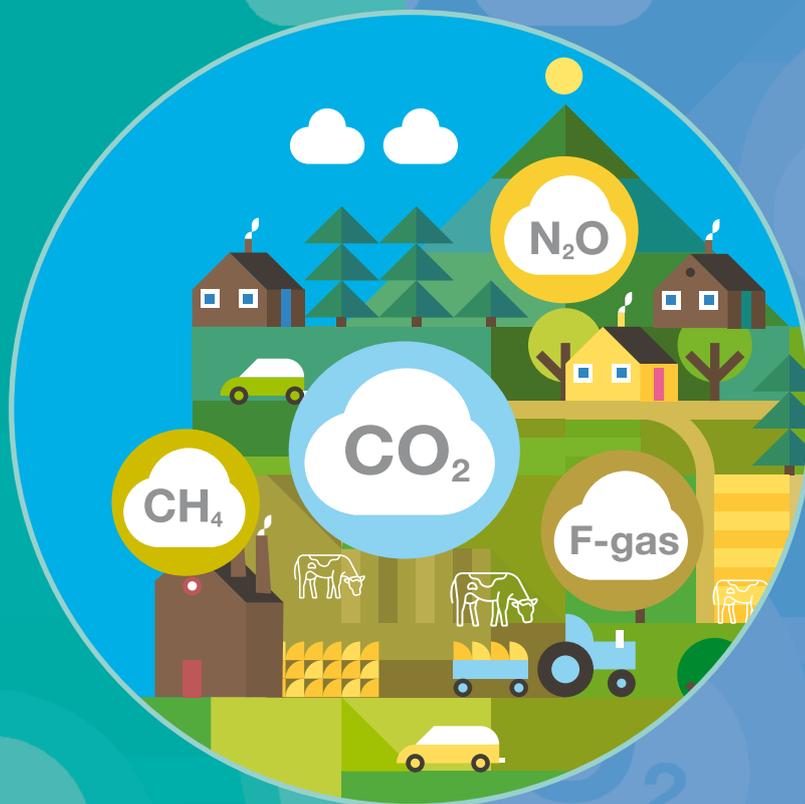


# Ireland's Greenhouse Gas Emissions Projections

2019-2040

July 2020



# 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.

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## Table of Contents

Key Findings	2
Executive Summary	3
1. Introduction	5
2. Approach	6
2.1 Methodology changes in the 2020 projections	6
3. Key Trends – Emissions projections out to 2030	8
3.1 Energy Industries	10
3.2 Transport	12
3.3 Agriculture	14
3.4 Residential	17
3.5 Manufacturing Combustion	18
3.6 Commercial and Public Services	18
3.7 Emissions from remaining sectors	19
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

<b>Climate Action Plan</b>	These projections show that full implementation of the 2019 Climate Action Plan will result in a reduction in Ireland's total greenhouse gas emissions by up to 23% by 2030 compared to the most recent greenhouse gas inventory levels (2018).
<b>Almost 3% per year annual emissions reduction</b>	Implementation of the "With Additional Measures" scenario (including the impact of the 2019 Climate Action Plan) is projected to save 79 Mt CO <sub>2</sub> eq over the period 2021-2030 compared to the "With Existing Measures" scenario. This represents an average annual reduction of 2.9% over the period.
<b>Potential to meet our EU obligations for 2030</b>	Ireland is projected to meet non-ETS EU targets over the period 2021 to 2030. This assumes full implementation of the 2019 Climate Action Plan and the use of flexibilities in relation to land use, land use change and forestry. However, Ireland's non-ETS emissions are projected to be only 2-4% below 2005 levels in 2020, compared to the EU target of 20%.
<b>Full and early implementation of the Climate Action Plan essential</b>	Full and early implementation of the 2019 Climate Action Plan is needed if the savings projected are to materialise. The scale and pace of the changes needed are significant, requiring much greater reliance on renewables, cross-cutting measures such as an €80 per tonne of CO <sub>2</sub> carbon tax by 2030 and further ambitious measures in sectors such as transport, agriculture and power generation.
<b>Decarbonising electricity generation</b>	A 70% contribution of renewable energy in electricity generation by 2030 will be achieved by approximately tripling the 2018 renewable generation capacity, while phasing out coal and peat use. Increased renewables, and greater interconnection, are projected to result in energy industries emissions decreasing by over 34% by 2030 compared to the most recent figures in 2018.
<b>Early action in agriculture</b>	Agriculture emissions are projected to continue to grow in the short term as the dairy herd expands. The 2019 Climate Action Plan envisages 16.5 Mt CO <sub>2</sub> eq savings from agriculture over the period 2021-2030. To achieve these savings will require early implementation of measures such as the use of protected urea fertilisers, improved animal health and low emission slurry spreading. Including the impact of such measures will see emissions reduce by over 12% compared to the most recent figures in 2018.
<b>Electrification of transport</b>	Full uptake of key measures set out in the 2019 Climate Action Plan for the transport sector, including almost 1 million electric vehicles on Irish roads by 2030 and an increase in the use of biofuels, will lead to a reduction of 38% in emissions from this sector, compared to the most recent figures in 2018.
<b>Energy efficient buildings</b>	Measures outlined in the 2019 Climate Action Plan for the residential, commercial/ public services and manufacturing sectors include the installation of over 600,000 heat pumps as well as much improved energy efficiency of Ireland's building stock. Full implementation of the Climate Action Plan will see a reduction in emissions from the residential and commercial/public services sectors of 53% and 36% respectively compared to the most recent figures in 2018.
<b>COVID-19 impact</b>	Work on the latest EPA emissions projections started in late 2019 and they are underpinned by strong projected growth in key sectors of the economy. The impact of Covid-19 is not included in these figures. This impact of the pandemic in terms of greenhouse gas emissions will be incorporated in the next round of projections.

