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Basing Ireland's carbon budgets on temperature neutrality would undermine obligations under the Paris Agreement

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Executive summary

Ireland has committed, through the Climate Action and Low Carbon Development (Amendment) Act 2021 and by ratifying the Paris Agreement, to pursue climate action with the *highest possible ambition*. Ireland is also bound under ambitious and binding climate targets at the EU level: a 55% reduction by 2030, a 90% reduction by 2040 (under discussion), and net-zero greenhouse gases by 2050. Together, that means doing everything feasible to reduce greenhouse gas emissions and to make a fair contribution to the Paris Agreement temperature goal limiting warming to 1.5°C.

We are now perilously close to breaking that limit. Achieving the Paris Agreement goals requires rapid and sustained emissions reductions across all greenhouse gases, including methane (CH₄), which is responsible for around 0.5°C of warming to date as a result of human activities. Given Ireland's position as among the world's highest per-capita emitters of methane, its approach to this gas in particular will set a precedent.

The Climate Change Advisory Council (the Council) has done important work and led an extensive process in preparing and proposing Ireland's second cycle of carbon budgets, an approach which has been documented in detail. However, the Council's choice to interpret 'climate neutrality' as *temperature neutrality* (or 'no additional warming') and use this as the basis for its proposed carbon budgets, carries serious risks. This interpretation allows high ongoing methane emissions to be treated as climate neutral, even though they continue to cause high ongoing warming.

Key messages

- Temperature neutrality reduces ambition and is inconsistent with Ireland's commitments under the Paris Agreement.
- It shifts greater mitigation responsibility onto other countries, or else implies abandoning the goals of the Paris Agreement.
- It entrenches inequality by 'grandfathering', rewarding high methane emitters, and penalising low emitters.
- It risks undermining the case for future carbon dioxide removals, essential to bring global temperatures down following overshoot of the Paris Agreement 1.5°C temperature limit.
- It is not compatible with the EU's approach to climate neutrality, and by adopting 'temperature neutrality', Ireland would require other EU states to do more.
- Temperature neutrality is also impractical as a policy goal for a number of reasons.

Recommendations

Adopting *temperature neutrality* as Ireland's definition of climate neutrality would weaken ambition, contradict international commitments and shift the burden of mitigation unfairly to others. To ensure that Ireland upholds the highest possible ambition, as required by law, we recommend:

1. **Reject temperature neutrality** as the basis for interpreting climate neutrality in carbon budgets.
2. **Re-evaluate the carbon budget process** to ensure alignment with Ireland's obligations under the Paris Agreement (Articles 2 and 4), including equity, responsibility, and capability principles.
3. **Adopt ambitious methane targets:** commit to at least the Global Methane Pledge level (30% reduction on 2020 levels by 2030), with the aim of deeper cuts by mid-century.
4. **Lead on food system transformation:** develop scenarios that explicitly include diversification away from ruminant-based agriculture, sustainable land use strategies, and pathways for resilient rural economies.
5. **Support for farmers:** pair ambitious methane targets with a just transition plan for the agricultural sector, including income diversification.
6. **Close the 2030 implementation gap immediately:** strengthen near-term measures to avoid making CB3 and CB4 unattainable.
7. **Explore alternative approaches:** consider split-gas frameworks or explicit dual targets for long- and short-lived gases, provided they uphold ambition and transparency.
8. **Ensure transparency in modelling:** publish assumptions and value judgments underpinning carbon budget methodologies, especially on equity and fairness.
9. **Plan for carbon removals responsibly:** adopt scenarios that realistically account for the scale, costs, and risks of carbon dioxide removals.
10. **Align fully with the EU framework:** commit to carbon budgets that are aligned with the EU's targets, and avoid approaches that would require other Member States to compensate for Ireland's emissions.

This policy brief was created through a funded research project called [SELS](#) (Sustainable integrated pathways for carbon-negative energy, land and food systems) which aims to develop a new integrated energy, land, food system modelling tool and capacity to support long-term climate planning and improve the evidence base for climate policy. The SELFS project is funded through the EPA Research Programme (2021-2030), which is a Government of Ireland initiative funded by the Department of Climate, Energy and the Environment. The views expressed in this report are those of the authors and do not necessarily reflect the views of the EPA or the Irish Government.

