

## Climate scepticism and climate science guide

Tearfund works on climate change because it's happening now and is hitting the poorest people hardest. These people already live in vulnerable situations and the impacts of climate change are pushing them over the edge.

Recent media coverage has brought attention to doubts around the underlying climate science and its credibility. We've created this guide to help you understand the main issues raised by climate sceptics and how you can respond to them.

The following arguments are often used as reasons why we shouldn't respond to climate change:

- Climate change isn't happening
- Climate change isn't man-made
- Climate change is happening but its impacts are beneficial
- Climate change is happening but it's too expensive to deal with the impacts: reducing emissions will hit industries and consumers and will undermine development

### Tips

- climate change is happening and its devastating the lives of poor people
- what's been reported in the news is the misuse and misinterpretation of the science
- if you can't respond, make a note of it and use some of the resources outlined below to find out

### **1. Climate change isn't happening**

Some sceptics argue that climate change isn't happening – they contest the evidence that the earth is warming, and some even argue that the earth has actually cooled over the last 50 years. These arguments indicate a misuse or misrepresentation of the overwhelming evidence for climate change coming from the scientific community.

The Intergovernmental Panel on Climate Change (IPCC) is an independent UN body consisting of about 2,800 of the world's top climate scientists from research institutions and universities supported by over 190 countries. Recently climate sceptics have cast doubt on the integrity of the IPCC by attempting to discredit their scientific findings. One of the greatest strengths of the IPCC is its proper assessment of the uncertainties.

The latest IPCC assessment report is the most comprehensive and authoritative scientific assessment of current understanding of climate change. During three stages of review, more than 2,500 expert reviewers collectively submitted 90,000 comments on the various drafts<sup>1</sup>. The final report is comprised of three volumes, which are one thousand pages each. In a document of this scale and size, it is likely (some would say inevitable) that small mistakes will be made even with a rigorous review system in place. The one or two errors that have recently been identified and subsequently rectified should not be used to negate the rest of the report.<sup>2</sup> None of the main conclusions – such as those in the Policy-makers summary - are in any way affected by the errors.

Fact: Global temperature is rising. The Greenhouse Effect is a natural process where greenhouse gases such as carbon dioxide trap some heat from the sun. This acts like a blanket around the earth, keeping the temperature warm enough for life. But over the last 200 years there has been a dramatic increase in the levels of carbon dioxide in the atmosphere because of the burning of fossil fuels for energy and transport. This has enhanced the greenhouse effect and led in the past century to a 0.76 rise in global temperature.

The IPCC predicts temperature rises of between 1.8 and 4 degrees C and perhaps even as high as 6.4 by the end of this century.<sup>3</sup> Impacts of less than 1 degree are already devastating for millions of people in developing countries. If global temperature rise exceeds 2 degrees, compared to pre-industrial levels, the consequences could be disastrous.<sup>4</sup>

<sup>1</sup> IPCC (2 February 2010) *Statement on IPCC Principles and Procedures* [www.ipcc.ch](http://www.ipcc.ch)

<sup>2</sup> Sir John Houghton (2010) *Copenhagen and the Climate Change Crisis, The JRI Briefing Papers – No. 19.* [www.jri.org.uk](http://www.jri.org.uk)

<sup>3</sup> IPCC (2007) *Climate Change 2007, Summary for Policymakers*, [www.ipcc.ch](http://www.ipcc.ch)

<sup>4</sup> See Tearfund (2007) *Two degrees, one chance* – for information on consequences of temperature rises above two degrees

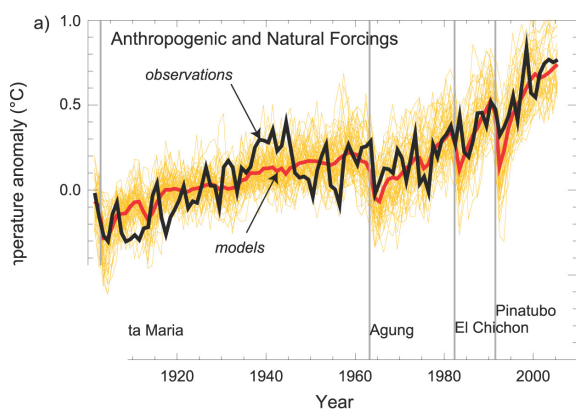
These impacts are well outside the range of natural variability. The scientific consensus is that the speed at which these temperature rises are occurring is well beyond anything we've seen in the past.

