

CLIMATE CHANGE AND COP26

Background Paper

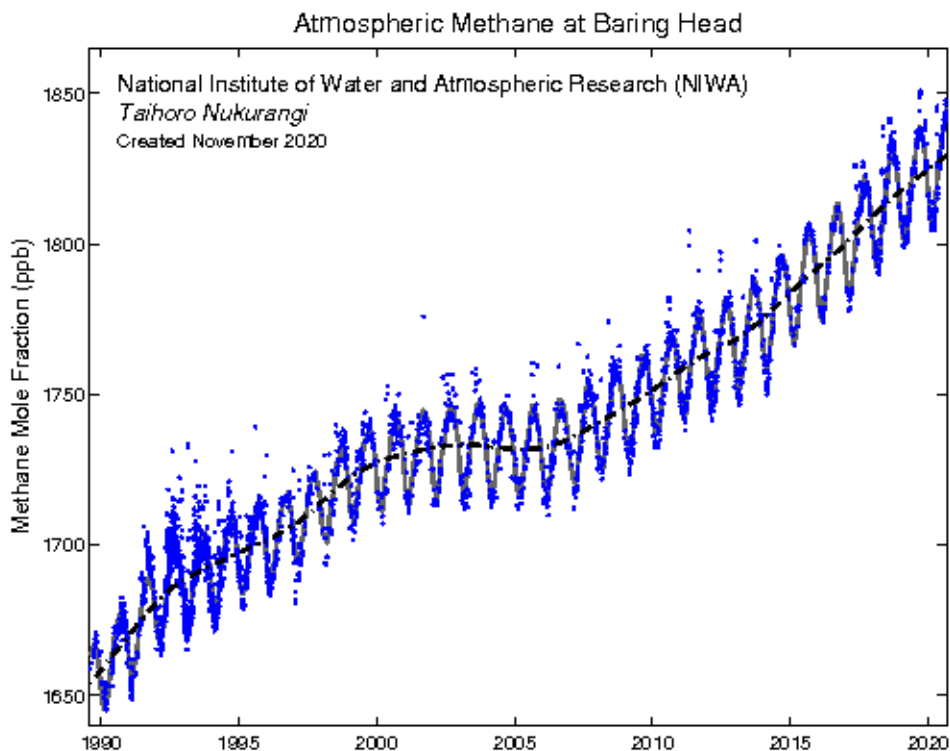


Scientific Background.

Climate change is the biggest threat that humanity has ever faced. Warming of the troposphere as a result of releasing man-made greenhouse gases into the atmosphere was predicted as long ago as 1896:

https://en.wikipedia.org/wiki/History_of_climate_change_science

Levels of carbon dioxide in the atmosphere have been measured continuously since 1958 at the Mauna Lao observatory in Hawaii. CO₂ has risen from a pre-industrial level of 280 parts per million (ppm) to 410 ppm (2020). Methane is the second most important greenhouse gas and has risen from a pre-industrial level of 722 parts per billion (ppb) to 1866 (2019). Methane levels plateaued in the nineties, but have started rising again since 2008 as shown by the observatory at Baring Head in New Zealand.



Methane Graph courtesy of Dr Hinrich Schaefer, National Institute of Water and Atmospheric Research (NIWA), Wellington, New Zealand

This has alarmed scientists who are unsure as to the cause(s)

<https://www.pnas.org/content/116/8/2805>

NASA favour a fossil fuel origin, and it is certainly true that the rise coincides with increased gas extraction, notably fracking. Other authorities favour tropical wetlands, but it is difficult to separate this from agricultural sources such as rice production in paddy fields, or methane released by ruminants (cattle goats etc). Lurking in the

background is the certainty that large quantities of methane will be released by thawing permafrost. An even more catastrophic scenario is the release of methane from the Arctic seabed where roughly 500bn tonnes is stored in the form of clathrates. In 2013 Peter Wadhams and colleagues from Cambridge university predicted that the release of just 50bn tonnes from the East Siberian Ice Shelf would raise global temperatures by 0.6C.

<https://www.sciencedaily.com/releases/2013/07/130724134256.htm>

In October 2020 scientists reported significant methane releases from this precise area of the Arctic Ocean where the continental shelf is only 30 metres below the surface.

