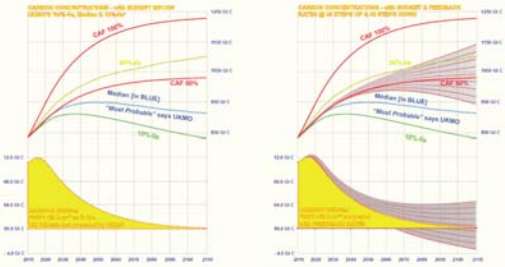
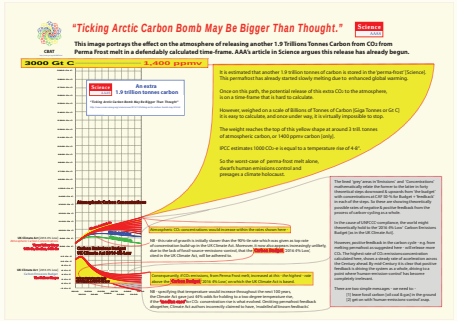
An analysis of the
CO_2 Emissions:Concentrations in UK Climate Act



"All known feebacks are in out model" but



Compare to extra potentially [1.9 Trill Tonnes] of CO_2 Emissions:Concentrations from melting permafrost.

However, here [after 25 years and to be published in 2013] is what the IPCC's AR5 is going to say about this matter: -

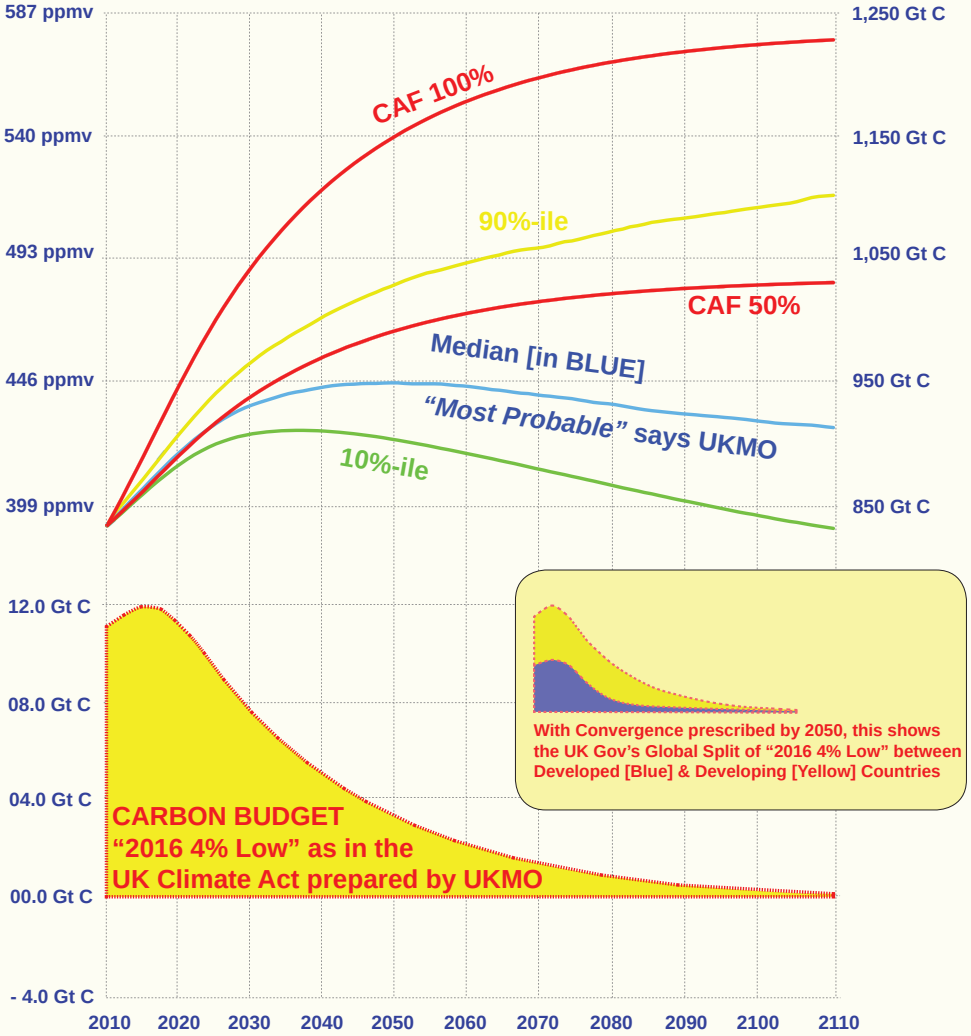
"Release from thawing permfrost is likely to provide a positive feedback, but there is limited confidence in quantitative projections of its strength. Projections for 2100 range from 33 to over 400 Gt C."
See Chart page 5 for the effect of this 'extra'400 Gt C
http://www.stopgreensuicide.com/TechnicalSummary_WG1AR5-TS_FOD_All_Final.pdf