## Executive Summary

This report provides an updated assessment of Ireland's total projected greenhouse gas emissions out to 2040 which includes an assessment of progress towards achieving its emission reduction targets out to 2020 and 2030 set under the EU Effort Sharing Decision (Decision No 406/2009/EU) and Effort Sharing Regulation (Regulation (EU) 2018/842).

The EPA has produced two scenarios in preparing these greenhouse gas emissions projections; a *With Existing Measures* scenario and a *With Additional Measures* scenario.

These emissions projections and specifically the *With Additional Measures* scenario include the impact of new climate mitigation policies and measures that are in Ireland's Climate Action Plan which was published in 2019. This Plan sets out a major programme of policies and measures aimed to help Ireland achieve its decarbonisation goals.

Compared to the *With Existing Measures* scenario, the *With Additional Measures* scenario (which includes the impact of the 2019 Climate Action Plan) will deliver an emission savings of approximately 78.8 Mt CO<sub>2</sub> eq over the period 2021-2030. An average reduction in emissions of 2.9% per year is projected over this period.

In relation to 2020 EU targets, Ireland is set to miss its target for compliance with the EU's Effort Sharing Decision (Decision No 406/2009/EC). Ireland's non-Emissions Trading Scheme<sup>1</sup> emissions are projected to be 2% and 4% below 2005 levels in 2020 under the *With Existing Measures* and *With Additional Measures* scenarios, respectively. This compares to the target of 20% below 2005 levels by 2020.

In terms of 2030 reduction targets the EU Effort Sharing Regulation (Regulation (EU) 2018/842) requires that Ireland reduce its non-ETS emissions by 30% on 2005 levels by 2030.

Ireland's non-ETS emissions are projected to be 6% and 29% below 2005 levels in 2030 under the *With Existing Measures* and *With Additional Measures* scenarios, respectively. With the use of a Land-Use, Land-Use Change and Forestry (LULUCF) flexibility, as provided for under EU legislation<sup>2</sup>, emissions are projected to be 12% and 34% below 2005 levels in 2030.

Under the Effort Sharing Regulation, Ireland has an estimated carbon budget of 378.3 Mt of CO<sub>2</sub> eq. The latest projections indicate that, under the *With Existing Measures* scenario, Ireland will exceed the carbon budget by approximately 51 Mt CO<sub>2</sub> eq over the 2021-2030 period assuming the Land-use, Land-use Change and Forestry (LULUCF) flexibility is fully utilised. Under the *With Additional Measures* scenario, the projections indicate that Ireland will have a surplus of approximately 8.9 Mt CO<sub>2</sub> eq over the 2021-2030 period with full use of the LULUCF flexibility.

