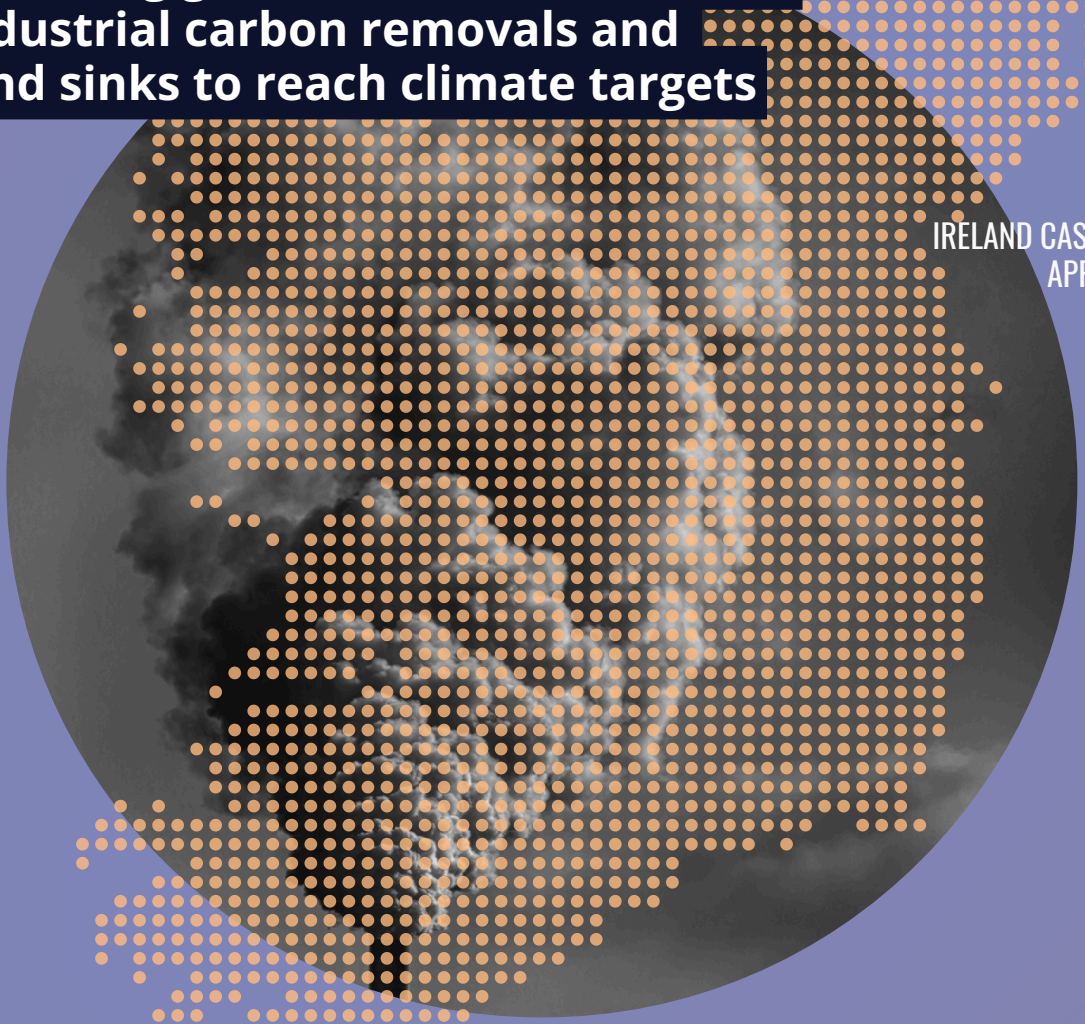
Leaning on Uncertainty

Assessing governments' reliance on industrial carbon removals and land sinks to reach climate targets



IRELAND CASE STUDY
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CARBON MARKET WATCH

IRELAND CASE STUDY

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At a glance...

For more information on carbon dioxide removals and a glossary, click here.

Ireland is relying heavily on carbon removals, both engineered and land-based, as a means to compensate for emission reduction gaps. Considerable delivery risks are already apparent, while longer-term targets and planning remain insufficiently defined.

Irish government planning for how to utilise carbon removals towards its 2050 net-zero goal is still evolving, with several analyses concluding a need for further development and strengthened transparency. A review of background documents received in response to information requests reveals notable challenges and inconsistencies in Ireland's approach. The records indicate that industrial removal technologies, such as Bioenergy with Carbon Capture and Storage (BECCS), may not become operational until some time after they are included as a viable option in Ireland's 2024 Climate Action Plan, which outlines Ireland's 2026 to 2030 carbon budget.

At the same time, Ireland's Climate Action Plan 2025 acknowledges that afforestation efforts have consistently fallen short of set targets. An assessment document by the Irish Department of the Environment for Ireland's 2024 Climate Action Plan[1], obtained through a request for additional information, suggests CO2 storage will only be available after 2030, rendering expected BECCS deployment as unfeasible within the second carbon budget timeframe (2026-2030). Afforestation targets have been missed by wide margins, yet planning documents continue to depend on the achievement of these rates. Crucially, Ireland provides no estimates of which emissions will actually be unavoidable at net zero, which is a missing foundation for a climate policy to be considered robust.

Rather than strategic planning centred on mitigating emissions by limiting emissions-intensive sectors such as agriculture and transport, it is carbon removals that are being positioned to address near-term emission reduction gaps. Table 1 provides an overview of the transparency and diligence in Ireland's plans for carbon removal in its climate policy.

