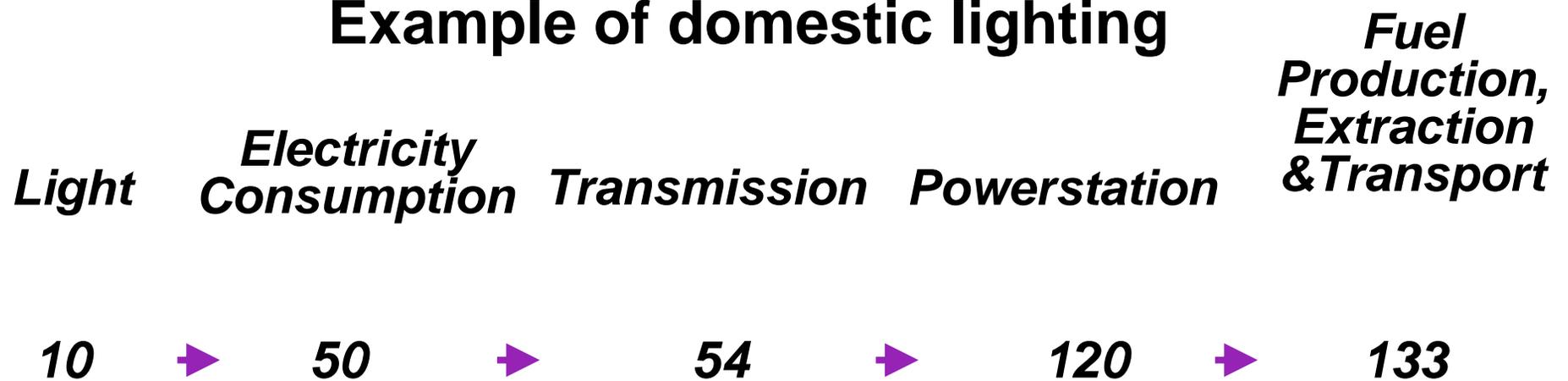
Technology Technology

Fossil Fossil + CCS Nuclear Waste / Biomass

Emissions Factor



Example of domestic lighting



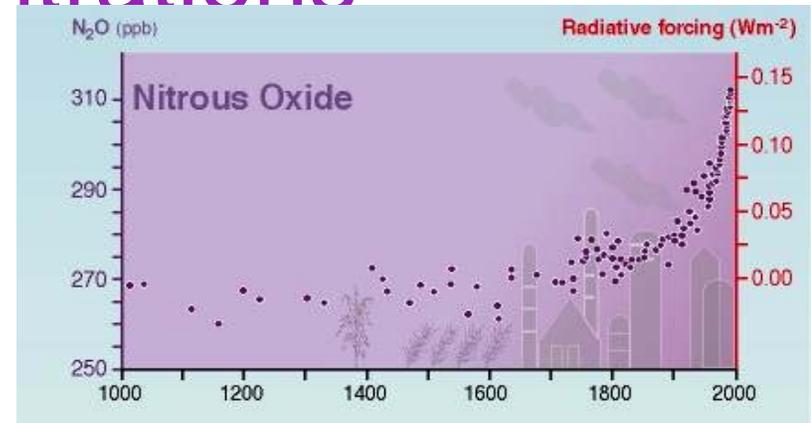
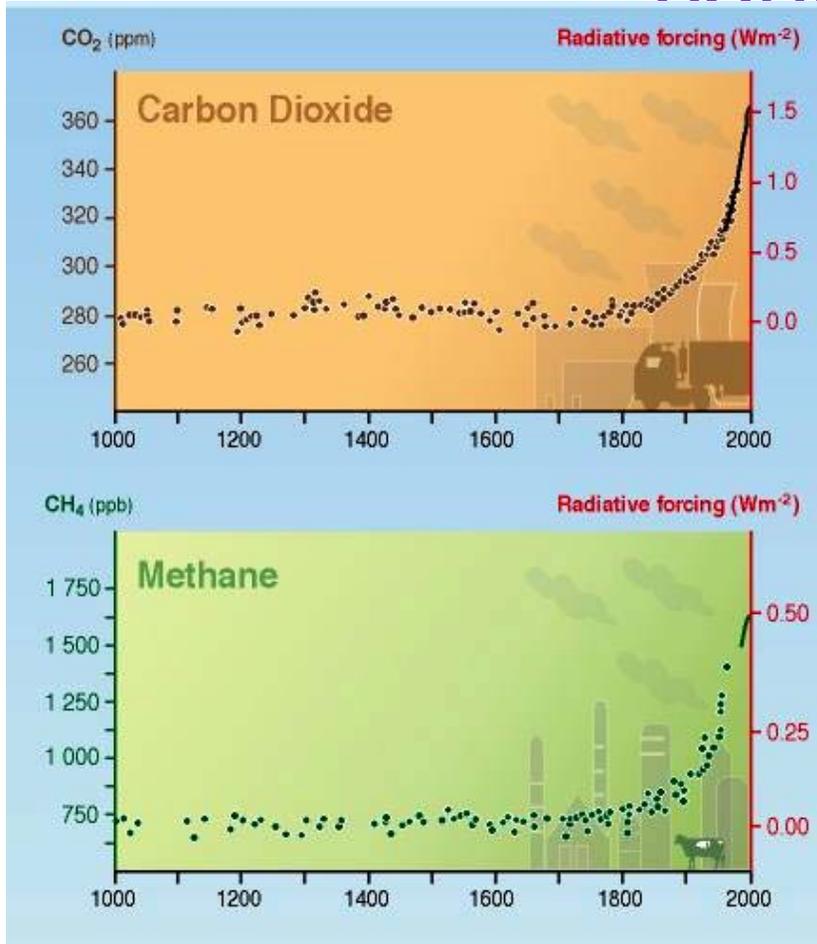
... carbon reductions from reducing demand could dwarf reductions from low-carbon supply in all but the long term!