Myth: The earth is cooling not warming. Some climate sceptics maintain that the earth is not warming because in some places there doesn't appear to be a rise in temperature, or temperatures seem to be decreasing. Global warming does not mean warming everywhere all the time. There are large regional variations in temperature and large variations from year to year. However, the IPCC has analysed data on a global scale over long time periods. The conclusions show clearly that global average temperature is rising. For example, eleven of the last 12 years (1995-2006) have ranked among the 12 hottest years since records began in 1850.<sup>5</sup> Regional and short-term variations do occur. For example, many short term variations are linked to the El Nino variations that occur in the Pacific. But these should not distract from the clear global long-term rise over an extended timeframe.

But what about the recent cold winters in the UK? Global warming doesn't mean that we will all have warmer weather in the future – that's partly why people refer to climate change rather than global warming. The rise in global average temperature will be associated with changes in climate patterns, for instance, bringing more erratic and severe weather in many places. Associated with the warmer average climate will be a more intense hydrological cycle with a tendency to more frequent and intense floods and droughts in many places.

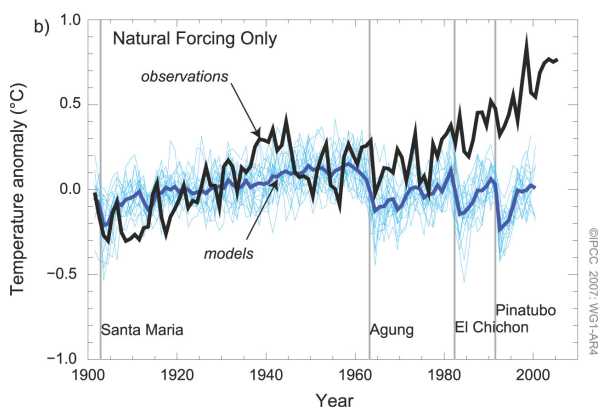
## 2. Climate change isn't man-made

Other sceptics accept the earth is warming but they do not think that this is caused by humans.



The 2007 IPCC Fourth Assessment Report states that 'most of the observed increase in globally averaged temperatures since the mid 20<sup>th</sup> Century is very likely (greater than 90 per cent) due to the observed increase in anthropogenic greenhouse gas concentrations.'<sup>6</sup>

The IPCC report concludes that the amount of carbon dioxide in the atmosphere has increased by about 40 per cent over the last 200 years. It is widely accepted by the scientific community that the burning of fossil fuels (coal, oil and gas) – to heat and light our homes, for industry and for transport – which produces carbon dioxide, is the main cause of this.



In addition, computer models have shown that just looking at natural effects on the climate (e.g. volcanoes, changes in the sun) do not by themselves account for observed and simulated global average temperatures. Only when you add in human-induced effects do the temperatures correlate with what's happening now.<sup>7</sup>

Figure: TS23, IPCC (2007) Fourth Assessment Report, Working Group II Report 'Impacts, Adaptation and Vulnerability'

### Further arguments raised by climate sceptics who don't believe that humans are part of the problem:

Climate change is part of the natural cycle and weather variability so what we are seeing now is just another warm period. There have been large changes of climate in the past including at various points the loss of ice over the north and south poles, and the extension of ice over much of Europe,

<sup>5</sup> IPCC (2007) *Climate Change 2007, Summary for Policymakers*, p2, www.ipcc.ch

<sup>6</sup> IPCC (2007) *Climate Change 2007, Summary for Policymakers*, p5, www.ipcc.ch

<sup>7</sup> Sir John Houghton (2010) *Copenhagen and the Climate Change Crisis, The JRI Briefing Papers – No. 19*. www.jri.org.uk

Asia and North America.<sup>8</sup> The largest of these changes are associated with changes in the geometry of the Earth's orbit that occur over periods of many thousands of years.<sup>9</sup> However, the rapid rise in temperature we are seeing now is unprecedented over at least the past 1000 years.

