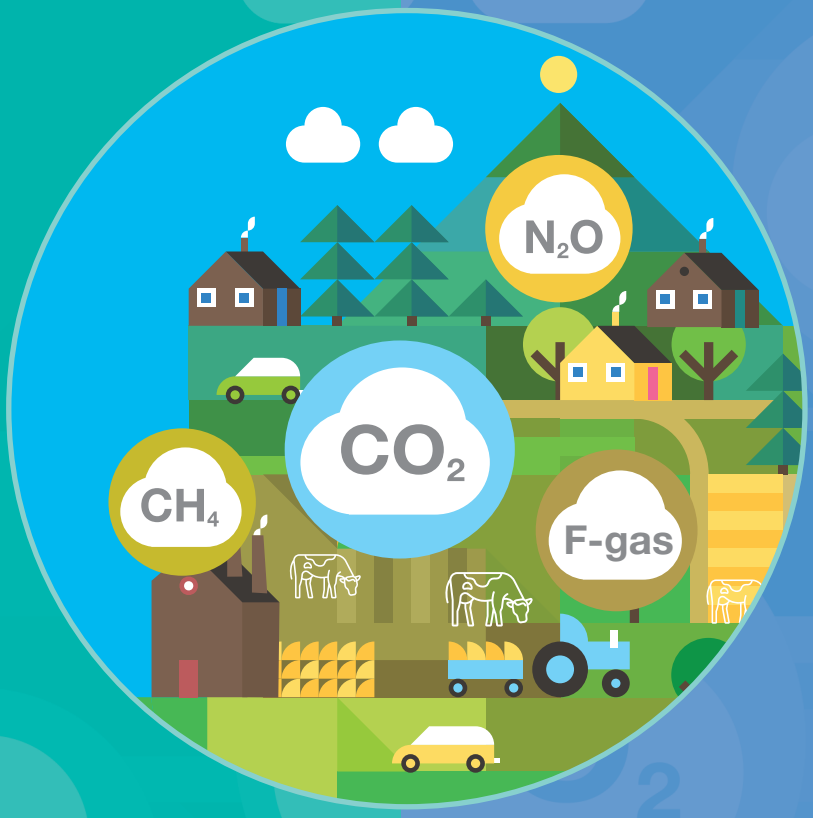
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Ireland's Greenhouse Gas Emissions Projections

2022-2040

June 2023



Environmental Protection Agency

The Environmental Protection Agency (EPA) is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

- **Regulation:** We implement effective regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.
- **Knowledge:** We provide high quality, targeted and timely environmental data, information and assessment to inform decision making at all levels.
- **Advocacy:** We work with others to advocate for a clean, productive and well protected environment and for sustainable environmental behaviour.

Our Responsibilities

LICENSING

We regulate the following activities so that they do not endanger human health or harm the environment:

- waste facilities (e.g. landfills, incinerators, waste transfer stations);
- large scale industrial activities (e.g. pharmaceutical, cement manufacturing, power plants);
- intensive agriculture (e.g. pigs, poultry);
- the contained use and controlled release of Genetically Modified Organisms (GMOs);
- sources of ionising radiation (e.g. x-ray and radiotherapy equipment, industrial sources);
- large petrol storage facilities;
- waste water discharges;
- dumping at sea activities.

NATIONAL ENVIRONMENTAL ENFORCEMENT

- Conducting an annual programme of audits and inspections of EPA licensed facilities.
- Overseeing local authorities' environmental protection responsibilities.
- Supervising the supply of drinking water by public water suppliers.
- Working with local authorities and other agencies to tackle environmental crime by coordinating a national enforcement network, targeting offenders and overseeing remediation.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Prosecuting those who flout environmental law and damage the environment.

WATER MANAGEMENT

- Monitoring and reporting on the quality of rivers, lakes, transitional and coastal waters of Ireland and groundwaters; measuring water levels and river flows.
- National coordination and oversight of the Water Framework Directive.
- Monitoring and reporting on Bathing Water Quality.

MONITORING, ANALYSING AND REPORTING ON THE ENVIRONMENT

- Monitoring air quality and implementing the EU Clean Air for Europe (CAFÉ) Directive.
- Independent reporting to inform decision making by national and local government (e.g. periodic reporting on the State of Ireland's Environment and Indicator Reports).

REGULATING IRELAND'S GREENHOUSE GAS EMISSIONS

- Preparing Ireland's greenhouse gas inventories and projections.
- Implementing the Emissions Trading Directive, for over 100 of the largest producers of carbon dioxide in Ireland.

ENVIRONMENTAL RESEARCH AND DEVELOPMENT

- Funding environmental research to identify pressures, inform policy and provide solutions in the areas of climate, water and sustainability.

STRATEGIC ENVIRONMENTAL ASSESSMENT

- Assessing the impact of proposed plans and programmes on the Irish environment (e.g. major development plans).

RADIOLOGICAL PROTECTION

- Monitoring radiation levels, assessing exposure of people in Ireland to ionising radiation.
- Assisting in developing national plans for emergencies arising from nuclear accidents.
- Monitoring developments abroad relating to nuclear installations and radiological safety.
- Providing, or overseeing the provision of, specialist radiation protection services.

GUIDANCE, ACCESSIBLE INFORMATION AND EDUCATION

- Providing advice and guidance to industry and the public on environmental and radiological protection topics.
- Providing timely and easily accessible environmental information to encourage public participation in environmental decision-making (e.g. My Local Environment, Radon Maps).
- Advising Government on matters relating to radiological safety and emergency response.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

AWARENESS RAISING AND BEHAVIOURAL CHANGE

- Generating greater environmental awareness and influencing positive behavioural change by supporting businesses, communities and householders to become more resource efficient.
- Promoting radon testing in homes and workplaces and encouraging remediation where necessary.

MANAGEMENT AND STRUCTURE OF THE EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.

Contents

Key Findings

Ireland's Climate Act Ambition	Ireland is not on track to meet the 51 per cent emissions reduction target (by 2030 compared to 2018) based on these projections which include most 2023 Climate Action Plan measures. Further measures still need to be identified and implemented to achieve this goal.
Carbon Budgets	The first two carbon budgets (2021-2030), which aim to support achievement of the 51 per cent emissions reduction goal, are projected to be exceeded by a significant margin of between 24 and 34 per cent.
Sectoral Emissions Ceilings	Sectoral emissions ceilings for 2025 and 2030 are projected to be exceeded in almost all cases, including Agriculture, Electricity, Industry, and Transport.
EU Targets	It is projected that Ireland can meet its original EU Effort Sharing Regulation target of a 30 per cent emission reduction by 2030 (compared to 2005) if all measures and flexibilities, including the LULUCF flexibility, are used. Reaching the new 42 per cent EU emission reduction target will require full and rapid implementation of Climate Action Plan 2023 measures and further measures to be implemented.
Implementation Gap	Emissions in the Additional Measures scenario are projected to be 29 per cent lower in 2030 (compared with 2018) whereas in the Existing Measures scenario the emissions reduction is projected to be 11 per cent. Faster implementation of measures will be required to meet both National and EU targets.
Electricity Generation	Emissions from the Energy Industries sector are projected to decrease by between 50 and 60 per cent over the period 2021 to 2030. Renewable energy generation is projected to range from 68 to over 80 per cent of electricity generation as a result of projected further and rapid expansion in wind energy and other renewables.
Industry	Manufacturing combustion emissions are projected to reduce by between 6 and 22 per cent from 2021 to 2030 with the implementation of efficiency measures and renewable heat generation. However Industrial Process emissions are projected to increase by 5 per cent from 2021 to 2030 due to anticipated increased cement production.
Agriculture	Total emissions from the Agriculture sector are projected to decrease by between 4 and 20 per cent over the period 2021 to 2030. Savings are projected from a variety of measures including switching to different fertilisers, limits on nitrogen fertiliser usage and bovine feed additives.
Transport	Transport emissions are projected to decrease by 1 to 35 per cent over the period 2021-2030. Measures that are projected to contribute to higher emissions reductions include 943,500 EVs by 2030, a 20 per cent biodiesel blend rate and a 20 per cent reduction in total passenger vehicle kilometres.
Buildings	Emissions from the Residential sector are projected to decrease by 36 to 47 per cent between 2021 and 2030 with Commercial and Public Services sector emissions projected to decrease by 19 to 49 per cent. Measures projected to achieve this include 5.7 TWh of biomethane used for heating, energy efficiency retrofits and the installation of up to 680,000 heat pumps in residential homes.
Land use, Land use Change and Forestry (LULUCF)	Emissions from the LULUCF sector are projected to increase over the period 2021 to 2030 as our forestry reaches harvesting age and changes from a carbon sink to a carbon source. Planned policies and measures for the sector, such as increased afforestation, water table management on agricultural organic soils and peatland rehabilitation, are projected to reduce the extent of the emissions increase.

1. Introduction

The Environmental Protection Agency (EPA) is the national body with responsibility to develop, prepare and publish projections of greenhouse gas emissions for Ireland. The EPA produces national greenhouse gas emission projections on an annual basis. These projections are compiled in line with EU guidelines to meet EU reporting obligations[1]. At a national level this report informs policy and the monitoring and reporting of Ireland's climate action performance to Government under the Climate Action and Low Carbon Development Act (Amendment) 2021[2] and to the public as outlined in the Climate Action Plan, 2023[3]. The report also provides an assessment of Ireland's progress towards achieving its EU emission reduction targets for 2030 as set out under the Effort Sharing Regulation[4].

This report provides an assessment of Ireland's total projected greenhouse gas (GHG) emissions from 2022 to 2040, using the latest inventory data for 2021 as the starting point[5]. As the first projected year (2022) has passed, indicator data is used where possible instead of projections. Preparing the EPA projections involves compiling and processing key data such as energy projections (projected fuel use in households, industry, services, transport and agriculture), developments in the agriculture and land use sectors and projected emissions from industrial products.

The EPA has produced GHG projections using two scenarios or levels of ambition. The two scenarios represent different possible trajectories for Ireland's GHG emissions and are explained in more detail in the Explainer in Section 2. The first scenario, *With Existing Measures* (WEM), forecasts Ireland's emissions including all national policies and measures implemented by the end of 2021. Implemented policies and measures such as those in the National Development Plan[6] (NDP), Climate Action Plan 2019[7] and Climate Action Plan 2021[8] are included in this scenario. Many Climate Action Plan 2021 policies and measures are not in the WEM scenario as they are still considered to be planned rather than implemented.

The second scenario *With Additional Measures* (WAM) has a higher level of ambition and includes government policies and measures to reduce emissions such as those in Ireland's Climate Action Plan 2023[9]. This was published in December 2022 and the included policies and measures have not yet moved into implementation phase. As implementation happens the policies and measures will be migrated into the *With Existing Measures* scenario.

This is the second set of projections prepared following the enactment of the Climate Action and Low Carbon Development Act (Amendment) 2021 (Climate Act), which set a target for a 51% reduction in emissions by 2030 compared to 2018. The national climate objective differs from the EU objective as it also directly includes the LULUCF sector. LULUCF stands for Land Use Land Use Change and Forestry, and it

1 Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action

2 Climate Action and Low Carbon Development (Amendment) Act 2021 (irishstatutebook.ie)

3 https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

4 Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement

5 https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-final-greenhouse-gas-emissions-1990-2021.php

6 https://www.gov.ie/en/publication/774e2-national-development-plan-2021-2030/

7 https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/

8 https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/

9 https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

includes both greenhouse gas emissions and removals associated with activities on land. LULUCF is further discussed in Section 3.

The Climate Act also provides for the establishment of carbon budgets to support achievement of Ireland's climate ambition. The 51% target, relative to 2018, is the primary constraint on carbon budgets over the course of the first two budget periods ending on 31 December 2030. The Climate Action Plan 2023 sets out a major programme of policies and measures that aim to achieve significant progress towards those objectives.