1. Backgroundⁱ

Climate Act and the carbon budget process

The 2021 Act requires the Council to propose carbon budgets that are consistent with the *national climate objective*—achieving a climate-neutral, environmentally sustainable economy by no later than 2050. These budgets must also align with Ireland’s obligations under the Paris Agreement.

In December 2024, the Council proposed revised budgets for 2031-2035 (160 Mt CO₂ eq) and a provisional budget for 2036-2040 (120 Mt CO₂ eq)ⁱⁱ. While under consideration by the Minister for Climate, Energy and Environment, the proposed budgets have been referred to the Joint Oireachtas Committee on Climate, Environment and Energy, who is presently evaluating the proposal.

This policy briefing focuses on the Council’s decision to interpret ‘climate neutrality’—a core basis for carbon budgets—as ‘temperature neutrality’, or ‘no additional warming’.

Unclear nature of ‘climate neutrality’

The Act defines the ‘national climate objective’ and a ‘climate neutral economy’. However, there is no clear definition of ‘climate neutrality’ in law or in the scientific literatureⁱⁱⁱ. The Council has chosen to equate climate neutrality with stabilising Ireland’s contribution to global warming—temperature neutrality—rather than achieving net-zero greenhouse gas emissions. This choice has major implications for the level of ambition expected from Ireland, and the fairness and adequacy of mitigation action.

Therefore, in the development of carbon budgets, ‘climate neutrality’ needs to be interpreted in light of the multiple requirements of the Act, which includes alignment with the Paris Agreement’s Articles 2 and 4, and including common but differentiated responsibility and respective capability (CBDR-RC).

The challenge of methane

Carbon dioxide (CO₂) accumulates in the atmosphere; therefore carbon dioxide emissions must fall to at least net-zero to stabilise temperatures^{iv&v}. Methane behaves differently: it breaks down within about 12 years, but while present it is a very powerful greenhouse gas. Cutting methane can reduce global temperatures within decades. To meet global temperature goals, global methane emissions require deep cuts, of around 50% between 2020 and 2050^{vi,vii}. Stabilising methane at current levels would lock in the ~0.5°C of warming that methane emissions have already caused, which is incompatible with the temperature goals of the Paris Agreement. Immediate cuts in methane emissions can keep ‘low warming’ carbon budgets within reach and reduce the reliance on carbon dioxide removals (CDR)ⁱⁱⁱ. Yet global methane emissions have been rising rapidly since 2006, with acceleration since 2020.

Agriculture is responsible for ~40% of global anthropogenic methane emissions, mainly from ruminant livestock and rice. If reduction of methane emissions related to food production are avoided or delayed there will be significant consequences. Continuing current agricultural practices and dietary patterns could contribute to 0.7°C–0.9°C of warming by 2100 with methane being responsible for up to 60% of projected warming from business-as-usual food consumption^{viii}. High-income countries, with considerable agricultural methane emissions, could contribute to limiting peak temperatures by immediately and decisively cutting methane emissions this decade. However, if they are indecisive regarding reductions of agricultural methane emissions during that period the opportunity is lostⁱⁱⁱ.

Ireland has as an unusual greenhouse gas emissions profile: the energy sector accounts for around 57% of emissions, while agricultural accounts for 37%, dominated by methane from ruminant livestock^{ix}. As a result, Ireland's per-capita methane emissions are among the highest in the world^x. This creates a unique challenge for Ireland, because methane emissions are closely related to ruminant production, and significant cuts in methane emissions challenges an economic strategy of expansion. However, high-income countries with large agricultural emissions also have a responsibility to take the lead on reducing greenhouse gas emissions.

Ireland's international obligations: Paris Agreement, EU targets & the Global Methane Pledge

Ireland has ratified the Paris Agreement^{xi}. Article 2.1a of the Paris Agreement establishes the long-term temperature goal, which requires countries to hold warming well-below 2°C while pursuing efforts to hold it to 1.5°C. This includes peaking global temperature and bringing temperature back down after any overshoot. Article 4 establishes the global mitigation goal, which is equivalent to achieving net-zero greenhouse gases in the second half of the century.