[1] Department of the Environment, Workshop Pre-Read: Technical CCUS Potential, May 28, 2025: "If local storage is pursued, the timelines for CCS could be delayed. When governing CO2 storage regulation/ policy is in place, development can take ~9 years, but the lack of regulation in Ireland could introduce significant additional delays."

TARGET SETTING	REMOVALS POLICY	TRANSPARENCY	FEASIBILITY
residual emissions definition	industrial removals	land use & sequestration rates	land use & sequestration rates
residual emissions quantification	land sink	technology & energy	technology & energy
general transparency	financing	transport & storage	transport & storage
reliance on international offsets	depth of assessments	biomass	biomass

Table 1: Traffic light graph; cell colours represent the level of transparency, depth, and plausibility of stated assessments and plans; green = overall relatively transparent and plausible, yellow = partly lacking transparency or depth, red = severe transparency gaps[2] or identified delivery risks. The classification is meant to provide a shorthand overview of key issues and best practices and is measured relative to the other reviewed countries.

Methodology Note

The case study was developed by reviewing publicly available policy and assessment documents, supplemented by transparency requests to national ministries and agencies. Data on 17 themes, including residual emissions, technology assumptions, and biomass sources, were analysed to identify gaps and best practices in countries' industrial CDR and land sink strategies. From the identified themes, 12 indicators were selected, as visible in Table 1. The collected information was clustered into themes, and key issues were broken down and underscored by references to authoritative documents in the detailed analysis section.

The scope of the analysis was limited to documents created by or on behalf of government ministries and agencies, with supplementary documents included where necessary. Detailed information on the methodology is available in the accompanying report. All reviewed documents and supplementary sources are either directly linked in the text or can be found in the list of sources at the bottom of this document.

[2] For a definition of what constitutes a transparency gap, please consult the methodology annex of the associated comparative analysis report.

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Detailed Analysis

Target setting

● Residual emissions and removal targets

Ireland's long-term climate strategy provides initial ideas of where residual emissions might persist, but a clear definition based on comprehensive assessments is lacking.

While no explicit definition of residual emissions is available in reviewed documents from Ireland, the 2024 Long-Term Low Emissions Development Strategy (LT-LEDS) states, "[...] it is likely unavoidable that some emissions will remain from production in the agriculture sector, remaining greenhouse gases will require balancing by sufficient levels of carbon dioxide removals to maintain an annual balance of emissions and removals from 2050 onwards." (p18).

Ireland's LT-LEDS provides a quantified estimate of residual emissions in the agricultural sector for 2050 by emissions type (p67). The document notes high uncertainty regarding the reductions of methane emissions and identifies expected residual emissions as being almost exclusively methane. While the ambition set by this framing, to avoid emissions in all non-agriculture sectors in the long-term, is high, it is not supported by clear reasoning. Furthermore, the question of which emissions and underlying activities are too important to avoid should not be considered only through an economic lens, but must also consider societal and political factors. Such detail is not acknowledged in the reviewed documents. The overall vague definition of 'likely unavoidable' emissions introduces uncertainty, is indicative of a lack of clarity over long-term planning, and represents a lack of transparency in Ireland's climate strategy.

Expected residual emissions in Ireland are not transparently quantified.

None of the four central documents for Ireland's climate planning - the most recent Climate Action Plans (CAP24 & CAP25), the National Energy and Climate Plan (NECP), and Ireland's LT-LEDS - provide transparent and credible quantifications of gross emissions in 2050.

Ireland's process to achieve the set national climate goals is outlined in its Climate Action Plan 2024 (CAP24) and the 2025 version (CAP25). CAP25 sets legislative carbon budgets in five-year increments, which are in place until 2030, and provisionally until 2035, but not beyond then.

Emissions development projections presented in Ireland's National Energy and Climate Plan (NECP) are broken down by sector until 2050 in two scenarios, WEM (With Existing Measures) and WAM (With Additional Measures). The WEM scenario is based on all measures and policies implemented before the end of 2022 and acts as a baseline. The WAM scenario includes the Irish government's plans available when projections were compiled, meaning that it does not include all emission reduction policies that will be necessary to achieve the 2050 target (p. iv). The WAM scenario projection in Ireland's 2024 NECP is the most recent publicly available official estimate of unaddressed emissions in 2050. It projects residual emissions in 2050 amounting to about 38.48 Mt CO_2eq in 2050 (p56), equating to 63% of Ireland's 1990 emissions, underscoring the absence of credible pathways to achieve national carbon neutrality goals.

Ireland's 2024 LT-LEDS provides sectoral emission estimates for 2050, but conflates emissions and removals, thereby failing to clearly present gross emissions in land-use, forestry, electricity, and industry sectors. Thus, it is impossible to determine the level of projected residual emissions.

The Irish government introduced 'residual unallocated emissions' in the past as a way to defer responsibility for a significant part of emissions in the second carbon budget period (2026-2030), now relying on removals to bridge the gap.

The 2020 Programme for Government introduced a category of 'residual unallocated emissions'[3] (also labelled 'residual unallocated savings') within the second carbon budget (2026-2030), stating: "In setting the second carbon budget for 2026-2030, we will not yet be in a position to identify all the emerging technologies, changing scientific consensus or policies to meet our full ambition. This will require a further allocation within the overall carbon budget, subject to intense evaluation." (p32). The 2024 NECP and Climate Action Plan look to address this task, proposing removal technologies such as biochar and BECCS as solutions before 2030. However, this approach reflects a near-term policy gap, where removals are being positioned as an early and presumably feasible solution to compensate for an insufficient sectoral allocation of emission reductions.

