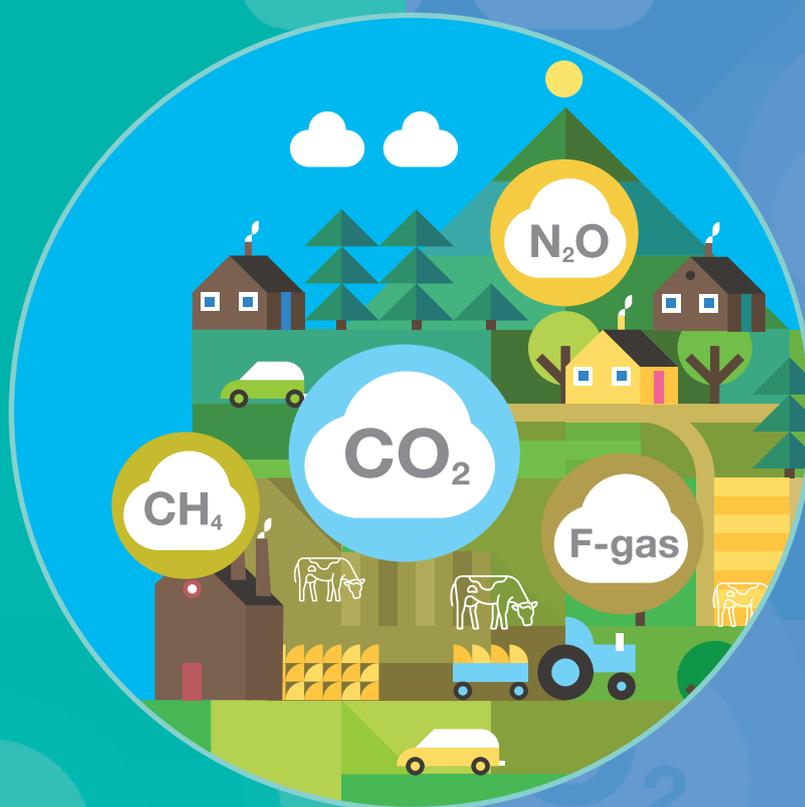


# Ireland's Greenhouse Gas Emissions Projections

2020-2040

June 2021



$\text{CH}_4$



$\text{CH}_4$

# 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.

## Table of Contents

Key Findings	2
1. Introduction	3
2. Approach	5
2.1 Methodology changes in the 2020-2040 projections	5
3. Key Trends – Emissions projections out to 2030	7
3.1 Energy Industries	9
3.2 Transport	10
3.3 Agriculture	12
3.4 Residential	15
3.5 Manufacturing Combustion	17
3.6 Commercial and Public Services	18
3.7 Emissions from Industrial processes and Waste	19
3.8 Fluorinated gas emissions	19
3.9 Cross-cutting Measures	20
4. Projected performance against targets under the National Policy Position	21
5. Projected performance relative to EU 2020 and 2030 Targets – Non ETS Emissions	22
6. Conclusion	25
Appendix – Underlying assumptions and additional data	26

## Key Findings

<p><b>Almost 2% per year annual emissions reduction</b></p>	<p>Implementation of "Additional Measures" (including those in the 2019 Climate Action Plan) is projected to save 58 Mt CO<sub>2</sub> eq over the period 2021-2030 compared to the "With Existing Measures". This represents a reduction of 1.8% per annum in emissions over the period.</p>
<p><b>2020 targets</b></p>	<p>Ireland's emissions covered by the 2013-2020 EU Effort Sharing Decision target are estimated to have been 7% below 2005 levels in 2020. Ireland is estimated to have cumulatively exceeded its compliance obligations by 12.2 Mt CO<sub>2</sub> eq over the 2013-2020 period, and will need to use credits and/or purchase surplus annual emission allocations from other member states to achieve compliance.</p>
<p><b>2030 targets</b></p>	<p>These Projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 to 2030 assuming full implementation of the 2019 Climate Action Plan and the use of the flexibilities available. Future, more ambitious targets as presented in the European Climate Law and Ireland's Climate Bill will require many (as yet unidentified) additional measures.</p>
<p><b>Decarbonising electricity generation</b></p>	<p>Increased renewable electricity generation, including a projected 5GW of offshore wind generation, is expected to contribute to a 70% contribution of renewable energy in electricity generation by 2030. Energy industries emissions are projected to decrease by one third by 2030 compared to the most recent figures in 2019.</p>
<p><b>Early action in agriculture</b></p>	<p>Agriculture emissions are projected to decline by 1.2% per annum over the 2021-2030 period, provided the 16.5 Mt CO<sub>2</sub> eq savings from the agriculture sector identified in the 2019 Climate Action Plan are realised. Increase use of protected urea fertilisers and low emission slurry spreading, along with other measures targeting methane emissions from animals, will be required.</p>
<p><b>Avoiding post-COVID rebound in transport</b></p>	<p>The impact of COVID is projected to have led to a 14% reduction in transport emissions in 2020 compared to 2019. The measures in the 2019 Climate Action Plan include 936,000 electric vehicles on the road by 2030 and are projected to reduce emissions to 25.5% below 2019 levels by 2030. It will be necessary to avoid a post-COVID surge in emissions to achieve that reduction.</p>
<p><b>Energy efficient buildings</b></p>	<p>The projected impact of COVID in the residential sector in 2020 is an increase of almost 9% in emissions compared to 2019, driven by increased working from home. This highlights the need for our houses to become far more efficient, particularly in the context of broader home working. Implementing the 2019 Climate Action Plan measure for the installation of over 600,000 heat-pumps by 2030 as well as retrofitting 500,000 homes to a B2 equivalent BER will help achieve this.</p>
<p><b>COVID-19 impact and Green Recovery</b></p>	<p>A strong impact from COVID is seen in the emissions projections for 2020 and 2021. A decrease of transport emissions and increase in residential emissions are the most obvious effects projected. Agriculture emissions are projected to have been little affected and energy emissions decreases are not primarily COVID related. As the economy exits from COVID restrictions, a "green recovery" where investment is targeted at measures which reduce or avoid greenhouse gas emissions, can result in better outcomes for society and the environment.</p>
<p><b>Scale of ambition requires immediate action</b></p>	<p>The scale and pace of the changes needed to achieve the targets set out in the 2019 Climate Action Plan are significant, but the extent of change required to meet the Climate Bill and European Climate Law targets is unprecedented. Further ambitious measures in key sectors such as agriculture, transport and power generation will need to be identified, planned and implemented as soon as possible.</p>

# 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 to meet EU reporting obligations<sup>1</sup> and to inform national policy development.

This report provides an assessment of Ireland's total projected greenhouse gas emissions from 2020 to 2040, updated using the latest inventory data for 2019. The report also provides an assessment of Ireland's progress towards achieving its emission reduction targets for 2020 and 2030 as set out under the EU Effort Sharing Decision (ESD)<sup>2</sup> and Effort Sharing Regulation (ESR)<sup>3</sup>.

The EPA and SEAI published a joint report in January 2021 estimating the impact of COVID restrictions on 2020 greenhouse gas emissions<sup>4</sup>. These projections provide an update on this assessment using the latest data available, with the COVID impacts discussed on a sectoral basis in Chapter 3.

Projected emissions data is reported for the following gases: Carbon Dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>), Nitrous oxide (N<sub>2</sub>O) and F-gases<sup>5</sup>. Emissions are classified into nine sectors; Agriculture, Transport, Energy Industries, Residential, Manufacturing Combustion, Industrial Processes, F-Gases, Waste, Commercial and Public Services.

Preparing the EPA projections involves obtaining and processing key data sets such as energy projections (projected fuel sales), animal numbers and emissions from industry, businesses and homes in Ireland.

The EPA has produced two scenarios in preparing these greenhouse gas emissions projections; a *With Existing Measures* (WEM) scenario and a *With Additional Measures* (WAM) scenario. These scenarios forecast Ireland's greenhouse gas emissions in different ways. The WEM scenario assumes that no additional policies and measures, beyond those already in place by the end of 2019 (latest national greenhouse gas emission inventory), are implemented. The WAM scenario assumes that in addition to the existing measures, there is also full implementation of planned government policies and measures to reduce emissions such as those in the 2019 Climate Action Plan<sup>6</sup>. This Plan sets out a major programme of policies and measures aimed to help Ireland achieve its decarbonisation targets.

Ireland's 2020 target under the ESD is to achieve a 20% reduction on 2005 levels of non-Emissions Trading Scheme (non-ETS) sector emissions (agriculture, transport, residential, commercial, non-energy intensive industry, and waste). Annual binding limits are set for each year over the period 2013-2020. Ireland's 2030 target under the Effort Sharing Regulation (ESR) is a 30% reduction of emissions compared to 2005 levels by 2030. There are also annual binding limits over the 2021-2030 period to meet that target. Ireland's compliance status at 2020 and 2030 can only be determined when the 2020 inventory is compiled, but the Projections allow an early assessment of the likelihood of compliance and indicate what actions may need to be taken.

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

2 DECISION No 406/2009/EC of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

3 Regulation (EU) 2018/842 of 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

4 Monitoring & Assessment: Climate Change: Air emissions Publications | Environmental Protection Agency (epa.ie)

5 F-gases are Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF<sub>6</sub>), and Nitrogen Trifluoride (NF<sub>3</sub>)

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

In relation to 2020 EU targets, Ireland is set to miss its target for compliance with the ESD as our non-ETS emissions are projected to be 7% below 2005 levels in 2020 under both projected scenarios compared to the target of 20% below 2005 levels by 2020. In 2020 the sectors with the largest contribution of emissions are Agriculture (37.4%), Transport (18.4%) and Energy Industries (14.8%). This projection includes the impact of COVID on the 2020 emissions which due to national lockdowns saw Transport emissions decline but Agriculture emissions largely unaffected. Ireland is projected exceed the 2020 ESD targets despite the impact of the pandemic.

These Projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 to 2030 assuming full implementation of the 2019 Climate Action Plan and the use of the flexibilities available. In terms of the 2030 targets, the ESR provides two new flexibilities (use of ETS allowances and credit from action undertaken in the Land Use, Land Use Change and Forestry (LULUCF) sector) to allow for a fair and cost-efficient achievement of the targets. Ireland can potentially avail of up to 26.8 Mt CO<sub>2</sub> eq of credits under the latter flexibility, almost 10% of the total available under this flexibility across the EU. This is in recognition of the greater relative contribution of Agriculture to Ireland's emissions profile, and the challenges associated with emissions reductions from that sector. Our projections show that Ireland can meet its 2030 targets only with the use of both flexibilities and, crucially, full implementation of the 2019 Climate Action Plan.

The Climate Action and Low Carbon Development (Amendment) Bill 2021, when enacted, will set a 'national climate objective' to achieve a climate neutral economy no later than 2050 and a total reduction of 51% emissions over the period to 2030. Once the policies and measures have been identified to address these targets, they will be included in future emissions projections.

## 2. Approach

As described in the Introduction the EPA has produced the projected greenhouse gas emissions for 2020 to 2040 using two scenarios; *With Existing Measures* and *With Additional Measures*. Our analysis in Chapter 3 only focuses on projected emissions as far as 2030 as most currently known policies and measures don't extend beyond that date.