Permafrost.

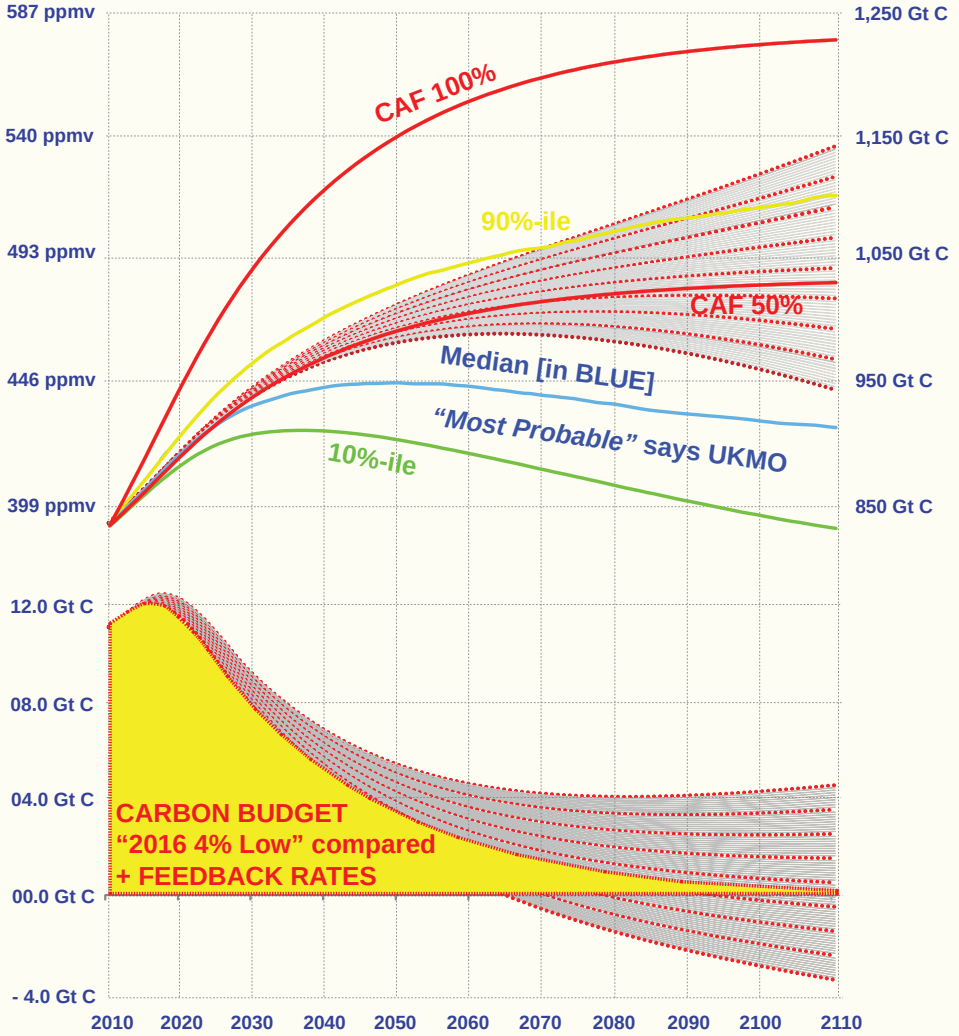
"The conjunction of a long carbon accumulation time scale and potential decomposition under climatic conditions leading to permafrost thaw sug ests potential irreversibility of permafrost carbon decomposition (leading to an increase of atmospheric CO2 and/or CH4 concentrations) on timescales of hundreds to thousands of years in a warming climate. The existing modelling studies of permafrost carbon balance under future warming that take into account at least some of the essential permafrost-related processes do not yield consistent results beyond the fact that present-day permafrost will become a net emitter of carbon during the 21st century under plausible future warming scenarios. This also reflects an insufficient understanding of the relevant soil processes during and after permafrost thaw, including processes leading to stabilization of unfrozen soil carbon, and precludes any quantitative assessment of the amplitude of irreversible changes in the climate system potentially related to permafrost degassing and associated global feedbacks at this stage."