[3] While the term 'residual unallocated emissions' might seem to be related to residual emissions, the meaning is vastly different. Residual emissions are widely understood as those emissions that are impossible to avoid at the point of net-zero. The Irish government uses the term 'residual unallocated emissions' to describe a portion of emission reductions that would be necessary to stay within the 2026-2030 emission budget, but was not allocated to a sector, let alone specific measures.

Ireland's LULUCF sector is projected to miss its 2030 targets, while demonstrating the continuation of an optimistic reliance on removals through afforestation towards 2050.

Ireland aims to reduce its LULUCF net emissions by 0.626 Mt CO_2eq by 2030 from a 2016-2018 baseline, to fulfil its targets under the EU LULUCF Regulation (CAP25, p109). However, both scenarios presented in Ireland's CAP25 would lead to an increase.

The WEM scenario shows LULUCF emissions rising from 3.98 Mt CO_2eq in 2022 to 7.9 Mt CO_2eq in 2030, while the WAM scenario projects a slightly lower increase to 5 Mt CO_2eq in 2030 (CAP25, p107). While the Irish LULUCF sector has been a net emitter since 1990 due to high grassland and wetland emissions, forest land is reported as a net emitter for the first time in 2022, marking new levels of decline (CAP24, p301). The Irish LULUCF sector accounted for approximately 11% of Ireland's total greenhouse-gas emissions in 2022 (p301).[4] Comparisons with the 2016-2018 baseline are not trivial due to LULUCF inventory refinements conducted by the Irish Environmental Protection Agency in 2024.

In a Joint Committee briefing by the Irish Parliament, revealed through a transparency request, the fact that Ireland will miss its LULUCF targets for 2030 under current projections is officially acknowledged (TR#12, p5). A briefing note on the current treatment of LULUCF in sectoral emissions ceilings, received in response to a transparency request, makes clear that no further plans for binding limits of LULUCF sector emissions are envisaged. The document by the Irish Department of Climate, Energy, and the Environment, titled 'Briefing note on the current treatment of LULUCF in the Sectoral Emissions Ceilings' notes that "[t]here is no explicit requirement to have a sectoral emissions ceiling for the LULUCF sector set out in legislation." (p1). If the Irish government follows this suggestion in future Climate Action Plans, their credibility would be undermined by shifting the burden for emission reductions on the path towards climate neutrality to other sectors. Additionally, it would risk non-compliance with Ireland's LULUCF net-emission target until 2030 under the EU LULUCF Regulation.

Looking further ahead towards 2050, Ireland's LT-LEDS and 2024 NECP offer various net-emissions projections for the country's LULUCF sector. The projections in the LT-LEDS include multiple scenarios under different assumptions resulting in varying net-emissions between 0 and 8 Mt CO_2eq in 2050 (p67). The pathway featured most prominently in the economy-wide summary (p20) is 'Activity Scenario B', which projects net emissions in the LULUCF sector of 2 Mt CO_2eq in 2050 (p67). The graph portraying this scenario shows about 10 Mt CO_2eq removals in 2050 that would stand against about 12 Mt CO_2eq emissions. The 'Activity Scenario B' pathway assumes highly ambitious afforestation rates of about 30 thousand hectares per year. Meanwhile,

[4] Inventory refinements conducted by the Irish Environmental Protection Agency between the preparation of the CAP24 and CAP25 led to reductions in the accounted overall net emissions in the LULUCF sector (see CAP25, p108).

Ireland's NECP includes projections of 6.31 Mt CO_2eq LULUCF net emissions in 2050 in its WAM projection (p56).

Industrial carbon removal is regarded as a short-term approach following the government's decision to defer the allocation of a substantial portion of emissions-reduction responsibilities until 2030 to specific sectors.

Carbon capture and storage (CCS) and carbon dioxide removal (CDR) are identified as key themes for addressing 'residual unallocated savings' (CAP24, p69 & p71). These unallocated emission volumes total 26 Mt CO_2eq over the entire second carbon budget period (2026-2030), of which 5.25 Mt CO_2eq would need to be abated in 2030 (see NECP, p195). Preparatory analysis for CAP24, obtained in response to a request for additional information, projects the technological carbon removal potential of 1.7 to 2.8 Mt CO_2eq by 2030 (CAP24 Handover document, p76). The more recent CAP25 only makes general remarks about which measures shall be taken to address the unallocated emission reductions in the second carbon budget. The document refers to 'carbon capture, removals, and hydrogen' as one of multiple options to achieve the necessary savings (p24). CAP25 states that "[r]ecommendations in relation to the unallocated savings will be made in 2025." (p24), which have not yet been published at the time of writing this report. The same document refers to a 'CCUS Task Force' that is developing a workplan for CCU, CCS and CDR market readiness, policy, and a regulatory framework (p82). Planning for emission reductions and removals for the second carbon budget has now extended into the budget period itself, constituting a critical delay that calls into question the credibility of Ireland's climate plans.