- The *With Existing Measures (WEM)* scenario assumes that no additional policies and measures beyond those already in place by the end of 2019 are implemented. This is the cut off point for which details of the latest national greenhouse gas emissions (known as the inventory), are available.
- The *With Additional Measures (WAM)* scenario assumes implementation of the *With Existing Measures* scenario in addition to implementation of planned government policies and measures adopted after the end of 2019. Importantly, this includes Ireland's 2019 Climate Action Plan<sup>6</sup>. This plan, published in June 2019, sets out a programme of policies and measures aimed to help Ireland achieve its decarbonisation goals.

These emissions projections take into account projected activity data provided by a number of key data providers including:

- Updated 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, particularly in relation to Climate Action Plan measures.
- Agricultural projections provided by Teagasc (Agriculture and Food Development Authority) which consider the impact of Food Wise 2025<sup>7</sup> for the agriculture sector. 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 and Teagasc.

### 2.1 Methodology changes in the 2020-2040 projections

A number of changes have been made to the approach used to produce these emissions projections compared to our previous assessment<sup>8</sup>. These changes include both updates to reflect newer source data, and methodological changes made to improve the accuracy and repeatability of the results. The EPA projections incorporate input data from other agencies, in addition to data sourced by the EPA directly from relevant Industries.

As a result of these methodological updates, there have been significant changes to this year's projections in Agriculture and Transport. The key changes made in preparation for the 2020-2040 projections are described below.

The SEAI uses a model developed by the Economic and Social Research Institute (ESRI) to produce the final energy demand projections. The energy demand is a key input into the EPA's work developing the projections. This model, called the "Ireland Environment, Energy and Economy" model (I3E) reproduces the structure of the economy in its entirety. The model is adjusted to take into account the projected impact of energy related policies and measures. This is the second year where the I3E model was used for the Energy

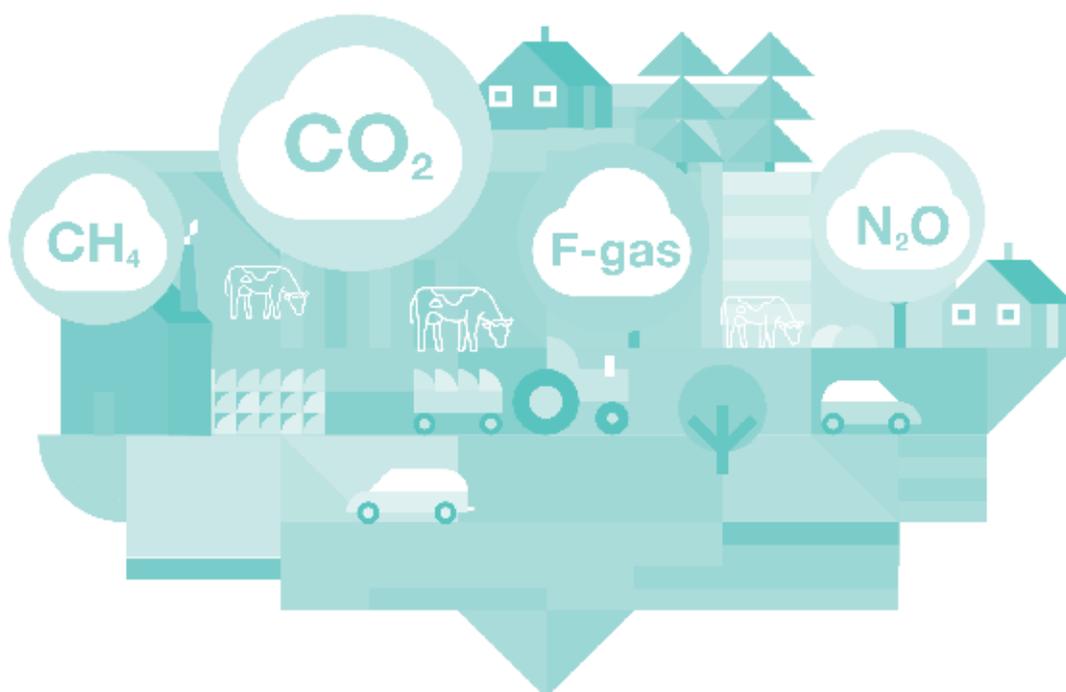
7 <https://www.gov.ie/en/publication/a6b0d-food-wise-2025>

8 <https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-greenhouse-gas-emissions-projections-2019-2040.php>

projections and as it continues to be further refined, adjustments are necessary to ensure alignment of energy demand outputs with econometric bottom up analysis. This particularly affects the Transport sector in these projections.

In Agriculture, the biggest change impacting the latest projections is the adoption of significant updates to the bovine methane model. These updates included new housing data, manure storage, slurry spreading, and animal feed data compiled by Teagasc and the Department of Agriculture.

The 2020-2040 projections also include some updates to the impact of new climate mitigation policies and measures announced in Ireland's Climate Action Plan, published in June 2019. This includes the impact of a carbon tax rising to €100 per tonne of CO<sub>2</sub> in 2030 in the *With Additional Measures* scenario and €80 per tonne in the *With Existing Measures* scenario.

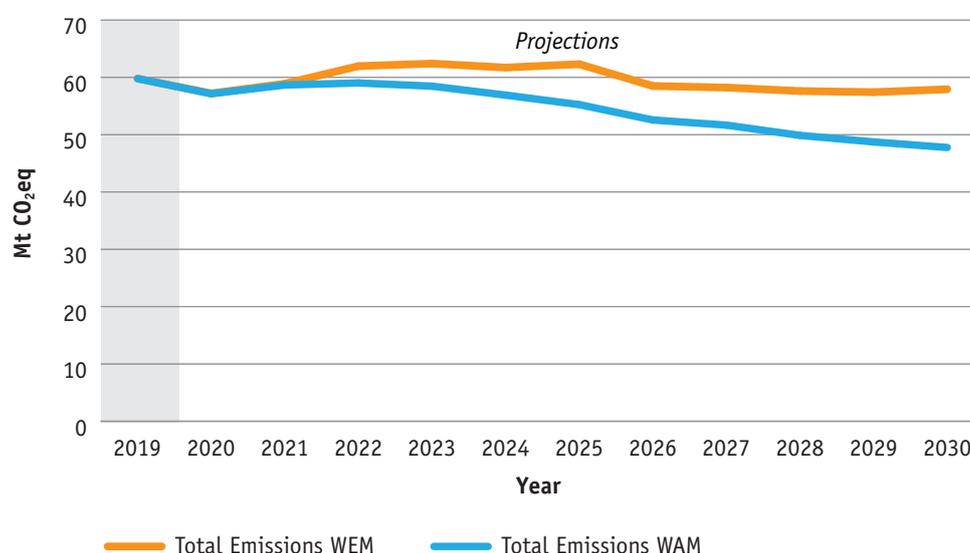


### 3. Key Trends – Emissions projections out to 2030

These greenhouse gas emissions projections show total emissions decreasing from the latest Inventory (2019) levels by 3% by 2030 under the *With Existing Measures* scenario and by 20% under the *With Additional Measures* scenario.

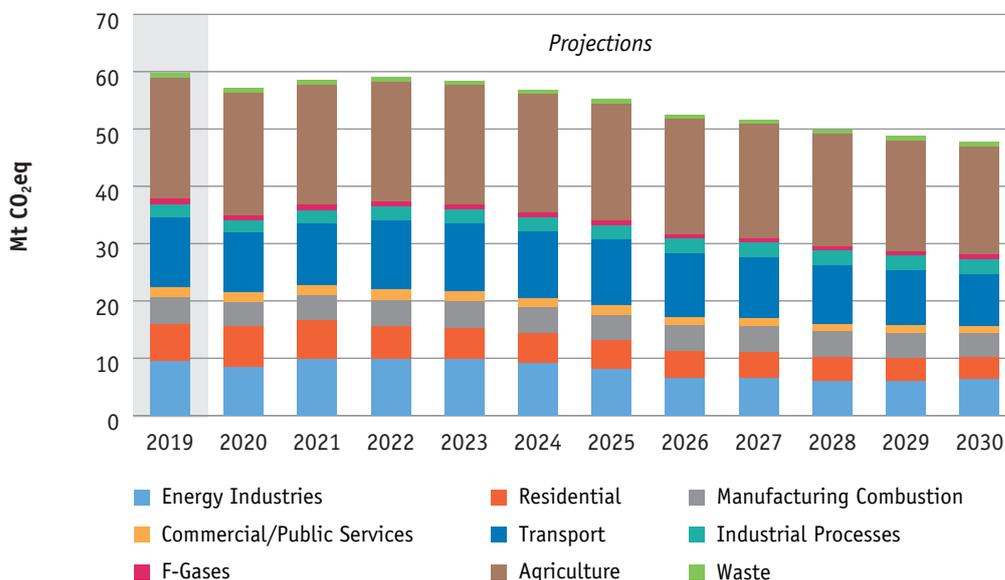
The expected trend in total greenhouse gas emissions under both scenarios is shown in Figure 1. The gap between both scenarios is largely attributed to significant reductions in key sectors such as power generation, residential, transport, commercial and public services and agriculture as a result of the Climate Action Plan. This is described in more detail for each sector throughout this chapter.

**Figure 1: Total Greenhouse Gas Emissions under the *With Existing Measures* (WEM) and *With Additional Measures* (WAM) scenario out to the year 2030**

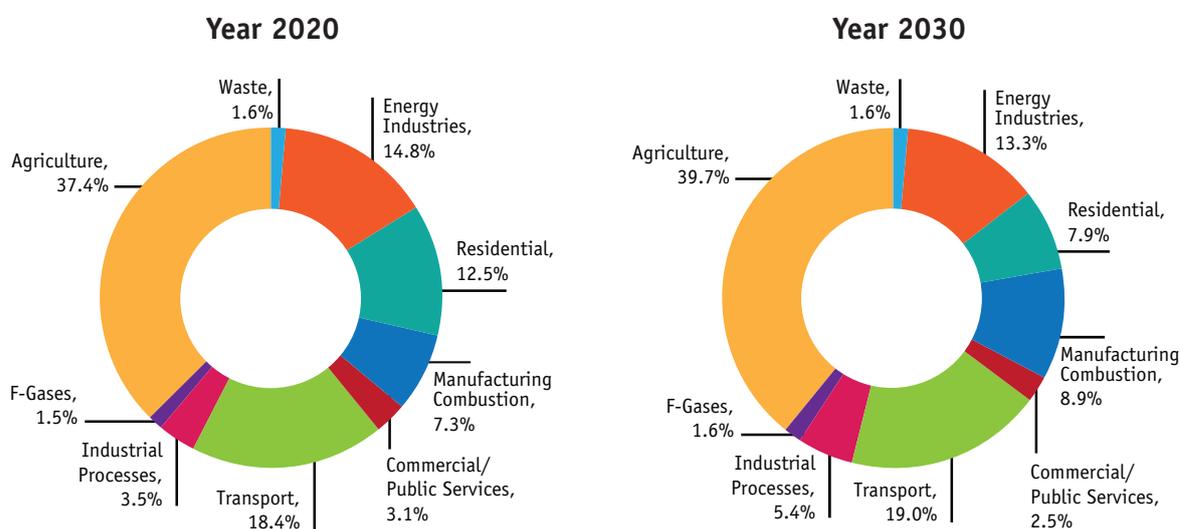


The sectoral percentage share throughout the projected time-period under the *With Additional Measures* scenario is shown in Figure 2 and Figure 3 compares projected emissions in 2020 with those in 2030. Three key sectors consistently have the largest share of emissions: Agriculture, Transport and Energy Industries. Under the WAM scenario, emissions from Agriculture, Transport and Energy Industries, are projected to decrease by 11.3%, 13.4% and 24.8% respectively over the period 2020 to 2030.