<https://www.theguardian.com/science/2020/oct/27/sleeping-giant-arctic-methane-deposits-starting-to-release-scientists-find>

Scientists are unsure whether this is a new phenomenon or whether they are observing something that has been happening for many years, Other observers regard this event as signalling the start of irreversible climate change.

<https://www.ft.com/content/248b1767-a96c-477d-9b4a-6feb1d7ab0a2>

The Intergovernmental Panel on Climate Change (IPCC) do not include release of methane from the Arctic seabed in their climate projections, as they regard it as a "high impact, low probability event". This approach may need to be revisited.

In the late seventies the US Government asked the Jason Committee to advise on global warming: [https://en.wikipedia.org/wiki/JASON_\(advisory_group\)](https://en.wikipedia.org/wiki/JASON_(advisory_group))

The committee concluded that a doubling of CO₂ concentrations in the atmosphere would lead to between 2 and 3 degrees C of warming. However the committee did not make policy recommendations, and there is considerable dispute as to why nothing more was done at that time.

https://www.bio.fsu.edu/~tschink/publications/HSNS4003_021.pdf

Global temperatures are monitored and measured by a number of different organisations and these have generated a number of data sets that are in remarkable agreement. The very latest data sets are available here courtesy of Professor Phil Jones from the Climate research Unit at the University of East Anglia, and will be published shortly in the Journal of Geographical Systems:

<https://crudata.uea.ac.uk/cru/data/temperature/>

These show that temperature increases are not evenly distributed across the surface of the planet. Air heats up quicker than water, so air temperatures over land are rising quicker than sea surface temperatures. Because most of the Earth's land mass is located in the Northern hemisphere, temperatures in the North are higher than the South. The greatest temperature changes are being witnessed at the poles as the melting of sea-ice allows greater heat absorption by the oceans. Thus, whilst the average global temperature has increased since 1850 by only 1.1C worldwide, over Europe the increase is 2C, and in the Arctic it is more than 3C since 1900.

Other phenomena not previously witnessed are afflicting the Arctic region including progressive thinning of the sea-ice, record-breaking loss of sea-ice during the summer, temperature fluctuations up to 30C above the seasonal average, and wildfires within the Arctic Circle.

<https://www.sciencedaily.com/releases/2020/09/200928155746.htm>

These not only release carbon dioxide and methane into the atmosphere, they also darken the snow leading to loss of albedo, and further heat absorption.

Another IPCC prediction that is proving to be overly cautious is melting of the ice-caps. 4 trillion tonnes of ice has been lost from Greenland since 1990, and a trillion tonnes in the past 4 years.

<https://www.scientificamerican.com/article/greenland-is-melting-at-some-of-the-fastest-rates-in-12-000-years/>

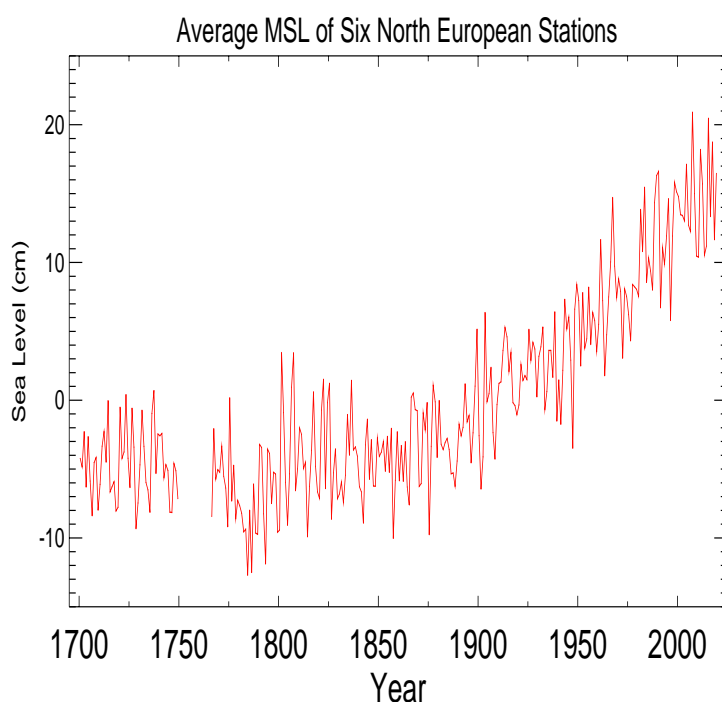
Currently ice is melting at 8,500 metric tonnes per second, a rate of loss that was not supposed to occur until 2040 according to the IPCC. Most of the sea-level rise (SLR) that has occurred thus far is due to thermal expansion of the oceans, but it is apparent that ice-cap melting will contribute an increasing percentage of SLR.