These obligations are grounded in equity and 'common but differentiated responsibilities and respective capability' (CBDR-RC). As countries determine their contribution to the Agreement's temperature goals, high-income countries with high historical emissions (i.e. more responsibility for climate change) and developed economies (i.e. more capability for climate action) have agreed to take the lead in reducing greenhouse emissions while supporting low-income, low-emissions countries to effectively implement the Paris Agreement.

By ratifying the Paris Agreement, Ireland has committed to pursue climate action with the *highest possible ambition*^{xii}.

Ireland as a Member State of the EU is part of a Union-wide target under the EU Climate Law. The EU aims to achieve net-zero greenhouse gases by 2050. The EU has adopted an intermediate target for 2030—a 55% reduction in greenhouse emissions based on 1990—and a target for 2040—a cut of 90%—is

under discussion. This target is aligned with the Paris Agreement long-term temperature goal and global mitigation goal.

Ireland is also a signatory to the Global Methane Pledge which commits countries to rapid and deep cuts in global methane emissions, 30%, on 2020 levels, by 2030. Some scientists consider this to be the minimum level necessary to meet safe temperature targets^{xiii}.

By ratifying these agreements, Ireland has committed to strong climate action. A domestic reinterpretation of climate neutrality that lowers ambition runs counter to these obligations.

2. What is temperature neutrality?

What does temperature neutrality mean and how does it differ from net-zero?

Temperature neutrality (or ‘no additional warming’) is an approach to defining climate neutrality that aims to stabilise, as opposed to reduce or eliminate, a country’s contribution to global warming by a given year. In this framing, a country is considered ‘climate neutral’ when its ongoing emissions no longer increase the level of warming it has already caused.

For long-lived gases like carbon dioxide, temperature neutrality is reached approximately when emissions reach net-zero, because carbon dioxide accumulates in the atmosphere and continues to increase temperatures until emissions are eliminated.

For methane the situation is different. Its shorter lifetime means neutrality can be achieved in a few decades by stabilising or slightly reducing methane emissions. The source of emissions still causes warming, however—methane is a very powerful greenhouse gas. In other words, methane emissions can still be very high, and cause significant ongoing warming, yet be considered ‘temperature neutral’ if the rate of warming is not increasing. For many industries, including Ireland’s agriculture sector, this could be achieved with relatively minor measures.

In practice, this means that by setting a goal of temperature neutrality, a country or sector could keep methane emissions at approximately constant levels (while cutting long-lived gases to net-zero) and claim ‘climate neutrality’.

Moreover, when applied together to a mix of greenhouse gases, the target of temperature neutrality could be met by counting a reduction in methane emissions as a ‘cooling’ effect which offsets ongoing positive emissions of long-duration gases like carbon dioxide. With this approach, methane emissions may still be relatively high, and carbon dioxide emissions may be positive (i.e. not net-zero).

The Bathtub Analogy: carbon dioxide (CO₂) and methane (CH₄)

Imagine a bathtub with the plughole blocked. Every drop of water added (every tonne of carbon dioxide emitted) raises the water level (global temperature). To stop the level rising, you must stop pouring water in (reduce carbon dioxide emissions to zero) or remove as much water as you add (reach net-zero carbon dioxide). Even if you slow the flow, the water level keeps climbing, because the total rise depends on the cumulative volume (total amount) of water poured in.

When you add bubble bath the foam (warming from methane emissions) rises quickly at first but then starts to disappear (methane is a potent greenhouse gas, but short lived in the atmosphere). If you keep adding bubble bath at the same rate the foam layer will stay at the same height (no extra/additional warming from methane). If you add more bubble bath over time, the foam gets taller (extra/additional warming from methane). If you add less bubble bath over time the foam gets shorter (you start to reverse the previous heating from methane). Stop adding bubble bath and the foam will eventually disappear.

Today, water and bubble bath are pouring into the bath faster than ever. The current height of water plus foam means the bath is dangerously close to overflowing. This represents the ~1.5°C of warming already caused by past carbon dioxide and methane emissions.