**Figure 2: Total Greenhouse Gas Emissions Projections by sector out to the year 2030 under *With Additional Measures* scenario**



**Figure 3: Total Greenhouse Gas Emissions Projections by sector share under the *With Additional Measures* scenario in in the year 2020 and 2030**

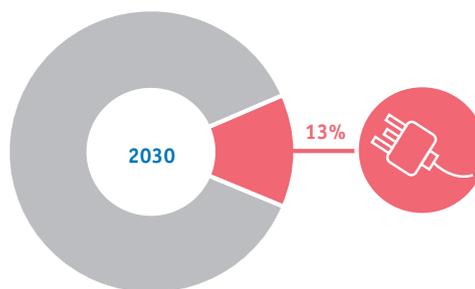


The increased proportion of emissions in 2030 from Agriculture (which is predominately from Methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O)) is largely a consequence of other sectors of the economy projected to decarbonize more swiftly. However, significant Agriculture emissions reductions have been committed to be delivered, as set out in Teagasc’s Marginal Abatement Cost Curve<sup>9</sup> and the AgClimatise roadmap.

<sup>9</sup> <https://www.teagasc.ie/media/website/publications/2018/An-Analysis-of-Abatement-Potential-of-Greenhouse-Gas-Emissions-in-Irish-Agriculture-2021-2030.pdf>

### 3.1 Energy Industries

The majority of emissions within Energy industries come from power generation and are largely regulated under the EU Emissions Trading Scheme (ETS). In addition, emissions from manufacture of solid fuels, petroleum refining (also largely included within ETS) and fugitive emissions are included. This sector contributed 15.8% of Ireland's total emissions in 2019 and is projected to be 13.3% in 2030 (in the *With Additional Measures* scenario). The projected trend in emissions from energy industries out to 2030 under the *With Existing Measures* and *With Additional Measures* scenarios is shown in Figure 4.



#### With Existing Measures scenario

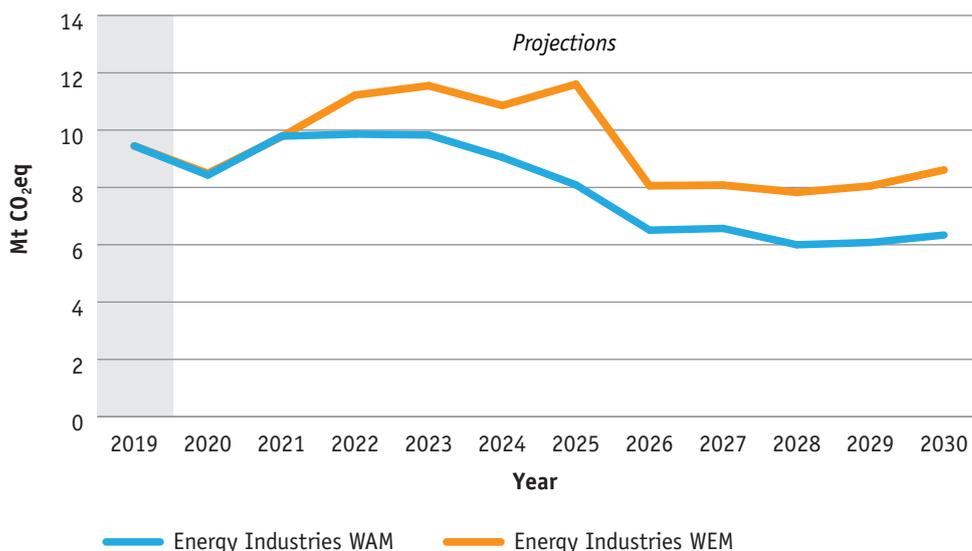
- Under the *With Existing Measures* scenario, emissions from the energy industries sector are projected to increase by 1.4% to 8.6 Mt CO<sub>2</sub> eq over the period 2020 to 2030.
- In terms of the renewable energy generated, this scenario projects Ireland reaching approximately 40% of electricity consumption from renewable energy by 2020. Renewable electricity generation capacity is dominated by wind energy. In 2030 it is estimated that renewable energy generation increases to approximately 55% of electricity consumption.
- The operation of three peat plants used for electricity generation until the end of 2020 only are included in the assumptions underpinning the energy projections following which just one plant continues to operate.
- In the assumptions underpinning the *With Existing Measures*, scenario, one peat station continues to operate until planning permission expires in 2023, cofiring with 30% biomass.
- The Moneypoint power station is assumed to operate in the market up to end 2025 at which point it no longer generates electricity from coal.
- It is assumed there will be a roll out of approximately 2.25 million smart meters by 2024, on a phased basis starting in 2019.

#### With Additional Measures scenario

- Under the *With Additional Measures* scenario, emissions from the energy industries sector are projected to decrease by 24.8% to 6.3 Mt CO<sub>2</sub> eq over the period 2020 to 2030.
- In this scenario it is assumed that for 2020 there is approximately a 40% share of renewable energy in electricity generation. In 2030 it is estimated that renewable energy generation increases to approximately 70% of electricity consumption. This is mainly a result of further expansion in wind energy (comprising 3.5 GW offshore and approximately 8.2 GW onshore). Expansion of other renewables (e.g. solar photovoltaics) also occurs under this scenario.
- Under the *With Additional Measures* the same peat assumptions are in place as for the *With Existing Measures* scenario.
- In this scenario the Moneypoint power station is assumed to operate in the market up to end 2024 at which point it no longer generates electricity from coal as set out in the 2019 Climate Action Plan.

- In terms of inter-connection, it is assumed that the Greenlink 500MW interconnector to the UK to come on stream in 2025 and the Celtic 700MW interconnector to France to come on stream in 2026.

**Figure 4: Greenhouse Gas Emissions Projections from the Energy Industries Sector under the *With Existing Measures (WEM)* and *With Additional Measures (WAM)* scenario out to 2030**



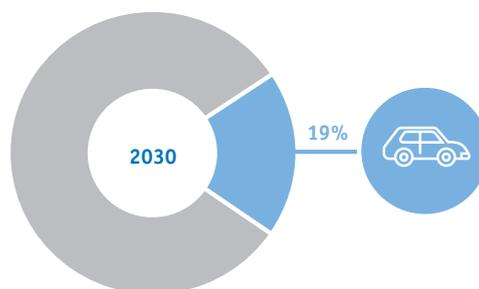
In both scenarios we can see a rising trend in emissions from 2028 to 2030 as projected increases in electricity demand outpace additional abatement measures.

### COVID Impact on Energy

Emissions from the Energy Industries sector are estimated to have decreased by 10.7% between 2019 and 2020. Whilst the pandemic measures played a part in this, reduced coal and peat use in power generation and an increase in renewable generation were more significant factors.

### 3.2 Transport

The main source of emissions from the transport sector is road transport, accounting for approximately 95% of transport emissions in 2019. 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 contributed over 20% of Ireland's total emissions in 2019, this is projected to reduce to 19% by 2030 (in the *With Additional Measures* scenario).



### With Existing Measures scenario

- Under the *With Existing Measures* scenario, transport emissions are projected to increase by 10.2% over the period 2020-2030 to 11.6 Mt CO<sub>2</sub> eq (see Figure 5).
- The main policy instruments impacting transport emissions in this scenario are the Biofuels Obligations Scheme<sup>10</sup> and uptake of electric vehicles.
- The Biofuel Obligation Scheme places an obligation on fuel suppliers to blend an increasing percentage of biofuel with their fuel. In terms of biofuels used in road transport fuel in the *With Existing Measures* scenario a statutory target of approximately 12% applies from 1 January 2020.
- In terms of the uptake of Electric Vehicles, the *With Existing Measures* scenario assumes approximately 490,000 Electric Vehicles on the road by 2030. This includes approximately 326,000 Passenger Battery Electric Vehicles and 148,000 Passenger Plug in Hybrid Electric Vehicles. This is in line with the assumptions agreed during the preparation of the energy projections.

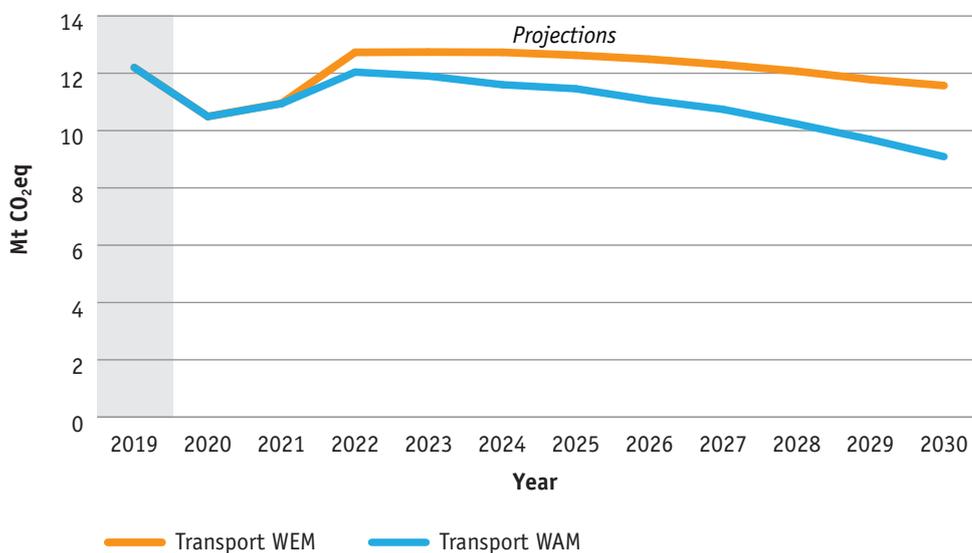
### With Additional Measures scenario

- Under the *With Additional Measures* scenario, transport emissions are projected to decrease by 13.4% over the period 2020 to 2030 to 9.1 Mt CO<sub>2</sub> eq (see Figure 5).
- For the *With Additional Measures* scenario, it is assumed that the Biofuel Obligations Scheme is developed further. Incremental increases are assumed to occur with 10% blend for petrol (E10) and a 12% blend for diesel (B12) in place in 2030.
- This scenario assumes 936,000 Electric Vehicles on the road by 2030, as a result of the implementation of the 2019 Climate Action Plan. This includes approximately 550,000 battery electric vehicles and 288,000 plug in hybrid electric vehicles.
- Other key policies and measures assumed in the transport emissions projections include Vehicle Registration Tax and Motor Tax Rebalancing and the improved vehicle fuel economy of the private car fleet and light goods vehicles. Both scenarios also include the impact of transport infrastructure projects such as Dublin Metro, Dart Expansion and BusConnects programme<sup>11</sup>.
- The projected trend in emissions from the transport sector out to 2030 under the *With Existing Measures* and *With Additional Measures* scenarios is shown in Figure 5. The extent of the impact of additional measures included in the Climate Action Plan over the period can be clearly seen, as well as the significant impact of COVID on transport emissions in 2020 and 2021.