The following is an original graph showing data from 1750 to the present day prepared by Professor Philip Woodworth at the National Oceanography Centre in Liverpool for this consultation and for the next edition of the Gilgamesh Gene.

<https://www.scientificamerican.com/article/greenland-is-melting-at-some-of-the-fastest-rates-in-12-000-years/>

It is significant that the mean SLR since 1900 is 1.7mm per annum, but since 1993, this has increased to 3.2mm/ year. This process can only end badly for coastal cities and low-lying areas such as Bangladesh, Vietnam and the Nile delta, not to mention Pacific islands whose average height above sea level is less than 2 metres. It should be recognised that sea levels do not need to flood communities before towns or cities are abandoned. Storm surges and increasingly frequent or ferocious hurricanes will persuade communities to move long before the sea actually reaches their front door, as Storms Katrina and Sandy demonstrated in New Orleans and New York.

Approximately 10% of the world's population live in coastal communities that are less than 10 metres above sea level, so the number of displaced persons could approach 1 billion.



(Courtesy of Professor Philip Woodworth at the National Oceanography centre in Liverpool)

Political Background.

This year the UK Government will host the twenty sixth Climate Change Conference, known as COP26, in Glasgow from Nov 1-12 inclusive, The President is Alok Sharma, Secretary of State at BEIS, but there is also a COP26 Cabinet Committee chaired by the Prime Minister whose stated purpose is to "oversee arrangements for COP 26". This division of responsibility could cause problems if areas of responsibility are not clearly demarcated.

Another organisation which claims not to have a defined hierarchical structure is Extinction Rebellion (XR) which exploded onto the scene in 2018 with a series of eye-catching demonstrations in Central London and elsewhere. Founded by a farmer from Llandeillo, Roger Hallam and a molecular scientist Dr Gail Bradbrook, XR achieved in one year what 30 years of lobbying and hundreds of other environmental groups had conspicuously failed to do: move global warming up the political agenda.

XR has been portrayed in some quarters as a violent organisation. For others it is a global movement that believes in, and practices non-violent direct action and civil disobedience.

As we approach COP26 it is important that those involved in the organisation of the event come together with representatives of XR and others privately and under Chatham House rules to explore the various agendas, find areas of agreement, probe areas of disagreement and seek to find a shared approach to COP26 which will make it a resounding success for the UK. Underpinning the discussion will be a clear outline of the science behind climate change.

GHG emissions

The graph below shows greenhouse gas emissions over a 40 years period: from 1970-2010. In 1990, the base-line year for Kyoto, GHG emissions totalled 38bn tonnes of carbon dioxide equivalent (CO₂e) world-wide. By 2010 this had risen to 49bn CO₂e of which only 65% (31.6bn tonnes) was due to CO₂ emissions from energy production and other industrial activities such as cement manufacture. CO₂ emissions from Agriculture Forestry and Other Land Use (AFOLU) accounted for another 11%. Other greenhouse gases such as methane (16%), nitrous oxide (6%) and trace gases such as halocarbons (2%) represented the remaining 24%.

In 2019 industrial emissions of CO₂ peaked at 36.6bn tonnes which indicates that total GHGs were slightly over 56bn tonnes of CO₂e, a figure that is seldom discussed by politicians or the media as they are not published on an annual basis.

