

**Submission to the Joint Committee on Environment and Climate Action**

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*“to inform their consideration of Ireland’s carbon budgets”*

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**1 INTRODUCTION**

My name is Professor Kevin Anderson. I currently hold a joint professorship in energy and climate change at the School of Engineering at the University of Manchester, the Centre for Sustainability and the Environment (CEMUS) at Uppsala University (Sweden) and the Centre for Climate and Energy Transformation at the University of Bergen (Norway). Prior to moving to academia in the mid-1990s, I worked for a decade as an engineer, principally in the petrochemical industry and I am a chartered engineer and fellow of the Institution of Mechanical Engineers.

I have examined issues around energy and climate change for thirty years. I have been a member of the Tyndall Centre (the UK's leading interdisciplinary and academic climate change research centre) since 2001, an organisation where I have previously served both as the Deputy Director and Director.

I attended both weeks of Glasgow and Paris Climate Conferences (respectively COP26 and COP21), as a scientific observer, presenting at formal events and engaging with scientists, policy makers and media. In relation to the Paris Agreement, several scientific colleagues and I scrutinised the evolving drafts of the Paris text, making clear and public assessments during major press conferences. I was commissioned by *Nature* to provide a personal evaluation of the final text of the Paris Agreement.

All views contained within this statement are attributable solely to me and do not necessarily reflect those of my wider researcher colleagues or associated organisations.

## 2 CONTEXT

### Political background

At the November Glasgow COP26, the Taoiseach reiterated Ireland's commitment to "play its part" in delivering the "large-scale reductions in greenhouse gas emissions [necessary to] keep the possibility of limiting warming to 1.5 degrees alive."

*"To achieve our Paris goals, immediate, large-scale reductions in greenhouse gas emissions are essential. Unless we act now, we will not keep the possibility of limiting warming to 1.5 degrees alive.*

*The scientists are playing their part, in helping us to understand the dynamics of climate change and in developing the technologies and responses we need to limit its effect.*

*As political leaders, it is our responsibility to put the necessary policies in place.*

*Ireland is ready to play its part."*

Similar recognition of the need to increase ambition to deliver on the 1.5°C framing of climate change has been forthcoming from a breadth of Irish policy makers (e.g. Eamon Ryan, Darren O'Rourke and Pauline O'Reilly), leading thinkers (Mary Robinson and Pope Francis) and institutions (from Oxfam to An Taisce).

### Quantitative background:

- Even allowing for the global banking crisis and Covid pandemic, Ireland's emissions in 2020 are unchanged from those in 1990. In the intervening years Ireland's average annual emissions have been almost 20% higher than they were in 1990.
- Ireland has territorial emissions of carbon dioxide per capita that are around 17% above the average for the EU27.
- In 2019 (latest year for comparative data) a typical Irish citizen had a total carbon footprint (i.e. a consumption-based emissions value) 27% higher than an average Chinese citizen, 75% above the global mean, and over ten times higher than that of a typical African person.
- In 2020 Ireland's GDP per capita (in purchasing power parity, PPP) placed it as the world's third richest country. It has a PPP/capita value of over twice that for the EU, more than five times the Global average and sixteen times that of a typical African citizen.
- The population density of Ireland is around 70 people per square kilometre, considerably lower than the EU value of 117. In addition, Ireland has a very long coastline, an extremely favourable wind regime and high tidal ranges. Overall, Ireland is disproportionately well served for developing renewable energy.

### My submission:

- a) Takes the commitment of the Taoiseach (and wider Irish establishment) at face value
- b) Is based on the carbon budgets provided in the IPCC AR6 report (2021)
- c) Adopts a framing of equity aligned with the UNFCCC's core concept of "common but differentiated responsibility and respective capabilities"
- d) Builds on the analysis outlined in a peer-reviewed paper: [A factor of two](#) (Anderson et al 2020)

### 3 ANALAYSIS

If Ireland's fair contribution to the 1.5°C commitment, reiterated in the speech of the Taoiseach, is to be realised, its mitigation policies need to be informed by a dispassionate analysis based on the latest carbon budgets (from AR6) and the equity criteria enshrined in CBDR-RC. Such analysis must eschew political sensibilities and not be constrained by ephemeral tenets of the economic status quo.