GRIP – Scenario Tool

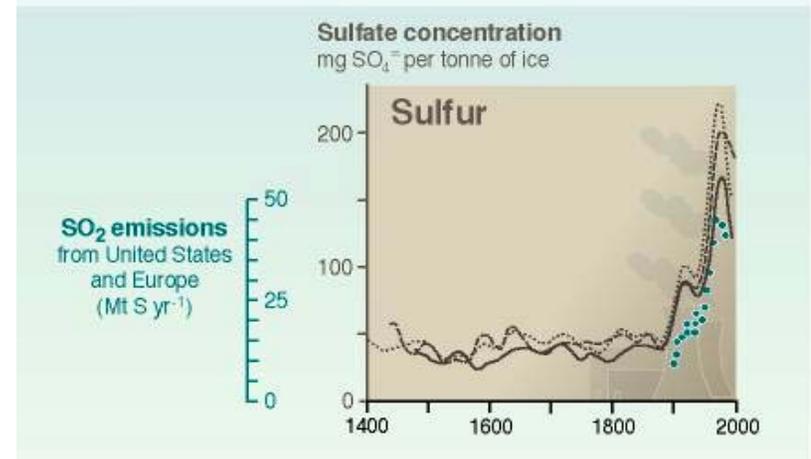
Questions...