Ireland's new 2030 target under the EU's Effort Sharing Regulation (ESR)[10] is to limit its greenhouse gas emissions by at least 42% by 2030[11]. This target was set in April 2023 upon amendment of the ESR. The 42% reduction defines the trajectory with annual binding emission limits over the period to 2030. New binding annual emission limits for 2023 to 2030 for the 42% reduction will be set by the EU later in 2023. Under the ESR two flexibilities may be utilised to allow for a fair and cost-efficient achievement of the target. These flexibilities are the use of EU Emissions Trading System[12] allowances and credit from action undertaken in the Land use, Land use Change and Forestry (LULUCF) sector.

Ireland's projected emissions trajectory 2022-2040 is set out in the following sections of this report. Each section of the report outlines our analysis and assessment with reference to the prescribed base year, targets and timeframes specified in the associated National or EU legislative context, outlined above.

10 Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement

11 Regulation (EU) 2023/857 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, and Regulation (EU) 2018/1999

12 https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets_en

2. Approach

2.1 Projected Scenarios

As described in the Introduction the EPA has produced the projected greenhouse gas emissions for 2022 to 2040 using two scenarios: *With Existing Measures* and the more ambitious *With Additional Measures*. Our analysis in this report focuses on projected emissions as far as 2030 as most current policies and measures are focused on this period.

These emissions projections consider projected activity data provided by a number of key data providers including:

- Energy projections provided by the Sustainable Energy Authority of Ireland (SEAI). Determination of anticipated progress in the implementation of energy related policies and measures was coordinated by EPA and SEAI in discussion with the relevant Government Departments.
- Agricultural projections provided by Teagasc (Agriculture and Food Development Authority) which are aligned with University of Missouri Food and Agricultural Policy Research Institute (FAPRI) Projections (September 2022) for medium-term developments in EU and World agricultural commodity markets[13]. Teagasc assume that agricultural policy continues as currently implemented and the Trade and Cooperation (Brexit) Agreement (TCA) reached between the EU and the UK governs UK-EU trade for the period to 2030. Determination of anticipated progress in the implementation of Agriculture related policies and measures was determined by the EPA in discussion with the Department of Agriculture, Food and the Marine (DAFM) and Teagasc.

Both scenarios use fuel prices from the European Commission recommended harmonised trajectories (see Appendix 1 for details). The prices were chosen to reflect the likelihood of near-term sustained higher prices and intensified uncertainty around longer-term future fuel prices.

Projected emissions data is reported for the following gases: Carbon Dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O) and F-gases. Emissions are classified into nine sectors; Energy Industries, Transport, Agriculture, Residential, Manufacturing Combustion, Commercial & Public Services, Industrial Processes, Waste and F-Gases[14].

13 https://www.teagasc.ie/rural-economy/rural-economy/agricultural-economics/

14 F-gases are Hydrofluorocarbons (HFCs), Perflurocarbons (PFCs), Sulphur Hexafluoride (SF6), and Nitrogen Trifluoride (NF3).

Explainer: EPA projections scenarios, what do they mean?

With Existing Measures (WEM)

The WEM scenario is a projection of future emissions based on the measures currently implemented and actions committed to by Government. To become part of the WEM scenario a policy or measure must be in place by the end of 2021 (the latest inventory year) and the projected emissions reduction is commensurate with the resources or legislation already in place or committed to Government Departments or Agencies. For example, the WEM scenario includes a measure where the Carbon tax increases annually and reaches €100 per tonne by 2030. This policy is considered to be implemented because annual carbon tax increases have been committed to in legislation (Finance Act 2020[15]).

With Additional Measures (WAM)

The WAM scenario is the projection of future emissions based on the measures outlined in the latest Government plans at the time Projections are compiled. This includes all policies and measures included in the WEM scenario, plus those included in Government plans but not yet implemented. For example, the WAM scenario includes the target of 945,000 Electric Vehicles on the road by 2030 in the Climate Action Plan 2023. The full amount of this ambition is not currently in the *With Existing Measures* scenario as actions still remain to be taken that would deliver it.

2.2 Excluded Policies and Measures

In so far as possible, the policies and measures contained in the Climate Action Plan 2023 are included in these projections. However, there are a number of exceptions where policies and measures were not included as the EPA could not see an implementation pathway to merit their inclusion at this point in time. These are detailed below:

Electricity

Policies and Measures up to 2030

- The Climate Action Plan 2023 target of 80% share from renewable electricity is projected as being exceeded. Onshore wind of 7.8 GW in 2030 and 6 GW of Solar PV was required to achieve this level of renewable electricity. This compares with 9 GW onshore wind and 8 GW of solar PV from CAP 2023;
- A pathway could not yet be modelled for the full 2GW target for new flexible gas fired generation, however, 1.2GW is included.

Policies and Measures post-2030

- 2 GW offshore wind for green hydrogen use in industry post-2030 (as outlined in Chapters 12 and 13 of the Climate Action Plan 2023) is not currently included.
- Demand-side measures to mitigate and manage energy demand such as growth from large energy users are not included.

15 Finance Act 2020 (irishstatutebook.ie).

Enterprise, Built Environment and Public Sector

Policies and Measures up to 2030

- Measures aimed at achieving emissions savings from a decrease in embodied carbon in construction materials (0.4 Mt CO_2 abatement by 2030) aren't currently modelled;
- The full target for 70-75% share of carbon neutral heating in Industry is not currently modelled.

Policies and Measures post-2030

- Emissions reductions associated with Carbon Capture and Storage are not modelled;
- 60-70% Share of carbon neutral heating in total fuel demand is not modelled.

Agriculture

Measures up to 2030

- Diversification measures with annual savings by 2030 of 1.5 Mt CO2 eq. Further information is needed to model an implementation pathway for these measures.

Overall

- Unallocated savings of 5.25 Mt CO_2 eq per annum 2026-2030 (or 26.25 Mt CO_2 eq cumulatively by 2030) as stated in the Climate Action Plan 2023 are not modelled;
- Further measures post-2030 in the electricity, industry, built environment and transport sectors where no specific measures have been identified are not modelled.

These savings combined are estimated provide an additional abatement of approximately 9 Mt CO_2 eq in 2030, based on the modelling used to prepare the Climate Action Plan 2023. The projections in this report are informed by the EPA's most recent inventories, updated macroeconomic inputs and new modelling data and research.

2.3 Reference/Base Years in the Report

Ireland's EU and national legislative commitments, have different levels of emissions reduction requirements, base years and timeframes for achievement.

The EU Effort Sharing Regulation (ESR) on greenhouse gas reduction requires a 42% reduction of emissions compared to 2005 levels by 2030, this is discussed in Section 3.

The Climate Act 2021 has specified 2018 as the base year from which a 51% emission reduction is to be achieved by 2030. The percentage changes referred to in Section 4 refer to the period 2018 to 2030.

The sectoral analysis in Section 5 uses the latest inventory year (2021) as a base year for projections to align with the current EU projections reporting requirements.

Each section of the report outlines the EPA's assessment with reference to the targets and base year specified in the associated legislation or reporting frameworks being discussed.

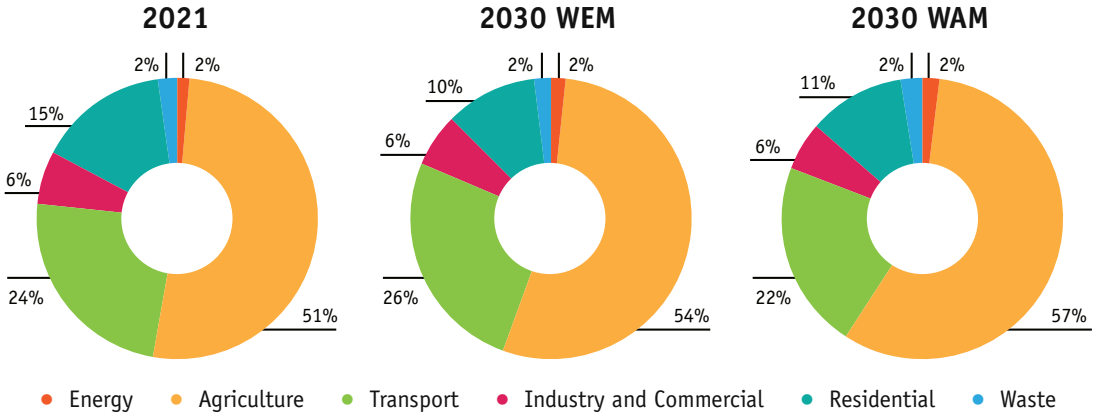
3. Projected Performance Against European Targets

Ireland's recently agreed 2030 target under the EU's Effort Sharing Regulation (ESR) is to deliver a 42% reduction of emissions compared to 2005 levels by 2030. The ESR includes the sectors outside the scope of the EU Emissions Trading System (EU-ETS) (such as Transport, Residential, Public/Commercial Services and Waste,)

The latest EPA projections show that currently implemented policies and measures (*With Existing Measures*) will achieve a reduction of 10% on 2005 levels by 2030, significantly short of the 42% reduction target. If policies and measures in the higher ambition (*With Additional Measures*) scenario are implemented, EPA projections show that Ireland can achieve a reduction of 30% by 2030, still short of the 42% reduction target.

The ESR sectors are shown in Figure 1 below. The Projections show that Agriculture and Transport emissions dominate the ESR and together they account for 75% and up to 80% of emissions in 2021 and 2030 respectively.

Figure 1: Sectoral share of Effort Sharing Regulation greenhouse gas emissions in 2021 and projected sectoral share in 2030 under the WEM and WAM scenarios



As described in the Introduction, a new 42% reduction target now applies for 2030 with new binding Annual Emission Allocation (AEA) limits yet to be fully implemented. The assessment made in this report therefore focusses on the ESR Annual Emission Allocations that were associated with the earlier ESR 30% reduction target[16].

The ESR provides two flexibilities (EU-ETS and LULUCF)[17] to allow for a fair and cost-efficient achievement of the targets. The full LULUCF flexibility of 26.8 Mt CO2 eq (theoretically available to Ireland under the ESR) is not considered to be possible to achieve based on the latest projections. New research led to a revision to the emission factor associated with forestry on organic (peat) soils and when this was implemented in the 2022 EPA projections report, it led to decreased projected removals/increased emissions associated with forest land for all periods. The total amount of LULUCF flexibility now projected to be available is 9.3 Mt CO_2 eq, significantly less than the theoretical flexibility available.

16 Specified in Commission Implementing Decision (2020/2126).

17 Use of EU-ETS allowances and credit from action undertaken in the Land use, Land use Change and Forestry (LULUCF) sector

The projected emissions and estimated Annual Emission Allocations (AEAs) with and without use of flexibilities under the Effort Sharing Regulation for the period 2021-2030 are shown in Figure 2.

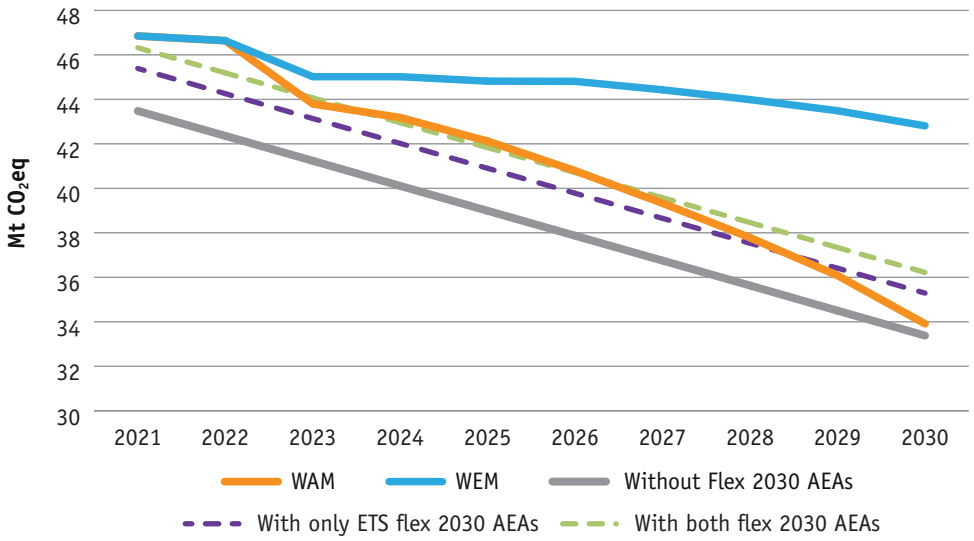
Under the *With Existing Measures* scenario, the projections indicate that Ireland will cumulatively exceed its ESR emissions allocation of 384.3 Mt CO_2 eq by 63.6 Mt CO_2 eq over the 2021-2030 period without the use of flexibilities.

