

# Climate – the times they are a changing.

It is tempting to look back in our lives with rose tinted spectacles - what lovely summers we had, the sun was shining every day - but the truth is that in the UK we have to be realistic and accept that, throughout a year, we may face a wide variety of weather conditions. However, in my lifetime I can feel that things are not quite as they used to be. The Farndale daffodils, North Yorkshire, equal to those of Wordsworth, always came out at Easter and **now** they are appearing much earlier in the year. Perhaps at an even grander level we should think about the winters? If we list the five worst winters of recent times we find that these are getting milder:-

**Winter of 1946/47** With the country recovering from the impact of the Second World War, the UK was struck down by one of the worst winters on record. The cold snap was felt across Europe, but the UK suffered the worst, and the country came to a standstill. Between January 1947 and March 1947, snow fell somewhere in the UK for 55 days. The snow was the main issue, but temperatures hit – 21 °C across the UK. Once the snow started to melt, the water poured into rivers. Many of these burst their banks and flooded nearby areas.

**The coldest winter in 200 years – 1962/63** Believed to be the coldest winter since 1740, the ‘Big Freeze of 1963’ is considered the worst in modern British history. Despite not breaking any records for the actual temperatures, the persistency of the sub-zero temperatures was harsh on the UK. To show how cold it was during this time, the river Thames froze over.

**The Big Snow of 1982** A mixture of snow blizzards and low temperatures made this winter spell record-breaking. At the time, the winter was the coldest in the UK for 100 years, with a mean daily temperature of 0.3 °C. This time also saw the coldest registered temperature in UK modern history recorded at Braemar, an extreme of -27.2 °C was recorded. Along with the freezing temperatures, there was an influx of snow. Snow fell on and off from December through to March, and some areas saw snow of up to 23ft.

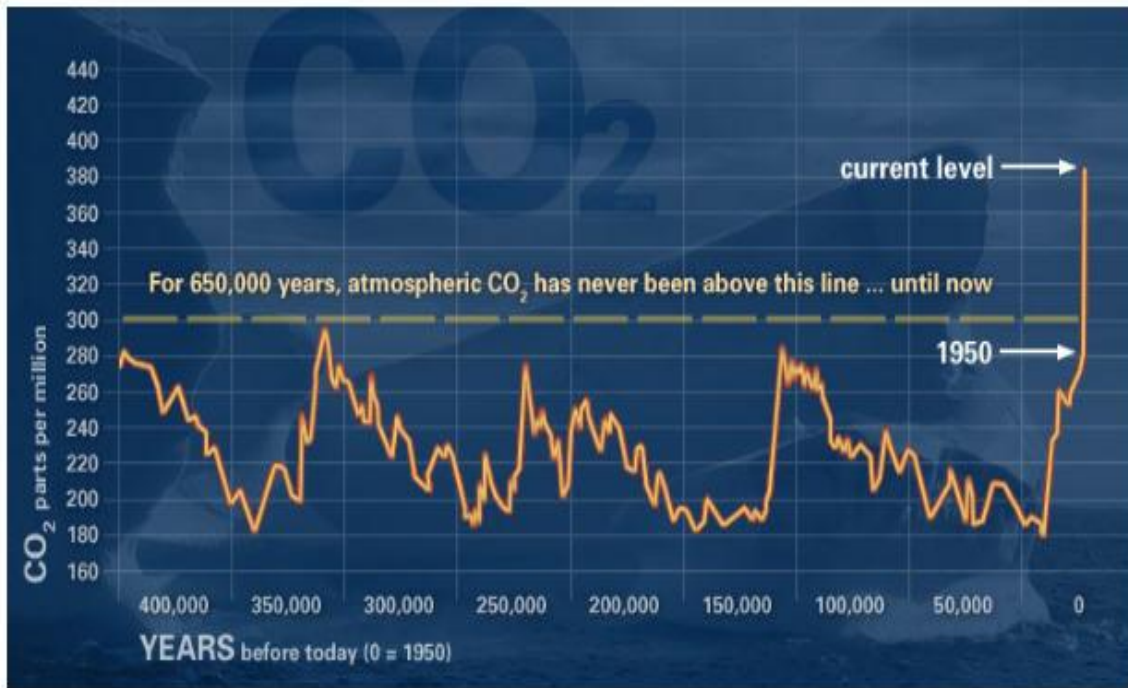
**The Big Freeze of 2010** A more recent example of harsh winter conditions in the UK. - December 2009 and January 2010 saw snowfall and low temperatures in a two-month spell that caused transport disruption, school closures and power failures across the UK.