Carbon Emissions Budget [2016 4% Low] and Three Possible Concentration Paths Underpinning UK Climate Act, provided by UKMO & the UK Climate Change Committee

CARBON CONCENTRATIONS
Showing 3 Rates of Accumulation '90%-ile, Median & 10%-ile'
over UKMO'S "2016 4% Low" EMISSIONS BUDGET BELOW



CARBON CONCENTRATIONS
Showing CAF 50% for 'BUDGET + FEEDBACK RATES'
@ 40 steps above & 40 steps below CAF 50% BUDGET ONLY



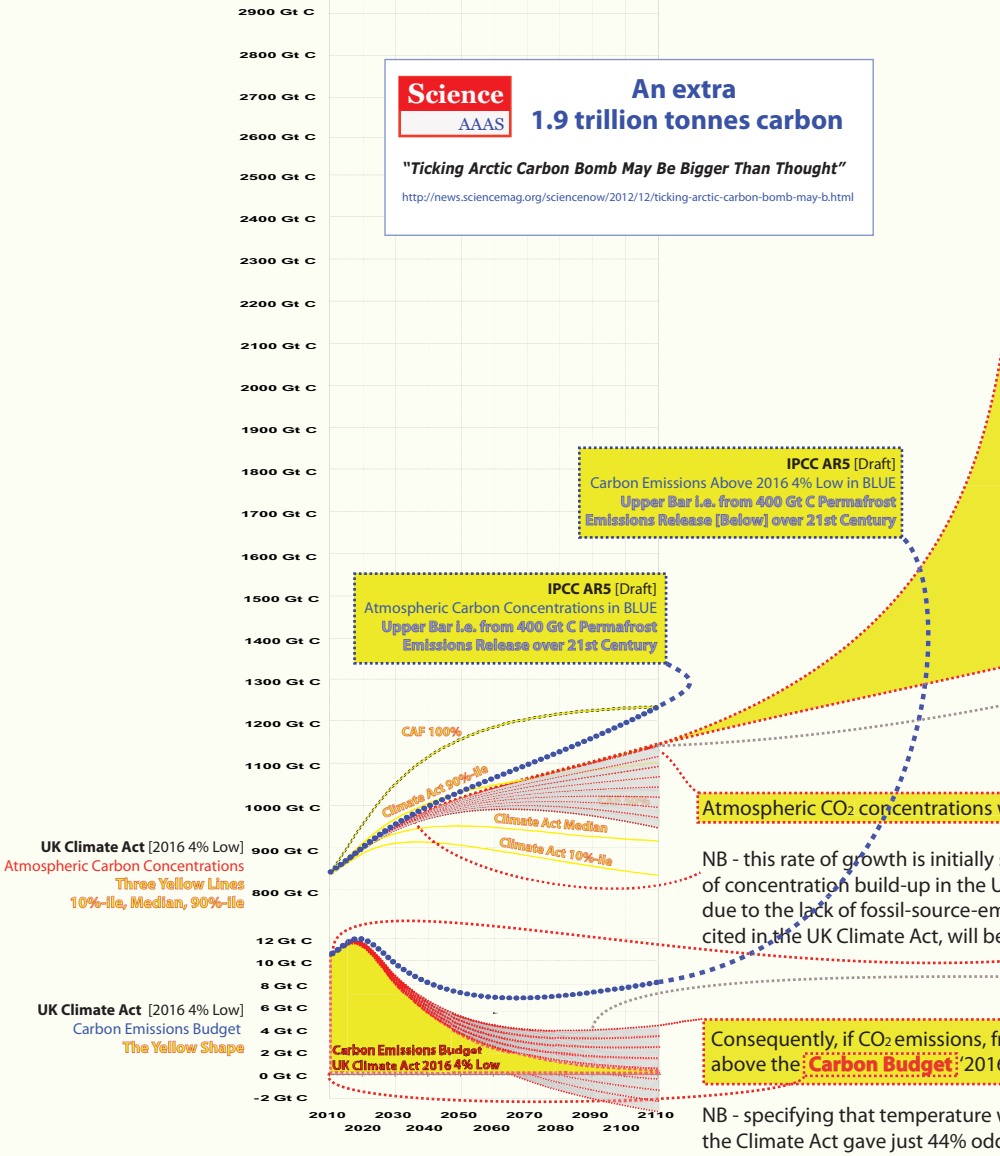
"Ticking Arctic Carbon Bomb May Be Bigger Than Thought."