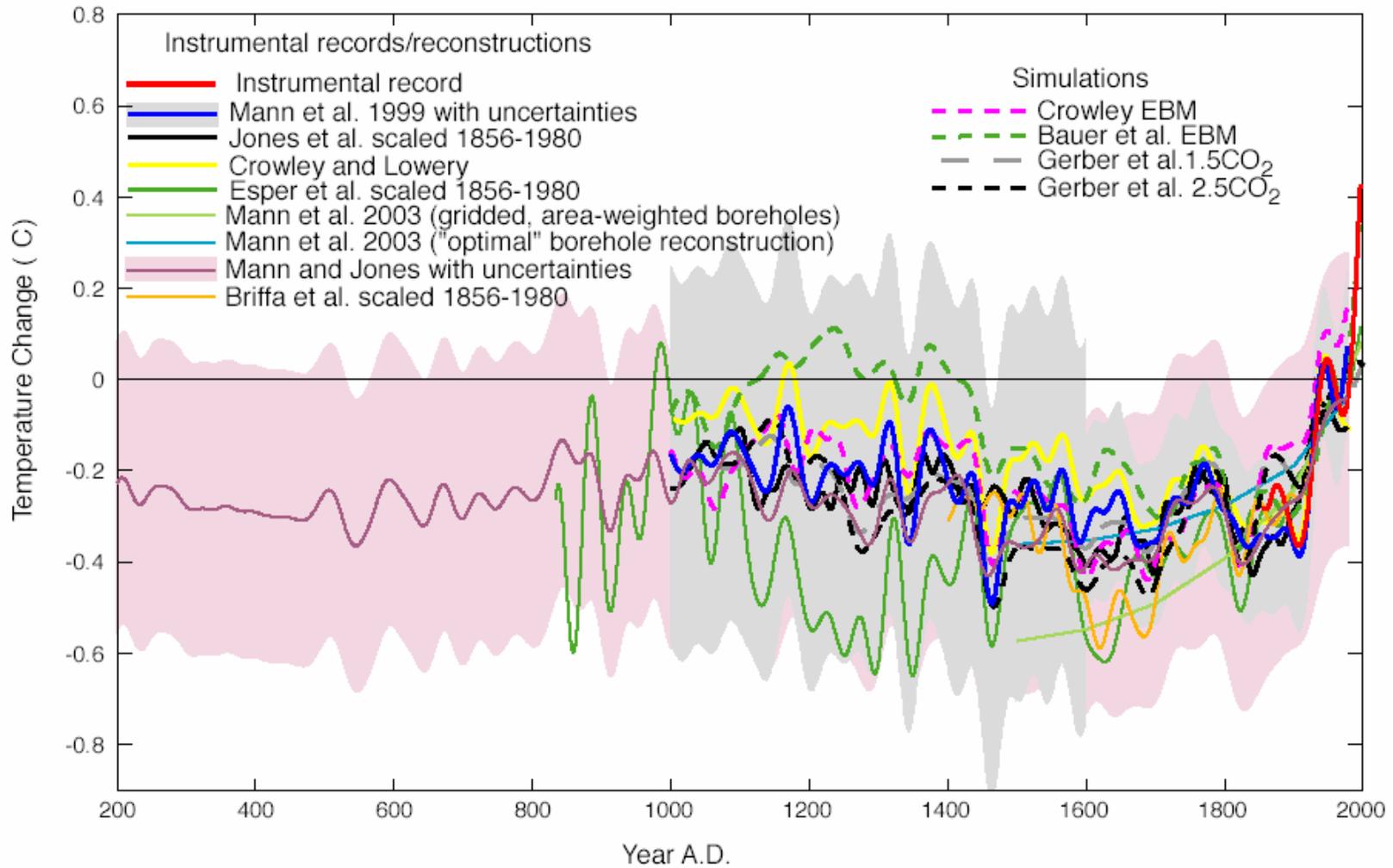
Changes in greenhouse gas concentrations