In 2020 the sectors with the largest contribution of emissions are Agriculture, Transport and Energy Industries with 32.6%, 19.8% and 18.7% share in total emissions respectively under the *With Additional Measures* scenario. Ireland exceeded its annual binding limits in 2016, 2017 and 2018. Over the period 2013-2020 Ireland is projected to cumulatively exceed its compliance obligations by approximately 13.4 Mt CO<sub>2</sub> eq under the *With Existing Measures* scenario and 12.6 Mt CO<sub>2</sub> eq under the *With Additional Measures* scenario.

<sup>1</sup> These sectors cover agriculture, transport, built environment (residential, commercial/institutional), waste and non-energy intensive industry.

<sup>2</sup> The 2019 Climate Action Plan indicates that Ireland intends to avail of the LULUCF flexibility which, over the compliance period, amounts to a credit of 26.8 Mt CO<sub>2</sub> eq.

In 2030, the contribution from Agriculture, Transport and Energy Industries is projected to change to 38.7%, 16.2% and 15% respectively. Despite projected reductions in the Agriculture sector in this scenario, the increased proportion in 2030 from Agriculture is largely a consequence of the projected reduction in fuel combustion (and therefore CO<sub>2</sub>) in the other sectors of the economy. Reducing emissions in the agriculture sector is more challenging however reductions can be delivered as set out in Teagasc's Marginal Abatement Cost Curve.

# 1. Introduction

The Environmental Protection Agency (EPA) produces national greenhouse gas emission projections on an annual basis. These projections are compiled to meet EU reporting obligations (Monitoring Mechanism Regulation No 525/2013<sup>3</sup>) and to inform national policy development, and update those published in June 2019<sup>4</sup>. The EPA has been designated by Government with the responsibility to develop, prepare and publish periodic projections of greenhouse gas emissions for Ireland, and acts as the national entity with overall responsibility for the preparation and reporting of emissions projections. The preparation of EPA projections is a collaborative process with input from a range of State bodies and Government Departments. In particular, key data providers Teagasc provide projected animal numbers and other key parameters related to the agriculture sector and energy projections are provided by Sustainable Energy Authority of Ireland (SEAI) and the Economic and Social Research Institute (ESRI).

This report provides an updated assessment of Ireland's total projected greenhouse gas emissions out to 2040. It describes progress towards achieving emission reduction targets set under the EU Effort Sharing Decision (Decision No 406/2009/EU) up to 2020 and a longer-term assessment on the projected situation in relation to the 2021-2030 carbon budget under the EU Effort Sharing Regulation (Regulation (EU) 2018/842).

Ireland's 2020 target is to achieve a 20% reduction of non-Emissions Trading Scheme (non-ETS) sector emissions (i.e. agriculture, transport, residential, commercial, non-energy intensive industry, and waste) on 2005 levels with annual binding limits set for each year over the period 2013-2020. New 2030 targets for EU Member States were adopted by the European Council in 2018. Ireland's 2030 target under the Effort Sharing Regulation (ESR) is a 30% reduction of emissions compared to 2005 levels by 2030<sup>5</sup>. There will be binding annual limits over the 2021-2030 period to meet that target.

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 lower mitigation potential for emissions from that sector.

Over the longer-term Ireland's National Policy Position on Climate Action and Low Carbon Development has set a target of 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 sectors. The long-term vision of low-carbon transition is also based on, in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

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3 Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No. 280/2004/EC.

4 <http://www.epa.ie/pubs/reports/air/airemissions/ghgprojections2018-2040/>

5 [https://ec.europa.eu/clima/policies/effort/proposal\\_en](https://ec.europa.eu/clima/policies/effort/proposal_en)

## 2. Approach

Greenhouse gas emissions are projected out to 2040 using two scenarios; *With Existing Measures* and *With Additional Measures*.

- The *With Existing Measures* scenario assumes that no additional policies and measures beyond those already in place by the end of 2018 are implemented. This is the cut off point for which the latest national greenhouse gas emission inventory data is available.
- The *With Additional Measures* scenario assumes implementation of the *With Existing Measures* scenario in addition to implementation of planned government policies and measures adopted after the end of the 2018. Importantly, this includes Ireland's 2019 Climate Action Plan<sup>6</sup>. This Plan, published in June 2019, sets out a major 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) in Q1 2020. The energy projections were prepared by SEAI, ESRI and University College Cork. The ESRI produce energy demand projections using the I3E model (Ireland Environment, Energy and Economy model)<sup>7</sup>. Determination of anticipated progress in the implementation of energy related policies and measures was coordinated by the SEAI in discussion with the relevant Government Departments prior to the energy projections being finalised.
- Agricultural projections provided by Teagasc (Agriculture and Food Development Authority) in November 2019 which considers the impact of Food Wise 2025<sup>8</sup> for the agriculture sector.