<sup>10</sup> <https://www.gov.ie/en/publication/91f03c-biofuels/>

<sup>11</sup> <https://busconnects.ie/>

**Figure 5: Greenhouse Gas Emissions Projections from the Transport Sector under the *With Existing Measures (WEM)* and *With Additional Measures (WAM)* scenarios out to 2030**

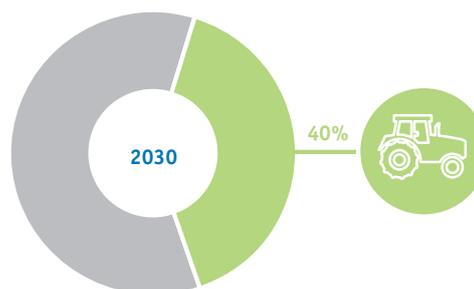


### COVID Impact on Transport

The impact of COVID is projected to have led to a 14% reduction in transport emissions in 2020 compared to 2019 (see Figure 5). Implementing the actions set out for the transport sector in the 2019 Climate Action Plan is projected to reduce emissions to 25.5% below 2019 levels by 2030. To realise that reduction it will be necessary to avoid a post-COVID surge in Transport emissions, potentially influenced by low fuel prices.

### 3.3 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/fishing is included. This sector contributed over 35.4% of Ireland's total emissions in 2019 and is projected to rise to 40% by 2030 (in the *With Additional Measures* scenario).



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 takes into account Food Wise 2025 policy targets and reflects trends in agricultural production at the time of preparing the projected activity data.

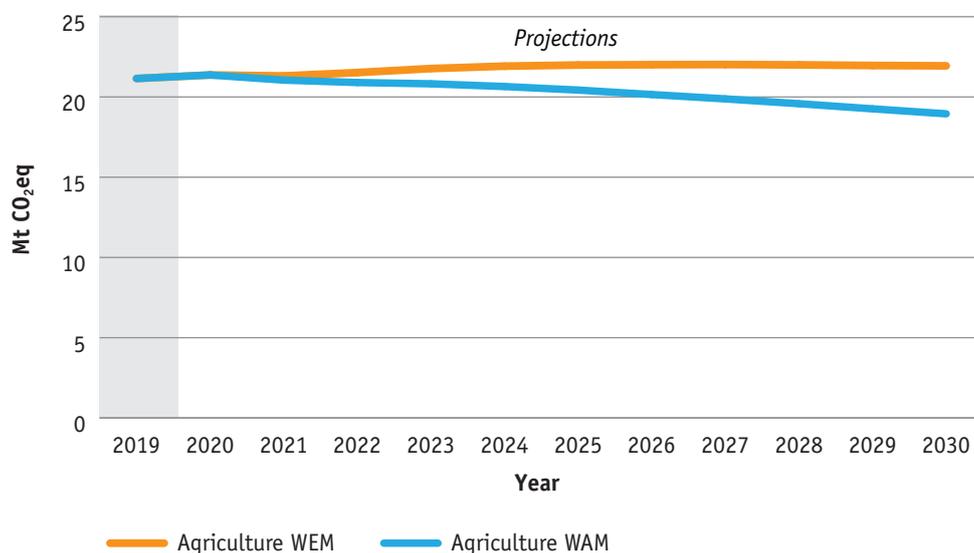
### With Existing Measures scenario

- Total emissions from agriculture are projected to increase by 2.7% over the period 2020-2030 to 21.9 Mt CO<sub>2</sub> eq under the *With Existing Measures* scenario.
- The data that underpins the *With Existing Measures* Scenario comes from Teagasc's Base Case Scenario. Under this scenario dairy cow numbers are projected to increase by 13% in 2030 relative to 2019. In contrast, beef cow numbers are projected to decrease by 20% by 2030. Total cattle in 2030 are projected to be 7.1 million, a 2% decrease relative to 2019. As dairy cows produce more methane per animal than other cattle, this overall decline in animal numbers doesn't reduce methane emissions.
- Dairy production systems operate at a higher stocking rate than beef production systems and this higher stocking rate is reflected in higher projected use of nitrogen fertiliser per hectare and in total aggregate nitrogen fertiliser use by the Irish agricultural sector. Total nitrogen fertiliser use in 2030 is projected to be 384,050 tonnes. This represents a 5% increase relative to 2019.
- Irish ewe and total sheep numbers are projected to increase over the period to 2030. By 2030 total Irish sheep numbers are projected to increase to 5.5 million. This represent an 8% increase relative to 2019. This increase reflects the increased profitability of sheep production in the period to 2030.
- The total crop land area is projected to continue to decline due to the higher level of profits per hectare in dairy farming as compared to tillage farming. By 2030 total cereal area harvested in Ireland is projected to decline to 223,000 hectares. This represent a 14% decrease relative to 2019.

### With Additional Measures scenario

- Under the *With Additional Measures* scenario emissions are projected to decrease to approximately 19 Mt CO<sub>2</sub> eq by 2030 which is an 11.3% reduction over the period 2020-2030.
- The *With Additional Measures* scenario assumes a total of 16.5 Mt CO<sub>2</sub> eq of mitigation over the period 2021-2030 attributable to measures in Ireland's Climate Action Plan (largely implementation of those measures included in the Teagasc Marginal Abatement Cost Curve<sup>9</sup>). Some of the key measures include nitrogen use efficiency, use of protected urea products, improved animal health, extended grazing, reducing crude protein in pigs, low emission slurry spreading, inclusion of clover in pasture swards.
- The projected trend in emissions from the agriculture sector out to 2030 under the *With Existing Measures* and *With Additional Measures* scenario is shown in Figure 6. The difference between both scenarios is attributed to the implementation of additional measures committed to in the Climate Action Plan leading to a 16.5 Mt CO<sub>2</sub> eq emissions saving over the projected period.

**Figure 6: Greenhouse Gas Emissions Projections from the Agriculture Sector under the *With Existing Measures (WEM)* and *With Additional Measures (WAM)* scenario out to 2030**



### Sensitivity Analysis

A sensitivity analysis of the *With Existing Measures* emissions scenario has been undertaken for the agriculture emissions projections. 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 Article 39 of the Governance of the Energy Union and Climate Action Regulation<sup>1</sup>. The sensitivity analysis undertaken for the agriculture emissions projections is 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 7 alongside the WEM scenario. It shows that stronger growth would likely lead to higher emissions over the projected period.

### Alternative Scenario (stronger growth in agricultural activity levels)

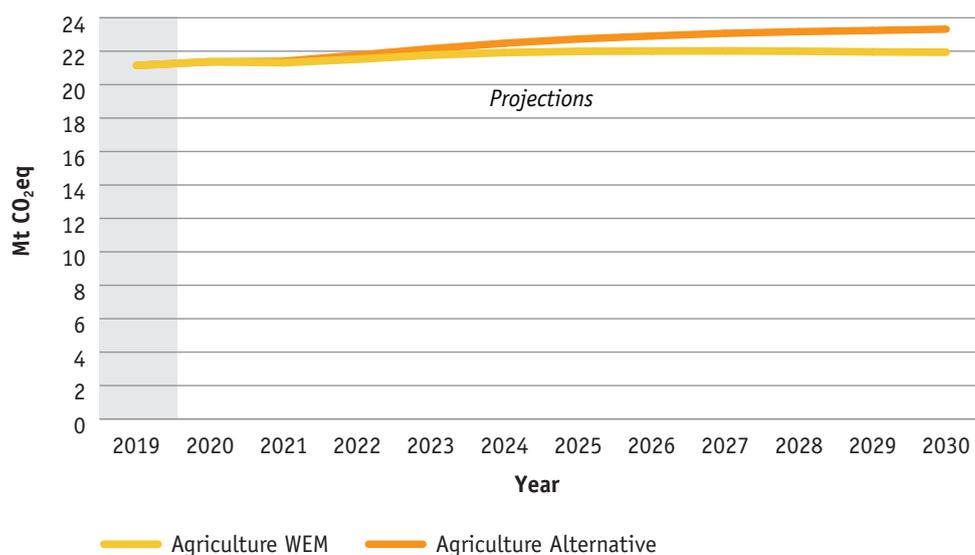
The alternative scenario seeks to assess what would happen to emissions if there was stronger growth in the Agriculture sector than what the Projections indicate is most likely to happen. This scenario assumes continued growth in the dairy herd accompanied by a stable, rather than contracting beef cow herd. Under this scenario the allocation of Ireland's Common Agricultural Policy (CAP) budget is assumed to change from 2020 onwards to provide additional coupled<sup>12</sup> support to beef cow numbers. Irish farm gate milk prices are also assumed to be higher than under the WEM scenario by approximately 10%. These two assumptions are used to generate a larger dairy and beef cow inventory.

Under this scenario, dairy cow numbers in 2030 are projected to increase 19% relative to 2019 with the provision of coupled direct payments from 2020 slowing the projected decline in the Irish beef cow numbers

<sup>12</sup> Direct payments may be either coupled to production or decoupled from it. Coupled direct payments are granted to farmers based on the amount produced, e.g. per tonne of wheat produced or per litre of milk, or linked to production inputs, e.g. hectares of arable crops or number of livestock.

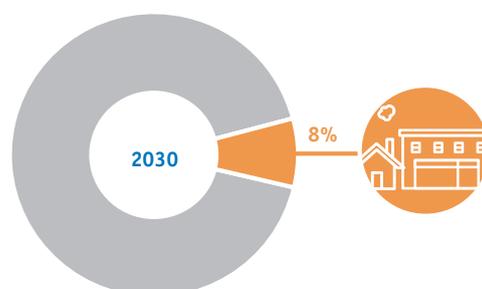
in 2030 to a 4% decrease relative to 2019. By 2030 projected total cattle inventories are 7.63 million, representing a 7% increase relative to 2019. As the dairy share of the total cattle population increases, the higher stocking rate is reflected in a higher level of nitrogen use per hectare and in total nitrogen use in aggregate over the period to 2030. In 2030 the total use of nitrogen is projected to be 416,730 tonnes.

**Figure 7: Sensitivity assessment of the Agriculture Sector under the With Existing Measures (WEM) scenario out to 2030**



### 3.4 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. This sector contributed 11% of Ireland's total emissions in 2019. Residential energy demand is influenced by the weather and fuel prices. By 2030 emissions from the residential sector are projected to reduce to 8% of Ireland's total emissions (in the *With Additional Measures* scenario).



