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Submission to the EU methane strategy consultation

As researchers actively working on the interactions of EU and member state climate mitigation policies, we welcome the opportunity to contribute briefly to this consultation on the proposed EU methane strategy. We attach a copy of a recent workshop paper presenting preliminary results from research investigating the application of "cumulative carbon budget" policy mechanisms in a fully integrated way across CO_2, N_2O and CH_4. In summary, we argue that:

- The "cumulative carbon budget" framework is essential to the development of climate mitigation policies that align with the global temperature goals of the Paris agreement, while also showing, clearly and transparently, the relative contributions from different parties to the agreement. This applies both to the EU as a whole (compared to non-EU parties) and among the member states of the EU itself.
- This can only be done effectively by integrating the *warming effects* across different greenhouse gases in an appropriate way. There are different methods to achieve this in the form of "carbon dioxide equivalent" warming. The current de facto method relies on "global warming potential over 100 years" (GWP_{100}). However, this gives a poor representation of the *cumulative* warming effect of short lived GHGs, specifically including methane (CH_4). We suggest that, for EU policy purposes, there is a useful role for the newly developed GWP* method of aggregating GHGs, in terms of **cumulative CO_2-we**.
- This does not alter the fact that anthropogenic flows of methane to atmosphere, originating from both energy related activities and agriculture, **are a very significant contributor to current and projected global warming**: it merely provides a more skilful way of understanding the contribution of methane relative to other GHGs.
- Very significant reductions in annual EU emissions of methane, **likely of at least 50% over the period 2020-2050**, remain essential to any plausible "fair share" contribution by the EU to meeting the Paris Agreement global temperature goals.
- In the case of methane from agricultural activities, this likely requires **a deliberate, strategic and long term shift in EU agricultural production to a lower relative proportion of methane intensive food products** (especially beef and dairy) in favour of much less methane intensive product types. In this way, overall EU production of food nutrition can and should **increase** (in line with separate commitments in the Paris Agreement) while still radically reducing the absolute level of associated global warming.
- Expansion of biogas production carries a particular risk of increased methane leakage: Policies are needed at EU and member state levels to explicitly monitor and manage this risk.

The findings above have been particularly informed by a research project, *Society-wide Scenarios for Effective Climate Change Mitigation (SSECCM-IE)*[1], funded under the Irish Environmental Protection Agency (EPA) Research Programme 2014-2020, grant reference 2018-CCRP-DS.14. The EPA Research Programme is a Government of Ireland initiative funded by the Department of Communications, Climate Action and Environment.

Yours sincerely,

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Attachment: Barry McMullin and Paul Price, Society-Wide Scenarios for Effective Integration of Paris-Aligned Climate Mitigation and Adaptation in National and Regional Policy, Climate2020, 7th Climate Change Online Conference, March 23-30, 2020.
https://tinyurl.com/Climate2020-McMullin-Price

[1] http://ecrn.eeng.dcu.ie/projects/sseccm-ie

Society-Wide Scenarios for Effective Integration of Paris-Aligned Climate Mitigation and Adaptation in National and Regional Policy

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Introduction

Climate science (IPCC 2018) and economics (Emmerling et al. 2019; Burke, Hsiang, and Miguel 2015) together indicate that achieving far earlier and deeper mitigation than pledged to date is likely now critical to effective climate action – particularly to ensure limits to adaptation are not breached. However, clear and coherent comparisons of national and regional climate action have been lacking. Therefore, summarising McMullin et al. (2019), a benchmarking method is presented to establish a prudent, fair share of the remaining global carbon dioxide (CO_2) budget (exclusive of other GHGs) for any Party to the Paris Agreement. Using Ireland as a case study, current policy ambition is analysed relative to this benchmarked national CO_2 quota, demonstrating early emergence of CO_2 debt, and showing tacit mitigation policy reliance on future, large scale carbon dioxide removal (CDR). Toward future research into society-wide scenarios for effective climate action, this paper also presents initial findings on the crucial roles of non-CO_2 mitigation and safeguarding land carbon stocks.