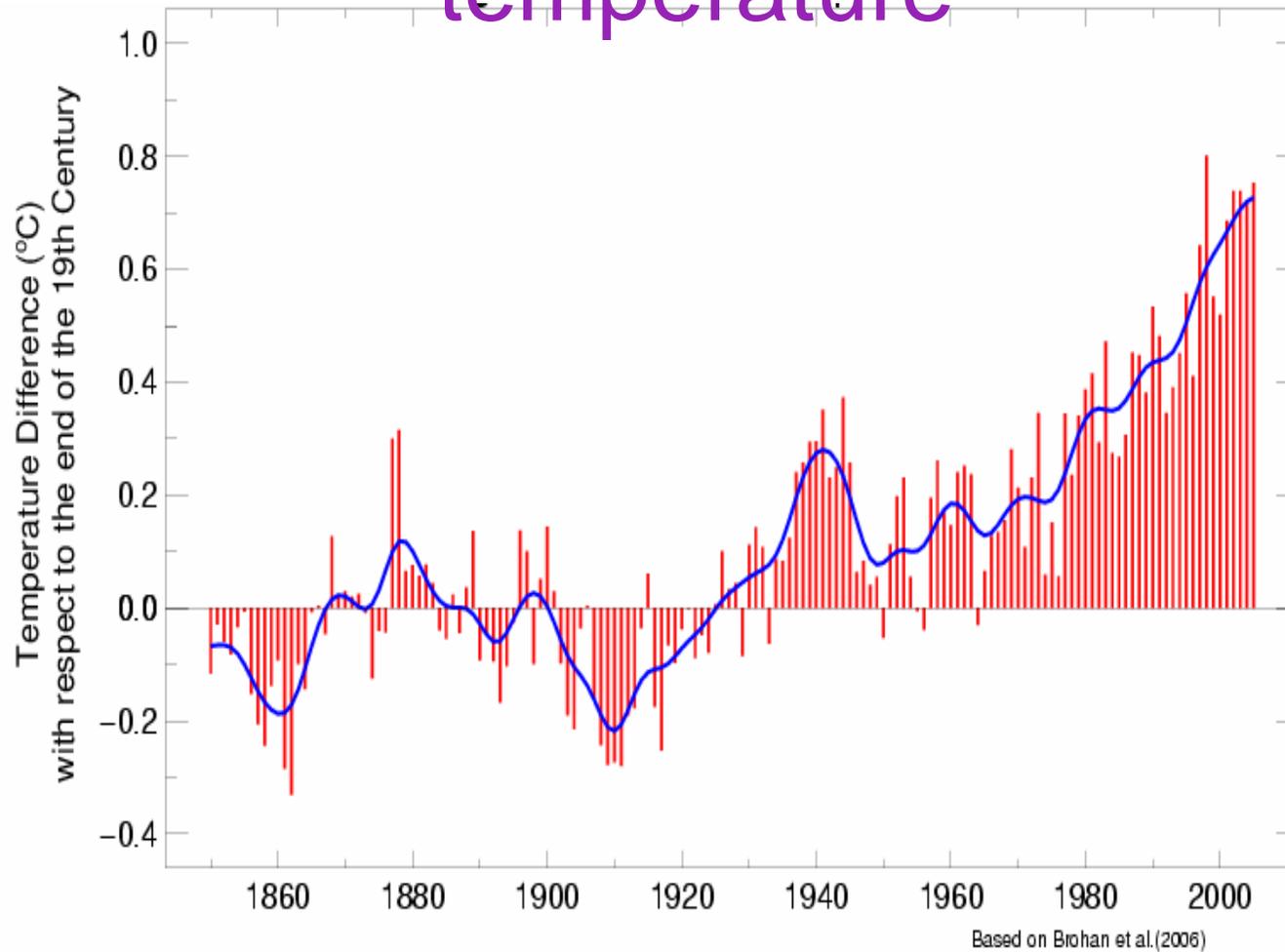
Sulfate aerosols deposited in Greenland ice