Industrial removals are expected to offset residual emissions from agriculture in the long term, since removal measures in the agricultural sector will not be sufficient to balance sectoral residual emissions. The Joint Oireachtas Committee emphasises that while fossil fuel emissions must reduce to zero, unavoidable agricultural emissions will require balancing through sufficient carbon dioxide removals from 2050 onwards (TR#12, p2). Ireland's LT-LEDS (2024) estimates residual emissions from agriculture to be between 7 and 11 Mt CO_2eq (p67). The provided graph shows expected removals from the agricultural sector amounting to 1-2 Mt in 2050. Therefore, at least 5-9 Mt of annual residual emissions would need to be balanced by other measures to achieve net-zero.

Intentions to exclude 'short-lived' emissions and adopt 'temperature neutrality' as the long-term goal would significantly reduce ambition by redefining what counts as 'residual emissions'.

While the Irish Climate Action and Low Carbon Development Act currently encompasses all greenhouse gases in the national net-zero climate target for 2050[5], the most recently proposed climate budget by the Advisory Council on Climate Change indicates intentions to exclude short-lived emissions such as methane from the 2050 goal (p8), since none of its modelled scenarios achieve net-zero greenhouse gas (GHG) emissions by 2050 when methane is included. This exclusion risks decreasing urgently needed mitigation efforts in methane- and nitrous oxide-emitting sectors, particularly agriculture and livestock.

Another potentially significant development is the proposal in Ireland's Climate Change Advisory Council's (CCAC) suggestion for a third carbon budget that interprets climate neutrality as stabilising the country's warming impact, also known as 'temperature neutrality'. The updated analysis, considering the temperature neutrality goal, results in a budget increase of 9 Mt CO_2eq for the third carbon budget period (2031-2035), compared with the provisional budget, which was based on a linear extrapolation to meet net-zero GHGs on the basis of GWP100 by 2050. The government will now need to decide on whether to adopt the CCAC's proposal. The CCAC itself noted that 'additional consideration is required' to assess whether the temperature neutrality interpretation is consistent with the Paris Agreement's long-term temperature goal (p28).

Implementing the new goal definition and excluding short-lived emissions in Ireland's climate plans would significantly lower the ambitions for emission reduction in Ireland and eliminate incentives to reduce emissions in methane-emitting sectors, where such cuts are urgently needed and would have immediate climate benefits. Interestingly, a caveat for such low-ambition climate policy for the agricultural sector was already carved out in national climate legislation. Ireland's LT-LEDS makes reference to the Irish Climate Action and Low Carbon Development Act, which requires national climate policy to take the "[...] special economic and social role of agriculture including with regard to the distinct characteristics of biogenic methane [...]" into account (p63). Following the scientific critique of the CCAC's third carbon budget (2031-2035) proposal, the CCAC has responded with a letter, which clarifies that for the third carbon budget to be in line with the Paris Agreement, early and deep cuts in methane emissions from the Irish agricultural sector are required.

[5] Section 1 of the Irish Climate Action and Low Carbon Development Act sets its long-term climate target due in 2050 as reaching a 'climate neutral economy' defined as " [...] a sustainable economy and society where greenhouse gas emissions are balanced or exceeded by the removal of greenhouse gases;".

● General transparency

Ireland demonstrates a high level of transparency on reported emissions and planned removal measures in the LULUCF sector until 2030.

Past emissions and removals are disaggregated into different land types, making it clear whether specific sub-sectors are net emitters or provide a net removal (CAP24, p301). In 2022, the largest portion of emissions in the sector came from grassland and wetlands, while settlements and forest land (the first year being a net emitter) contributed relatively little to overall emissions. Harvested wood products accounted for about -2 Mt of removals. (p301) Projections of sub-sectors until 2030 under envisaged measures to reach Ireland's LULUCF Regulation target can be found in the Teagasc MACC 2023 report (p33 & 34).

However, Ireland's Climate Action Plan 2024 reveals a transparency gap in the use of expected industrial removal volumes. While industrial CDR is already positioned as a solution in the second carbon budget (2026-2030), the Climate Action Plan 2024 states the intention to predominantly use it during the third carbon budget period and beyond (p180), without specifying which volumes are planned for each period or how decisions on this will be taken.

Further transparency issues emerge in the documentation.

When outlining pathways to climate neutrality, the LT-LEDS mentions published EPA data without referencing a specific report or providing a link (p65). Regarding public engagement, while the CAP24 mentions a wide range of initiatives (such as the "National Dialogue in Climate Action Engagement Programme" or the "Climate Conversations 2024") where CDR might be included, there is no specific mention of public engagement programmes for CDR, an explicit inclusion of the topic, or how results were taken into account in climate planning.

● Reliance on international offsets

Currently, Ireland does not mention plans to include international credits in its climate plans, while future use is not explicitly excluded.

In the reviewed documents from Ireland, no indication of current or future reliance on offsets in the form of international carbon credits could be found. This aligns with the outdated EU NDC from October 2023, which states that domestic targets will be met without international credits (p10, fn1). Since then, the European Union has permitted

the use of a limited amount of international credits to reach the 2040 climate target, also reflected in its November 2025 NDC. Whether Ireland chooses to make use of this option remains to be seen.

Removals policy

● Specific plans and foreseen measures

Ireland plans early deployment of BECCS and biochar, though recent policy documents show uncertainty about which specific removal approaches will be implemented.