Science AAAS

CBAT
http://www.gci.org.uk/CBAT.html

This image portrays the effect on the atmosphere of releasing another 1.9 Trillions Tonnes Carbon from CO_2 from Perma Frost melt in a defendably calculated time-frame. AAA's article in Science argues this release has already begun.

3000 Gt C **1,400 ppmv**



It is estimated that another 1.9 trillion tonnes of carbon is stored in the 'perma-frost' [Science]. This permafrost has already started slowly melting due to enhanced global warming.

Once on this path, the potential release of this extra CO_2 to the atmosphere, is on a time-frame that is hard to calculate.

However, weighed on a scale of Billions of Tonnes of Carbon [Giga Tonnes or Gt C] it is easy to calculate, and once under way, it is virtually impossible to stop.

The weight reaches the top of this yellow shape at around 3 trill. tonnes of atmospheric carbon, or 1400 ppmv carbon [only].

IPCC estimates 1000 CO_2-e is equal to a temperature rise of 4-8˚.

So the worst-case of perma-frost melt alone, dwarfs human emissions control and presages a climate holocaust.

Atmospheric CO_2 concentrations would increase at the rate shown here -

NB - this rate of growth is initially slower than the 90%-ile rate which was given as top rate of concentration build-up in the UK Climate Act. Moreover, it now also appears increasingly unlikely, due to the lack of fossil-source-emissions-control, that the **Carbon Budget** '2016 4% Low', cited in the UK Climate Act, will be adhered to.

Consequently, if CO_2 emissions, from Perma Frost melt, increased at *this - the highest - rate* above the **Carbon Budget** '2016 4% Low', on which the UK Climate Act is based.

NB - specifying that temperature would increase throughout the next 100 years, the Climate Act gave just 44% odds for holding to a two degree temperature rise, if the **'median case'** for CO_2 concentration rise is what evolved. Omitting permafrost feedback altogether, Climate Act authors incorrectly claimed to have, *'modelled all known feedbacks'.*

The lined 'grey' areas in 'Emissions' and 'Concentrations' mathematically relate the former to the latter in forty theoretical steps downward & upwards from 'the budget' with concentrations at CAF 50-% for Budget + 'feedback' in each of the steps. So these are showing theoretically possible rates of *negative* & *positive* feedback from the process of carbon-cycling as a whole.

In the cause of UNFCCC-compliance, the world might theoretically hold to the '2016 4% Low' Carbon Emissions Budget [as in the UK Climate Act].

However, *positive* feedback in the carbon cycle - e.g. from melting permafrost as suggested here - will release more CO_2. The highest rate of CO_2 emissions:concentration calculated here, shows a steady rate of acceleration across the Century ahead. By mid-Century it is clear that, in this scenario, *positive* feedback is driving the system as a whole, driving to a point where 'human-emission-control' has become completely irrelevant.

There are two simple messages - we need to: -

[1] leave fossil carbon [oil coal & gas] in the ground
[2] get on with 'human-emissions-control' asap.

Prior to looking at the potential for destruction by positive feedback from melting permafrost [see page 4] the Carbon Budget “2016 4% Low” in the UK Climate Act is shown with the range of concentrations curves they published 90%-ile, median & 10%-ile [page 4].