#### With Existing Measures scenario

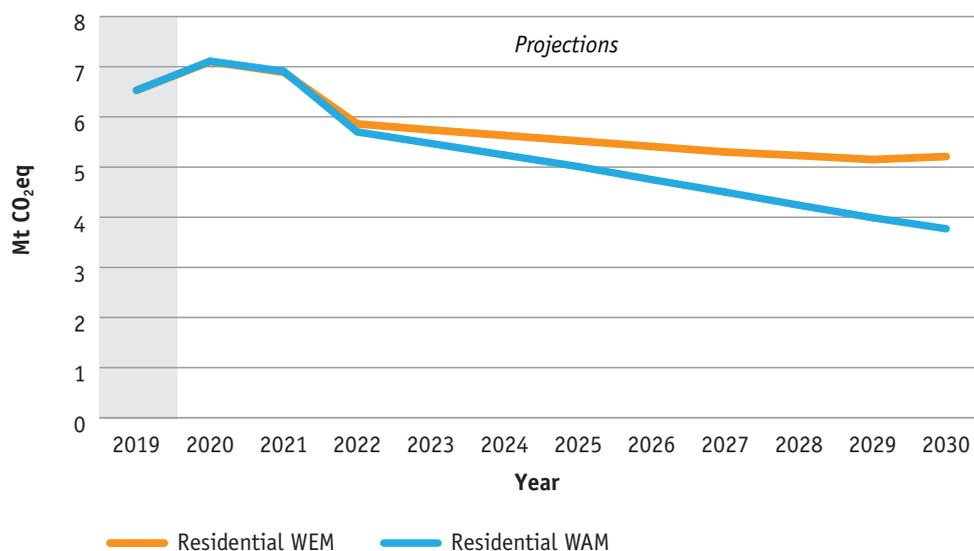
- Under the *With Existing Measures* scenario, emissions from the residential sector are projected to decrease by 26.4% between 2020 and 2030 to 5.2 Mt CO<sub>2</sub> eq.
- The *With Existing Measures* scenario assumes implementation of a range of residential energy efficiency programmes including, for example, Better Energy Homes and Warmer Homes Schemes, Better Energy Communities Programme 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.

### With Additional Measures scenario

- Under the *With Additional Measures* scenario, emissions are projected to decrease by 47% between 2020 and 2030 to 3.8 Mt CO<sub>2</sub> eq. This scenario assumes full implementation of the Climate Action Plan.
- Measures in the Climate action plan include:
  - Supports for retrofitting 385k residential oil boilers with heat pumps and a ban on oil boilers (2022) and gas boilers (2025 in new homes);
  - Energy Efficiency programmes involving upgrades to homes, and retrofits to achieve BER 'B2' rating;
  - The addition of 120 GWh of heat from district heating by 2028 growing linearly from 2023.

The projected trend in emissions from the residential sector out to 2030 under the *With Existing Measures* and *With Additional Measures* scenario is shown in Figure 8. This difference between both scenarios is attributed to the implementation of additional measures committed to in the Climate Action Plan leading to a further 12.3 Mt CO<sub>2</sub> eq reduction over the projected period in the *With Additional Measures* scenario.

**Figure 8: Greenhouse Gas Emissions Projections from the Residential Sector under the *With Existing Measures (WEM)* and *With Additional Measures (WAM)* scenarios out to 2030**

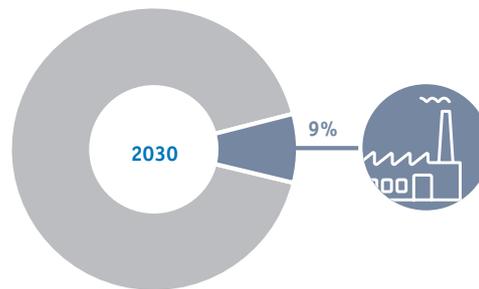


### COVID Impact in the Residential Sector

The impact of many people working from home as a result of COVID can clearly be seen in a projected increase in greenhouse gas emissions relative to 2019 from the Residential sector in 2020 and 2021 (Figure 8). The projected impact of COVID in 2020 is an increase of almost 9% in emissions compared to 2019. This highlights the need for our houses to become far more efficient, particularly in the context of broader home working. Implementing the 2019 Climate Action Plan measure for the installation of over 600,000 heat-pumps by 2030 as well as retrofitting 500,000 homes to a B2 equivalent BER will help achieve this.

### 3.5 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 7.7% of Ireland's total emissions in 2019. This is projected to increase to 9% in 2030 (in the *With Additional Measures* scenario). Two scenarios are presented for this sector.



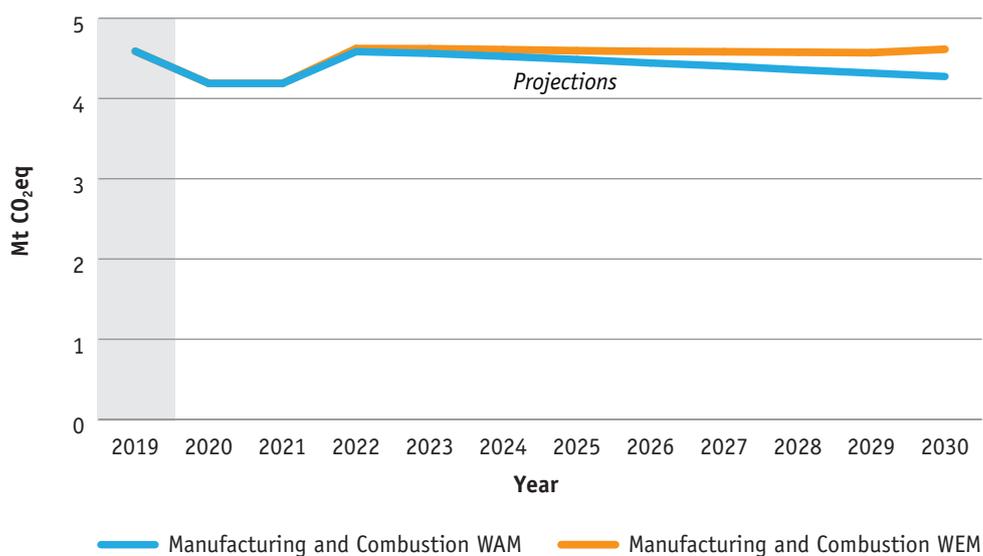
#### With Existing Measures scenario

- Under the *With Existing Measures* scenario, emissions from manufacturing combustion are projected to increase by 10.2% between 2020 and 2030 to 4.6 Mt CO<sub>2</sub> eq (Figure 9). This scenario assumes implementation of existing energy efficiency programmes such as the SEAI Large Industry Programmes, Accelerated Capital Allowances and the Excellence in Energy Efficiency Design (EXEED) programme.

#### With Additional Measures scenario

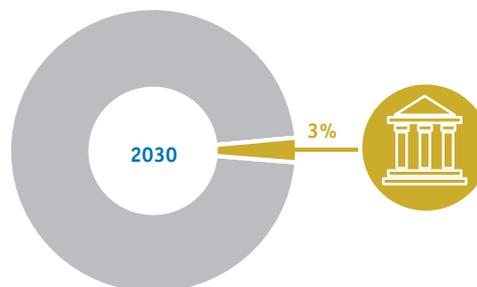
- Under the *With Additional Measures* scenario, emissions from manufacturing combustion are projected to increase by 2.1% between 2020 and 2030 to 4.3 Mt CO<sub>2</sub> eq (Figure 9). This scenario assumes further roll out of energy efficiency programmes including those listed above.

**Figure 9: Greenhouse Gas Emissions Projections from the Manufacturing Combustion Sector under the *With Existing Measures* (WEM) and *With Additional Measures* (WAM) scenarios out to 2030**



### 3.6 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 3% of Ireland's total emissions in 2019 and is projected to stay at this level in 2030 (in the *With Additional Measures* scenario).



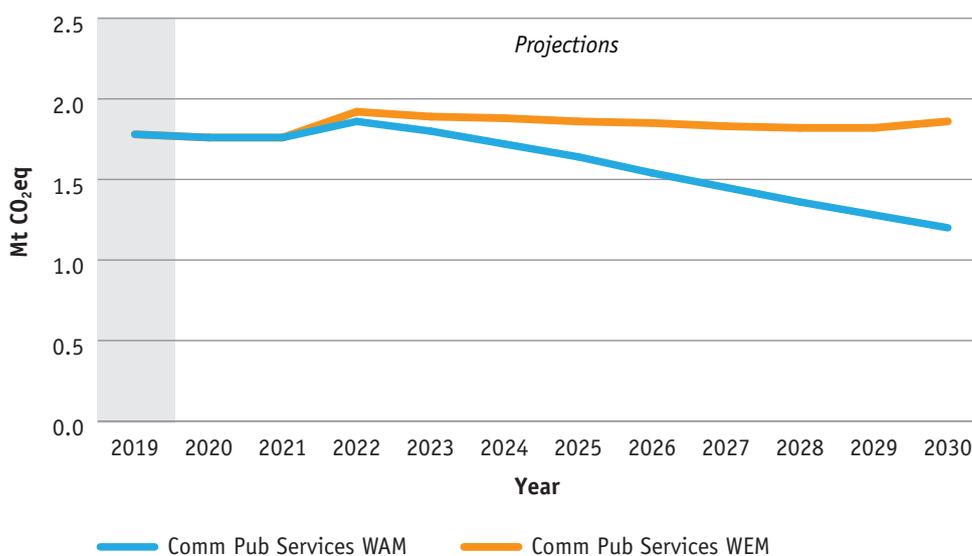
#### With Existing Measures scenario

- Under the *With Existing Measures* scenario, emissions from the commercial and public services sector are projected to increase by 5.3% between 2020 and 2030 to 1.9 Mt CO<sub>2</sub> eq (Figure 10). This scenario assumes implementation of a range of existing energy efficiency programmes including, for example, Public Sector Programme, ReHeat, Excellence in Energy Efficiency Design (EXEED) and Better Energy Communities Programmes in addition to the impact of building regulations and heat pumps supports.

#### With Additional Measures scenario

- Under the *With Additional Measures* scenario, emissions from the commercial and public services sector are projected to decrease by 31.8% between 2020 and 2030 to 1.2 Mt CO<sub>2</sub> eq (Figure 10). This scenario assumes full implementation of the Climate Action Plan which includes further delivery of energy efficiency programmes as outlined above.

**Figure 10: Greenhouse Gas Emissions Projections from the Commercial and Public Services Sector under the *With Existing Measures* (WEM) and *With Additional Measures* (WAM) scenarios out to 2030**



### 3.7 Emissions from Industrial processes and Waste

The Industrial Processes and Waste sector contributed 3.8% and 1.5% of Ireland's total emissions in 2019 respectively. There is only one scenario (*With Existing Measures*) for greenhouse gas emissions projections from the Waste sector and Industrial Processes sector based on available data. Ireland's landfill rate for municipal waste dropped to just 14% in 2018<sup>13</sup>, reflecting a steep decline from 62% in 2008 and is on track to comply with the Landfill Directive<sup>14</sup> target of less than 10% of Municipal waste landfilled by 2035.