Ireland's carbon dioxide removal plans reveal expectations of a very early deployment, beginning already in the second carbon budget period (2026-2030) and intensifying thereafter. The Climate Action Plan 2025 references carbon capture, removals and hydrogen among several measures to address 5.26 $MtCO_2eq$ of planned but unidentified annual emission reductions from 2026 to 2030, with specific recommendations to be made in 2025 (p24). However, the primary emphasis on industrial removal policy development is intended predominantly for the third carbon budget period (2031-2035) and beyond, as noted in the 2024 Climate Action Plan (p180).

Contrarily, a background document demonstrating modelling of how unallocated savings would be tackled, the Climate Action Plan 2024 Master Emissions Pathway, shows three modelled pathways to address a part of the 26 Mt unallocated savings in the 2026-2030 carbon budget. The reliance on Energy from Waste (EfW) BECCS, Biomass BECCS, and biochar, in the models, amounts to a cumulative expected delivery over the 5-year period of 6.11 Mt in the 'high scenario', 4.79 Mt in the 'medium scenario', and 2.98 Mt in the 'low scenario' (see Figure 1). Of those options, only the ‘high scenario’ would achieve sufficient emission reductions and removal volumes to fully address the deferred emission reductions.

Ireland’s Climate Action Plan (2024) and its latest National Energy and Climate Plan (NECP) likewise suggest reliance on CDR during this period, with ‘carbon removal technologies such as biochar’ mentioned as a possibility to address this glaring planning shortfall (CAP24, p69; NECP 2024, p194). The NECP (2024) explicitly mentions biochar and BECCS as promising solutions to address this shortcoming in emission reduction plans (p195). The 2025 Climate Action Plan only mentions biochar as considered without giving reasons for this change, raising the question of whether the use of BECCS is still planned, thereby demonstrating a transparency gap.

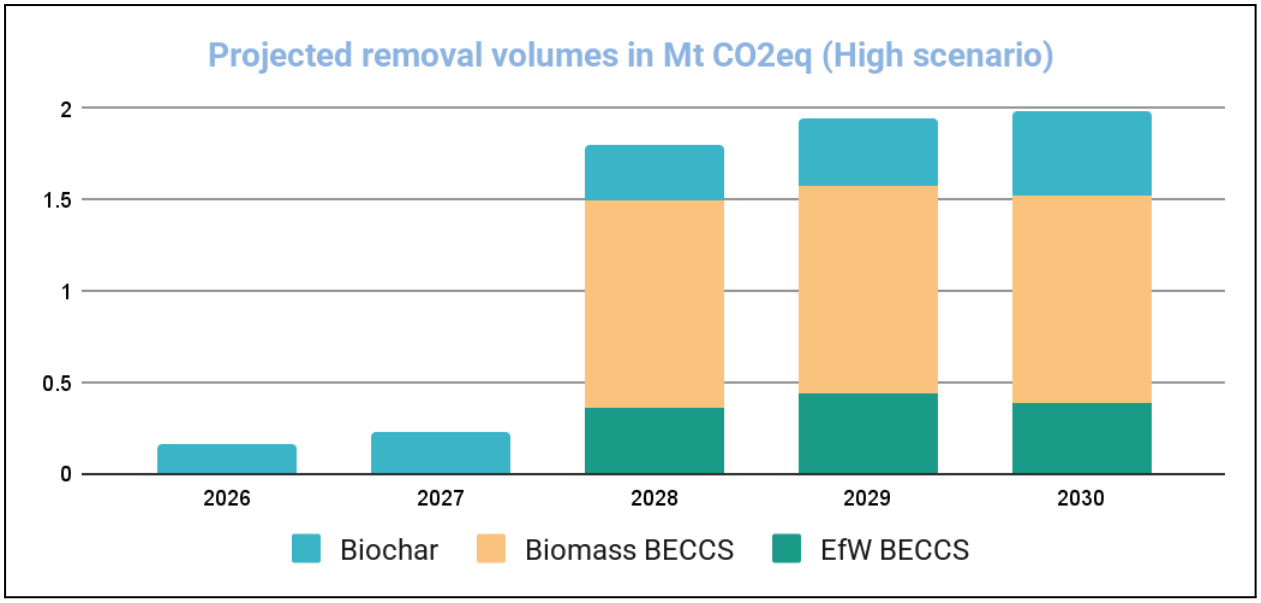

Figure 1: Projected removal volumes to address 'unallocated emission savings' in Ireland's second carbon budget (2026-2030). EfW = Energy from Waste; Data source: CAP24 Master Emissions Pathway

BECCS features most prominently in Ireland's planning documents among the various CDR technologies under consideration.

In the electricity sector, projected emissions until 2050 show negative emissions in three out of four presented pathways. BECCS is explicitly mentioned, but with detail lacking over allocation, volumes, biomass or CO_2 feedstocks. (LT-LEDS 2024, p41, referencing SEAI pathways) The cement sector presents projections that are more fully calculated. BECCS is envisioned to enable this sector to reach negative emissions, with the Rapid Progress scenario showing CO_2 neutrality in 2040 and approximately -1 $MtCO_2$ of net-negative emissions in both 2045 and 2050 (LT-LEDS 2024, p47). The Climate Change Advisory Council, in its Carbon Budget Proposal Report, mentions that BECCS in cement manufacturing is expected to be deployed from 2030 to 'decarbonise emissions' from this process (p13).

To balance land-use emissions, Ireland leans heavily on afforestation, while on the ground, progress lags behind.