Empirical evidence

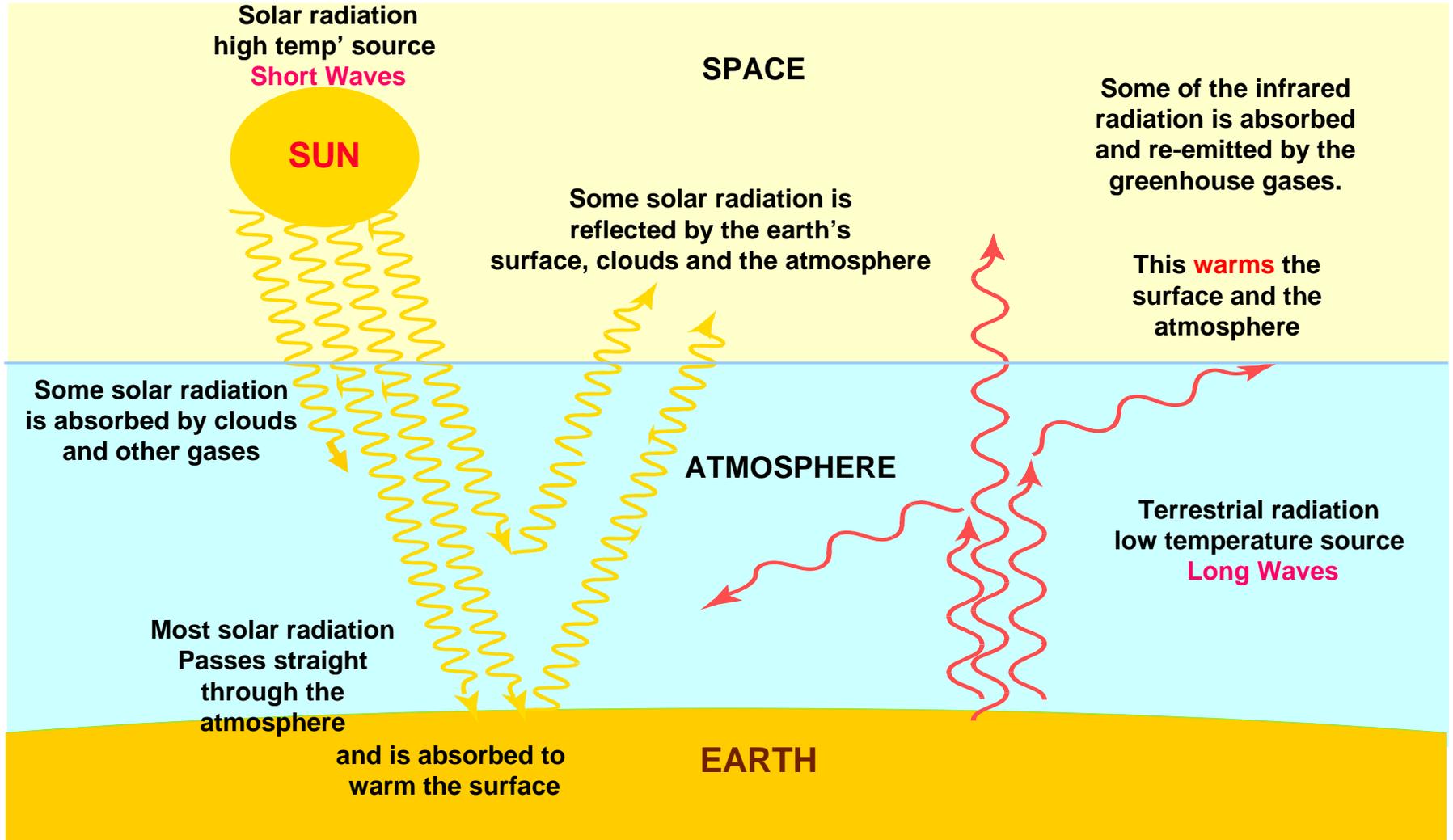


Empirical evidence - temperature



Greenhouse effect

The Met. Office Hadley Centre



Arguments surrounding climate change (Royal Society)



Naomi Oreskes of the University of California, San Diego, wrote in *Science* late last year (vol 306, p 1686): Review of all 928 peer-reviewed papers on climate change published between 1993 and 2003

"Politicians, economists, journalists and others may have the impression of confusion, disagreement or discord among climate scientists, but that impression is incorrect."

The IPCC has become too politicised and does not accurately reflect the wide range of views within the scientific community. The IPCC summary for policymakers does not adequately represent the scientific uncertainty.

The work of the IPCC is backed by the worldwide scientific community. A joint statement of support was issued in May 2001 by the science academies of Australia, Belgium, Brazil, Canada, the Caribbean, China, France, Germany, India, Indonesia, Ireland, Italy, Malaysia, New Zealand, Sweden and the UK. It stated: "We recognize the IPCC as the world's most reliable source of information on climate change and its causes, and we endorse its method of achieving consensus."

Arguments surrounding climate change

Many scientists do not think that climate change is a problem. Some scientists have signed petitions stating that climate change is not a problem

In the journal *Science* in 2004, Oreskes published the results of a survey of 928 papers on climate change published in peer-reviewed journals between 1993 and 2003. She found that three-quarters of the papers either explicitly or implicitly accepted the view expressed in the IPCC 2001 report that human activities have had a major impact on climate change in the last 50 years, and none rejected it.