- Emissions from **Industrial Processes** include process emissions from mineral, chemical, metal industries, non-energy products and solvents. Emissions are projected to increase by 29% between 2020 and 2030 to 2.6 Mt CO<sub>2</sub> eq. The majority of emissions come from cement and lime industries and the projections are based on growth forecasts from the cement industry.
- **Waste sector** emissions are projected to decrease by 13.8% between 2020 and 2030 to 0.8 Mt CO<sub>2</sub>eq. The waste sector includes landfill, incineration and open burning of waste<sup>15</sup>, mechanical & 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. It is assumed that the amount of landfill gas flared and utilised for energy production remains at 60% from 2020 onwards in line with more recent trends in the latest inventory.

### 3.8 Fluorinated-gas emissions

Fluorinated gases accounted for approximately 1.5% of Ireland's total national greenhouse gas emissions in 2019. 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, metered dose inhalers and electrical switch-gear).

#### With Existing Measures scenario

- Fluorinated-Gas (F-Gas) emissions are projected to decrease by 14.6% to 0.76 Mt CO<sub>2</sub> eq between 2020 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 12.6% between 2020 and 2030 to 0.77 Mt CO<sub>2</sub> eq under the *With Additional Measures* scenario.
- The key difference between both scenarios is the result of the different future uptake rates in heat pumps in each scenario (i.e. more heat pumps being deployed in the *With Additional Measures* scenario) and a switch to lower Global Warming Potential gas (R32) in air conditioning units and heat pumps over the projected period in the *With Additional Measures* scenario.

<sup>13</sup> <https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/municipal/>

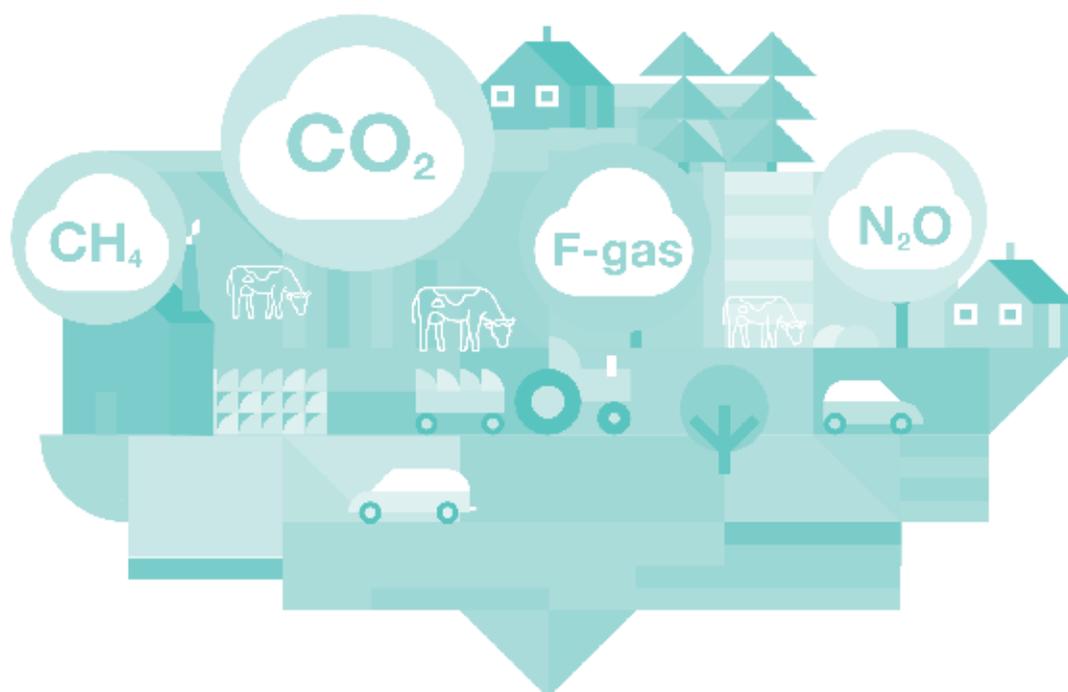
<sup>14</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0850&from=EN>

<sup>15</sup> Household waste that is burned

### 3.9 Cross cutting measures

The 2020-2030 projections include a number of cross cutting measures that have a significant impact across a number of sectors in terms of energy consumption and emissions reduction. The most significant include carbon tax and supports for renewable heat which are outlined below.

- Carbon tax on fossil fuels applies to industry, residential, commercial services, transport and agriculture sectors. Under the *With Existing Measures* scenario, carbon tax steadily increasing to a rate of €80 per tonne of CO<sub>2</sub> is assumed across the projected period. Under the *With Additional Measures* scenario the carbon tax increases to €100 per tonne of CO<sub>2</sub> by 2030. This has the effect of reducing the energy demand across all sectors outside of the Emissions Trading Scheme.
- The Support Scheme for Renewable Heat (SSRH) supports the adoption of renewable heating systems by commercial, industrial, agricultural, district heating, public sector and other non-domestic heat users not covered by the emissions trading system. Both the *With Existing Measures* and *With Additional Measures* scenario assumes 1,600GWh of additional renewable heat (six year ramp up from 2020 to 2025) supported under the Support Scheme for Renewable Heat (SSRH)<sup>16</sup>.
- Under the *With Existing Measures* scenario 175,000 residential oil boilers are replaced with heat pumps by 2030. Under the *With Additional Measures* scenario it is projected that 385,000 existing residential oil boilers, gas boilers and electric heaters are replaced with heat pumps and that district heating is deployed in Dublin (120 GWh by 2028 growing linearly from 2023).
- Under the *With Additional Measures* scenario, a total of 1,600GWh of biogas is projected to be used across the heat and transport sectors by 2030, with a linear increase from 2025 is assumed projected.

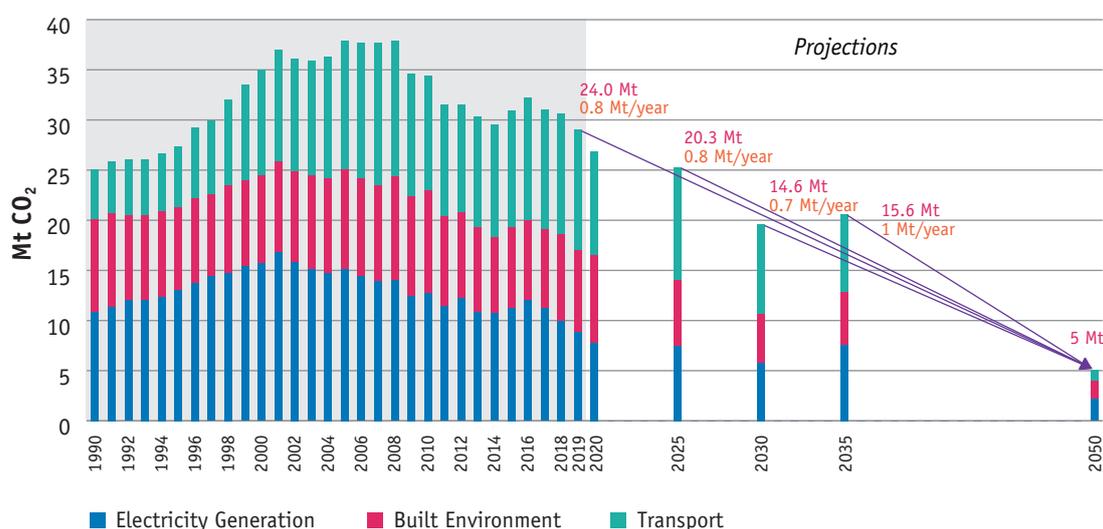


<sup>16</sup> <https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/>

## 4. Projected performance against targets under the National Policy Position

Ireland's existing long term National Policy Position on Climate Action and Low Carbon Development<sup>17</sup> sets out a low-carbon road map process that will be guided by a long-term low-carbon transition. This is based on an aggregate reduction in carbon dioxide (CO<sub>2</sub>) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport (EGBET) sectors<sup>18</sup>. The latest historic and projected emissions for CO<sub>2</sub> only (under the *With Additional Measures* scenario) from EGBET sectors, in addition to the 2050 target pathway based on the long-term vision of low-carbon transition as described above, are shown in Figure 11.

**Figure 11: Historic and projected CO<sub>2</sub> emissions from the electricity generation, built environment and transport (EGBET) sector**



In the past year, Ireland's long-term climate ambition has been restated and the Climate Action and Low Carbon Development (Amendment) Bill 2021, sets out the 'national climate objective' to achieve a climate neutral economy no later than 2050 and a total reduction of 51% emissions over the period to 2030. Under the EU Governance of the Energy Union and Climate Action Regulation<sup>1</sup> each member state is required to submit its long-term strategy to achieve climate ambitions and update this every five years. While the relative contributions expected of emissions reductions and land-based removals (e.g. from forestry) have yet to be defined, it is clear that these targets represent a significant additional challenge compared to the ambition in the 2019 Climate Action Plan.

<sup>17</sup> <https://www.gov.ie/en/publication/6f393-national-climate-policy-position/>

<sup>18</sup> Presentation of electricity generation, built environment and transport sectors in Figure 9 is based on EPA's interpretation of the categorisation of the sectors that are included in the national policy document and how they are estimated to align with IPCC reporting categories.

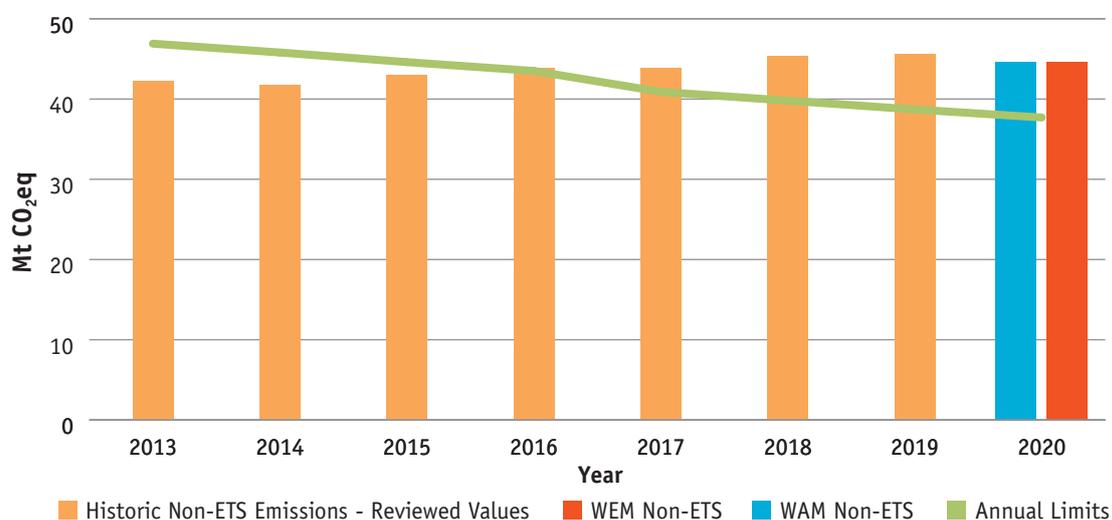
## 5. Projected performance relative to EU 2020 and 2030 Targets – Non ETS Emissions

The EU's Effort Sharing Decision (Decision No 406/2009/EC) set 2020 targets for EU Member States including Ireland. These targets cover greenhouse gas emissions from sectors that are not included in the EU Emissions Trading Scheme. For Ireland, these sectors cover agriculture, transport, built environment (residential, commercial/institutional), waste and non-energy intensive industry - collectively referred to as non-ETS sector emissions – and Ireland's target is to achieve a 20% reduction by 2020 on 2005 levels. There are annual emission limits for the period 2013-2020 to ensure a gradual move towards the 2020 target.