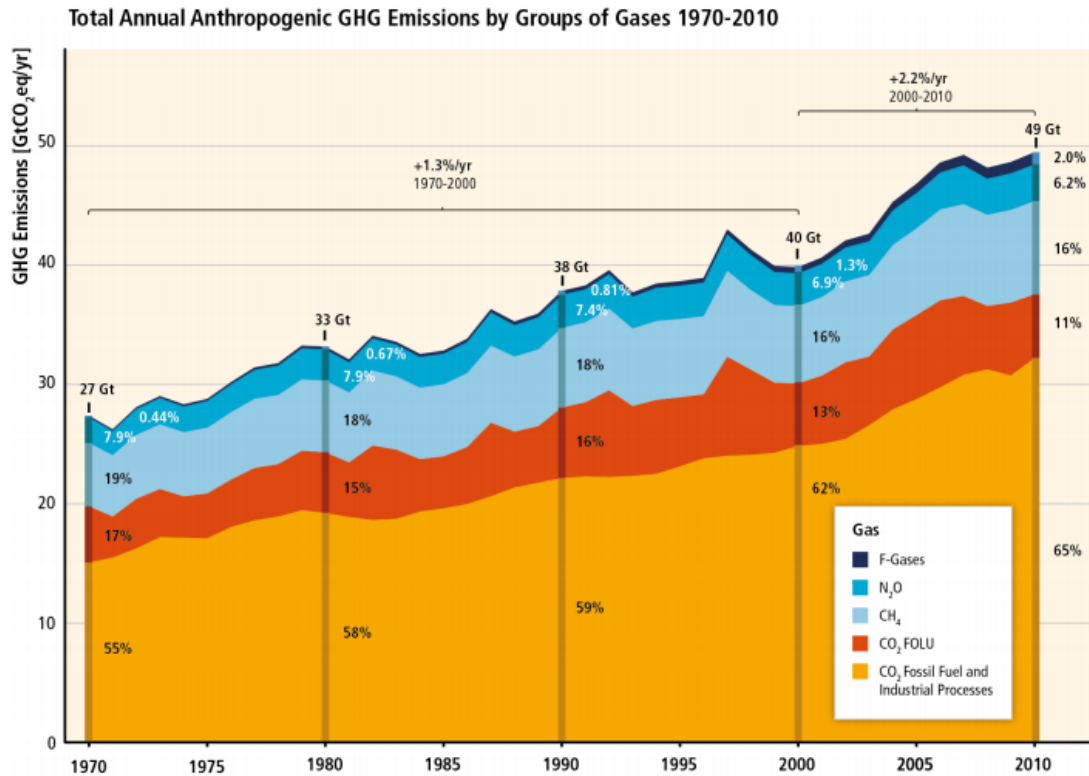
<https://www.sciencemag.org/news/2019/12/greenhouse-gas-emissions-year-set-new-record-rate-growth-shrinks>

Industrial emissions of CO₂ in 2020 have fallen by 2.4bn tonnes due to the Covid pandemic

<https://www.carbonbrief.org/global-carbon-project-coronavirus-causes-record-fall-in-fossil-fuel-emissions-in-2020> but that is only equivalent to a reduction of 7%. In order to limit global warming to the preferred limit of 1.5C agreed in Paris in 2015, the IPCC estimate that reductions of 7.7% are required every year over the coming decade.

https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

The only Government to recognise this requirement is the Scottish Government that has announced its intention of reducing carbon emissions by 75% by 2030.