**Winter 2010/11** The 1982 record for coldest winter was wiped away by the temperatures recorded in December 2010. Snow did fall during this time, but it fell unexpectedly in late November, which isn’t seen often in the UK. As with the previous winter, the cold weather led to transport issues and school closures. Due to the snow starting in November and the cold weather across December, it is estimated that the UK economy lost out on £1.2 billion in the run-up to Christmas.

So, with a personal experience of living through all these winters, I do have to conclude that something is happening to our climate and, as these changes alter seasons across the world, it isn't a surprise that five out of our top 10 warmest winters has been in the period 2010-2021. The warmest winter came during December 2019 to February 2020. Despite a rather wet few months with floods across the UK, the mean temperature for this period had a value of 5.28 °C which is mild for that time of year. Experts predict we may begin to see a shift to wetter but warmer winters in upcoming years because of climate change.

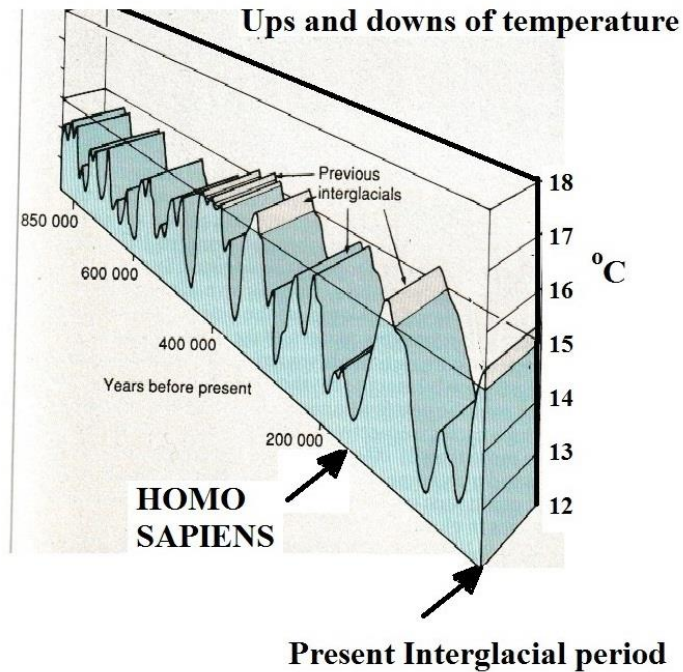
One admits that the above may just be gut feelings and these can be misleading. We should, therefore, see if scientific studies show a clearer light on climate changes.

One of the strongest pieces of evidence for human-induced climate change is the consistent rise in carbon dioxide (CO<sub>2</sub>) in modern times, as measured at the Mauna Loa Observatory in Hawaii, where CO<sub>2</sub> has been observed since 1958. As of December 2021, the concentration of CO<sub>2</sub> in Earth's atmosphere was about 416 parts per million (ppm), with a steady recent growth rate of about 2 ppm per year. Over millennia this present level has never been seen before, as shown:-



The earth's mean temperature follows similar cycles

After the extinction of the dinosaurs ( about 50 million years ago), mammals evolved rapidly and filled the evolutionary niches they left behind. Almost 130,000 years ago (**0.13 million years ago**) – Modern humans evolved, Homo Sapiens. They evolved in Africa from earlier humans. They left Africa around 35,000 years ago and spread around the globe. (a word of caution - human evolution is still somewhat mysterious, due to gaps in the fossil record). Domestication of animals and the practice of agriculture developed over 10,000 to 5,000 years ago.




Real time data on the CO<sub>2</sub> levels can be found on Twitter

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417.80 parts per million (ppm) CO2 in air 15-Mar-2022

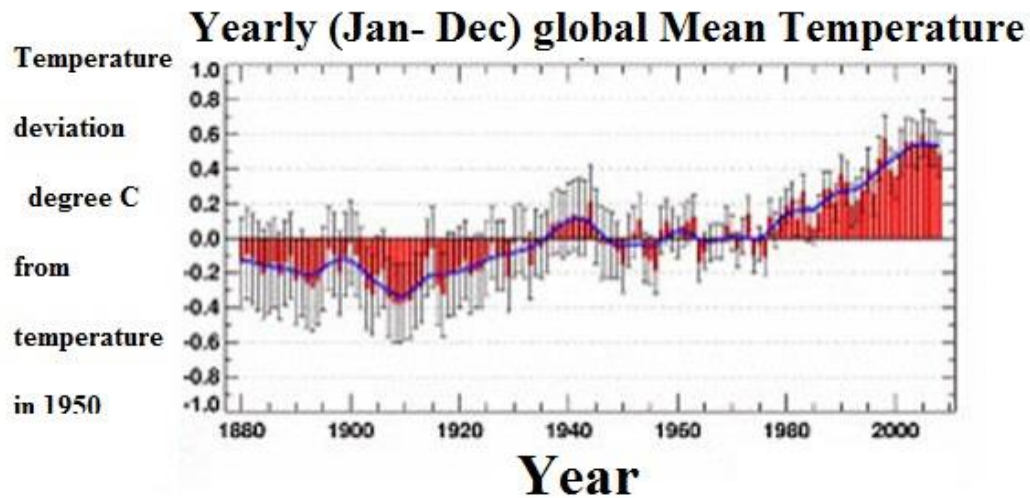
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The Keeling Curve  
The Keeling Curve is a daily record of global atmospheric carbon dioxide concentration maintained by Scripps Institution of Oceanography at UC San ...

