

Global warming: a clear and present danger

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The sceptics are wrong: scientific evidence supports the argument that climate change is a real threat that requires urgent and committed action, says the British government's chief scientific advisor, David King.

The science of climate change is not a new subject. Indeed, the greenhouse gas concept was put forward as long ago as 1827 by the French mathematician Joseph Fourier, who first worked out that our atmosphere absorbs heat that would otherwise radiate out into space. Were it not for the "greenhouse effect", life on this planet would not exist as we know it. The average temperature would be -19 degrees Centigrade, rather than the relatively balmy 15C that we experience, and there would be much wider variation between daytime and nighttime temperatures.

An Irish-British scientist, John Tyndall, discovered in 1860 that the greenhouse effect is not due to major constituents of nitrogen and oxygen but to the minority gases in our atmosphere, especially water vapour, carbon dioxide and methane: what came to be known as "greenhouse gases".

The first global warming calculations were offered in 1896 by the Swedish chemist (and 1903 Nobel prizewinner), Svante August Arrhenius. He estimated that if the human population should burn so much fossil fuel that the carbon dioxide level in the atmosphere should double, the result would be an average global temperature increase of 5C .

He wasn't far out. The most recent calculation, based on enormous computer programmes at a number of world centres, including the Hadley Centre for Climate Prediction and Research, yields global temperature increases of $1.5-6\text{C}$ for a doubling of carbon-dioxide levels.

At the higher end, the impact of such a temperature rise would be immense. For example, the difference in temperature between an ice age and a warm period is about $5-8\text{C}$.

I set out this history to make the point that our current understanding of climate change has long roots. There is inevitably much that remains uncertain in the science, given the enormous complexity of the Earth and climate systems themselves. But equally a good deal of the science is now well-established.

Scientific understanding has been enhanced greatly by the work of the Intergovernmental Panel on Climate Change (IPCC). Drawing on the work of around 2,000 scientists worldwide, and with rigorous peer-review processes at its heart, the IPCC represents an unparalleled assessment of the research evidence from leading scientists from across the globe. The work of the IPCC has been vital in underpinning and informing

international efforts to tackle climate change, including the Kyoto Treaty.

Nonetheless, it is often reported that scientists themselves cannot agree whether climate change is really happening, whether it is influenced by human activities and whether, even if both things are true, it really matters that much. The bad news is that this is for the most part a pseudo-debate. Tempting as it may be for some to believe that “it’s just the environmentalists doom-saying again”, the reality is that the overwhelming majority of credible scientific opinion is clear on all three points. This includes scientific opinion in the United States as much as elsewhere.

Beyond any reasonable doubt, climate change is happening. Mankind is driving the process mostly through our use of fossil fuels. And it is serious – in my view the most serious and potentially catastrophic problem that we face today.

Unmitigated climate change will both magnify humanity’s existing scourges – poverty, disease, famine – and add to these new ones, such as through increasing climatic extreme events, rising sea levels and flooding on a scale beyond human experience.

So if scientific opinion is so united on these points why does “the debate” on the science continue to be reported?

Part of the answer is in the nature of the media itself, which likes to present two sides of a story. “Scientists agree” is not such a great headline as “scientists at loggerheads”. This applies equally to spheres of science other than climate change.

There is also an issue that some, including some politicians, simply do not want to hear the evidence, regarding the implications as just too unpalatable (and politically unpopular) to be faced.

Sceptics and evidence

A few words are appropriate on the theme of the “climate change sceptics” who overall fall into three camps.

First, there is a very small group of serious scientists who stress the problems of modelling aerosols and cloud cover. They do not reject the greenhouse model, the observed increases in carbon dioxide or the observed increase in global temperature. The best known is the American climatologist, Richard Lindzen.

Second, there is another small group of scientists who appear at every meeting but are not seriously regarded. These include a Danish scientist who argues, without any proper evidence, that sea levels are not rising at all; a French scientist who claims from a study of records of tea plantation companies in Tanzania that there has been no temperature increase around Kilimanjaro despite the loss of 85% of its ice cap (which has been dated back to the last ice age) over the past 100 years; and a British scientist who says that global warming is happening but is due to increased solar activity (his model has no basis in measurements).

Third, there is a very vocal group of professional lobbyists. Some have had scientific training, but most have not. They manage to make their voice heard as they are articulate and clearly well-funded. They fall into the same category as lobbyists for the tobacco companies who claim that links between smoking and ill-health are still not proven.

In summary, it is quite clear that the balance of international scientific opinion is enormously in support of the conclusion that climate change is a real and present danger, requiring urgent and committed action. It nonetheless remains a significant issue, in terms of gaining wider political and public consensus on the need for action, that the arguments put forward by the sceptics gain publicity and influence far beyond that which can be justified by the standing of the individuals concerned, by the validity of their arguments, and by the scientific credibility of the evidence that they are able to put forward.

I therefore welcome this [openDemocracy](#) debate as a contribution to public engagement and understanding on this critical issue.

Beyond any reasonable doubt, climate change is happening.

Professor Sir David King is the chief scientific advisor to the UK government and head of the Office of Science and Technology.

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