Whilst the following analysis focusses specifically on carbon dioxide emissions arising from energy use and supply, the role of wider emissions (principally agricultural emissions of methane and nitrous oxide) are key factors in estimating the size of the remaining carbon budget.

For this submission just two of the AR6 headline budgets values are considered. The first is the value for a 67% chance (or better) of not exceeding 1.5°C. This value is chosen to represent the ramping up of the 1.5°C ambition evident in the G7 Climate and Environment Ministers' communique (May 2021) and subsequently as the underpinning of the Glasgow COP26. This increase in ambition followed the IPCC's SR1.5 (2018) report in which the scale and scope of the difference in impacts associated with only a small change in temperature was emphasised (i.e. the impacts at 2°C compared with those estimated for 1.5°C). The second value is for a 50:50 chance of 1.7°C, chosen to represent the Paris Agreement's commitment to cut emissions in line with "*well below 2°C*" and "*pursue efforts to limit ... warming to 1.5°C*". The carbon budget for a 50% of 1.7°C is almost the same as that for an 83% of staying below 2°C. AR6 gives these carbon budget values as, respectively, 400GtCO<sub>2</sub> (hereafter the 1.5°C budget) and 850GtCO<sub>2</sub> (hereafter the 2°C budget). Both of these budgets are for emissions starting in 2020.

Updating the budgets to January 2022 and making very conservative allowances for process emissions from industry (dominated by cement), leaves an 'energy only' global carbon budget of around 270GtCO<sub>2</sub> for 1.5°C and a less onerous 680GtCO<sub>2</sub> for 2°C. It is important to keep in mind that that the 2°C budget significantly increases the risks of far more devastating climate impacts. These will be felt initially by poorer and climate vulnerable communities elsewhere (typically both low-emitters and people of colour) and within a decade or so by our own children and grandchildren.

To give these budget values some high-level perspective, if current levels of emissions were to persist (and they are presently still on an upward trajectory) they would represent under eight years for 1.5°C and under nineteen years for 2°C. However, these are global values, and Ireland has signed up to mitigate emissions informed by the equity concept captured in CBDR-RC. Accordingly, if even a weak interpretation of CBDR-RC was to be adopted, then wealthy nations, such as Ireland, would have a much smaller carbon budget.

Provisionally, and based on the method outlined in the Factor of Two paper (linked above) and updated with AR6 carbon budgets and to the start of 2022, then Ireland's energy-only carbon budgets would range from, very approximately, 120MtCO<sub>2</sub> (1.5°C) to 300MtCO<sub>2</sub> (2°C). As noted, these are provisional estimates, and cover the period 2022-2100, and are for all energy CO<sub>2</sub>, including international aviation and shipping.

Another way of viewing these budgets is in terms of highly stylised emission pathways. At Ireland's current level of energy-only emissions (including an estimate for international aviation and shipping), it will consume its fair share of the global carbon budget for 1.5°C in a little over three years, and for 2°C, in a little over 8 years. If, however, Ireland was to immediately begin a simple straight line reduction from its current emissions to zero CO<sub>2</sub>, the time to zero fossil fuel emissions would extend to between 2029 (1.5°C) and 2038 (2°C). Alternatively, the budgets could be used to prescribe an exponential emission reduction pathway of between 12% p.a. (2°C) and 30% p.a. (1.5°C), assuming these reductions begin from this year (2022). Each year of delay, increase substantially these reduction rates, bringing forward still earlier the date of zero fossil fuels.

## Why so different to other analysis

There are two key reasons why the carbon budget values and emission pathways presented here are much more onerous than those typically forthcoming from both global mitigation models and more detailed national models.