Methods

The strongly linear relationship between nett cumulative anthropogenic CO_2 emissions and resultant global warming permits scientific estimation of the remaining global carbon budget (GCB) to meet the Paris Agreement target of at least limiting to "well below 2 ºC" (Rogelj et al. 2019) . Estimating a national fair share of the GCB – a cumulative national CO_2 quota (NCQ) – differs from the more prevalent use of point-in-time emission rate targets, which do not, in themselves, allow assessment of good faith, 'fair share' contributions to meeting the temperature goals of the Paris Agreement, even on an aspirational basis. Therefore, McMullin et al. (2019) assesses the *prudent*, remaining GCB in per

capita terms, based on the GCB range estimated by IPCC SR15 (Rogelj et al. 2018). Ireland's *minimally equitable* NCQ is assessed as a national case study: first, by top-down division of the global carbon budget, based on Raupach et al. (2014), allocated by: *population* (equal per capita) division; or *inertia*, grandfathered according to current (inequitable) allocation. This is then compared to cumulative CO_2 emissions on the basis of: current national policy aspirations, based on stated objectives; and current national policy projections, as reported by Ireland to the UNFCCC.

Results (see annex for abbreviations)

The low-end GCB value of 610 $GtCO_2$ as of 2015, divided by the global population of 7.38 billion, gives a remaining global equal per capita quota of 83 tCO_2, which can only be described as *minimally equitable* as it neglects consumption accounting, prior historical responsibility and current mitigation capacity. On this basis, the carbon quota of any nation is simply given by multiplying this value by the nation's population in 2015. For Ireland, this ***Low-GCB-Pop*** NCQ was 391 $MtCO_2$ from 2015. The corresponding exponential, constant, required reduction rate ***R*** was -11% from 2015, meaning that any failure to meet that reduction rate increases the required rate for subsequent years. For Irish policy aspirations: ***NMO-95***, for a 95% reduction by 2050 relative to 1990, total future cumulative CO_2 commitment is 517 $MtCO_2$, with R = -8.3%; for ***NMO-80,*** the corresponding values are 917 $MtCO_2$ with R = -4.7%. For Irish projections: ***WEM*** (with existing measures) gives cumulative CO_2, only up to the end of 2035, of 964 $MtCO_2$ with R = +0.7%; the corresponding ***WAM*** (with additional measures) values are 937 $MtCO_2$ and +0.4%. Figure 1 compares these results for Ireland on the basis of depletion from the 391 $MtCO_2$ remaining 2015 NCQ value.

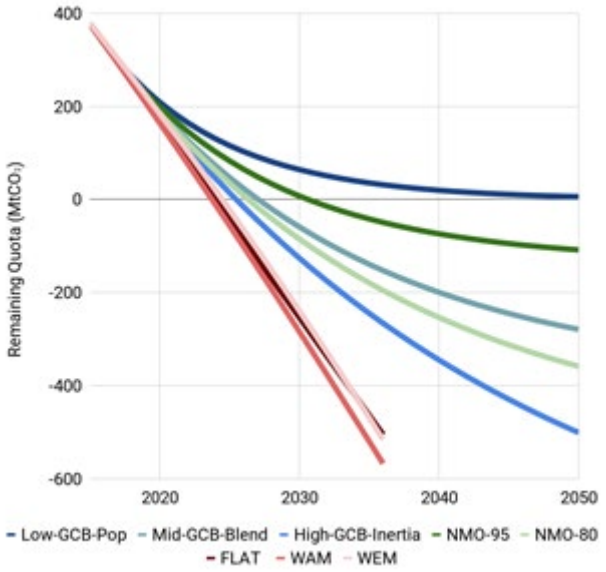

Figure 1. Depletion of Ireland's prudent, minimally equitable, remaining national CO_2 quota of 391 $MtCO_2$ from 2015, showing exponential pathways corresponding to the scenarios described in the text. By definition/construction, Low-GCB-Pop is the only scenario which does not go negative (does not enter CO_2 debt relative to that chosen quota).

