

Carbon dioxide and climate change

1. Agreement

There appears to be general agreement about the following facts.

If it were not for certain gases occurring naturally in the atmosphere the world's average temperature would be some 33°C colder than it is. That is, it would be around minus 19°C instead of plus 14°C.

This is because these gases trap some of the infrared radiation that escapes from the Earth's surface. This blanketing effect results in the lower layers of the atmosphere being warmer, and the upper layers colder, than if these gases were not there. This phenomenon is known as the *natural greenhouse effect*.

Water vapour is responsible for 80 or 90% of the natural greenhouse effect. The remainder is due to carbon dioxide, methane, and a few other minor gases.

Carbon dioxide (CO₂) is responsible for about 15% of the natural greenhouse effect. If it were not for the CO₂ in the atmosphere the Earth's average temperature would be 5°C cooler than it is.

For the first 200,000 years of the history of modern humans (*Homo sapiens*) the mixture of these natural greenhouse gases was relatively constant.

During the past two hundred years there has been an increase in the CO₂ concentration in the atmosphere – from 292 parts per million to the current 392 parts per million.

This increase in atmospheric CO₂ is mainly the consequence of two sets of human activities: (1) deforestation, and (2) the combustion of fossil fuels as a source of energy for driving machines and providing heat

As a consequence of this increase in atmospheric CO₂ the Earth's average surface temperature has increased by about 0.8°C, with about two thirds of the increase in temperature occurring since 1980. This is known as the *enhanced greenhouse effect*.

2. The uncertainties

Because of the complexity of the carbon cycle on our planet there are uncertainties about the precise effect of increasing CO₂ in the atmosphere on global temperature. It cannot be assumed, for example, that doubling the CO₂ concentration in the atmosphere will simply double the contribution of this gas to global warming – that is from around 5°C to 10°C – an extra 5°C.

Climate scientists construct mathematical models to try to predict the degree of increase in temperature. Because of the uncertainties in the system these models come up with a variety of different results – ranging from a further increase in the 21st century of 1.1°C to an increase of 6.4°C.

There are also differences of opinion within the scientific community about the relative contributions of fossil fuel use and deforestation to the increase in CO₂ in the atmosphere over the past 250 years. One view holds that most of the rise in atmospheric CO₂ since 1750 has been due to the destruction of the capacity of forests and soils to take up CO₂ from the atmosphere –rather than the use of fossil fuels.

3. The climate change deniers

As in all reform movements there is the predictable backlash from anti-reformers. In the case of climate change the anti-reformers are commonly referred to as deniers.

The main disputed issues relate to the causes of the increase in average global temperature, whether humankind is responsible for it, and what will be the likely consequences of global warming.

4. Perspectives

Growth in carbon emissions

The amount of carbon dioxide emitted by the human population today is around 8000 times greater than it was when farming began some 450 generations ago, and 90% of this increase has occurred over the past 80 years. This increase is equivalent to the difference in weight between a small apple and a tonne of bricks.

Scale of deforestation

Eighty per cent of the world's original forests have been destroyed by humankind. Recently trees were being lost in the Amazon at the rate of 2000 a minute.

Scientific opinion

Studies show that 97–98% of the most published climate researchers believe humans are causing global warming. The finding that the average global temperature has increased in recent decades as a result of human activities has been endorsed by the academies of science in all of the major industrialized countries.

The carbon tax and coal exports

According to the Australian Government Australia may, through the carbon tax, reduce its annual emissions of CO₂ by 159 million tonnes by 2020. Australia's contribution to global CO₂ emissions through the export of coal amounts to some 770 million tonnes per year – that is, well over four times its potential reduction of emissions through the carbon tax.

5. Conclusions

From these facts it would seem very likely that the anthropogenic increase in the concentration of CO₂ in the atmosphere will result in a significant increase in global temperature. If no action is taken the consequences for humanity will be very serious.

We must tackle this problem swiftly and with every possible means at our disposal – including

- (1) forestation and reforestation on a massive scale
- (2) carbon sequestration in the soil and possibly by other means such as large scale algal growth
- (3) a huge reduction in the use of fossil fuels.

This will require enlightened and strong government action, supported by an informed and concerned electorate.