- 1) Virtually all global models adopt planetary scale uptake of 'carbon dioxide removal' (CDR), beginning in earnest in a decade or so from now, increasing in scale over time and continuing across and beyond the century. This ubiquitous assumption that future generations will remove from the atmosphere the emissions we have chosen not to mitigate is increasingly being brought into question. Whilst it certainly reduces significantly the level of mitigation demanded of today's policymakers, it does so at a very considerable risk to future generations. To give a sense of the scale of this assumption (dominated by technologies that are, at best, at pilot-scale): the level of emissions typically assumed to be removed from the atmosphere is not too far from the net level of CO<sub>2</sub> absorption by total global photosynthesis. Put another way, it assumes an industry approaching the size of the current global oil and gas industry, from one that currently remains in its early infancy.
- 2) Within the national mitigation analysis and models of wealthier nations, equity (in the form of CBDR-RC and enshrined in the UNFCCC, and all subsequent international climate agreements), receives scant if any attention. Play out the implications of the carbon budgets explicit or implied in the mitigation policies of wealthier nations, and it is immediately evident that such nations allocate themselves a disproportionate quantity of the small and rapidly dwindling carbon budget (for both 1.5°C and 2°C).

My personal view on CDR, is that it should be the subject of a major programme of research and development. Moreover, if '*negative emissions technologies*' and so-called '*nature-based solutions*' can meet stringent ecological and social sustainability criteria, then they should be deployed. However, that they may work at scale in decades from now should not be relied on when developing today's mitigation policies. In terms of energy specifically, emissions need to reach real zero, not net zero. Ultimately, any absorption of CO<sub>2</sub> through CDR will need to compensate for the warming from that residual element of agricultural emissions that cannot be eliminated. That said, even here agricultural emissions will need to be kept under very tight control, as the prospect of successfully and reliably removing hundreds of billions of tonnes of CO<sub>2</sub> from the atmosphere and burying it somewhere securely remains highly speculative.

## 4 KEY CONCLUSIONS:

- 1) If Ireland is to meet its Paris climate commitments it has to limit its total emissions of energy-related carbon dioxide, i.e. its carbon budget, to between 120MtCO<sub>2</sub> and 300MtCO<sub>2</sub>. The former is for a "likely" chance of staying below 1.5°C, the latter for a even chance of staying below 1.7°C (which equates to a very likely chance of below 2°C). These values are from the start of 2022.
- 2) If Ireland began an immediate cut in its emissions, such as to deliver a straight line mitigation path from today to zero emissions, then these budgets equate to reaching zero emissions by between 2029 and 2038. Another way of viewing this, is that 120MtCO<sub>2</sub> equates to an annual mitigation rate of around 30% p.a., with 300MtCO<sub>2</sub>, much lower at a little over 12% p.a. These reductions include emissions from international aviation and shipping.
- 3) Whilst these conclusions for energy-based emissions are hugely challenging, they nevertheless are based on carbon budgets that rely on major and ongoing reductions in global emissions of non-CO<sub>2</sub> GHGs. In Ireland's case, this plays out as a fundamental change in the nation's agricultural emissions of methane and nitrous oxide, requiring a profound rethink in Ireland's agricultural practices and consumption of meat and dairy.

- 4) There is no easy way out of the dilemma rich high emitting nations now find themselves in. We are here precisely because we have for thirty years been unprepared to face the climate challenges with honesty and integrity. Whether wealthy nations fail again now is a matter of choice – a choice where honesty and integrity are this time far more important than economic expediency and Machiavellian policies.

## **5 SUMMARY:**

Ireland is an extremely wealthy nation, with a highly educated population and very favourable renewable energy potential. Moreover, it has a low population density that should make siting of renewable supply much less problematic than for most other nations. Despite Ireland's unique financial and geographical position to lead the world in renewable energy development, according to the Sustainable Energy Authority of Ireland, only 11% of its gross energy consumption is from renewable sources. Or put another way, around 90% of Ireland's total energy consumption is unsustainable. Ireland's failure to deliver any reduction in net emissions since 1990, despite its favourable financial position and geography suggests, thus far, that climate change has received no serious political attention. The unprecedented carbon budget challenges Ireland faces today stem, in part, from its own choice to ignore three decades of clear scientific analysis. Each year this failure to heed the science continues, so the mitigation challenge will increase. Ultimately, the physics of the climate will always beat any ephemeral economics that ignores it, with the subsequent climate impacts bequeathed to Ireland's own future and to more vulnerable communities elsewhere today.