Historic (2013-2019) and projected emission levels (2020) for non ETS sector emissions under the *With Existing Measures* and *With Additional Measures* scenarios are shown in Figure 12. In addition, it shows the annual compliance/non-compliance in relation to the annual emission limits.

Ireland's Non ETS emissions are projected to be 7% below 2005 levels in 2020 under both the *With Existing Measures* and *With Additional Measures* scenarios. The target for Ireland is a 20% reduction. Ireland exceeded its annual binding limits in 2016, 2017, 2018 and 2019. Further information on the 1990-2019 inventory is available<sup>19</sup>.

**Figure 12: *With Existing Measures* and *With Additional Measures* greenhouse gas emission projections and comparison with the linear reduction pathway required between 2013 and 2020<sup>20</sup>**



To determine compliance under the Effort Sharing Decision, any overachievement of the binding emission limit in a particular year (between 2013 and 2020) can be banked and used towards compliance in a future year.

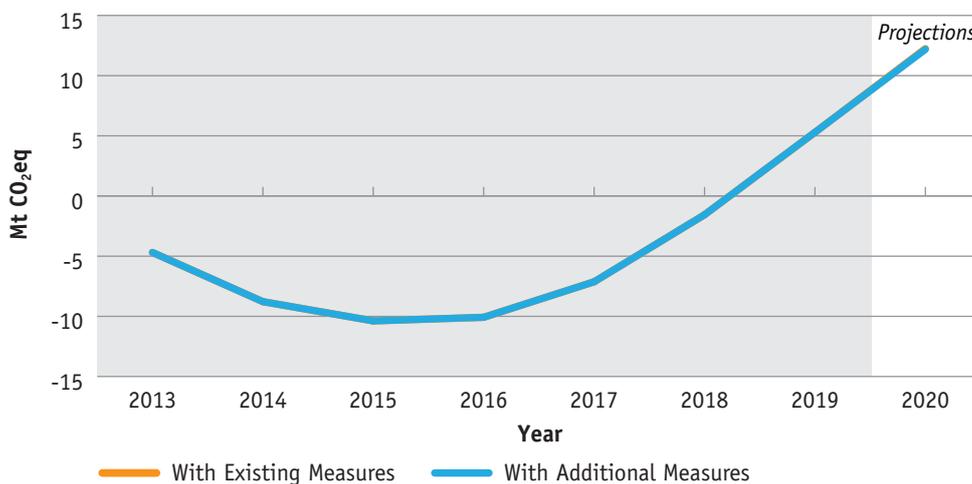
However, even using this mechanism Ireland will still be in non-compliance according to the latest projections.

<sup>19</sup> <https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/greenhouse-gas-emissions-final-2019.php>

<sup>20</sup> 1 Mt = 1,000,000 tonnes

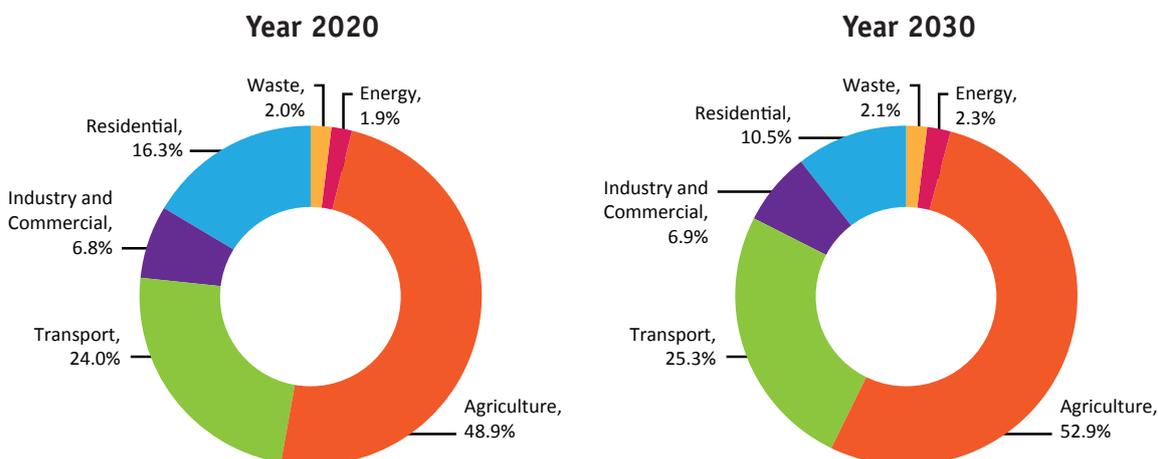
Over the period 2013-2020 Ireland is projected to cumulatively exceed its compliance obligations by 12.2 Mt CO<sub>2</sub> eq under the *With Existing Measures* and *With Additional Measures* scenarios (Figure 13).

**Figure 13: Projected cumulative distance to target for Ireland's Non-ETS emissions 2013 to 2020**



Agriculture and transport dominate non-ETS sector emissions accounting for 72% and 76% of emissions in 2020 and 2030 respectively, as shown in Figure 14.

**Figure 14: Projected sectoral share of Effort Sharing Decision sector greenhouse gas emissions in 2020 and 2030 under the *With Additional Measures* scenario**



The 2018 EU Effort Sharing Regulation on greenhouse gas emission reductions sets out binding emission reduction targets for Member States in sectors falling outside the scope of the EU emissions trading system for the period 2021-2030. This Regulation maintains existing flexibilities under the current Effort Sharing Decision (e.g. banking, borrowing and buying and selling between Member States) and provides two new flexibilities (use of ETS allowances and credit from action undertaken in the Land Use, Land Use Change and Forestry (LULUCF) sector) to allow for a fair and cost-efficient achievement of the targets.

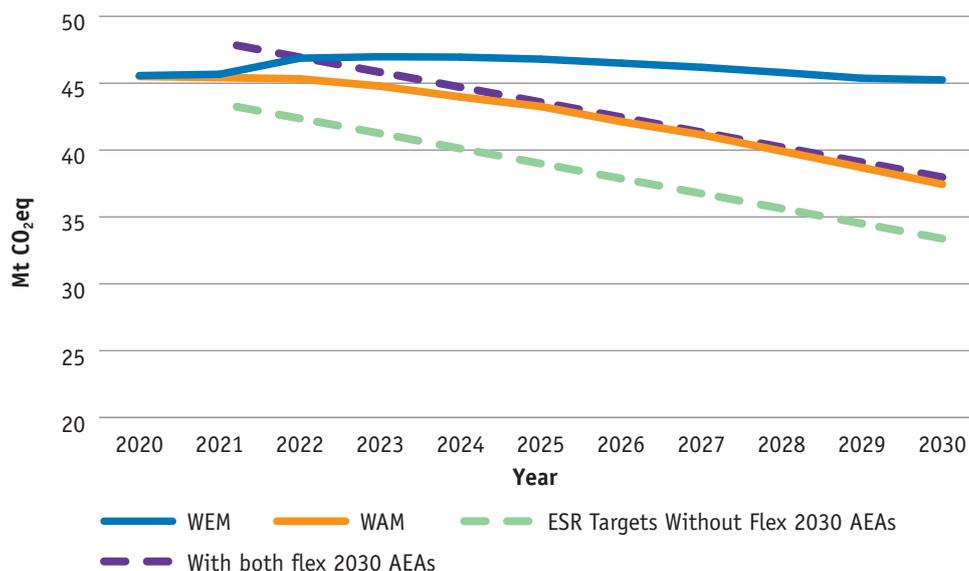
Ireland's non ETS emissions are projected to be 5% and 21% below 2005 levels in 2030 under the *With Existing Measures* and *With Additional Measures* scenarios, respectively. The target for Ireland is a 30% reduction. With the use of both LULUCF flexibility and ETS flexibilities, emissions are projected to be 15% and 31% below 2005 levels in 2030.

Under the *With Existing Measures* scenario, the projections indicate that Ireland will cumulatively exceed its ESR emissions allocation<sup>21</sup> of 384.3 Mt CO<sub>2</sub> eq by 51.3 Mt CO<sub>2</sub> eq over the 2021-2030 period assuming the Land-use, Land-use Change and Forestry (LULUCF) flexibility only is fully utilised. If the ETS flexibility is also used the exceedance will reduce to 32.2 Mt CO<sub>2</sub> eq.

Under the *With Additional Measures* scenario, the projections indicate that Ireland will cumulatively exceed the ESR emissions allocation by 11 Mt CO<sub>2</sub> eq over the 2021-2030 period assuming the LULUCF flexibility only is fully utilised. If the ETS flexibility is also used Ireland is projected to have a surplus under the ESR of 8.1 Mt CO<sub>2</sub> eq.

The projected non ETS emissions and estimated Annual Emission Allocations (AEAs) with and without use of flexibilities under the Effort Sharing Regulation (ESR) for the period 2021-2030 are in Figure 15.

**Figure 15: Projected Non ETS emissions and estimated Annual Emission Allocations (AEAs) with and without use of flexibilities under the Effort Sharing Regulation (ESR) for the period 2021-2030<sup>22</sup>**



See also Table 3 in the Appendix for projected Annual Emissions Allocations and annual exceedances. This table also shows the level of compliance with the use of flexibilities provided for in EU legislation including separately for LULUCF, ETS and in the case that both flexibilities are fully used. AR5 calc file.

21 The ESR emissions allocation is the sum of the Annual Emission Allowances from 2021-30

22 Targets are defined under IPPC 5th assessment report GWP's

## 6. Conclusion

Since the EPA's last greenhouse gas emissions projections in July 2020 the Climate Action and Low Carbon Development (Amendment) Bill 2021 has been published, with a 'national climate objective' to achieve a climate neutral economy no later than 2050 and a total reduction of 51% emissions over the period to 2030. Within our society nobody has been untouched by the ongoing impact of the global Coronavirus pandemic.

Early estimates by the EPA of the impact of the COVID pandemic on greenhouse gas emissions in 2020<sup>4</sup> indicated a reduction in greenhouse gas emissions for 2020 as a result of COVID restrictions, and these latest projections now see that impact continuing into 2021 and beyond. Though these reductions are significant and involved a great degree of hardship for many people, Ireland can't rely on external events such as COVID-19 to achieve emissions goals. The level of annual emissions reductions required to achieve a 51% emissions reduction by 2030 is far greater than is estimated to have occurred due to the COVID lockdown measures in 2020.

In the Transport sector, the analysis showed that fuel use (particularly diesel fuel which powers both passenger and freight transport) rebounded to pre lockdown levels very quickly after the most stringent restrictions were removed. The increase in Residential sector emissions that accompanied homeworking highlighted the inefficiency of our current building stock and Agriculture emissions continued to increase despite the global pandemic. These impacts illustrate that the scale of emissions reductions anticipated requires further transformative measures to come in future iterations of national Climate Action Plans.