Water vapour and not carbon dioxide is the main greenhouse gas. Water vapour is an important contributor to the greenhouse effect and because of its large volume, some sceptics say that it is responsible for global warming. But this cannot be the case because water vapour doesn't stay in the atmosphere for longer than a few days and its volume is not directly increased by human activities. This means that there is no build up in the atmosphere. Carbon dioxide, on the other hand, stays in the atmosphere for over 100 years. Certain amounts of carbon dioxide and other gases such as methane can be absorbed and stored by forests, soil and oceans, but there's a limit to how much they can soak up.<sup>10</sup> The amount of water vapour in the atmosphere is however increasing as a result of greater evaporation from the oceans because of global warming. The magnitude of global warming is approximately doubled by this effect which is an example of a positive feedback.

Changes to the sun are causing climate change. Changes to the sun such as sunspots can cause the amount of solar energy reaching the earth to change. This can cause changes to global temperature. For example it is thought that warming in the last 19<sup>th</sup> and early 20<sup>th</sup> century was caused by changes to the sun.<sup>11</sup> However, during the past 50 years scientists conclude that solar effects and volcanic dust 'would likely have produced cooling'.<sup>12</sup>

### **3. Climate change is happening but its effects are beneficial**

Some people state that climate change is happening but its impacts are beneficial. They suggest that higher global temperatures and more carbon dioxide in the atmosphere will benefit agriculture and boost food production. Whilst there may be some beneficial impacts, adverse effects will predominate.

For example, higher temperatures may help plant growth, but water availability will decrease making production more difficult, and higher temperatures can restrict growth of plants and trees. Poor countries are already suffering from the impacts of a global 0.76 degree global temperature rise (often higher in individual regions). Tearfund's partners in developing countries have been reporting anecdotal evidence of changes to the climate for many years, and the negative impacts these have on their work in poor communities.

Global temperature rise is already causing climate changes like:

- unusual and erratic rainfall which can cause crop failure, leading to hunger and loss of livelihoods
- too much rainfall bringing floods and washing away crops and homes
- increased severity and frequency of extreme weather events such as flooding and droughts
- sea level rise as a result of warming oceans

People who are already living on the edge are pushed further into poverty when they have to walk longer distances to access drinking water, as malnutrition increases, as mosquitoes spread to new areas increasing malaria and as more people are forced to leave their homes to find food and shelter putting pressure on areas already vulnerable.

And many scientists are deeply concerned about what are known as 'tipping points' which could be reached if the rate of warming is not drastically reduced. These might include more rapid melting of the Greenland and West Antarctic ice sheets which could lead in time to massive sea level rises (up to 7 metres for complete melting of the Greenland ice cap – although this is likely to take many centuries) or the collapse of the Amazon rainforest which would release large amounts of carbon dioxide. It is difficult to see how these tipping points would have any benefits.

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<sup>8</sup> Met Office, *Climate change – frequently asked questions*, [www.metoffice.gov.uk/climatechange/guide/faqs/](http://www.metoffice.gov.uk/climatechange/guide/faqs/)

<sup>9</sup> New Scientist (2007) *Climate change: a guide for the perplexed*, [www.newscientist.com/article/dn11462-climate-change-a-guide-for-the-perplexed.html](http://www.newscientist.com/article/dn11462-climate-change-a-guide-for-the-perplexed.html)

<sup>10</sup> New Scientist (2007) *Climate change: a guide for the perplexed*, [www.newscientist.com/article/dn11652-climate-myths-co2-isnt-the-most-important-greenhouse-gas.html](http://www.newscientist.com/article/dn11652-climate-myths-co2-isnt-the-most-important-greenhouse-gas.html)

<sup>11</sup> New Scientist (2007) *Climate change: a guide for the perplexed*, [www.newscientist.com/article/dn11650-climate-myths-global-warming-is-down-to-the-sun-not-humans.html](http://www.newscientist.com/article/dn11650-climate-myths-global-warming-is-down-to-the-sun-not-humans.html)

<sup>12</sup> IPCC (2007) *Climate Change 2007, Summary for Policymakers*, p5, [www.ipcc.ch](http://www.ipcc.ch)

#### **4. It is too expensive to address the effects of climate change: reducing emissions will hit industries and consumers and will undermine development**

Having tried to prove that climate change isn't happening or is not caused by humans, the final refuge of climate sceptics is to argue that dealing with the problem will be too expensive, or adapting to the problem will undermine efforts to alleviate poverty.