### 2.1 Methodology changes in the 2020 projections

A number of changes have been made to the approach used to produce these emissions projections compared to that used for the 2019 emissions projections. These changes include both updates to reflect newer source data, and methodological changes made to improve the accuracy and repeatability of the results. As always, the EPA projections are produced in close collaboration with other key agencies such as the ESRI, the SEAI and Teagasc, and methods are constantly being reviewed and improved by all. The key changes made for 2020 are described below in detail.

A new model was used by the ESRI for producing energy demand projections, a key input dataset that the SEAI use to produce the final energy demand projections. This new model, called the "Ireland Environment, Energy and Economy" model (I3E) reproduces the structure of the economy in its entirety. As before, the SEAI adjusts the output from this model to take into account the projected impact of energy related policies and measures.

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6 <https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx>

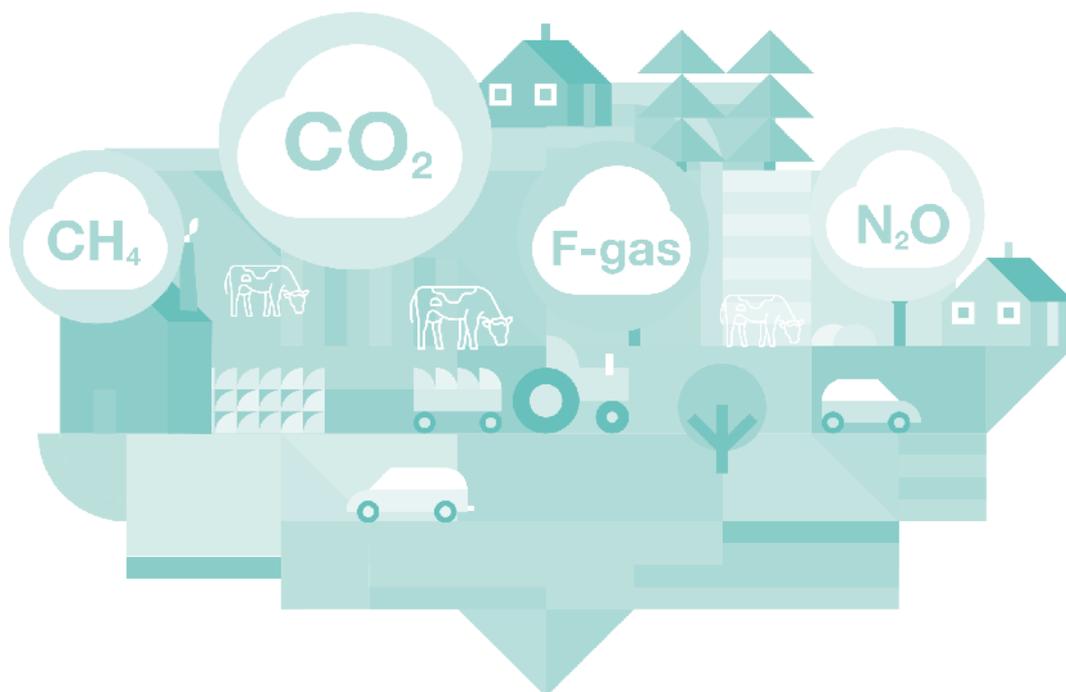
7 <https://www.esri.ie/current-research/the-i3e-model>

8 <http://www.agriculture.gov.ie/foodwise2025/>

For the 2020 emissions projections, fuel price data (that is used as input for the ESRI I3E model) were sourced from the UK Department for Business, Energy and Industrial Strategy (BEIS) 2018 publication. These are significantly lower than the fuel prices used to produce the energy demand projections that underpinned the 2019 emissions projections, which were based on the 2016 EU Reference scenario fuel prices.

As the new model is still being further improved (eg. a transport sector module is currently being built to provide more granular detail for that sector) and the UK BEIS prices are far closer to current trends in fossil fuel prices than the EU Reference scenario prices, it is considered prudent during the development phase not to use a higher fuel price scenario, given the risk it may underestimate emissions. Once the new model has been established for long enough to assess its performance, this approach will be reviewed.