Also shown are potential [positive/negative] feedback gradations above & below Constant Airborne Fraction at 50% [CAF 50%] of this Carbon Emissions Budget. These are shown in Grey and they are directly linked *carbon-tonne-for-tonne by weight* to the array of constant rates for the build-up or accumulation of Atmospheric Carbon Concentrations shown in Grey above.

This recognizes the real potential for feedback responses like this, as is shown in the imagery that follows, where the weights, dates and rates for potential CO_2 release from melting permafrost for example are mooted. This makes it easy to analyse emissions:concentration paths in the Climate Act.

These rates of ‘feedback-response’ are shown above & below the red-line of CAF 50% of the fixed-budget [2016 4% Low] only. Above and below CAF 50% [Budget-only], this changing concentrations potential is shown by adding 40 steps of positive feedback upwards and also subtracting 40 steps of negative feedback downwards. All these possible concentration response rates are measured as combinations of the ‘*Carbon Budget + the feedback rates’* shown above and below the budget. With these gradations, CAF is held constant at 50% for each of the *combinations* of the ‘*Carbon Budget + the feedback rates’.*

The rate of acceleration/deceleration or the *shape* of the curvature in the concentration path *is the critical issue*, as concentrations are ‘cumulative-emissions’ and are acquiring speed and embedding momentum in that curvature.

It is vital to understand that once we get established on one of these paths, they are not easily changed, especially if increasingly dominated by the relative weight of the add-on effects of positive feedback. [For example, the maximum concentration path shown is the result of reaching an annual release of 4 Gt C by 2100 from permafrost melt for example compared with ‘the budget’ that reaches near zero by that year]. This is the issue because there is huge momentum in these rates and weights of change and these can become completely self-perpetuating i.e. beyond any 'human emissions control' through restrictions in the 'emissions-budget'. The bottom-line is that we cannot just 'switch positive-feedback off' and at worst it has the potential to trigger what is portrayed in the graphic assembly shown on page 5 - dangerous runaway [and unstoppable] rates of climate change.

The United Kingdom Meteorological Office [UKMO] Hadley Centre modelled the emissions:concentrations scenario underpinning the UK Climate Act called ‘2016 4% Low’ and it is shown in solid Yellow at the bottom of the image on page 4.

Contradicting research published in IPCC AR4 regarding 'coupled' and 'uncoupled' emissions:concentrations scenarios [scenarios with and without feedback], UKMO claimed at the time [2008] to ‘have modelled all known feedbacks’ in "2016 4% Low" and they defended this assertion aggressively in a Parliamentary hearing.

It is clear that the UKMO ‘90%-ile’ curve accelerates much faster than CAF 50%. This portrays rising positive feedback, or that emissions are being released increasingly in excess of ‘the Budget accumulating as concentrations at CAF 50%. However, as can be seen clearly against the 40 graduated curves of ‘constant acceleration’ [the grey lines above CAF 50% in the image on the right], the ‘positive feedback’ for their '90%-ile' curve then slows down to well below CAF 50%, *even though the UKMO’s temperature curve for this scenario [not shown here] continues to rise throughout the 21st Century.* This is counter-intuitive as it suggests that this rate of positive feedback will lessen though temperature is continuing to rise which would, if anything, *accelerate* [and not decelerate] this curve, as is suggested in the ‘what-if’ representation of this feedback on page 5.

They said that the 90%-ile concentration path was most improbable. However, the only thing improbable about it was the shape or the early acceleration and the subsequent deceleration of the curve. That said, the danger of getting on a concentration path that accelerates to over 1,100 Gt C by 2100 due to the emergence of positive feedback taking hold, is not improbable at all. On the contrary, with acceleration all the way from increasing warming and melt, it is wholly possible. It is also a cause for great concern as graduation to runaway rates of climate change means becoming caught on an infinite damage curve and being unable to do anything about it.

It is clear that the UKMO median curve initially accelerates the concentration build-up from 44% to slightly over CAF 50% [2010-2020] and then falls back so fast that even concentrations are falling from 2050 onwards. This indicates the UKMO’s extraordinary view - quite unsupported by any evidence - that sinks will have become more than 100% efficient from 2050 onwards. In other words, while feedback becomes strongly negative from around 2030 onwards, it is so strongly negative by 2050 that the sinks are absorbing more than all human sources a releasing!