Policy relevance: This method enables analysis of proposed policy. For example, in the case of Ireland a new Climate Action Plan (DCCAE 2019) aims to strengthen climate governance; however, insofar as they can be inferred, the mitigation trajectories implied by the plan still suggest a very early exhaustion of the assessed prudent, fair share (Paris-aligned) CO_2 quota by 2024, with consequent emergence of CO_2 debt – reaching net zero emissions in 2050, but an accumulated CO_2 debt of ~580 $MtCO_2$. Given the CO_2 debt apparent even in high ambition energy CO_2 mitigation pathways, further research is now examining society-wide scenarios. Ireland's forestry CO_2 removals are projected to fall, and CO_2 emissions due to organic soil emissions and extraction (for horticulture and energy) continue to be high. Immediate cessation of peat extraction and limiting timber harvest – potentially retaining biomass toward future permanent CDR via Bioenergy with Carbon Capture and Storage –could become mitigation priorities.

Ongoing and further research: Further research is needed to develop policy-relevant, society-wide scenarios for effective climate change mitigation and adaptation. In particular, non-CO_2 emissions affect CO_2-only budgets. This is particularly so in Ireland, which has the highest per capita nitrous oxide and methane emissions in the EU (the latter currently rising at 2% per

year) due to increasing nitrogen fertiliser use to increase dairy and beef production. Extending the above research, a scenario comparison tool, based on the new GWP* warming-equivalent method (Cain et al. 2019), is indicating that capping system fertiliser input would provide a policy driver for steady/permanent reduction in methane emissions (through cattle herd reduction). A substantial reduction in climate forcing due to methane (Fuglestvedt et al. 2018), would thereby be enabled that could be essential to achieving credible Paris Agreement -aligned mitigation for Ireland and reduced reliance on speculative future CDR.

Conclusions

For developed countries with heavy fossil fuel reliance, current approaches to decarbonisation are grossly inadequate. Analyses that stress long-term and sectoral measures or percentage renewable energy penetration targets can divert attention from the primary near-term mitigation priority of quickly reducing unabated fossil carbon combustion. Our analysis highlights that vulnerable islands and small developing countries generally have far slower depletion rates of their 2015 CO_2 quotas than developed nations, therefore they have more time and emissions 'space' within their per capita quota to enable adaptation and mitigation. By contrast, comparable NCQs and CO_2-debt trajectories for developed nations starkly illustrate the urgency needed for them to achieve radical near-term action and limit the escalating risk of catastrophic policy failure. The core recommendation for both national and global climate action must be the prioritisation of achieving nett zero CO_2 emissions within a *stated* overarching nett CO_2 cumulative quota constraint, supplemented by non-CO_2 mitigation, while limiting commitment to CO_2 debt and rigorously respecting a *nett* CO_2 annual emission rate pathway that is commensurate with satisfying this cumulative constraint. The key message from this analysis is that delayed climate action is escalating risks of catastrophic policy failure in mitigation and adaptation.

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Abbreviations

CDRCarbon dioxide removal from the atmosphere via biological or chemical pathways to land, ocean or geological storage.

GCBGlobal carbon budget, the remaining cumulative CO2 (in this analysis based on the reference year of 2015) relating to likelihood of limiting to a stated temperature limit to global mean surface warming.

NMONational Mitigation Objective: by 2050, reducing national GHG emissions by either 80% or 95% relative to 1990.

NCQNational CO2-only quota. Defined in this research as an equal per capita share of a prudent, minimally equitable fair share of the remaining global carbon budget.

WAMWith Additional Measures. Scenario reported to EU including proposed policy measures.

WEMWith Existing Measures. Scenario reported to EU including only existing policy measures.

Low-GCB-Pop National CO2-only quota based on an equal per capita share of the 2015 GCB.

Mid GCB-Blend National CO2-only quota based on mid-value blending inertia and population.

High-GCB-Inertia National CO2-only quota by current per capita share of 2015 global emissions.