The decline of the land sink is attributed to the harvesting of 1990s-era plantings and current forest management profiles (CAP25, 108). To reverse this trend, Ireland's LULUCF plans focus on activity-based measures rather than specific removal quantities. For 2021-2025, quantified targets include 8,000 hectares per year of afforestation and 66,000 hectares of peatland rehabilitation (i.e. the restoration of carbon-rich wetlands by active management) (CAP24, p299). Long-term ambitions range from 8,000 to 30,000 hectares per year of afforestation (LT-LEDS 2024, p20), with the Forest Strategy aiming to achieve a forest cover of 18% of Ireland's total land mass, an increase of more than

6% from current levels at 11.6 % (CAP24, p302). CCAC forestry models suggest net-zero land use emissions could be reached between 2040 and 2046, depending on afforestation rates (CCAC Carbon Budget Proposal Report 2024, p15). The latest Agriculture and LULUCF review by the Irish Climate Change Advisory Council notes that in 2024, with just 1,573 hectares planted, afforestation implementation is falling far short of the 8,000 hectare yearly target. The European Commission also flagged a lack of progress in Ireland's LULUCF sector in its EU-wide assessment of the final updated national energy and climate plans. It notes that despite recent improvements in performance, Ireland still expects a gap of 1.36 Mt CO_2eq in 2030 to reach its target under the LULUCF Regulation (p49).

Ireland does not yet disclose the types and volumes of removal technologies and measures meant to contribute towards climate goals, while assessments only give broad estimates.

Potential volumes for industrial removals are only disclosed in background documents received from transparency requests. The total abatement potential for industrial removals in 2030 is estimated between 1.7 and 2.8 MtCO_2eq, while conflating fossil and biogenic emissions (CAP24 Handover Document, p76).

BECCS projections vary, with the consultancy Environmental Resources Management (ERM) estimating 2.6 MtCO_2/yr of carbon removal by 2050, though underlying studies for these figures are not provided (#7, p18; #9, p16). Biochar is receiving increasing attention as a potential solution for the emission cuts not yet assigned to sectors (CAP24, pp70-71; NECP 2024, pp194-195), with the 2025 bioeconomy strategy set to consider its use (CAP 2025, p67). From agriculture, long-term projections indicate approximately 1-2 MtCO_2eq of removals are expected in 2050 (LT-LEDS, p67), likely achieved through applying carbon farming measures (CAP24, p68). Direct Air Capture is not yet relied upon in plans (LT-LEDS 2024, p34), with Ireland's Energy Authority warning that DAC would require additional renewable energy, creating competition with hydrogen production (SEAI Net Zero by 2050, pp85-86).

The Irish government has outlined broad policy and feasibility assessment plans for industrial removals, but timelines for the policy are mostly undefined.

Ireland commits to developing a comprehensive strategic framework for negative emissions technologies in the longer term. The LT-LEDS 2024 mentions intentions to develop a strategy for negative emissions technologies, including CCS (presumably for application in BECCS systems) and DAC within the next ten years (p34). Furthermore, the Climate Action Plan 2024 commits to establishing a framework to analyse the potential of BECCS deployment as part of a broader effort on CCS technology,

encompassing environmental, technical, and financial assessments (LT-LEDS 2024, p48). This framework is represented by the 'CCUS Taskforce', which has the mandate to work on such assessments and is led by the consultancy ERM. The task force is currently accompanying the ministry's work towards CAP 26 (see TR#1, p2 for info on the Task Force). Further, the timing of the envisaged removal policy is unclear. The Climate Action Plan 2024 itself notes the intention of CCU policy is to support deployment in Ireland's third carbon budget (2031-2035) and beyond (p180). This stands in contrast to early deployment plans to address the shortfall in planning for emission reductions in the second carbon budget (2026-2030), as noted in background documents. The inconsistencies in the Irish government's carbon removal plans undermine the overall credibility of its climate strategy.

Planning for the development and governance of potential removal volumes is still underdeveloped, and key information was only made available upon request.

The consultancy ERM has identified the need for a removals registry, dedicated funding schemes, and permitting or infrastructure planning for DAC and BECCS (TR#8, p12). According to background documents for the Climate Action Plan 2024, an assessment of potential economic, social, and environmental impacts, alongside a roadmap, was planned for release by the second quarter of 2024 (TR#13, p58). It would broadly relate to 'carbon capture and storage technologies', and BECCS is specifically mentioned as a potential focus area (Ibid.). However, no such encompassing review and roadmap could be found in the reviewed documents. The process might overlap with the promised assessments mentioned in Ireland's 2024 LT-LEDS (p48) also referred to in the paragraph above.

Ireland's own energy agency, the Sustainable Energy Authority of Ireland (SEAI), has urged Irish authorities to define the role of negative emissions in achieving net-zero by 2050, while recommended assessments and political decisions are still lacking. SEAI, in its 2023 'Net Zero by 2050' report, specifically lists implications on energy supply and biomass feedstocks, and tradeoffs between zero-emission fuels and BECCS. Furthermore, it highlights the additional renewable energy requirements that potential DAC technology deployment would create, and how it might compete with the demands of hydrogen production (pp85-86). This urgency stands at odds with the observation that frameworks for CDR deployment are still under development, while reliance on these technologies is already assumed in the second carbon budget period.

● Associated financial cost and source of financing

While Ireland takes the first steps in assessing the costs for engineered removals, additional sources of financing that avoid competition with emissions reductions are not yet explored.

