

Prospects for Carbon Budgets 1 & 2

Outlook for delivering carbon budgets and sectoral emissions ceilings to 2030 given latest emissions data

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1 Overview

The Irish Government published Sectoral Emissions Ceilings (SECs) in September 2022. These ceilings set out the maximum amount of greenhouse gas emissions (GHGs) that are permitted in different sectors of the economy during a carbon budget period, Carbon Budget 1 (CB1, covering 2021-25) and Carbon Budget 2 (CB2, covering 2026-30). The finalisation of the SEC for the LULUCF sector has been deferred and in addition, 26 Mt CO_{2e} of "unallocated savings" have not been assigned to sectors in CB2.

This note accompanies an article for the Irish Times published on October 6th 2022 and is complemented by data tables¹.

2 Outlook for 2022 and Carbon Budget 1

This section examines share of the first carbon budget that have already been emitted in 2021, according to EPA inventory data, assesses likely GHG emissions in 2022 by sector, according to ongoing monthly data, and an outlook for the annual cuts required of each sector for the remainder of carbon budget 1 required to keep under the sectoral emissions ceiling. Analysis is confined to Agriculture, Transport, Electricity and Buildings, which together accounted for 75% of GHG emissions in 2021 (including LULUCF).

2.1 Agriculture

In 2021, GHG emissions from the agriculture sector rose by 3% to 23.1 Mt CO_{2e}, around the same level as in 2018. This constituted 22% of its CB1 SEC (106 Mt).

In 2022, it is likely that emissions of N_2O from agricultural soils <u>will fall significantly</u> as fertiliser sales are projected to be 20% lower than in 2021 due to high prices and the adoption of new technologies and practices. This saving will be partly offset by rising methane emissions from a 37,300 <u>rise in total</u> <u>cattle numbers</u> in the year to June, driven by an extra 22,000 dairy cows. A best estimate for this sector is a stabilisation or fall in emissions this year, potentially bringing emissions back to 2020 levels.

¹ <u>https://www.marei.ie/bold-action-is-necessary-to-keep-the-first-carbon-budget-within-reach/</u>

https://www.irishtimes.com/environment/climate-crisis/2022/10/06/bold-action-is-necessary-to-keep-first-carbon-budget-within-reach/

https://docs.google.com/spreadsheets/d/1vgnt5iymmZWG6drs0QZvZWAwrc6Z7MlgJQHvIX7GjWc/edit?usp=s haring



If GHG emissions in this sector do indeed stabilise in 2022, the sector must deliver cuts of 7% @ach^{limate-Marine} year in 2023, 2024 and 2025 to meet its first SEC. If 2022 sees GHGs fall to 2020 levels (a cut of 3% this year), the sector will have to deliver cuts of 5% each year for the rest of CB1, with emissions falling to 19 MtCO_{2e} in 2025, the same level as in 2011. On the other hand, if GHG emissions do not fall either this or next year, the sector will face a far more challenging task of reducing emissions by 15% in 2024 and in 2025 to stay within its budget, requiring emissions to fall to 17 MtCO_{2e} in 2025, the lowest level on record.



2.2 Transport

In 2021, emissions from the transport sector rose by 6.3% to 10.9 Mt CO_{2e}, 10% lower than in 2018 as traffic for the first half of the year was still supressed by COVID-19 lockdown measures. This constituted just over 20% of its first SEC (54 Mt) in one year. Therefore, the sector could deliver on its SEC by reducing GHG emissions by only 1% each year to 2025.

However, emissions in 2022 are likely to grow relative to last year: car traffic is now (as of September 2022) 2% <u>above 2021 levels</u>, and <u>petrol and diesel sales</u> for road vehicles are around 13% higher in the period to July this year relative to 2021. Should this 13% rise in oil consumption be reflected in annual emissions for the sector, this would see GHG emissions rising to 12.3 Mt this year. If cuts were to begin next year from that level, transport emissions would need to fall by 10% each year in 2023, 2024 and 2025 to stay within its sectoral ceiling, with emissions falling to 9 Mt in 2030, the same level as in 1999.