Under the *With Additional Measures* scenario, the projections indicate that Ireland will cumulatively exceed the ESR emissions allocation by 26.2 Mt CO_2 eq over the 2021-2030 period.

The projections show that Ireland can achieve compliance under the ESR in the With Additional Measures scenario using the EU-ETS and LULUCF flexibilities but only with implementation of the Climate Action Plan 2023. Using both flexibilities, this gives a cumulative surplus under the ESR of just 2.2 Mt CO_2 eq. This is a small amount of headroom and highlights the need for full and rapid implementation of policies and measures in the Climate Action Plan 2023.

Use of the EU-ETS flexibility alone is not projected to achieve compliance under the ESR (cumulative exceedance of 7.1 Mt CO2 eq) even with full implementation of policies and measures in the Climate Action Plan 2023.

Figure 2: Projected emissions and estimated Annual Emission Allocations (AEAs) with and without use of flexibilities under the Effort Sharing Regulation for the period 2021-2030



4. Projected Performance against National Climate Objective

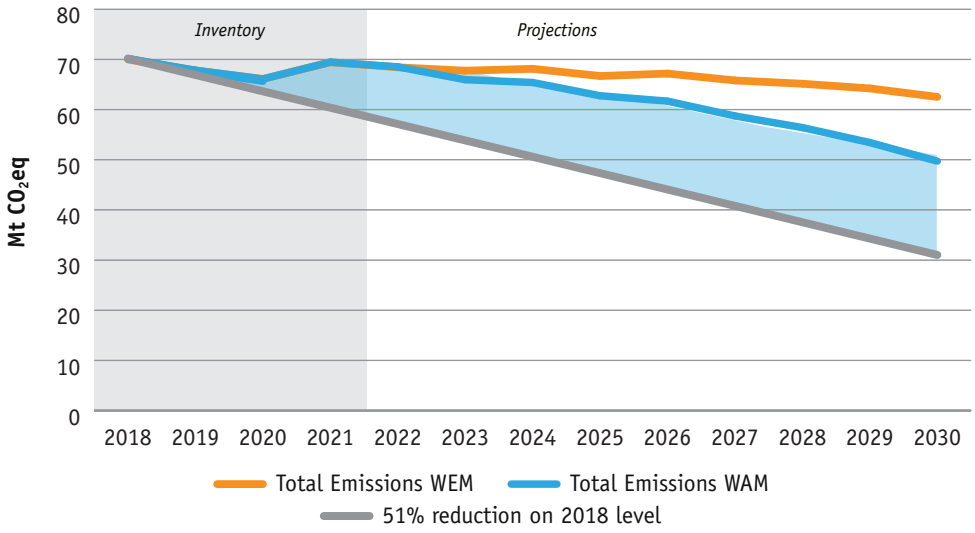
The Climate Act 2021 sets a national climate objective of achieving a climate resilient and climate neutral economy by the end of the year 2050. An interim target has been set out to achieve a reduction of 51% in total emissions (including LULUCF) over the period 2018 to 2030 to see Ireland on the right trajectory.

The projections show that implemented policies and measures in the *With Existing Measures* (WEM) scenario can deliver an 11% reduction in greenhouse gas emissions by 2030 compared to the 2018 level. The "*With Additional Measures*" (WAM) scenario, including policies and measures from the 2023 Climate Action Plan, is projected to deliver a 29% emissions reduction over the same period.

Both projected scenarios indicate that even with implementation of all climate plans and policies Ireland will not meet the 51% emissions reduction target by 2030 . Figure 3. below demonstrates the 'gap' between (*With Additional Measures* scenario) projections and the 51% target.

Earlier in the report it was highlighted that approximately 9 Mt CO2 eq of savings identified in CAP 23 are not in these projections. If that amount of savings were realised in 2030, the percentage reduction in emissions achieved in total (with LULUCF) would be 42%.

Figure 3: Total Greenhouse Gas Emissions (including LULUCF) under the *With Existing Measures* and *With Additional Measures* scenarios out to the year 2030



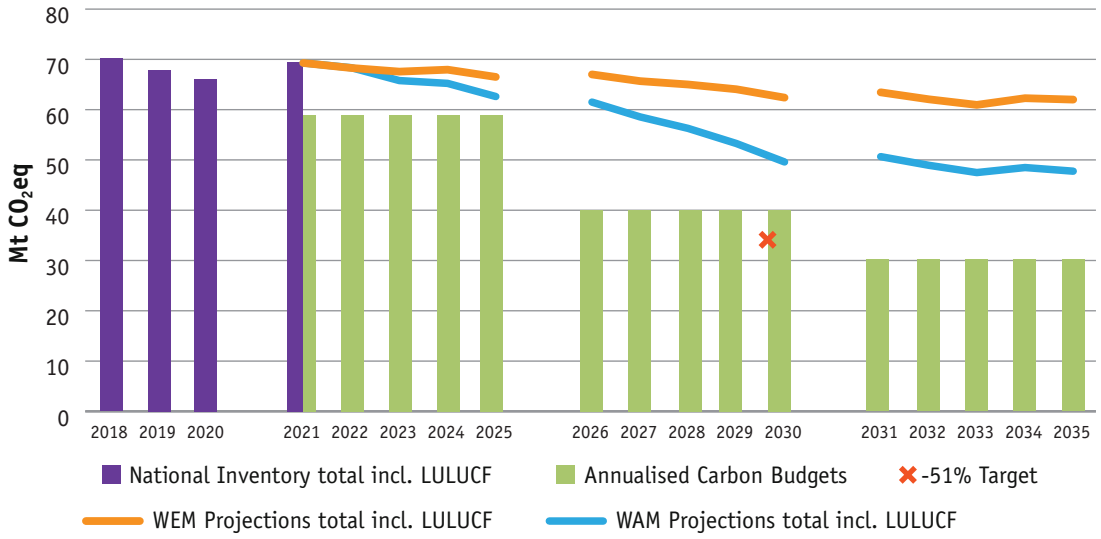
4.1 Carbon Budgets

The Climate Action and Low Carbon Development (Amendment) Act 2021 provides for the establishment of carbon budgets to support achieving Ireland's climate ambition. The 51% target is the primary constraint on carbon budgets over the course of the first two budget periods ending on 31 December 2030, relative to 2018. The provisional carbon budget proposed for 2031 to 2035 continues the trajectory towards climate neutrality by 2050[18].

18 https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/Technical%20report%20on%20carbon%20budgets%2025.10.2021.pdf

Three Carbon budgets have been proposed over the period 2021 to 2035. Figure 4 shows the annualised carbon budgets and the extent to which these budgets are exceeded with the latest projected emissions data, both in the *With Existing Measures* and higher ambition *With Additional Measures* scenarios.

Figure 4: Annualised carbon budgets (2021-25, 2026-30 and 2031-35) and projected emissions data (Mt CO_2 eq) (including LULUCF) under the *With Existing Measures* and *With Additional Measures* scenarios



For illustrative purposes the budget is split evenly across each period. LULUCF is included in the carbon budgeting process so the projections in Figure 2 also include LULUCF emissions.

- Budget 1 from 2021-2025 has been proposed at 295 Mt CO_2 eq. In the WEM scenario this is projected to be exceeded by 45 Mt CO_2 eq and in the WAM scenario by 37 Mt CO_2 eq.
- Budget 2 from 2026-2030 has been proposed at 200 Mt CO_2 eq. In the WEM scenario this is projected to be exceeded by 125 Mt CO_2 eq and in the WAM scenario by 80 Mt CO_2 eq.
- Budget 3 from 2031-2035 has been proposed at 151 Mt CO_2 eq. In the WEM scenario this is projected to be exceeded by 160 Mt CO_2 eq and in the WAM scenario by 93 Mt CO_2 eq.

4.2 Sectoral Ceilings

Since the 2022 projections, Sectoral Ceilings[19] have been announced by Government as a mechanism to assist with the achievement of Carbon Budgets and the ambition in the Climate Act 2021. These sectoral ceilings are legally binding and set out the maximum amount of greenhouse gas emissions permitted in different sectors that align with Governmental responsibility. The sectors do not align exactly with the projections sectors but can be mapped to them. 'Electricity' for example largely maps to the sector the EPA refers to as Energy Industries in projections reporting. There is no ceiling set as yet for LULUCF.

19 https://www.gov.ie/en/publication/76864-sectoral-emissions-ceilings/

Table 1: Assessment of Achievement of Sectoral Targets under the With Additional Measures scenario

Sectors	Emissions 2018 (Mt CO_2 eq)	Projected Emissions 2030 (Mt CO_2 eq)	Percentage Reduction 2030 vs 2018	Target Reduction 2030 vs 2018
Electricity	10.3	3.9	-62%	~-75%
Transport	12.2	7.2	-41%	~-50%
Buildings (Residential)	7.1	3.7	-48%	~-40%
Buildings (Comm and Public)	1.5	0.8	-50%	~-45%
Industry	7.0	6.2	-11%	~-35%
Agriculture	23.4	19.0	-19%	~-25%
Other[20]	2.2	1.7	-21%	~-50%
LULUCF (no ceiling currently)	6.3	7.2	15%	N/A
Total with LULUCF	70.0	49.7	-29%	**-51%**

In percentage terms, Table 1 shows that the largest sectoral ceiling exceedances projected are for Industry and Electricity in the second budget period. Looking at the overall percentage emissions reduction target of -51% by 2030 compared to 2018, the projections are indicating a significant shortfall with only -29% projected to be achieved.

Table 2: Assessment of Achievement of Sectoral Ceilings under the With Additional Measures Scenario

Sectors	Projected Emissions 2021-2025 (Mt CO_2 eq)	Sectoral Ceiling 2021-2025 (Mt CO_2 eq)	Projected Emissions 2026-2030 (Mt CO_2 eq)	Sectoral Ceiling 2026-2030 (Mt CO_2 eq)
Electricity	45.2	40	28.2	20
Transport	55.1	54	42.4	37
Buildings (Residential)	29.8	29	22.9	23
Buildings (Comm and Public)	7.1	7	5.3	5
Industry	34.4	30	33.5	24
Agriculture	111.6	106	99.5	96
Other[19]	9.7	9	8.9	8
LULUCF (no ceiling currently)	39.1		39.3	
Total with LULUCF	332.1	295	280.0	200

From Table 2, which shows the sectoral ceilings in tonnes of CO_2 equivalent, we can see that none of the sectoral ceilings are projected to be achieved in the first budget period (2021-25) with high (percentage) exceedances projected in Electricity and Industry. For the second budget period the picture is notably worse except for Buildings (Residential) where compliance with the ceiling is being projected.