Turning off the CO₂ tap will take time, and we are not confident that we can remove water from the bath later (through large-scale carbon dioxide removal (CDR)). Meanwhile, methane contributes about 30% of the total height (around 0.5°C of warming). If foam from the bubble bath stays the same height (aiming for 'temperature neutrality' of methane) the level of water and foam in the bath remains too high. Only by turning off the water (carbon dioxide) and the reducing by at least half the amount of bubble bath (methane) that is added can we bring the level of water and foam in the bath to a level where the bath is safe from overflowing. This is why cutting methane is seen as the fastest way to reduce near-term warming in the next decade or two.

3. Key problems with temperature neutrality

Inadequate under the Paris Agreement

The interpretation of ‘climate neutrality’ used by the Council^{xiv} considers the stabilisation of a country’s contribution to global warming, that is ‘temperature neutrality’ or ‘no additional warming’, as offering a physical sciences basis for aligning Ireland’s climate targets with Article 2 of the Paris Agreement. This interpretation, however, is inadequate. The Paris Agreement’s long-term temperature goal establishes temperature limits, and requires global mean temperatures not only to stabilise, but to peak and then decline to 1.5°C following any overshoot^{xv} of the Paris Agreement temperature goal.

A strategy of temperature neutrality would only stabilise Ireland’s contribution to global warming. If every country were to adopt this approach, it would not deliver the peak-and-decline pathway needed, and the 1.5°C goal would be lost.

Findings from Duffy et al 2025ⁱⁱⁱ, show that the approach proposed by the Council only briefly achieves temperature neutrality.

Crucially, the temperature neutrality approach allows dramatically higher levels of emissions compared with other approaches, such as the net-zero greenhouse gas approach used by the EU, while claiming climate neutrality. This artificially lowers ambition and reduces the level of effort required, and also risks underestimating the amount of carbon dioxide removals that Ireland will have to deliver.

At the global level, adopting temperature neutrality for methane could imply stabilising methane emissions. While this does not add to warming, it would maintain the ~0.5°C of warming methane has already caused. Reducing methane and reversing some of this warming is essential if we are to limit the extent of overshoot and return below the 1.5°C temperature limit. If Ireland were to stabilise methane at current levels, other countries would have to do more to compensate or accept that the Paris Agreement temperature goals will be permanently breached.

Inadequate under the EU and Global Methane Pledge

The proposed interpretation of ‘climate neutrality’ would also create a divergence with the EU’s approach, under which Ireland is bound as a Member State. The EU definition of climate neutrality is clear: net-zero greenhouse gases by 2050, not temperature neutrality. If Ireland were to change the domestic target to allow for high and ongoing (but stable) methane emissions, other Member States would be required to go deeper into net-negative emissions, relying on carbon dioxide removals, to make up the shortfall at an EU level. This outcome is unlikely to be accepted^{xvi}.

Ireland is already projected to miss its 2030 Effort Sharing Regulation (ESR) target by the widest margin in the EU on a per-capita basis, exposing it to potential compliance costs estimated at up to €26 billion^{xvii}. Methane accounts for 37% of Ireland's emissions under the ESR, significantly greater than the EU average.

Methane reductions in the scenarios^{xviii} underpinning the Council's proposed carbon budgets are not aligned with the level of ambition in the Global Methane Pledge (a 30% reduction, on 2020 levels, by 2030). This would require other signatories to achieve deeper reductions to compensate, or for the pledge be abandoned.

Fairness

Temperature neutrality—stabilising the a country's warming impact by 2050—is not only scientifically insufficient, it is also inherently unfair. It implicitly embeds a principle of 'grandfathering'^{xix}. Grandfathering means that the emissions that have been produced by a country in the past determine that country's entitlement to emissions in the future.

Applied to methane, the temperature neutrality approach measures the impact of a *change* in emissions, rather than the absolute level of warming caused by emissions. This diverges from the standard and globally-accepted method of measuring the warming impact of a greenhouse gas, which measures the absolute warming caused, rather than warming relative to past emissions. This new proposed approach particularly favours countries with historically high methane emissions by allowing them to continue emitting at elevated levels while claiming to be climate neutral. Conversely, low-emitting countries that increase methane emissions modestly, perhaps to meet basic development or food security needs, are penalised disproportionately.