Furthermore, traffic volumes are still 8% below 2019 levels and could continue to grow. Should transport emissions not start falling next year, but instead remain elevated at 12.3 Mt, the sector would need to reduce emissions by 20% in 2024 and in 2025, falling to 8 Mt in 2030, the same level as in 1997.

The electrification of the car fleet is slow, limiting prospects for significant mitigation potential by 2025. Vehicles with an internal combustion engine <u>still dominate new car sales</u>, with private vehicles running on oil accounting for 87% of the total so far this year, and large SUVs accounting for 60% of the market, growing from 53% in 2021.





2.3 Electricity

Greenhouse gas emissions from power generation grew by 18% in 2021, to nearly 10 Mt, mainly due to a resurgence in coal-fired power generation and steady growth in electricity demand. This constituted 24% of its sectoral emission ceiling for CB1 of 40 Mt.

<u>Data on power generation</u> so far in 2022 indicate that GHG emissions are still on a growth trajectory: thermal generation rose by 8% in the year to August (mainly from natural gas), and total generation rose by around 3%. As a result, GHG emissions could rise by around 5% this year, depending on how windy the coming months will be and how electricity demand will respond to rising prices.

The growth in 2021 emissions and potential rise in 2022 will make the sectoral emissions ceiling a significant challenge to meet: the sector could be faced with emissions cuts of 20% each year in 2023, 2024 and 2025 if cuts start next year, or annual 40% cuts if emissions merely stabilise next year, which would require emissions in the sector to fall to 4 Mt in 2025. By contrast, had emissions started to fall this year already, in line with a steady trajectory, an annual cut of 10% in emissions would have been sufficient, with emissions in 2025 needing to fall to 6 Mt.



2.4 Buildings

Residential, public and commercial buildings emitted 8.5 Mt CO₂ in 2021, around 24% of their collective sectoral emissions ceiling for CB1 of 36 Mt. Residential sector emissions were elevated in 2021 due to working from home and low oil prices, and there are indications that oil and natural gas consumption will fall in 2022: In the year to August, estimates indicate that natural gas consumption for heating fell by 7% relative to the same period in 2021, and oil deliveries for heating were down by around 3% in the first half of the year. However, this may be partially offset by an increase in the use of coal and peat for heating, as households could turn to solid fuels in response to high gas prices for the coming winter.



Should emissions start to fall significantly this year, the residential sector can meet its SEC with a sustained 10% annual fall in emissions. However, if emissions merely stabilise this year, annual cuts of 15% will be required in 2023, 2024 and 2025. Moreover, if emissions don't start to fall in 2023 and only stabilise, emissions would need to fall by 30% in 2024 and 2024 to stay within budget.



3 Outlook for Carbon Budget 2

3.1 Overall sectoral pathways to 2030

Figure 1 and Table 1 details a scenario consistent with sectors delivering their SECs for CB1 and CB2, and indicates the scale of "Unallocated Savings" in CB2 (totalling 26 Mt over the five-year period, or 5 Mt on average) which has yet to be assigned to sectors. To keep to the overall Carbon Budget 1 and 2, from 2023 (excluding LULUCF), overall emissions need to fall by 7% each year from 2023. As currently allocated, SECs lead to a 5% annual fall as "Unallocated Savings" account for 26 Mt of the second carbon budget.





Figure 1: Trajectories for sectors (excluding LULUCF and "Other") consistent with Carbon Budgets 1 and 2. Scenario assumes transport & power sector GHG emissions are 13% & 5% higher in 2022 relative to 2021, respectively, and in all other sectors GHG emissions plateau in 2022, and annual reductions begin in 2023.