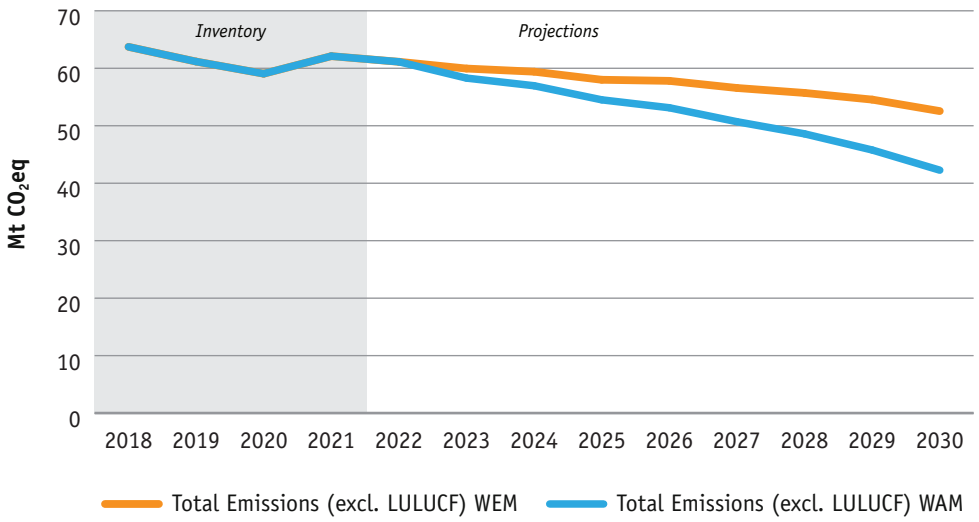
20 F-gases, Waste and Petroleum refining.

5. Key Trends – Emissions Projections out to 2030

This section aims to show the projected trends in total emissions and sectoral greenhouse gas emissions from the latest inventory year (2021) to 2030. Greenhouse gas emissions projections show total emissions decreasing from the latest Inventory (2021) levels by 15% by 2030 under the *With Existing Measures* (WEM) scenario and by 32% under the more ambitious *With Additional Measures* (WAM) scenario. As explained in the introduction the WAM scenario includes Government policies and measures that have not yet moved into implementation phase and it is a more ambitious scenario than the WEM.

The expected trend in total greenhouse gas emissions under both scenarios is shown in Figure 5. The difference between both scenarios is largely attributed to significant emissions reductions in key sectors such as power generation, residential, transport, commercial and public services and agriculture as a result of measures outlined in the Climate Action Plan 2023 and other policy documents such as Ag Climatise. This is described in more detail for each sector throughout this section.

Figure 5: Total Greenhouse Gas Emissions (excluding LULUCF) under the *With Existing Measures* and *With Additional Measures* scenarios out to 2030



Total emissions by sector throughout the projected time-period under the *With Existing Measures* scenario is shown in Figure 6. In Figure 7 emissions in 2021 are compared with projected emissions in 2030 by sectoral share in both the WEM and WAM scenarios. Both Figures show that three key sectors consistently have the largest share of emissions: Agriculture, Transport and Energy Industries.

Under the WEM scenario, emissions from these key sectors are projected to decrease by 4% for Agriculture, 1% for Transport and 50% for Energy Industries. When we look at the more ambitious WAM scenario, Agriculture, Transport and Energy Industries are projected to decrease by 20%, 35% and 60% respectively over the period 2021 to 2030.

Figure 6: Total Greenhouse Gas Emissions Projections by sector out to the year 2030 under the WEM scenario

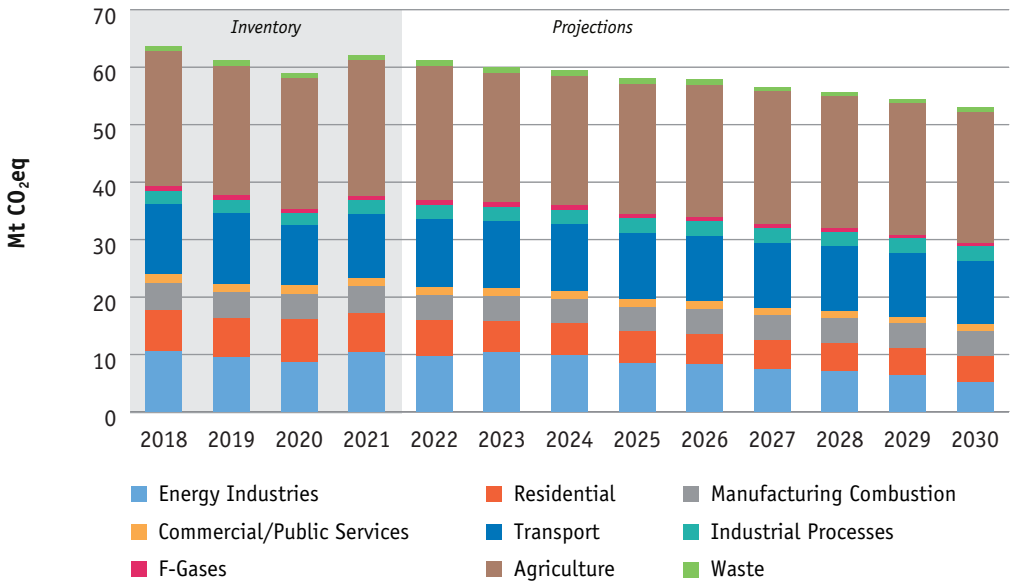
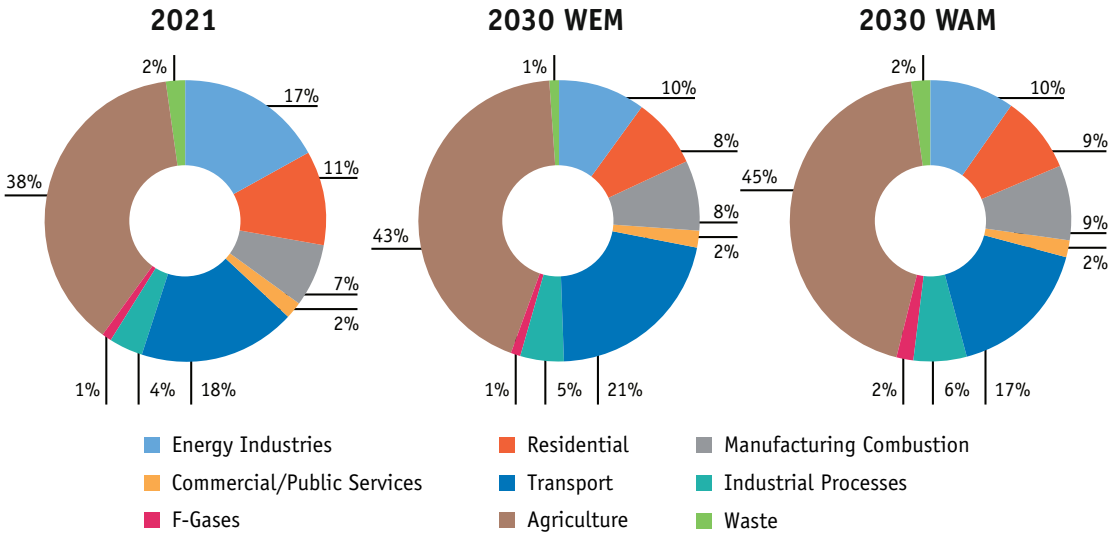
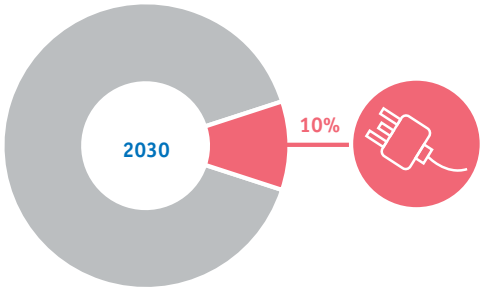


Figure 7: Greenhouse Gas Emissions by sector share in 2021 and Projected Greenhouse Gas Emissions by sector share under the WEM and WAM scenario in 2030



The proportion of emissions from Agriculture in 2030 for both scenarios is a consequence of other sectors of the economy projected to decarbonise more swiftly. Transport emissions become a smaller proportion by 2030 in the WAM scenario as a result of ambitious planned 'Avoid' and 'Shift' measures in the Climate Action Plan 2023. Emissions from Energy Industries continue to decrease in both projection scenarios due to implementation of Ireland's renewable power generation production targets.

5.1 Energy Industries



The majority of emissions within Energy Industries come from power generation and are largely regulated under the EU Emissions Trading Scheme (EU-ETS). In addition, emissions from the manufacture of solid fuels, petroleum refining (also largely included within EU-ETS) and fugitive emissions are included. This sector contributed 17% of Ireland's total emissions in 2021 and is projected to reduce to 10% in 2030 (in the *With Existing Measures* scenario). The projected trend in emissions from energy industries is shown in Figure 8.

Decarbonisation of power generation is a key measure in the Energy Industries sector. In both the WEM and WAM scenarios the fuel used in Moneypoint switches from coal to oil in 2024 and the plant is assumed to close by 2030 based on its current life expectancy. The use of peat and heavy fuel oil in power generation is projected to cease in 2023. The majority of Ireland's non-renewable energy generation is projected to come from natural gas by 2030. The WEM and WAM projections scenarios are described below.

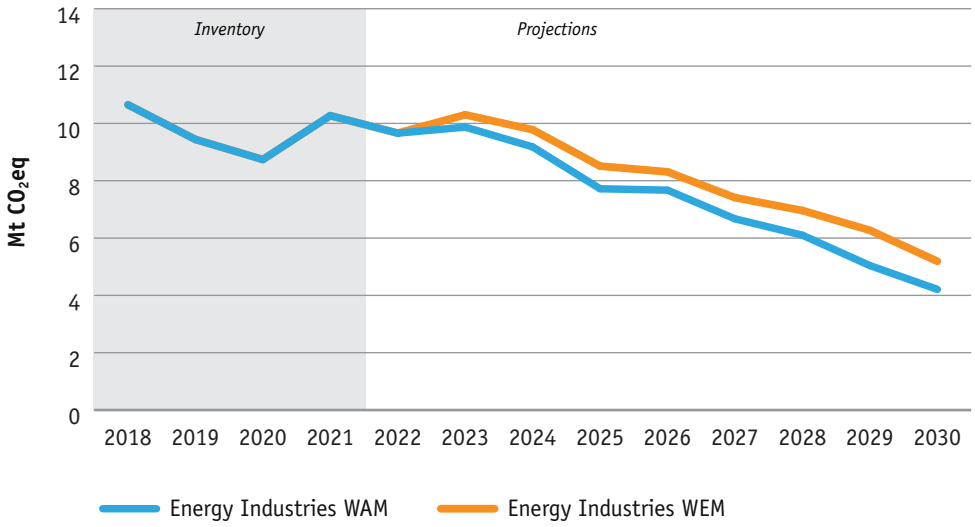
With Existing Measures scenario

- Under the *With Existing Measures* scenario, emissions from the energy industries sector are projected to decrease by 50% from 10.3 to 5.2 Mt CO_2 eq over the period 2021 to 2030 (Figure 8).
- This scenario projects Ireland reaching 68% of renewable electricity share by 2030. Renewable electricity generation capacity is dominated by wind energy, with solar and hydro sources also contributing to the mix.
- In terms of inter-connection, the *With Existing Measures* scenario has the Greenlink 500MW interconnector to the UK coming on stream in 2025 and the Celtic 700MW interconnector to France coming on stream in 2027.