The Irish LT-LEDS acknowledges that the costs of 'certain technologies', needed to meet Ireland's carbon neutrality goal, are uncertain (p19). An obtained document titled 'Climate Action Plan 2024 Handover document' from February 2024 by the Irish Department of Environment, Climate and Communications provides more information. It explains the abatement costs for carbon removals quantified for 2026-2030 between 60 and 125 EUR/tCO_2eq[6] for BECCS and from 10 to 50 EUR/tCO_2eq3 for biochar (TR#13, p76). Further work to estimate costs for delivering measures (including potential removal measures), as outlined in the Irish Carbon Action Plan 2024 (p71), is to be prepared by a task force ahead of the Climate Action Plan 2026 and well in advance of the second carbon budgetary period (2026-2030). The timeline and specific work to assess costs and financing options is not clarified in the reviewed documents.

Constraints and risks

● Land use and sequestration rates

While relatively sophisticated modelling frameworks are used, overall transparency is low regarding how land use and sequestration rates are accounted for in projections.

For the LULUCF sector, CAP24 (p309) refers to the 2023 Marginal Abatement Cost Curve (MACC) report (LULUCF projections found on pp33 & 34) authored by the Teagasc Climate Centre. This report includes projections of greenhouse gas emissions in the agriculture and the LULUCF sector until 2030. The Teagasc MACC report then refers to the 'Carbon Budget Model' developed and used by Canadian authorities, which represents a fairly detailed model. It could not be identified in reviewed documents whether scenarios calculated for Ireland used the full level of detail and capabilities of the model. Furthermore, no information on whether the projections and assessments made by Irish authorities include indirect land use change, or future climate change related impacts on the LULUCF sector could be found. This raises additional concerns about the feasibility of plans and eventual unintended repercussions.

[6] Numbers adjusted presuming a unit-error in the reviewed document (kg instead of t), which would have resulted in estimations far beyond the range of other estimations.

Efforts toward further plans and assessments are ongoing, but documents are scattered and do not offer detailed information of planned assessments.

The second part of an overarching land use review, which was initiated in 2023 and led by the Irish Department for Climate, Energy and the Environment, is still delayed at the time of writing this report. Results were expected in the first quarter of 2025 (NECP24, p149). Underlying this, the Climate Action Plan 2025 (p113), mentions a Land-Use strategic implementation plan to deliver plans described in the 'Collite Forest Estate Strategic Land-Use Plan'[7].

The latter represents a long-term framework for managing Ireland's forest that outlines objectives to balance wood production, biodiversity, climate action, and recreation. The Land-use strategic implementation plan includes multiple assessments to reach afforestation targets of 100,000 hectares by 2050 which shall result in the achievement of 18 Mt sequestered CO_2. The assessments planned between 2026 and 2030 include questions of land use availability, policy frameworks, stakeholder collaboration and financing. A disconnect in afforestation goals and timelines becomes apparent, when comparing with provisions in CAP25. The many layers of planning documents and processes additionally result in low transparency and potentially incoherent accountability.

Ireland's LULUCF sensitivity analysis pushes non-forestry measures to biophysical limits to show pathways that would reach the LULUCF Regulation goal.

In Ireland's LT-LEDS two options for a national LULUCF sector emissions scenario, are proposed (p67). One with moderate wetland rewetting and 8,000 hectares of annual afforestation to be achieved by 2050, and one with maximal rewetting and additional afforestation (30,000 ha/year to be achieved by 2050).

The CAP24 Handover document, obtained in response to a request for additional information, offers further details. In both pathways, non-forestry measures are described as being 'at biophysical limits', meaning all theoretically available wetland would be rewetted (CAP24 Handover document, p41f). A footnote indicates: "Afforestation abatement pathway modelled to approximately reach net zero for LULUCF by 2050", potentially suggesting that afforestation levels were increased to reach the required removal levels, once all other options were exhausted (p41f).

For BECCS and biochar, no assessments on land use and sequestration rates could be found, putting the feasibility of these CDR measures in the short-term into question and raising concerns of exacerbated land use pressures and overestimated removal benefits.

[7] Collite is a state-owned commercial forestry business managing approximately 7% of the Irish land.

Technology and energy

The technical feasibility of carbon removal technology has already been raised multiple times as a key concern in decision-making processes.

Ireland's LT-LEDS from 2024 mentions 'uncertainty surrounding the availability and cost of certain technologies', given the timescales to 2050 (p19). Documents received through transparency requests further reveals parties flagging overreliance concerns.

In a parliamentary briefing on Ireland's NECP and LTS, led by the Joint Oireachtas Committee on Environment and Climate Action, the following question is raised: 'Does the Strategy place too much faith in unproven technologies/carbon removals?' (TR#12, p3). The given answer deflects, stating the necessity to use technologies for residual emissions. Another background document that supported decision-making for Ireland's Climate Action Plan 2024 assesses the feasibility of BECCS and biochar deployment to address emission cuts lacking sectoral assignment in the second carbon budgetary period (2026-2030). In a first overall assessment, the feasibility of BECCS and biochar is rated 'high', while a more detailed assessment rates the technical feasibility of both technologies within the timeframe only as 'neutral' (TR#13, p60 & p76). Still, the Climate Action Plan 2024 relies on the nascent removal technologies as two out of five potential options to address the pending emission reductions.

Implementation time plans raise grave delivery risks.