												ANNUAL GROWTH					
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	CB1	CB2	2023-30	2023-25	2026-30	2025-6	
ELECTRICITY	10	10	8	7	5	5	4	4	4	3	40	20	-12%	-20%	-9%		
TRANSPORT	11	12	11	10	9	8	8	7	7	6	54	37	-8%	-10%	-7%		
RESIDENTIAL	7	7	6	5	4	4	4	4	4	4	29	23	-5%	-15%	0%		
COMMERCIAL	1.5	1.5	1.4	1.4	1.3	1	1	1	1	1	7	5	-6%	-5%	-7%		
INDUSTRY	7	7	6	5	5	5	5	5	5	5	30	24	-4%	-13%	0%		
AGRICULTURE	23	23	21	20	19	19	19	19	19	19	106	96	-2%	-7%	0%		
UNALLOCATED						5	5	5	5	5		26					
TOTAL (EXCL UNALLOCATED)	59	61	54	48	43	42	41	40	39	38	266	205	-5%	-11%	-3%	-3%	
TOTAL (INCL UNALLOCATED)	59	61	54	48	43	37	36	35	34	33	266	179	-7%	-11%	-5%	-15%	

Table 1: Annual trajectory consistent with Carbon Budgets 1 & 2 Sectoral Emissions Ceilings, excluding LULUCF and "Other"

LULUCF emissions are not factored into this analysis as the government has not yet set a SEC for the sector. However, this sector emitted nearly 8 Mt in 2021, more than residential buildings, and EPA



projections indicate that emissions are on an upwards trajectory. It remains to be determined^{gy • Climate•} whether the overall carbon budgets are open for revision once the LULUCF SEC is published. If they are not, then any lower mitigation in LULUCF would reduce the SEC available to other sectors.

3.2 Power sector trajectories

The outlook for a power generation mix consistent with the sectoral emissions ceilings will be determined by future electricity demand growth. Eirgrid's 2022 Generation Capacity Statement (GCS) median projection sees power demand rising from 30 TWh in 2018 to 45 TWh in 2030, an upwards revision on last year's GCS (Figure 2).



Figure 2: Total Electricity Requirement forecast for Ireland 2021 – 2031. Eirgrid GCS 2022

The sectoral emissions ceiling for natural gas sets a limit on the amount of electricity to be generated with fossil fuels, and assuming no oil or coal in the generation mix from 2023, sets a limit on the electricity which can be generated with natural gas for the sector to stay under-budget (Figure 3).



Figure 3: The Sectoral Emissions Ceilings limit overall CO2 emissions in Carbon Budgets 1 & 2. If natural gas remains the only fossil fuel in the generation mix from 2023, this requires a sharp fall in gas-fired power generation from 2024, halving gas use between 2021 and 2030

In the absence of other power generation technologies, renewables must meet the remaining electricity demand. Figure 4 shows the share of electricity that must come from renewables in 2025



and 2030, and the total renewable electricity generation, that is required to meet Eirgrid's projected ater-Marine electricity demand scenarios. Even in the "Low" scenario, renewable electricity generation must double relative to 2021 by 2025, to 23 TWh, and meet a 63% share in the generation mix by 2025, rising to 80% by 2030.

With "High" electricity demand growth, renewables must account for 68% of power generation by 2025 and 84% by 2030.



Figure 4: RE share and total generation required to meet Eirgrid GCS 2022 demand forecasts while remaining underneath sectoral carbon budget ceilings for CB1 and CB2. This assumes natural gas is the only fossil fuel un the generation mix from 2023, and the carbon intensity of gas-fired generation is 404 gCO₂/kWh. *2022 renewable generation is based on the first 6 months of 2022 and is based on SEAI monthly electricity generation data.

This simple analysis does not take into account the potential for electricity imports through existing and future interconnectors, or the potential for alternative electricity sources such as low-carbon gases or carbon capture and storage. Should other fossil fuels remain in the generation mix from 2023, it will increase the requirement for renewable electricity generation.

This analysis demonstrates that to meet the SECs, the power sector must rapidly and immediately deploy renewable electricity and manage electricity demand growth.