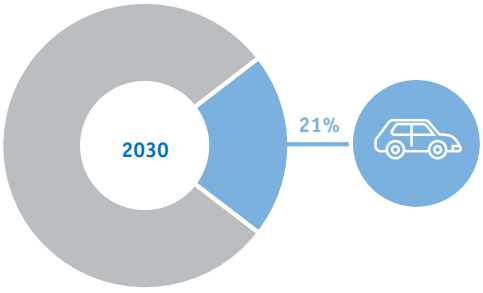
With Additional Measures scenario

- Under the *With Additional Measures* scenario, emissions from the energy industries sector are projected to decrease by 60% from 10.3 to 4.2 Mt CO_2 eq over the period 2021 to 2030 (Figure 8), a decrease of 1.0 Mt CO_2 eq more than the WEM scenario.
- In this scenario it is assumed that by 2030 renewable electricity share increases to at least 80% (as set out in the Climate Action Plan 2023). This is mainly a result of further and rapid expansion in wind energy (comprising 7.8 GW onshore and 5 GW offshore). A large expansion of other renewables (such as solar photovoltaics increasing to 6 GW by 2030) is also assumed under this scenario.
- A total of 1.7 GW storage is to be in place by 2030 in the WAM scenario, including Turlough Hill pumped storage.
- Production of up to 5.7 TWh of Biomethane by 2030 is included in the WAM scenario.
- 1.2 GW of new flexible gas fired generation is included in the WAM scenario.

Figure 8: Greenhouse Gas Emissions Projections from the Energy Industries Sector under the *With Existing Measures* and *With Additional Measures* scenarios out to 2030



5.2 Transport



The main source of emissions from the transport sector is road transport. Freight transport energy demand is strongly influenced by the level of commercial activity in the economy. Personal transport energy demand is significantly influenced by both the level of employment as well as the oil price. This sector also includes combustion of fuel used in rail, navigation, domestic aviation and pipeline gas transport. This sector is projected to contribute to 21% of Ireland's total emissions by 2030 in the *With Existing Measures* scenario.

The main policy instruments impacting transport emissions are the move from diesel and petrol to electric vehicles and a mix of renewable fuels in petrol and diesel at the pumps. Both scenarios have differing levels of ambition in terms of biofuel and electric vehicle targets. There is also increased ambition in terms of avoiding transport emissions and moving to sustainable transport in the WAM scenario.

The latest Projections indicate that the share of total road transport CO_2 emissions from Heavy Duty Vehicles (HDVs) and Light Goods Vehicles (LGVs) is projected to increase from approximately 35% pre-COVID to up to 57% by 2030, and 74% by 2040 in the *With Additional Measures* Scenario (WAM). This is as a result of continued projected growth in demand for freight transport services as well as faster mitigation of passenger transport emissions.

Figure 9 shows the trend in emissions from Transport in the WEM and WAM scenarios. The WEM and WAM projections from 2022 to 2030 are described below.

With Existing Measures scenario

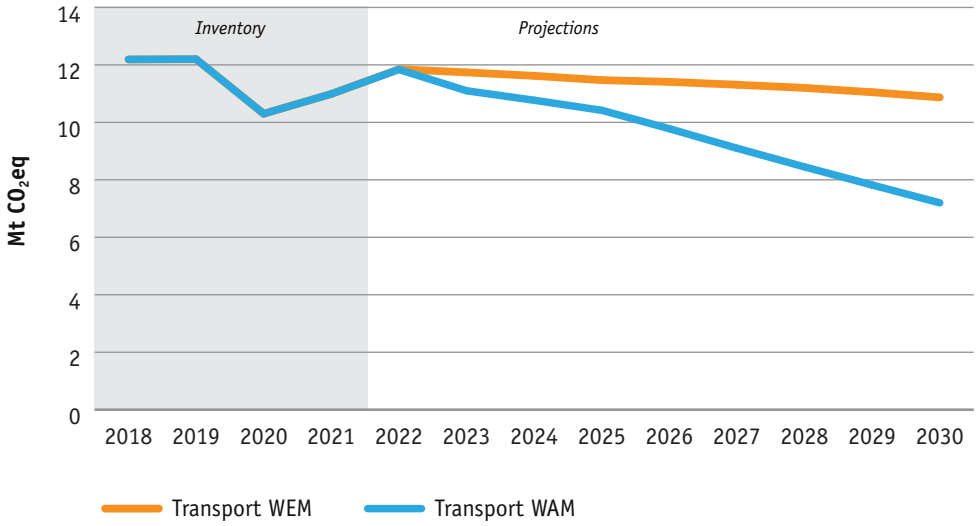
- Under the *With Existing Measures* scenario, transport emissions are projected to decrease by 1% over the period 2021-2030 from 10.9 to 10.8 Mt CO_2 eq.
- The Biofuel Obligation Scheme places an obligation on fuel suppliers to blend an increasing percentage of biofuel with their fuel. For road transport in the WEM scenario a 10% blend for petrol and a 12% blend for diesel at the pumps by 2030 is assumed. A statutory target of approximately 12% biofuel applies from 1 January 2020.
- In terms of the uptake of Electric Vehicles, the *With Existing Measures* scenario assumes approximately 554,000 electric vehicles on the road by 2030. This includes approximately 404,000 passenger battery electric vehicles and 89,000 passenger plug in hybrid electric vehicles.
- The WEM scenario includes an additional 500,000 public transport and active travel journeys by 2035 and the impact of transport infrastructure projects such as the DART Expansion and BusConnects programmes.

With Additional Measures scenario

- Under the *With Additional Measures* scenario, transport emissions are projected to decrease by 35% over the period 2021 to 2030 from 10.9 to 7.2 Mt CO_2 eq (see Figure 9).
- For the *With Additional Measures* scenario, it is assumed that incremental increases will occur in the Biofuel Obligations Scheme with 10% blend for petrol and a 20% blend for diesel at the pumps by 2030.
- This scenario assumes 943,500 electric vehicles on the road by 2030, as a result of the implementation of the Climate Action Plan 2023. This includes 845,000 private electric vehicles, and 95,000 commercial electric vehicles.
- This scenario also includes a 20% reduction in total vehicle kilometers to be achieved by behavioural and sustainable policies and measures outlined in the Climate Action Plan 2023, such as a 50% increase in daily active travel journeys and a 130% increase in daily public transport journeys.
- The impact of transport infrastructure projects such as the DART Expansion and BusConnects programme is also included in the WAM scenario.

The extent of the impact of ambitious additional policies and measures in the Climate Action Plan 2023 over the period can be seen in Figure 9, as well as the significant impact of COVID restrictions on transport emissions in 2020 and the rebound in 2021.

Figure 9: Greenhouse Gas Emissions Projections from the Transport Sector under the *With Existing Measures* and *With Additional Measures* scenarios out to 2030

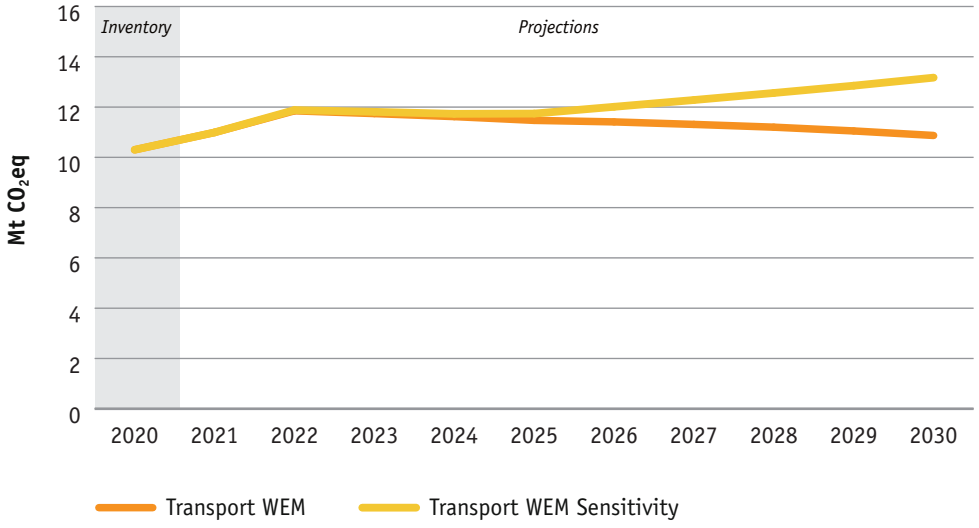


Sensitivity Analysis

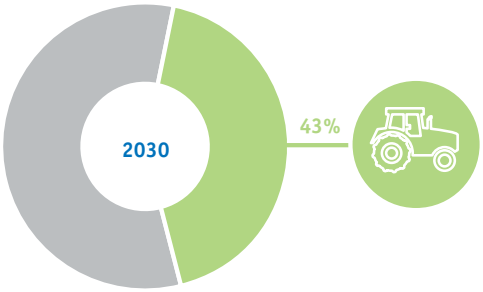
A sensitivity analysis involves modelling how much projection results change when key parameters are varied. Different sensitivity analyses can be performed to examine the effects that various economic and policy impacts could have on the projected emissions. Performing sensitivity analyses is also a part of producing projections in compliance with EU reporting requirements.

A sensitivity analysis of the *With Existing Measures* emissions scenario has been undertaken for the transport emissions projections based on alternative projected activity data – in this case reflecting lower fossil fuel prices. The resulting alternative scenario is presented in Figure 10 alongside the WEM scenario. It shows that lower fossil fuel prices would likely lead to higher emissions over the projected period.

Figure 10: Sensitivity assessment of the Transport Sector under the *With Existing Measures* scenario out to 2030



5.3 Agriculture



Agriculture sector emissions arise from enteric fermentation (methane emissions arising from digestive process in livestock), manure management and nitrogen and urea application to soils. In addition, fuel combustion from agriculture, forestry and fishing is included. This sector contributed 38% of Ireland's total emissions in 2021 and is projected to rise to 43% by 2030 (in the *With Existing Measures* scenario). The WEM and WAM projections from 2022 to 2030 are described below and the projected trajectory for both scenarios is shown in Figure 11.

The data underpinning the agriculture projections are based on an updated analysis undertaken by Teagasc of the projected animal populations, crop areas and fertiliser use which are aligned with University of Missouri Food and Agricultural Policy Research Institute (FAPRI) Projections (September 2022) for medium term developments in EU and World agricultural commodity markets. Teagasc assume that agricultural policy continues as currently implemented and the Trade and Cooperation (Brexit) Agreement (TCA) reached between the EU and the UK governs UK-EU trade for the period to 2030.

With Existing Measures scenario

- Total emissions from agriculture (including fuel used in agriculture, forestry and fishing) are projected to decrease by almost 4% over the period 2021-2030 from 23.6 to 22.8 Mt CO_2 eq under the *With Existing Measures* scenario. The WEM scenario assumes that those measures for which there is legislative levers in place prior to the end of 2021 are included in the scenario.
- The Nitrates Action Programme includes actions on these measures such that all slurries on Nitrates derogation farms are required to be spread with Low Emission Spreading technologies (LESS). Current evidence shows that the use of LESS has penetrated to non-derogation farms. Therefore, the target of 90% of slurries spread by LESS by 2027 as per AgClimatise is applied.
- The target lime application of 2 Mt per annum by 2030 is reached (AgClimatise) including enhanced nutrient use efficiency as a result.
- The use of inhibited urea fertiliser remains at current levels.