For Ireland, this creates a serious risk of adopting a metric that entrenches inequality. Because its per-capita methane emissions are already among the highest in the world, a stabilisation pathway under temperature neutrality locks in a very large "warming entitlement". This directly contradicts a key principle of the Paris Agreement – that high-income, high-emissions countries should take the lead in cutting emissions.

Adopting temperature neutrality also risks perverse accounting outcomes: some high-emitting countries or sectors could even appear to have 'negative' methane emissions when reducing from a high baseline, generating credits that could offset their carbon dioxide emissions. This would allow developed countries to claim additional room for fossil fuel emissions, while developing countries are penalised for growth, worsening global inequality.

The Council's analysis compounds this problem by choosing 2021 as the base year for assessing temperature neutrality, disregarding warming contributions prior to this, including of carbon dioxide. This has been described as an 'indefensibly late' base year, according to advice commissioned by the Council^{xx&xxi}.

This is not a neutral scientific exercise. The modelling methodology used to develop the Council's proposed carbon budgets, establishing temperature neutrality, masks significant implicit value judgements related to these questions of justice and fairness. These judgements have not been analysed in relation to legal obligations that carbon budgets are aligned with the Paris Agreement, which requires equity, responsibility and capability considerations. The Council acknowledges that if the global population emit at the same rate as Ireland, current global warming would exceed 3.6°C. This comparison illustrates both the inequity and potential risk to the Paris Agreement long-term temperature limit.

Risks for policy development

The Council's temperature neutrality scenario, analysed in Duffy et al (2025), achieves temperature neutrality but does not account for the small cumulative warming from residual methane emissions and declining background methane emissions. This approach is often justified as mirroring the climate outcome of net-zero greenhouse gases for short-live climate forces like methane. However, this equivalence only holds if both cumulative impacts and the global background emissions context are fully accounted for. This highlights two major shortcomings of the target: (1) sensitivity to global emissions trends and modelling assumptions, including the mistaken idea that constant methane emissions equate to temperature neutrality, which makes for a moving target and (2) a risk of over-reliance on (anticipated) methane reduction in the short-term, which may lead to underestimation of the long-term need for carbon dioxide removals in the longer-term. These shortcomings could misdirect climate policy, and delay the urgent action needed to steer Agriculture Forestry and Other Land Use towards a sustainable 'solution space'.

The international credibility of this approach is also questionable. In Aotearoa New Zealand, the government's adoption of a 'no additional warming' target for methane has drawn sharp criticism from scientists^{xxii}, saying the approach 'redefines the goal of climate action as simply stabilising the warming impact of emissions from any give source at current levels—rather than seeking to 'minimise all greenhouse gas emissions' and their contribution to warming.' They also warn that such a move could jeopardise Aotearoa New Zealand's commitments under the Paris Agreement and are inconsistent with equity, responsibility and capability commitments under Article 4 of the Paris Agreement. If Ireland

follows this path, it risks being grouped with a small number of outliers, undermining its reputation both within the EU and internationally.

Undermining global food security

Using a temperature neutrality approach allows Ireland to maintain high per-capita methane emissions, while disproportionately penalising countries for growing their methane emissions, even from a low baselineⁱⁱⁱ. This approach denies emissions space to low-emitting countries that may need to expand their agricultural sectors to address food insecurity. In effect, it locks in an inequitable distribution of warming responsibility, entrenching privilege for high-income exporters like Ireland.

4. Recommendations

Adopting *temperature neutrality* as Ireland's definition of climate neutrality would weaken ambition, contradict international commitments and shift the burden of mitigation unfairly to others. To ensure that Ireland upholds the highest possible ambition, as required by law, we recommend:

1. **Reject temperature neutrality** as the basis for interpreting climate neutrality in carbon budgets.
2. **Re-evaluate the carbon budget process** to ensure alignment with Ireland's obligations under the Paris Agreement (Articles 2 and 4), including equity, responsibility, and capability principles.
3. **Adopt ambitious methane targets**: commit to at least the Global Methane Pledge level (30% reduction, on 2020 levels, by 2030), with the aim of deeper cuts by mid-century.
4. **Lead on food system transformation**: develop scenarios that explicitly include diversification away from ruminant-based agriculture, sustainable land use strategies, and pathways for resilient rural economies.
5. **Support for farmers**: pair ambitious methane targets with a just transition plan for the agricultural sector, including income diversification, land restoration, and investment in innovation.
6. **Close the 2030 implementation gap immediately**: strengthen near-term measures to avoid making CB3 and CB4 unattainable.
7. **Explore alternative approaches**: consider split-gas frameworks or explicit dual targets for long- and short-lived gases, provided they uphold ambition and transparency.
8. **Ensure transparency in modelling**: publish assumptions and value judgments underpinning carbon budget methodologies, especially on equity and fairness.

9. **Plan for carbon removals responsibly:** adopt scenarios that realistically account for the scale, costs, and risks of carbon dioxide removals.
10. **Align fully with the EU framework:** commit to carbon budgets that are aligned with the EU's targets, and avoid approaches that would require other Member States to compensate for Ireland's emissions.

Endnotes

- ⁱ Many of the arguments below have been presented alongside supporting evidence and references in a peer-review academic journal, Environmental Research Letters, in a paper titled *National temperature neutrality, agricultural methane and climate policy: reinforcing inequality in the global food system*, Duffy et. al (2025) (<https://doi.org/10.1088/1748-9326/adf12d>). Dr Róisín Moriarty and Professor Hannah Daly are co-authors of this academic paper.
- ⁱⁱ CCAC 2024 <https://www.climatecouncil.ie/carbonbudgets/carbonbudgetproposal2031-2040/>
- ⁱⁱⁱ Duffy et al 2025 <https://doi.org/10.1088/1748-9326/adf12d>
- ^{iv} IPCC Synthesis Report Summary for Policymakers
https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf
- ^v IPCC 2021 AR6 WGI Summary for Policymakers
https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf
- ^{vi} In global scenarios assessed by the IPCC for AR6, global methane emissions fall by 47-60% between 2020 and 2050 in pathways compatible with 1.5°C
- ^{vii} Rogelj & Lamboll 2024 <https://www.nature.com/articles/s43247-023-01168-8>
- ^{viii} Ivanovich et al 2023 <https://www.nature.com/articles/s41558-023-01605-8>
- ^{ix} EPA 2024 https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/Ireland's-NIR-2024_cov.pdf
- ^x Rogelj & Schleussner 2019 <https://dx.doi.org/10.1088/1748-9326/ab4928>
- ^{xi} List of countries that have ratified the UNFCCC Paris Agreement
https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=en
- ^{xii} Schönfeld & Rogelj preprint https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5027491
- ^{xiii} Ocko et al 2021 <https://iopscience.iop.org/article/10.1088/1748-9326/abf9c8>
- ^{xiv} Wheatley 2023 <https://www.tandfonline.com/doi/full/10.1080/14693062.2023.2191921>
- ^{xv} Rogelj, Geden, Cowie & Reisinger 2021 <https://www.nature.com/articles/d41586-021-00662-3>
- ^{xvi} Geden 2024 <https://www.climatecouncil.ie/media/CBWG%20Report%20Carbon%20Dioxide%20Removal.pdf>
- ^{xvii} Irish Fiscal Advisory Council & Climate Change Advisory Council 2024 <https://www.fiscalcouncil.ie/wp-content/uploads/2025/03/Irelands-climate-action-and-the-potential-costs-of-missing-targets.pdf>
- ^{xviii} Lanigan, Hanrahan, Donnellan & Richards 2024
<https://www.climatecouncil.ie/media/CBWG%20Report%20FAPRI%20Model.pdf>
- ^{xix} Rogelj & Schleussner 2019 <https://iopscience.iop.org/article/10.1088/1748-9326/ab4928>
- ^{xx} Mintz Woo, 2024
<https://www.climatecouncil.ie/media/CBWG%20Report%20Some%20Moral%20Considerations.pdf>
- ^{xxi} McMullin, Sweeney & Price 2025 <https://www.postcarbonireland.org/etc/2025/CB-Cy2-Consultation.pdf>
- ^{xxii} Open Letter to Prime Minister Luxon regarding the government's review of New Zealand's biogenic methane target <https://biogenicmethane.org/>