15 March 417.8  
16 May 421.4

Most scientists agree that such high levels of CO<sub>2</sub> are resulting in Global warming that is currently observed.



Each member of the public may have their own views on climate change and may feel it is all part of a natural cycle. But the scientific method is built on debate among scientists. Scientists test a question, or hypothesis, and then submit their results to the scrutiny of other experts in their field. That scrutiny, known as "peer review," includes examining the data, experimental and/or analytical methods and findings and the fundamental elements of climate change and global warming is not in dispute by scientists.

We may therefore ask “are we feeling any effects of global warming?” Thank goodness in our country we have only to put up with relatively minor changes. For farming methods that I grew up with we did need good summers so that hay could be dried and collected and, ideally, fair weather and sunshine for three consecutive weeks was needed. Today’s farming involves making silage and often the whole crop can be collected in a matter of three days. In other parts of the world, we see a different story. In many regions of Africa there has been no rainfall for three or four years so cropping and keeping livestock is impossible. Other regions of India and the Pacific Islands are being flooded so that once good productive land is now under water.

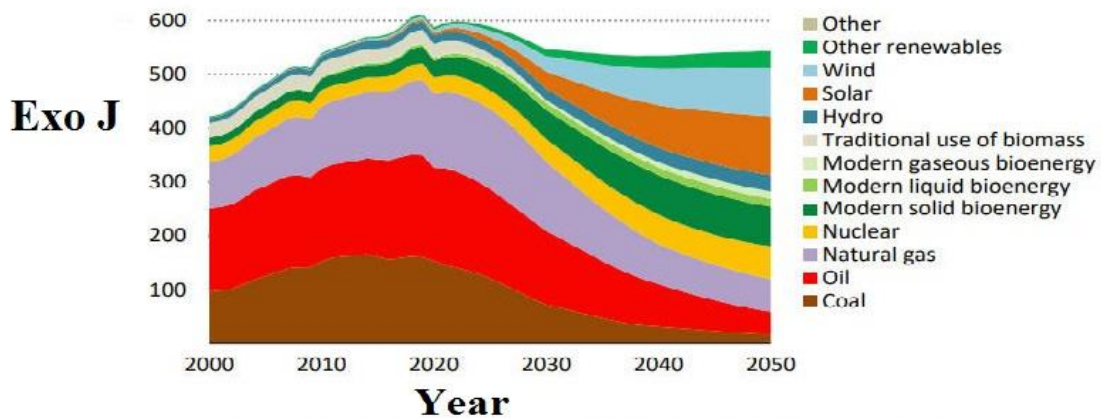
Mark Lynas, in his book “High Tide – News from a Warming World” gives numerous situations around the world that can be attributed to climate change. In his later book “Our final warming – Six degrees of Climate Emergency” he explores a future world in which Global Warming has reached a level SIX °C above the pre-industrial level. He shares his thoughts in the following video presentation :-

<https://www.youtube.com/watch?v=5Gc3GHDJM9Q>

In the UN Paris Agreement signed in 2015 world leaders vowed to hold global temperature rise to below 1.5 °C. Of course, this can only be done by radically altering our use of fossil fuels.

One scenario that has been suggested is given below

## A possible scenario for energy use



*Renewables and nuclear power displace most fossil fuel use in the NZE, and the share of fossil fuels falls from 80% in 2020 to just over 20% in 2050*

Each nation would have to significantly cut their reliance on coal, oil or gas so that the total global use would approach 100 Exo Joules. The consumption is presently over 400 Exo Joules so the scale of adjustment is formidable.

The urgency of our predicament cannot be overstated-

We are on the Titanic - our visibility is good - we can see a huge iceberg looming ahead - what do we do ?????

Footnote – the Putin war with Ukraine is presently throwing our precarious supply of oil and gas into chaos and it must be admitted that the way forward is uncertain at this moment of time.

Reference with model calculation of global warming

Barker and Ross “An introduction to global warming” in Am. J. Phys. Dec 1999  
Vol. 67 (12) page 1216