



Department of Energy & Climate Change

From: Bryant Hannah (Comms)

To: Geoff Beacon

Cc: Betts Peter, International Climate Change, Honour Sarah (Science and Innovation),
Bain Tom (Strategy), Foster James (Analysis), Jingree Anjali (Communications)

Subject: IPCC Carbon Budget and Climate Feedbacks

Date: Friday, April 29, 2016 3:19 PM

Dear Geoff,

You spoke to Pete Betts at the LSE, and subsequently via email, during which you raised several thoughtful points on the science of feedbacks, and their potential policy implications. With thanks to several of my colleagues, I've tried to answer your questions to Pete below.

In answer to your specific questions:

1. Am I correct in thinking that some of these feedbacks were not used in the models that calculated the "remaining carbon budgets" - as used in the IPCC AR5?

That's correct, the models used vary in what they include, and some feedbacks are absent as the understanding and modelling of these is not yet advanced enough to include. From those you raise, this applies to melting permafrost emissions, forest fires and wetlands decomposition.

2. Are there other missing feedbacks that should be considered?

The feedbacks you mention are certainly important, although there are several other feedbacks that could be included but are currently too difficult to model. As knowledge and understanding advances, they will be added to the climate models.

3. Have the impacts of the feedbacks 1-4 above been reassessed?

Our understanding of these feedbacks is constantly evolving, reflected in peer-reviewed research published since AR5, and we would expect future IPCC reports to similarly update climate model projections and associated carbon budgets.

4. Has DECC any estimates on how "missing feedbacks" would change the values of these remaining carbon budgets?

DECC (as for the IPCC) has not made any direct estimate of this. Understanding of the feedbacks currently excluded from climate models is constantly evolving, though the majority of these feedbacks, if included, would likely further reduce the available global carbon budget. The Met Office Hadley Centre Climate Programme, funded by DECC and Defra, delivers scientific evidence on climate variability and change. The effect of additional Earth system feedbacks, such as the ones you mention, on global carbon budgets is one of the many research topics currently being covered by the programme.

5. As of December 2015, what is DECC's estimate of the remaining carbon budget - for the 66% probability of keeping global temperature rise below 2°C?

DECC doesn't estimate the remaining global carbon budget, however others such as the Global Carbon Project (<http://www.globalcarbonproject.org/index.htm>) have estimated updates to the IPCC's budget, based on emissions since 2010.

6. In the discussions of INDCs, would it be correct to use the remaining carbon budget as a target for the sum of national INDCs?

As discussed above, while the budget concept is useful to give a measure of progress, it is not a good basis for a target as such.

7. How long must the budget last? (i.e. should we rely on extracting carbon from the atmosphere, later in the century?)

There are a wide range of pathways for achieving the well below 2°C goal. With considerable uncertainty over future technology costs, development, performance, and wider impacts, it is too soon to definitively say whether and by when we should rely on negative emissions technologies (and what form these might take). However, many pathways to below 2°C that are consistent with emissions to date now rely on negative emissions later in the 21st century.

8. I have found Carbon briefing: Making sense of the IPCC's new carbon budget, quite useful. Is it more-or-less correct?

The Carbon Briefing report is an accurate explanation of the IPCC's carbon budget.

Regardless of the eventual impact of missing feedbacks, this issue only underlies the importance of increasing global ambition. While we will continue to strive for the best possible understanding of the science of climate change, we cannot lose sight of the imperative of national and international action to reduce emissions. The UK is committed to playing its part in this effort, with our legally-binding target of at least 80% reductions by 2050, and we will continue to work with all countries and all stakeholders to implement the Paris Agreement and increase global ambition.

Best Regards,

Hannah Bryant

DECC Media Officer

Communications Directorate