It is worth noting that the 'fossil-carbon' burned to the atmosphere, is not going back down the coal-mines or the oil and gas fields when some of it returns to the ‘natural sinks’. It is going into the biota [living carbon] on land and in the oceans, where it is theoretically being re-absorbed. This, one way or another, is what the UKMO projects and it is unrealistic because it is fossil carbon to biota. Asked about this, UKMO said it was, *'entirely reasonable'.*

Then, after reaching 100 sink-efficiency, UKMO’s median curve indicates that feedback becomes less strongly negative. Once again, though clearly modelled and shown in their median curve, this shape is not supported by any evidence it is contradicted and is completely unexplained.

With regard to the potential acceleration rate of nonlinear change, it is some sense unknowable. Certainly, none of UKMO's work ignoring feedback from melting permafrost, remotely approximates any of the 40 acceleration or deceleration curves shown [image page 3; grey lines above & below CAF 50%].

Nonetheless, the UKMO stated that, ‘the Median curve’ is, *"the most probable curve"*. This statement is complex and deceptive as - it should be carefully noted - they said this whilst also assigning only 44% odds for staying below 2 degrees with this median concentration curve over their ‘2016 4% Low’ emissions scenario. In that we are supposedly committed to not exceeding 2 degrees, it is a political and misleading statement.

In fact, 'all' the negative and/or the positive feedbacks they claim were modelled in their 3 concentrations curves, lack consistency or any credible explanation [at least in the climate system] for the actual shape of the concentration curves that were drawn.

Concealed by opaqueness, the 'assumptions' that are revealed on close analysis, at best appear arbitrary and actually defy common sense. This is classic output from the kind of ‘Black-Box’ climate model being used by Governments to generate economic and policy-computations from what are even more contestable ‘Black-Box’ economic models [vide Garnaut]. UKMO's work on this scenario is not fit for purpose, if UNFCC-compliance is still seriously the intention.

In this it is extraordinary - it defies commons sense - that they should have: -

[a] chosen to calculate a scenario with unrealistically optimistic assumptions about 'sink-efficiency';

[b] chosen to exhibit, prefer and prescribe a scenario with odds that predict a failure to achieve UNFCCC-compliance at two degrees;

[c] chosen in what is acknowledged as a C&C negotiation scenario, to simply 'prescribe convergence by 2050'.

Overall, UKMO’s varying rates of acceleration & deceleration in future sink performance, present what appears as a knowledgeable and detailed - but what actually is - a dubious and discreditable array of pretended 'prescience-insights'. Doing this reveals that their analysis, far from being 'scientific, is ideologically opaque and untrustworthy.

In essence, "2016 4% Low" was a politically constructed and politically pre-emptive global-emissions-budget-scenario for COP-15. However, it was no surprise that this created anything less of a political scandal at COP-15, than unequal life-evaluation did at COP-1 [see pp 6-10].

That said, it was a surprise to discover that the DECC Minister [Miliband] who presented this to the global community at COP-9 was so extensively ignorant of what he was dealing with and what he was actually doing throughout the whole process.

The main point surely is that UNFCCC-compliance is the primary and over-riding purpose of the exercise.

Consequently, it makes far more sense to pose a single trajectory to safe and stable concentrations and then vary the size of the contraction-budgets to reflect the varying rates of sink-performance [positive to negative feedback effects] that need to be projected due to the uncertainty about this issue that remain. This, as portrayed here for example is transparent.

Proceeding this way has to more sensible and transparent, than - as the UK Government did - to simply: -

[a] ‘fix a carbon-budget’ with a ‘Black-Box climate model’ with rates of failure attached,

[b] then project an arbitrary array of such arbitrarily varied rates of concentration accumulation,

[c] as a preliminary to generating a hydra of contestable economic computations from a range of ‘Black-Box’ economic models,

[d] not to mention promoting the *prescriptive* political confrontation at COP-15 in Copenhagen in 2009,

[e] where being able to blame ‘the other side’ was arguably a deliberate feature of what was arguably the UK Governmmen’s ‘planned failure’.