Sir Nicholas Stern who advises the government on climate change and the economy has estimated that the investments needed now to tackle climate change are roughly the same as 2% of global GDP. However, costs could increase up to 20 per cent if we fail to act.<sup>13</sup>

The International Energy Agency (IEA) is the world's top energy body. It estimates that each year of delayed action adds \$500 billion to mitigation costs between today and 2030 (World Energy Outlook, October 2009).

Much of the initial expense could be offset by savings made over time. Many jobs could be created by increasing renewable energy sources and developing and building green technologies. The UK Low Carbon Transition Plan, published by the UK government in 2009, predicted that more than 1.2 million green jobs could be created in the UK by 2020. The plan estimates that by 2020 the implementation of all the policies in the UK would only add an additional 8% to today's annual household bills.<sup>14</sup>

It is fair to say that there will be costs associated with combating climate change. But developing countries, who are least responsible for the problem, should not have to bear the burden. Estimates of how much public money is needed to help poor countries adapt to climate change and develop sustainably vary considerably. Tearfund believes that at least \$200 billion of new, additional public money will be needed every year by 2020. Developed countries are most responsible historically for climate change so should provide finance and technology to help poor countries, who are least responsible, to adapt. If we fail to act now to reduce our emissions then these figures will only rise further.

Countries like the UK have become wealthy as they developed from using cheap fossil fuels. Some commentators question whether it is possible to develop without a high-carbon industrial revolution. Tearfund's vision is to see the poorest and most vulnerable people lifted out of poverty, and thus we place a high value on the right to survival for all poor communities. However, this does not mean that the right to development is not important. Simply that the kind of development that must take place has the opportunity to be fundamentally different from the pathway the North has taken. Clean development pathways that leapfrog existing high-carbon technologies and patterns should in the long run be highly beneficial for developing countries. Renewable energy and energy efficiency offer opportunities for different development pathways. If everyone followed the same development pathway as the wealthy west, global emissions could rise by at least 6 degrees, devastating poor countries and rendering development impossible.

The impacts of climate change are pushing poor people further into poverty. The 2010 World Development Report states that 'failing to safeguard the environment eventually threatens economic and social achievements... unmitigated climate change is incompatible with sustainable development'<sup>15</sup>. Failure to act will result in higher costs in the future.

#### **For more in depth information, you could try the following:**

Intergovernmental Panel on Climate Change [www.ipcc.ch](http://www.ipcc.ch)

Met Office, *Climate change – frequently asked questions*:

[www.metoffice.gov.uk/climatechange/guide/faqs/#faq](http://www.metoffice.gov.uk/climatechange/guide/faqs/#faq)

New Scientist (2007) *Climate change: a guide for the perplexed*:

[www.newscientist.com/article/dn11462-climate-change-a-guide-for-the-perplexed.html](http://www.newscientist.com/article/dn11462-climate-change-a-guide-for-the-perplexed.html)

Sir John Houghton (2009) *Global Warming, the Complete Briefing*

**If you have any questions, please email [enquiries@tearfund.org](mailto:enquiries@tearfund.org), or call 0845 355 8355**

<sup>13</sup> HM Treasury (2007) *Stern Review on the economics of climate change, executive summary*; <http://www.guardian.co.uk/environment/2008/jun/26/climatechange.scienceofclimatechange>

<sup>14</sup> HM Government (2009) *The UK Low Carbon Transition Plan*

<sup>15</sup> The World Bank (2010) *World Development Report 2010: Development and Climate Change*