Arguments surrounding climate change

There is little evidence that global warming is happening or, if it is happening, it is not very much. Some parts of the world are actually becoming cooler. Increased urbanisation could be responsible for much of the increase in observed temperatures. Satellite temperature records do not show any global warming. If there has been global warming recently, it would not even be a unique occurrence within the past 1000 years. Europe has been much warmer in the past.

Few scientists dispute that the global average temperature has been rising for at least a century. The IPCC 2001 report concluded, based on worldwide measurements, that the average surface temperature of the Earth had risen by 0.6 centigrade degrees (+/-0.2°C) during the 20th century. The IPCC found that, in terms of the global average temperature, the 1990s were very likely (a 90-99% chance) to have been the warmest decade since records began in 1861, and that 1998 was the warmest year. Furthermore, the increase in surface temperature during the 20th century in the Northern Hemisphere was likely (a chance of 66 to 90%) to have been greater than for any other century for the last 1000 years. The IPCC report recognised that “temperature changes have not been uniform globally but have varied over regions and different parts of the lower atmosphere”. For instance, some parts of the Southern Hemisphere oceans and parts of Antarctica have not warmed in recent decades. The report also noted that there have been two major periods of warming globally: 1910 to 1945 and since 1976. It concluded that “it is virtually certain that there has been a generally increasing trend in global surface temperature over the 20th century, although short-term and regional deviations from this trend occur.



Arguments surrounding climate change



The Earth is getting hotter, but not because of emissions of greenhouse gases from human activities. Carbon dioxide makes up such a tiny fraction of the atmosphere that even if it doubled it would make little difference to the climate. Variations in the sun are more likely to be the cause of climate changing than increases in greenhouse gases.

About half of the solar energy entering the top of the Earth's atmosphere eventually reaches the surface where it is absorbed. Much of the solar energy is absorbed by the Earth's surface and then released as infra-red radiation, some of which is absorbed by greenhouse gases such as water vapour, carbon dioxide and methane. Increases in the concentrations of greenhouse gases in the atmosphere enhance the greenhouse effect and, on average, lead to further warming. It has been long established that carbon dioxide strongly absorbs infra-red radiation. The IPCC 2001 report pointed out that carbon dioxide is "the dominant human-influenced greenhouse gas", and is responsible for more than half the warming due to changes in atmospheric concentrations. A recent study by Solanki and others, published in the journal *Nature*, found that the level of solar activity during the past 70 years has been "exceptional" when considered over the period of the last 11,400 years. However, they concluded that "although the rarity of the current episode of high average sunspot numbers may indicate that the Sun has contributed to the unusual climate change during the twentieth century, we point out that solar variability is unlikely to have been the dominant cause of the strong warming during the past three decades".

Arguments surrounding climate change



There is no reliable way of predicting how temperatures will change in the future. The climate is so complex that it is hard to predict what might happen. The IPCC's climate scenarios are developed by economists not scientists and are often misleadingly presented as predictions or forecasts, when they are actually just scenarios – the most extreme of which are totally unrealistic. The IPCC's findings are dependent on models that are badly flawed. No climate model has been scientifically validated. The IPCC 2001 predictions showed a wider uncertainty range than that in earlier reports.

There is conflicting evidence about whether the ice at the poles is melting and, in fact, it is actually becoming thicker in Antarctica.

The IPCC 2001 report indicated that in 2000 Arctic ice had thinned overall by 40% in the late summer and early autumn (with 66 to 90% certainty) in the past few decades, and decreased in extent by 10 to 15% since the 1950s in the spring and summer. There has also been a widespread retreat of non-polar glaciers. However, there was no demonstrated change in the overall extent of Antarctic sea ice between 1978 and 2000.

Arguments surrounding climate change



- Even if climate change is occurring, it won't be that dangerous. Abrupt climate change is just another scare story. While an atmospheric concentration for carbon dioxide of 550 parts per million has been proposed as a political target, there has been no scientific determination of "dangerous" levels of greenhouse gas concentrations.