A presentation from the CCUS Taskforce workshops led by the consultancy ERM from May 2025, titled 'Workshop Pre-Read: Technical CCUS Potential' ('CCUS', here including negative emissions technology) represents a first approach to a feasibility analysis. It notes that 'CCUS activities typically have significant development timelines, and CCUS deployment in Ireland could begin in the mid 2030s' (TR#7, p27). This mid-2030s deployment assumes international storage availability within six years, or around nine years if domestic storage must be pursued. Critically, these timelines do not include 'time taken to develop enabling policy and regulation in Ireland' (TR#7, p27). ERM identifies clear feasibility concerns for plans to use negative emissions and CCU/CCS technology to target promised emission cuts that lack sectoral assignment before 2030.

Transport and geological storage of CO_2

Ireland's removal plans depend on inadequately assessed storage solutions, with domestic capacity underexplored and international options lacking rigorous feasibility studies.

Plans for a national strategy to support infrastructure requirements to capture, transport and store CO_2 are mentioned as actions until 2030 (LT-LEDS 2024, p47), building on infrastructure developed for CCUS. A presentation by ERM from April 2025 in the course of the CCUS Taskforce workshops titled 'Evidence Gaps & Prioritisation', identifies a total domestic storage capacity of 365 $MtCO_2$ in the two most promising storage locations (TR#5, p9). The review considers geological storage in Ireland a vital area, but beyond the scope of their current work, choosing instead to focus on the availability of international storage locations in the EU and UK (p15). For international storage locations, the review notes a current lack of rigorous assessment on feasibility (p19). For the transport of CO_2, first steps in planning are taken, and key concerns include predominantly the costs for shipping and developing potential clusters and networks (TR#5, p19). An interim report by ERM from the CCUS Taskforce process, titled ' Interim Report: CCUS Policy & Regulations' gives further insight into the state of carbon storage regulation in Ireland (TR#23). The document from June 2025 notes that Irish legislation has a ban in place on onshore & offshore CO_2 storage (p20). Additionally, many aspects, such as review mechanisms, permitting systems for CO_2 storage sites, or financial provisions, have yet to be developed (pp20-40).

● Biomass supply

Plans for biomass supply for biochar and BECCS show large scales of biomass is needed, and uncertain sourcing.

For biochar, Ireland's Climate Action Plan 2024 notes biogenic woody residue as feedstock (CAP24, p71). Background documents for Ireland's Climate Action Plan show that biomass demand for biochar is estimated around 5-15% of Ireland's gross volume roundwood production (CAP24 handover document, p75).

Planning for volumes of BECCS reveals that feasibility assessments are based on needed carbon removals rather than building on sustainable supply volumes.

BECCS is included in the Sustainable Energy Authority's "Net Zero by 2050" report as a green hydrogen production route, with modelling informed by the CCUS report. Critically, the approach reveals planning based on required carbon removals rather than sustainable supply constraints: "We assume an individual power BECCS unit has a capacity of 300 MW, with the operating hours set to meet each scenario's negative emissions volume" (SEAI Net Zero by 2050, p71). This means capacity will be scaled to meet emissions targets, rather than determining feasible BECCS volumes based on sustainable biomass availability.

Tensions between sustainable biomass supply for decarbonisation and LULUCF goals in Ireland are already evident, which the reliance on BECCS and biochar risks exacerbating. Ireland's LT-LEDS notes that reaching emission reduction goals for LULUCF is increasingly challenging as the age profile of the forest stock matures and harvesting levels are projected to increase (p65). Additionally, some sectors such as cement and transport are already relying on biomass supply for their decarbonisation aims (p65). This raises competition for biomass between decarbonisation and carbon removal deployment as an unaddressed risk.

Key issues

Ireland's climate policy currently relies on novel removals and afforestation to compensate for non-delivery of emission reductions in the short-term and lacks fundamental planning towards carbon neutrality in the long-term:

1. Very early reliance on BECCS and biochar, despite background documents demonstrating non-feasibility within the expected timeframe. Ireland positions engineered CDR as essential from 2026 onwards, yet internal assessments reveal fundamental contradictions. Deployment timelines suggest BECCS won't be available until the mid-2030s, which is after the period when it is being counted towards meeting targets, and only if international CO_2 storage becomes accessible and enabling policies are developed.
2. Reliance on high levels of afforestation, which are systematically underdelivered by a large margin, leads to Ireland being set to miss its LULUCF target. The gap between planned and actual tree planting rates is substantial and persistent across multiple years, leading to a widening shortfall in expected carbon sequestration. This systematic underdelivery raises serious questions about the functionality of relying on afforestation as a key strategy. The repeated failure to achieve planting targets suggests that current policy approaches are inadequate and that Ireland's LULUCF projections may be fundamentally unrealistic.
3. Reactive deployment of removals in lieu of strategic planning on residual emissions. Reviewed documents from Ireland reveal that long-term planning about the role and deployment of carbon dioxide removals is lacking. Removal technologies and measures are presented as a remedy to insufficient climate policy that should be focused on emission reductions. The absence of a quantified residual emissions estimate and a slow phasing-in approach of removals towards carbon neutrality suggests Ireland is deploying removals in a reactive manner to address near-term mitigation shortfall rather than to balance genuinely unavoidable emissions.
4. Overall, the level of transparency is poor in assessments, planning, and decision-making for novel removal policy in Ireland. Transparent plans for how expected removal volumes can be achieved in the short and long term remain absent, CO_2 storage solutions are inadequately assessed, and key assessments are delayed or are lacking in public disclosure, with unspecified timelines.

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