In the short term, it is projected that Ireland will still miss its target for compliance with the EU's Effort Sharing Decision (ESD) 2020 targets, despite the impact of COVID on 2020 emissions. Non-Emissions Trading Scheme emissions are projected to be 7% below 2005 levels in 2020 under both projected scenarios. The cumulative exceedance over the 2013 to 2020 lifetime of the ESD is projected to be over 12 Mt CO<sub>2</sub> eq. In the medium term, Ireland is still projected to meet its 2030 target under the Effort Sharing Regulation as long as there is full implementation of the Climate Action Plan 2019 measures. Ireland will also need to avail of both flexibilities provided for in EU legislation in order to comply, the Land-use, Land-use Change and Forestry (LULUCF) flexibility and the Emissions Trading (ETS) flexibility.

The Climate Action Plan 2019 identified important measures, particularly in the *agriculture* and *transport* sectors, which along with decarbonising *electricity generation* will play the biggest part in achieving Ireland's emissions reduction ambitions. Some of these measures are already underway, with increased uptake of low emission slurry spreading and electric vehicle adoption being evident in the latest data. Implementation of these and other actions will have to accelerate in the future and be joined by new measures, including those aimed at removing CO<sub>2</sub> from the atmosphere, to achieve the new 2030 and 2050 goals. The scale of the changes necessary is difficult to overstate and will impact all sectors and all of society but is commensurate with what is required to tackle the existential challenge we face.

## 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* 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 2019.

The *With Additional Measures* scenario is based primarily on SEAI's *Advanced* energy projection that accounts for implementation of the *With Existing Measures* scenario as well as planned policies and measures (including Ireland's 2019 Climate Action Plan).

Energy demand projections underpinning the latest emissions projections were prepared by SEAI in conjunction with the Economic and Social Research Institute (ESRI) and University College Cork. The ESRI produce energy demand projections using the I3E model (Ireland Environment, Energy and Economy model)<sup>23</sup>. Future international fossil fuel prices are given as input to the I3E model. For the low fossil fuel price scenario (i.e. in the case of the energy related projections described in this document), the UK Department for Business, Energy and Industrial Strategy (BEIS) low price scenario is applied<sup>24</sup>.

The recommended ETS carbon prices are based on the EU Reference Scenario. The software used for 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 *Baseline* 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 2019 but which are considered too recent to be detectable in any time-series analysis. The *Advanced* energy projections builds on the *Baseline* projections with adjustments made to account for implementation of additional policies and measures outlined in Ireland's 2019 Climate Action Plan.

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

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<sup>23</sup> <https://www.esri.ie/current-research/the-i3e-model>

<sup>24</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/863717/beis-2019-fossil-fuel-price-assumptions.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/863717/beis-2019-fossil-fuel-price-assumptions.pdf)

**Table 1: Key macroeconomic assumptions underlying the projections out to 2040**

	2020	2021-2025	2026-2030	2031-2035	2036-2040
<b>Average Annual % Growth Rate</b>					
GDP	-10.35	6.21	3.29	3.27	3.27
GNP	-14.10	7.11	3.29	3.27	3.26
Personal Consumption	-11.07	6.69	3.28	3.26	3.26
	2020	2025	2030	2035	2040
Housing Stock ('000)	2,071	2,196	2,322	2,322	2,322
Population ('000)	4,824	5,021	5,225	5,437	5,658
EUETS: Carbon € <sub>2016</sub> /tCO <sub>2</sub>	25	28	30	40	53
Carbon tax €/tCO <sub>2</sub> (WEM Scenario)	26	56	80	80	80
Coal \$ <sub>2016</sub> /boe	6.68	6.70	6.73	6.81	6.29
Oil \$ <sub>2016</sub> /boe	27.54	28.76	29.80	30.41	27.54
Gas \$ <sub>2016</sub> /boe	18.30	19.44	20.40	20.69	18.74
Peat €/MWh	25	25	25	25	25

The following is the expected progress by 2020 in terms of Renewable Energy targets under the *With Additional Measures* (Advanced energy projection) Scenario:

- 40.2% renewable electricity (RES-E) share (full target is 40%)
- 4.6% renewable heat (RES-H) share (full target is 12%)
- 10.1% renewable transport (RES-T) share (full target is 10%)
- 13.3% Overall Renewable Energy (RES) share (full target is 16%)

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

- 69.4% renewable electricity (RES-E) share
- 23.2% renewable heat (RES-H) share
- 34.2% renewable transport (RES-T) share
- 34.2% Overall Renewable Energy (RES) share

The above information is based on model input assumptions underpinning the *Advanced* energy projection 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 takes into account Food Wise 2025 policy targets and reflects trends in agricultural production at the time of preparing the projected activity data.

The breakdown of historical and projected emissions for the non-ETS and ETS sectors (Mt CO<sub>2</sub> eq) under the *With Existing Measures* and *With Additional Measures* scenarios is shown in Table 2.

**Table 2: Historical and projected emissions for the non-ETS and ETS sectors (kt CO<sub>2</sub> eq<sup>25</sup>) for *With Existing Measures* and *With Additional Measures* scenarios**

		Non-ETS sector	ETS sector	Total
Historical	2005	47866.24	22398.10	70264.34
	2008	47747.01	20384.45	68131.46
	2009	45140.80	17215.57	62356.37
	2010	44595.60	17353.82	61949.41
	2011	42036.22	15757.37	57793.58
	2012	41932.74	16852.40	58785.14
	2013	42864.05	15706.53	58570.58
	2014	42094.04	15968.53	58062.57
	2015	43583.55	16848.41	60431.95
	2016	44722.49	17752.65	62475.14
	2017	45199.52	16915.35	62114.86
	2018	46986.60	15539.42	62526.01
	2019	45580.74	14196.90	59777.64
Projected	<i>With Existing Measures scenario</i>			
	2020	44606.84	12604.05	57210.90
	2025	45815.44	16501.61	62317.04
	2030	44275.90	13671.49	57947.38
	2035	44387.93	16040.12	60428.05
	2040	45633.13	17619.02	63252.15
	<i>With Additional Measures scenario</i>			
	2020	44539.71	12604.05	57143.76
	2025	42326.26	12911.16	55237.42
	2030	36592.13	11167.99	47760.12
	2035	36166.90	13374.95	49541.85
	2040	36607.76	14462.82	51070.58

Note: Totals excludes Land Use, Land Use Change and Forestry (LULUCF)

The projected non ETS emissions in Table 2.2 are the projected emissions that are within scope of the Effort Sharing Decision and Effort Sharing Regulation. The projected ETS emissions are estimated emissions from stationary installations within the ETS sector. The difference between the projected total emissions and the sum of projected non ETS and ETS emissions in this table are NF3 emissions and CO<sub>2</sub> from domestic aviation for the years 2019 and 2020, and CO<sub>2</sub> emissions from domestic aviation for the other projected years.

25 Units: 1,000 kilotonnes (kt) = 1000 gigagram (Gg)

CO<sub>2</sub> Equivalent: greenhouse gases other than CO<sub>2</sub> (i.e. methane, nitrous oxide and so-called F-gases) may be converted to CO<sub>2</sub> equivalent using their global warming potentials

**Table 3: Projected non-ETS emissions and allowances for the 2021 to 2030 ESR compliance period for *With Existing Measures* and *With Additional Measures* scenarios<sup>20</sup>**

<i>Mt CO<sub>2</sub> equivalent</i>	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Non-ETS Projections - WEM	45.68	46.88	46.99	46.97	46.82	46.52	46.21	45.83	45.40	45.29	462.60
Non-ETS Projections - WAM	45.42	45.32	44.78	43.97	43.26	42.13	41.15	39.92	38.69	37.44	422.08
Projected Annual Emission Allocations (WEM)	43.48	42.36	41.24	40.11	38.99	37.87	36.75	35.63	34.50	33.38	384.30
Gross Exceedance - WEM	2.20	4.52	5.76	6.86	7.83	8.65	9.46	10.20	10.90	11.91	78.29
Gross Exceedance - WAM	1.94	2.96	3.54	3.86	4.27	4.26	4.40	4.29	4.18	4.06	37.77
<b>Total LULUCF Flexibility</b>	<b>2.68</b>	<b>26.80</b>									
<b>Total ETS Flexibility</b>	<b>1.91</b>	<b>19.08</b>									
Net Exceedance -WEM	-2.38	-0.06	1.17	2.27	3.24	4.06	4.88	5.62	6.31	7.32	32.42
Net Exceedance -WAM	-2.64	-1.63	-1.04	-0.73	-0.32	-0.33	-0.18	-0.29	-0.40	-0.53	-8.10
Net Exceedance - WEM - LULLUCF Flexibility only	-0.48	1.84	3.08	4.18	5.15	5.97	6.78	7.52	8.22	9.23	51.49
Net Exceedance - WAM - LULLUCF Flexibility only	-0.74	0.28	0.86	1.18	1.59	1.58	1.72	1.61	1.50	1.38	10.97
Net Exceedance- WEM - ETS Flexibility only	0.30	2.62	3.85	4.95	5.92	6.74	7.56	8.30	8.99	10.00	59.22
Net Exceedance- WAM - ETS Flexibility only	0.04	1.05	1.64	1.95	2.36	2.35	2.50	2.39	2.28	2.15	18.70

## Sectoral Breakdown

Under Section 3 of this report 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 ETS and non-ETS)
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*<sup>26</sup> (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).

Further details on the models used for preparing the energy projections (i.e. I3E, Plexos Integrated Energy Model, SEAI's Energy Scenario Tool, SEAI BioHeat Model) are included in the 2020 submission made under Article 14 of the Monitoring Mechanism Regulation (Regulation 525/2013). This is available in relevant 2020 submission folders at the following link:

[https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14\\_lcds\\_pams\\_projections/projections/](https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14_lcds_pams_projections/projections/)

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<sup>26</sup> These gases comprise HFCs (Hydrofluorocarbons), PFCs (Perfluorocarbons), SF<sub>6</sub> (Sulphur Hexafluoride) and NF<sub>3</sub> (Nitrogen Trifluoride). They are much more potent than the naturally occurring greenhouse gas emissions (carbon dioxide, methane and nitrous oxide).

# An Gníomhaireacht um Chaomhnú Comhshaoil

Tá an Gníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaoil a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaoil a chosaint ar thionchar díobhálach na radaíochta agus an truailithe.

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, spriocdhírthe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.
- Tacaíocht:** Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaoil atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaoil inbhuanaithe.

## Ár bhFreagrachtaí

### CEADÚNÚ

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

- 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 peitрил;
- 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 húdarás 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 fheabhsúcháin.
- 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 ídionn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaoil.

### BAINISTÍOCHT UISCE

- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uisce idirchreasa agus cósta na hÉireann, agus screamhuiscí; leibhéal 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 GCOMHSHAOIL

- 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 tréimhsíúil ar Staid Chomhshaoil 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 gcomhshaoil in Éirinn (m.sh. mórfheananna forbartha).

### COSAINN RAIDEOLAÍOCH

- Monatóireacht a dhéanamh ar leibhéal 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 tairmí 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 gcomhshaoil ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaoil (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 STRUCTÚR AN GCC

Tá an ghníomhaíocht á bainistiú ag Bord Iánaimeartha, 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.