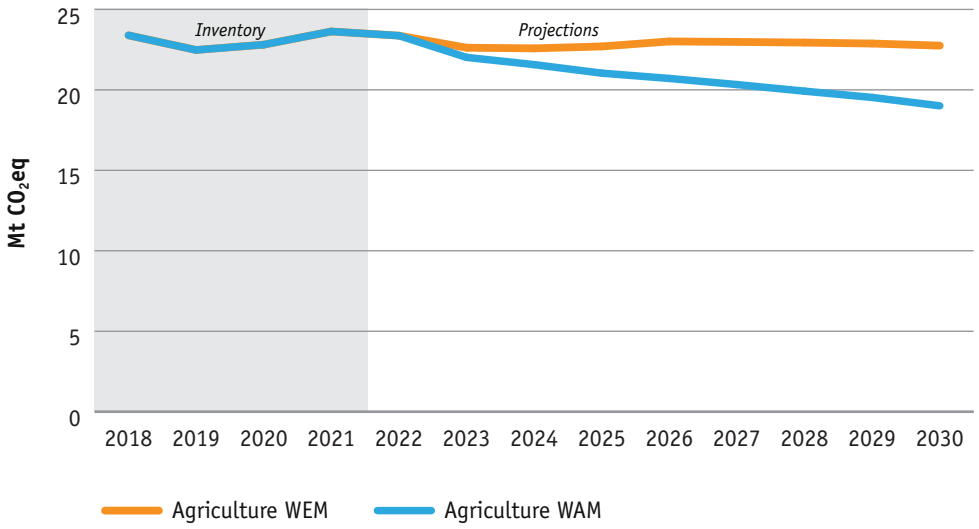
With Additional Measures scenario

- Under the *With Additional Measures* scenario emissions are projected to decrease to 19 Mt CO_2 eq by 2030 which is an almost 20% reduction over the period 2021 to 2030. The WAM scenario assumes the WEM measures plus the measures outlined in Climate Action Plan 2023, the Teagasc GHG MACC, AgClimatise and Teagasc NH_3 MACC are in place, these are:
- Reduction in crude protein in pig diets;
- Use of slurry amendments for cattle and pigs
- All slurry stores (cattle and pig) to be covered by 2027
- Drying of poultry manure
- Use of low emission slurry spreading techniques for pig slurry

- Replace 65% of CAN and NPK fertiliser products with inhibited urea fertiliser by 2030
- Target fertiliser sales at 350 kt N by 2025 and 300 kt N by 2030.
- Methane reduction measures: slurry additives to reduce methane emissions, reduced slaughter age for cattle, reduced age to first calving, feed additives (cattle), dairy economic breeding index (EBI) optimisation.

As outlined in Section 3.1 above, diversification measures mentioned in table 16.6 in the Climate Action Plan 2023 have not yet been included and further information is required on the effects they may have on the measures outlined above.

Figure 11: Greenhouse Gas Emissions Projections from the Agriculture Sector under the *With Existing Measures* and *With Additional Measures* scenarios out to 2030



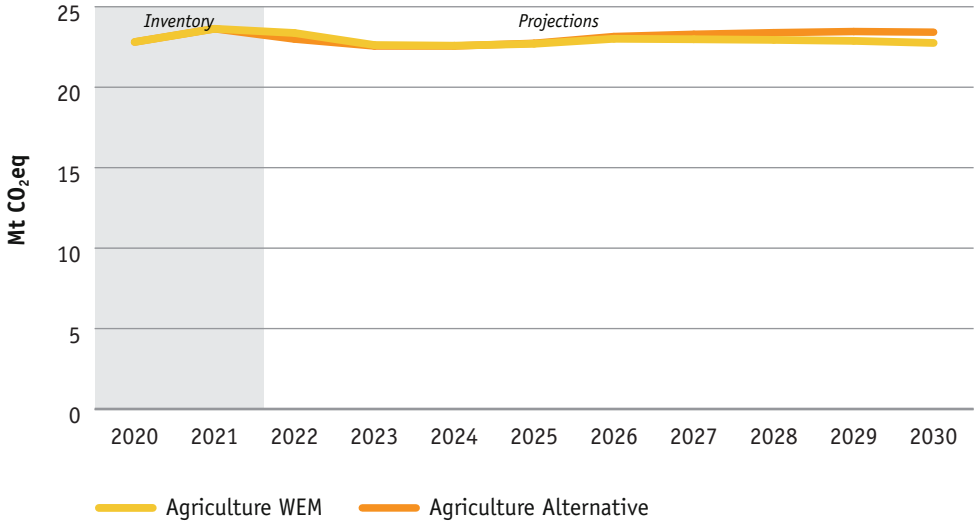
Sensitivity Analysis

A sensitivity analysis of the *With Existing Measures* emissions scenario has been undertaken for the agriculture emissions projections based on alternative projected activity data that assumes stronger growth in agricultural activity levels. The resulting alternative scenario is described in more detail below and presented in Figure 12 alongside the WEM scenario. It shows that stronger growth would likely lead to higher emissions over the projected period.

The assumptions for the sensitivity scenario (stronger growth in agricultural activity levels) are described below.

The sensitivity scenario examines the consequences of continued strong growth in the dairy herd accompanied by beef cow herd that is projected to contract at a slower rate than the rate of decline observed since the end of the milk quota regime in 2015. Under this sensitivity scenario, with stronger milk prices, Irish dairy cow numbers are projected to increase. Dairy cow numbers in 2030, under the sensitivity scenario, are projected to reach 1.756 m. This represents an 12% increase relative to 2022.

Figure 12: Sensitivity assessment of the Agriculture Sector under the *With Existing Measures* scenario out to 2030

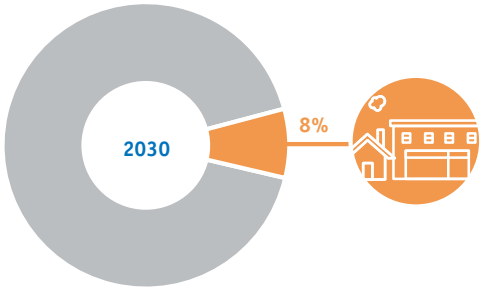


In addition, the provision of coupled direct payments linked to suckler cows from 2022 onwards slows the projected rate of decline in the Irish beef cow inventory. By 2030, under the sensitivity scenario, Irish beef cow numbers are projected to be 0.748 m. This represents an 16% decrease relative to 2022. As the dairy share of the total cattle population increases the higher stocking rate is reflected in a higher level of nitrogen use per hectare. In 2030 the total use of nitrogen is projected to be 419,546 tonnes. This represents a 22% increase relative to the observed levels of use in 2022.

By 2030 Irish ewe and total sheep numbers are projected to decline 16% relative to 2022 due to greater competition for land from other grassland enterprises (milk and beef production). Pig and poultry production are assumed to stay the same as the WEM scenario. Total cropland area is projected to decrease 11% over the period 2022 to 2030 at a higher rate than the WEM due to the higher profitability of land use in dairy production systems.

5.4 Residential

Emissions from the Residential Sector arise from fuel combustion for domestic space and hot water heating such as natural gas, oil, coal and peat. Residential energy demand is influenced by the weather and fuel prices. There was a reduction of 6% in Residential emissions between 2020 and 2021 due to the ending of COVID restrictions. This sector contributed 11% of Ireland's total emissions in 2021. By 2030 emissions from the residential sector are projected to reduce to 8% of Ireland's total emissions (in the *With Existing Measures* scenario). The WEM and WAM projections from 2022 to 2030 are described below.



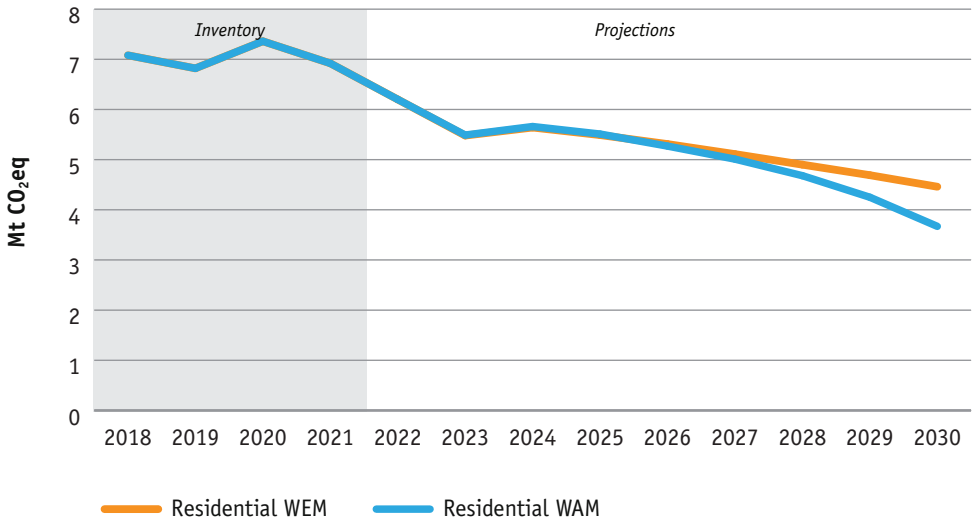
With Existing Measures scenario

- Under the *With Existing Measures* scenario, emissions from the residential sector are projected to decrease by 36% between 2021 and 2030 from 6.9 to 4.5 Mt CO_2 eq (Figure 13).
- The *With Existing Measures* scenario assumes heat pump uptakes based on grant rates funded by National Development Plan 2021-2030 allocation (annual delivery in line with estimated funding allocation) and a ban on oil boilers (from 2022) and gas boilers (from 2025) in new dwellings.
- The *With Existing Measures* scenario also assumes implementation of a range of residential energy efficiency programmes also in line with the National Development Plan and the impact of building regulations. These programmes provide funding for renewable heating systems, attic and wall insulation and other energy efficiency upgrades for private households and communities.
- This scenario includes the completion of two district heating schemes currently under development that could produce 0.07 TWh by 2030.

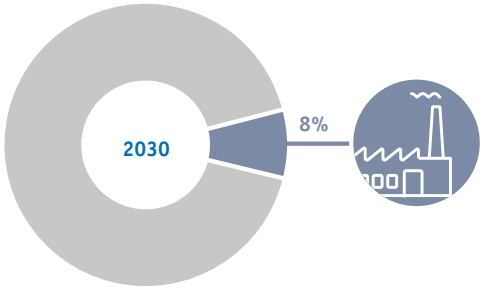
With Additional Measures scenario

- Under the *With Additional Measures* scenario, emissions are projected to decrease by 47% between 2021 and 2030 from 6.9 to 3.7 Mt CO_2 eq (Figure 13). This scenario assumes full implementation of the relevant measures in the Climate Action Plan 2023, these include:
  - The installation of 680,000 heat pumps by 2030 (400,000 in existing homes and 280,000 in new homes).
  - Residential Energy Efficiency programmes involving upgrades to homes, and retrofits to achieve the cost optimal equivalent of a BER 'B2' rating in 500,000 dwellings by 2030;
  - As indicated in the Climate Action Plan 2023; a total of 5.7TWh of biomethane use across the heat sector by 2030 (split between Residential, Commercial/Public Services and Industry);
  - This scenario includes district heating growth to 1.2TWh in 2030 in the Residential sector. The remaining 1.5 TWh of the full 2.7TWh outlined in the Climate Action Plan 2023 is allocated to the Commercial and Public Services Sector (see Section 5.6).
  - An effective ban on fossil fuel boilers in existing residential buildings after 2030 based on advancing the energy and carbon performance requirements of the Building Regulations as indicated in the Climate Action Plan 2023.

Figure 13: Greenhouse Gas Emissions Projections from the Residential Sector under the *With Existing Measures* and *With Additional Measures* scenarios out to 2030



5.5 Manufacturing Combustion



Emissions from this sector arise from fuel combustion used in manufacturing industries in Ireland. It also includes combustion for combined heat and power systems for own-use in these industries. Fuel combustion in manufacturing contributed 7% of Ireland's total emissions in 2021. This is projected to increase to 8% in 2030 (in the *With Existing Measures* scenario).

The projected trajectory of emissions from the manufacturing combustion sector from 2022 to 2030 is shown in Figure 14. The WEM and WAM projections are described below.

With Existing Measures scenario

Under the *With Existing Measures* scenario, emissions from manufacturing combustion are projected to reduce by 6% between 2021 and 2030, from 4.6 to 4.4 Mt CO_2 eq (Figure 14).