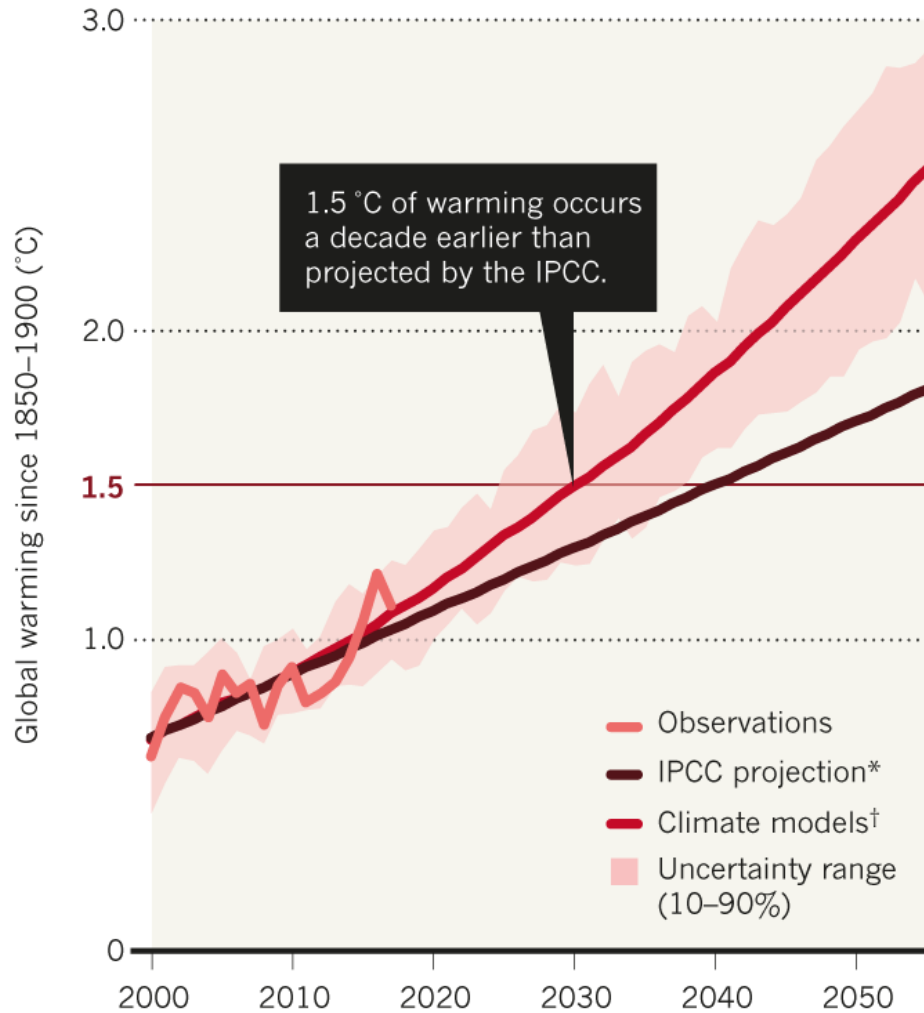
There are two further concerns. Firstly due to the thermal inertia of the oceans, we are already well beyond the 1.5C limit because there is another 0.6C of "committed warming" built into the atmosphere if GHG levels stay at their present level.

Recent modelling demonstrates that if all GHG emissions stop tomorrow (a rather preposterous scenario) OR if we found an energy efficient way to capture carbon directly from the atmosphere, then it MIGHT be possible to keep temperature rises below 1.5C.

The other major concern is that temperatures are rising more rapidly than predicted. A paper in Nature in 2018 predicted that we will reach 1.5C of warming by 2030, rather than the IPCC estimate of 2040. 2020 is the hottest year on record with an average global temperature of 1.2C and a peak of 1.25C of global warming.

ACCELERATED WARMING

Climate simulations predict that global warming will rise exponentially if emissions go unchecked.



*Trend for 2001–15 extended with a constant rate of 0.2 °C per decade, as per IPCC special report. †Ten-year average, 37 climate models for the RCP8.5 scenario (IPCC Fifth Assessment, 2014).

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The deviation from IPCC forecasts appears to be due to rapidly rising methane and a reduction in sulphur emissions from power stations and shipping.

Lower sulphur emissions rapidly results in lower concentration of sulphate aerosols in the atmosphere which normally exert a cooling effect,

<https://earthobservatory.nasa.gov/features/Aerosols>.

Conclusion.

It is obvious that the Kyoto protocol has proven a spectacular political failure. Annual CO₂ emissions have risen by 60% since 1990, and more anthropogenic CO₂ has been emitted since 1990 than in all the previous years going back to the start of the industrial revolution.

We cannot afford for this process of diplomatic failure and political denial to continue any longer. We absolutely must do everything in our power to make COP26 a success, and that means everybody pulling together and working towards a common goal, including XR and every other environmental group on the planet.

This consultation is one step in the process. As I said in a Lancet editorial published in April 1989: "The costs may be considerable, but the costs of doing nothing are incalculable". <https://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2889%2992275-7/fulltext>

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The author is Founder and Chair of Help Rescue the Planet, an educational charity dedicated to minimising air pollution and mitigating climate change. He is also the former Chair of CLEAR The campaign for Lead Free Air and Former Scientific Advisor to the All Party Parliamentary Group on Air Pollution (2017-2021) He is the author of The Gilgamesh Gene published by Shephard Walwyn in 2017.