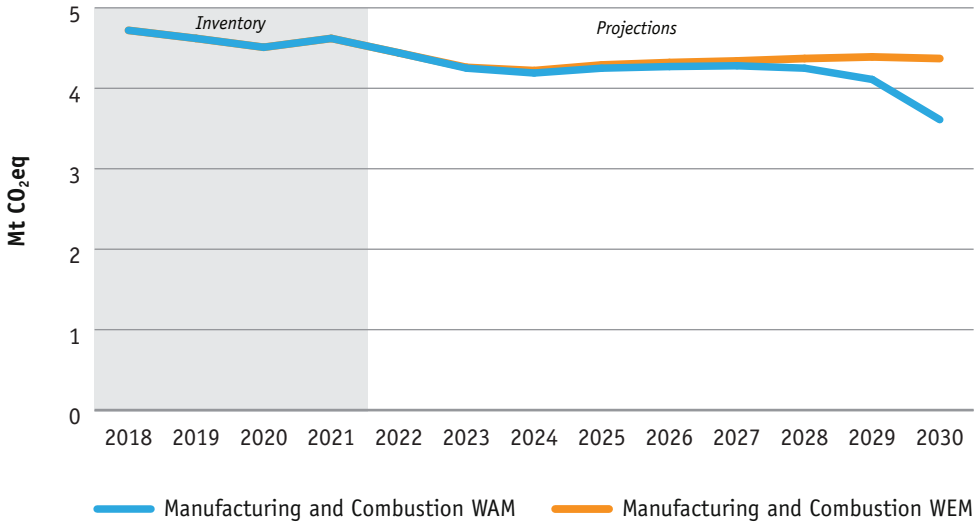
- This scenario assumes implementation of existing energy efficiency programmes such as SEAI's Large Industry Programme (to maintain strong energy management and environmental protection practices in industry), Accelerated Capital Allowances programme (aims to improve the energy efficiency of Irish companies by encouraging them to purchase energy saving technologies) and the Excellence in Energy Efficiency Design programme (EXEED), a process for energy efficiency design management in businesses.

With Additional Measures scenario

Under the *With Additional Measures* scenario, emissions from manufacturing combustion are projected to decrease by 22% from 4.6 to 3.6 Mt CO_2 eq between 2021 and 2030 (Figure 14). This scenario assumes further roll out of energy efficiency programmes including those listed above. It also includes:

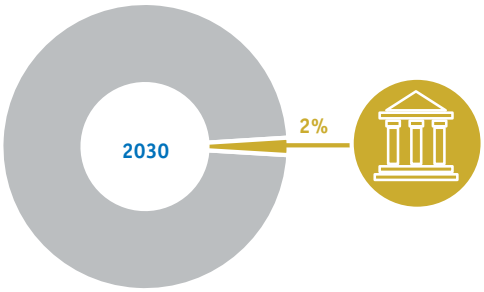
- As indicated in the Climate Action Plan 2023; a total of 5.7TWh of biomethane use across the heat sector by 2030 (split between Residential, Commercial/Public Services and Industry)
- An increase in carbon-neutral heating in low and high temperature heat in Manufacturing and Industry.

Figure 14: Greenhouse Gas Emissions Projections from the Manufacturing Combustion Sector under the *With Existing Measures* and *With Additional Measures* scenarios out to 2030



5.6 Commercial and Public Services

Emissions from the Commercial and Public Services Sector arise from fuel combustion for space and hot water heating. This sector contributed 2% of Ireland's total emissions in 2021 and is projected to maintain this proportion out to 2030 (in the *With Existing Measures* scenario). The projected trajectory of emissions from the commercial and public services sector from 2022 to 2030 is shown in Figure 15. The WEM and WAM projections are described below.



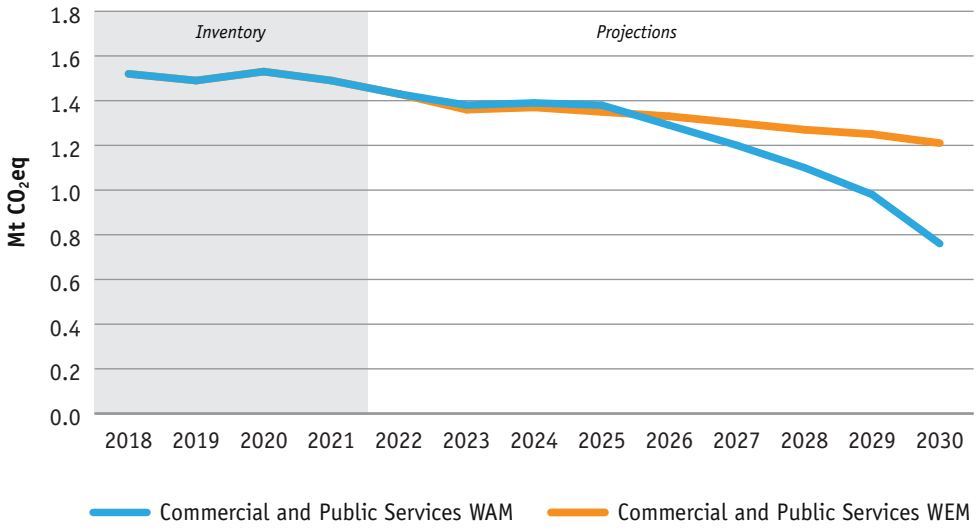
With Existing Measures scenario

- Under the *With Existing Measures* scenario, emissions from the commercial and public services sector are projected to decrease by 19% between 2021 and 2030 from 1.5 to 1.2 Mt CO_2 eq (Figure 15).
- This scenario assumes implementation of a range of energy efficiency programmes including retrofit of public building stock, with a focus on decarbonisation through schemes such as the Support Scheme for Renewable Heat and Public Sector Capital Exemplars.

With Additional Measures scenario

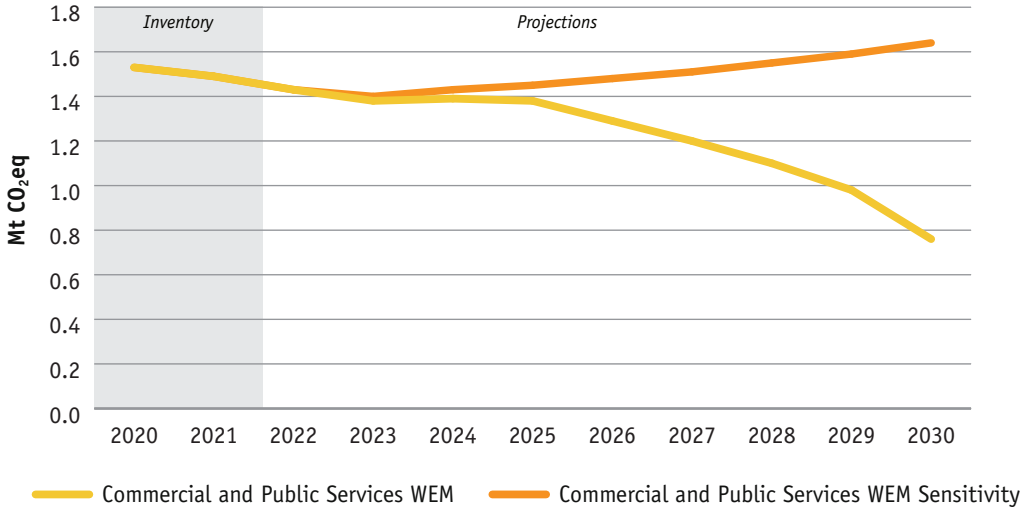
- Under the *With Additional Measures* scenario, emissions from the commercial and public services sector are projected to decrease by 49% between 2021 and 2030 from 1.5 to 0.8 Mt CO_2 eq (Figure 15).
- This scenario also assumes implementation of a range of energy efficiency programmes including the retrofit of public building stock and commercial buildings with a focus on decarbonisation and the Energy Performance Contract scheme (introduced from 2024 to 2030).
- As indicated in the Climate Action Plan 2023; a total of 5.7TWh of biomethane use across the heat sector by 2030 (Residential, Commercial/Public Services and Industry).
- This scenario includes district heating growth to 1.5TWh in 2030 in the Commercial and Public Services sector. The remaining 1.2 TWh of the full 2.7TWh outlined in the Climate Action Plan 2023 is allocated to the Residential Sector (see Section 5.4).
- An effective ban on fossil fuel boilers in new non-residential buildings after 2030 based on advancing the energy and carbon performance requirements of the Building Regulations as indicated in the Climate Action Plan 2023.

Figure 15: Greenhouse Gas Emissions Projections from the Commercial and Public Services Sector under the *With Existing Measures* and *With Additional Measures* scenarios out to 2030



A sensitivity analysis of the Commercial and Public Services sector *With Existing Measures* emissions scenario has been undertaken based the impact of higher demand growth in energy use in datacentres[21]. The resulting alternative scenario is presented in Figure 16 alongside the WEM scenario. It shows that increased demand in data centres would likely lead to higher emissions over the projected period.

Figure 16: Sensitivity assessment of the Commercial and Public Services Sector under the *With Existing Measures* scenario out to 2030



21 The activity data for datacentre demand was extrapolated from the Eirgrid Ireland Capacity Outlook 2022-2031 report EirGrid_SONI_Ireland_Capacity_Outlook_2022-2031.pdf (eirgridgroup.com).

5.7 Industrial Processes and Waste

The Industrial Processes and Waste sectors contributed 4% and 2% of Ireland's total emissions in 2021 respectively. There is only one scenario (*With Existing Measures*) for greenhouse gas emissions projections from these sectors based on available data.

- Emissions from Industrial Processes include process emissions from mineral, chemical, metal industries, non-energy products and solvents. Emissions are projected to increase by 5% between 2021 and 2030 from 2.5 to 2.6 Mt CO_2 eq. The majority of emissions come from the production of cement and lime and the projections are based on growth forecasts from the cement industry in Ireland.
- Waste sector emissions are projected to decrease by 18% between 2021 and 2030 from 0.9 to 0.8 Mt CO_2 eq. The waste sector includes landfill, incineration and open burning of waste, mechanical and biological treatment and wastewater treatment. Emissions are primarily attributable to methane emissions from landfill which reduce over the projected period in line with the projected reduction in waste going to landfill and the age of the waste already there. The amount of landfill gas flared and utilised for energy production is 58% in 2021 and is projected to decrease to 51% in 2030 and 40% by 2050 in line with more recent trends in the latest inventory. Ireland's landfill rate for municipal waste dropped to 16% in 2020, reflecting a steep decline from 58% in 2010 and is on track to comply with the Landfill Directive target of less than 10% of Municipal waste landfilled by 2035.

5.8 Fluorinated-gases

Fluorinated gases (F-gases) accounted for 1% of Ireland's total national greenhouse gas emissions in 2021. The key sources of fluorinated gas emissions in Ireland are production, use and disposal of equipment containing these fluids (e.g. refrigerators, mobile air conditioning systems, heat pumps and electrical switch-gear).

With Existing Measures scenario

Fluorinated-Gas (F-Gas) emissions are projected to decrease by 16% from 0.8 to 0.6 Mt CO_2 eq between 2021 and 2030 under the *With Existing Measures* scenario. This is largely due to the move away from mobile air-conditioning systems in vehicles that contain F-Gases with a high global warming potential.

With Additional Measures scenario

Emissions are projected to reduce by 14% between 2021 and 2030 from 0.8 to 0.7 Mt CO_2 eq under the *With Additional Measures* scenario.

The results show that in the more ambitious WAM scenario fluorinated-gas emissions are slightly higher than in the WEM scenario by 2030. The reason for this is the different projected uptake rates in heat pumps in each scenario. In the WAM scenario the number of heat pumps being deployed annually is over double the number in the WEM scenario by 2030. The switch to lower Global Warming Potential gas (R32) in and heat pumps and air conditioning units over the projected period in the *With Additional Measures* scenario means that despite this large increase in heat pump numbers, the increase in GHG emissions is small.

5.9 Land use, Land use Change and Forestry (LULUCF)

The LULUCF sector is made up of six land use categories (Forest Land, Cropland, Grassland, Wetlands, Settlements, and Other Land) and Harvested Wood Products. In 2021 this sector accounted for 10.5% of national total emissions (including LULUCF). These categories are sub-divided into land remaining in the same category (e.g. Forest land remaining forest land) and land converted from one category into another (e.g. grassland converted to forest land).

LULUCF historically has not been included in the published national emission totals unless explicitly stated but is reported in submissions to the EU and the United Nations. It's inclusion as a sector for the first time in this projections report reflects the inclusion of the LULUCF sector within scope of Ireland's Carbon Budgets.

With Existing Measures scenario

The *With Existing Measures* scenario assumes that Measures for which there are legislative levers in place prior to the end of 2021 are included, these are:

- Savings associated with Bord na Móna rewetting/restoration/rehabilitation under the Peatlands Climate Action Scheme (PCAS) are included but rewetting/water-table management on drained agricultural land is not.
- The WEM scenario also assumes that afforestation rates are consistent with current practice.

It is projected that the LULUCF sector will have net emissions by 2030 of 9.7 Mt CO_2 eq, an increase of 31.7% compared to 2021, due largely to expected forest harvesting given the age of the forest estate.

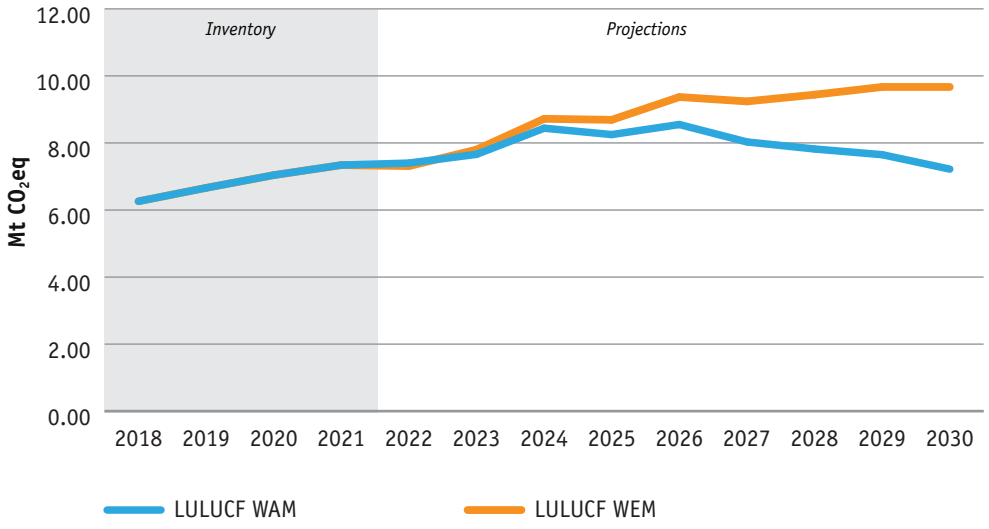
With Additional Measures scenario

The WAM scenario assumes that the measures outlined in the Climate Action Plan (2023) are implemented, including;

- Afforestation rates increased to 8,000 hectares per annum;
- Water table management on 80,000 hectares of grassland on drained organic soils and improved management of grassland on mineral soils.
- Use of cover crops and straw incorporation on cropland
- Additional wetlands rewetted/restored/rehabilitated over and above those included in PCAS

In the WAM scenario, net emissions in 2030 are projected to be 7.2 Mt CO_2 eq, a decrease of 1.6% compared to 2021 with wetland and grassland rewetting and water-table management playing a mitigation role counteracting the impact of expected forest harvesting.

Figure 17: Greenhouse Gas Emissions Projections from the LULUCF Sector under the *With Existing Measures* and *With Additional Measures* scenarios out to 2030



Appendix – Underlying Assumptions and Additional Data

Two emissions projections scenarios are presented which show two potential outlooks to 2040 depending on policy development and implementation. These are called:

- *With Existing Measures*
- *With Additional Measures*

The *With Existing Measures* (WEM) scenario is based primarily on SEAI's Baseline energy projection which incorporates the anticipated impact of policies and measures that were in place (and legislatively provided for) by the end of 2021.

The *With Additional Measures* (WAM) scenario is based primarily on SEAI's energy projection that accounts for implementation of the *With Existing Measures* scenario as well as planned policies and measures.

Energy demand projections underpinning the latest emissions projections were prepared by SEAI in conjunction with the Economic and Social Research Institute (ESRI). The ESRI produce energy demand projections using the I3E model (Ireland Environment, Energy and Economy model[22]). Future international fossil fuel prices are given as input to the I3E model. In the case of the energy related projections described in this document the fuel price assumptions use European Commission recommended harmonised trajectories. A varying carbon tax that increases by €7.50 per annum and reaches €100 per tonne by 2030 is used in both scenarios. Post 2030. the carbon tax remains constant at €100 per tonne.

The recommended EU-ETS carbon prices are based on the EU Reference Scenario. The software used to model the Irish Electricity Market is PLEXOS which is a power systems modelling tool used for electricity market modelling and planning.

To produce the finalised WEM energy projections, SEAI amends the output of the energy demand produced by ESRI to take account of the expected impact of energy efficiency measures put in place before the end of 2021 but which are considered too recent to be detectable in any time-series analysis. The WAM energy projections builds on the WEM projections with adjustments made to account for implementation of additional policies and measures outlined in the Climate Action Plan 2023.

Key parameters underlying the macroeconomic outlook and therefore the *With Existing Measures* and *With Additional Measures* emission projections scenarios are shown in Table A.1.

22 https://www.esri.ie/current-research/the-i3e-model

Table A.1 Key macroeconomic assumptions underlying the projections out to 2040

	2022	2025	2030	2035	2040
	Average Annual % Growth Rate				
GNI*	-3.8	3.4	3.3	3.3	3.3
	2022	**2025**	**2030**	**2035**	**2040**
Housing Stock ('000)	1,913	1,998	2,168	2,311	2,452
Population ('000)	4,933	5,052	5,257	5,471	5,694
EU-ETS: Carbon €/tCO_2	75	80	80	82	85
Carbon tax €/tCO_2 (WEM Scenario)	41	63.5	100	100	100
Coal €/toe	220	128	130	131	139
Oil €/toe	643	643	643	643	680
Gas €/toe	1391	554	473	473	473
Peat €/MWh	25	25	25	25	25

The following is the expected progress by 2030 in terms of Renewable Energy targets under the *With Existing Measures* Scenario:

- 67.5% renewable electricity (RES-E) share
- 22.9% renewable heat (RES-H) share
- 14.9% renewable transport (RES-T) share
- 31.4% Overall Renewable Energy (RES) share

The following is the expected progress by 2030 in terms of Renewable Energy targets under the *With Additional Measures* Scenario:

- 82.0% renewable electricity (RES-E) share
- 37.4% renewable heat (RES-H) share
- 26.7% renewable transport (RES-T) share
- 45.3% Overall Renewable Energy (RES) share

The above information is based on model input assumptions underpinning the energy projections provided by the SEAI.

The data underpinning the agriculture projections are based on an updated analysis undertaken by Teagasc of the projected national herd population, crop areas and fertiliser use which are aligned with University of Missouri Food and Agricultural Policy Research Institute (FAPRI) Projections (September 2022) for medium-term developments in EU and World agricultural commodity markets. Furthermore, agricultural policy continues as currently agreed and the Trade and Cooperation (Brexit) Agreement (TCA) reached between the EU and the UK governs UK-EU trade for the period to 2031.

The breakdown of historical and projected emissions for the Effort Sharing Regulation (ESR) and EU-ETS sectors (Mt CO2 eq) under the With Existing Measures and With Additional Measures scenarios is shown in Table A.2

Table A.2: Historical and projected emissions for the ESR and EU-ETS sectors (kt CO_2 eq) for *With Existing Measures* and *With Additional Measures*

		ESR sector	EU-ETS sector	Total
Historical	**2005**	49,198	22,333	71,531
	2010	45,710	17,322	63,032
	2015	44,909	16,815	61,724
	2020	45,798	13,258	59,056
Projected				***With Existing Measures* scenario**
	2022	46,638	14,492	61,129
	2025	44,820	13,176	57,996
	2030	42,812	10,055	52,867
	2035	40,396	10,745	51,140
	2040	38,374	9,507	47,880
				***With Additional Measures* scenario**
	2022	46,639	14,487	61,126
	2025	42,117	12,388	54,505
	2030	33,909	8,590	42,500
	2035	30,769	8,972	39,741
	2040	27,549	7,182	34,731

Sectoral Breakdown

Ireland's Greenhouse Gas Emission Sectors are categorised as the following for analysis:

1. Energy Industries (electricity generation, waste to energy incineration, oil refining, briquetting manufacture and fugitive emissions);
2. Residential (combustion for domestic space and hot water heating);
3. Manufacturing Combustion (combustion for Manufacturing industries in EU-ETS and ESR);
4. Commercial and Public Services (combustion for Commercial and Public Services space and hot water heating);
5. Transport (combustion of fuel used in road, rail, navigation, domestic aviation and pipeline gas transport);
6. Industrial Processes (process emissions from mineral, chemical, metal industries, non-energy products and solvents);
7. F-Gases (gases used in refrigeration, air conditioning and semiconductor manufacture);
8. Agriculture (emissions from fertiliser application, ruminant digestion, manure management, agricultural soils and fuel used in agriculture/forestry/fishing);
9. Waste (emissions from solid waste disposal on land, solid waste treatment (composting), wastewater treatment, waste incineration and open burning of waste).

Models Used

Further details on the models used for preparing the energy projections (i.e. I3E, Plexos Integrated Energy Model, SEAI National Energy Modelling Framework, SEAI BioHeat Model) are included in the 2023 submission made under Article 18 of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action. This is available in relevant 2023 submission folders at the following link: https://reportnet.europa.eu/public/dataflows

An Ghníomhaireacht um Chaomhnú Comhshaoil

Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

- **Rialú:** Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.
- **Eolas:** Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.
- **Tacaíocht:** Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.

Ár bhFreagrachtaí

CEADÚNÚ

Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:

- saoráidí dramhaíola (m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- an diantalmhaíocht (m.sh. muca, éanlaith);
- úsáid ghlanscartha agus scaoileadh rialaithe Orgánach Géinmhodhnaithe (OGanna);
- foinsí radaíochta ianúcháin (m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha);
- áiseanna móra stórála peitril;
- sceitheadh fuíolluisce;
- gníomhaíochtaí dumpála ar farraige.

FORFHEIDHMIÚ NÁISIÚNTA I LEITH CÚRSAÍ COMHSHAOIL

- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus gníomhaireachtaí eile chun dul i ngleic le coireacht chomhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, díriú ar chiontóirí, agus maoirsiú a dhéanamh ar fheabhsúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (WEEE), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

BAINISTÍOCHT UISCE

- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchreasa agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus áitiúil (m.sh. tuairisciú tréimhsiúil ar Staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí).
- Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn
- Fardail agus réamh-mheastacháin na hÉireann maidir le gás ceaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn (m.sh. mórphleananna forbartha).

COSAINT RAIDEOLAÍOCH

- Monatóireacht a dhéanamh ar leibhéil radaíochta, agus measúnacht a dhéanamh ar a oiread is atá muintir na hÉireann gan chosaint ar an radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

TREOIR, FAISNÉIS INROCHTANA AGUS OIDEACHAS

- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol (m.sh. Timpeall an Tí, Mapaí Radóin).
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

MÚSCAILT FEASACHTA AGUS ATHRÚ IOMPRAÍOCHTA

- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

BAINISTÍOCHT AGUS STRUCHTÚR AN GCC

Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:

- An Oifig um Inbhuanaitheacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fhianaise agus Measúnú
- An Oifig um Chosaint Radaíochta agus Monatóireacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.