The 2020 emissions projections include 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 of €80 per tonne of CO<sub>2</sub> in 2030, which has a significant impact on projected energy demand, as well as sector specific measures such as greatly increased uptake of electric vehicles. The latest emissions projections consequently see a greater impact of policies and measures over the longer term and therefore a greater reduction in emissions in the *With Additional Measures* scenario.



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

These greenhouse gas emissions projections show total emissions decreasing from the latest (2018) levels by 2% by 2030 under the *With Existing Measures* scenario and by 23% under the *With Additional Measures* scenario.

Figure 1 shows the expected trend in total greenhouse gas emissions under both scenarios. 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 of the sectors below.

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

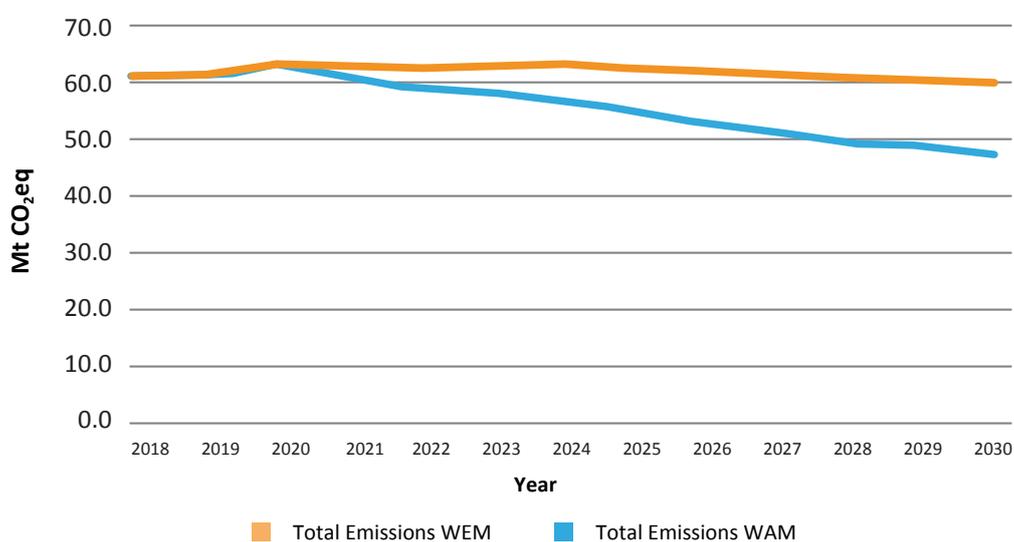
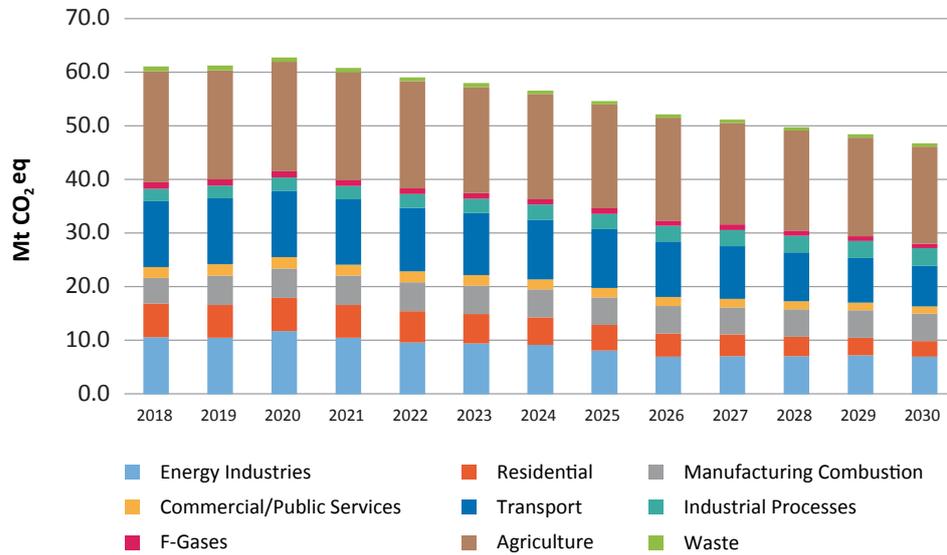


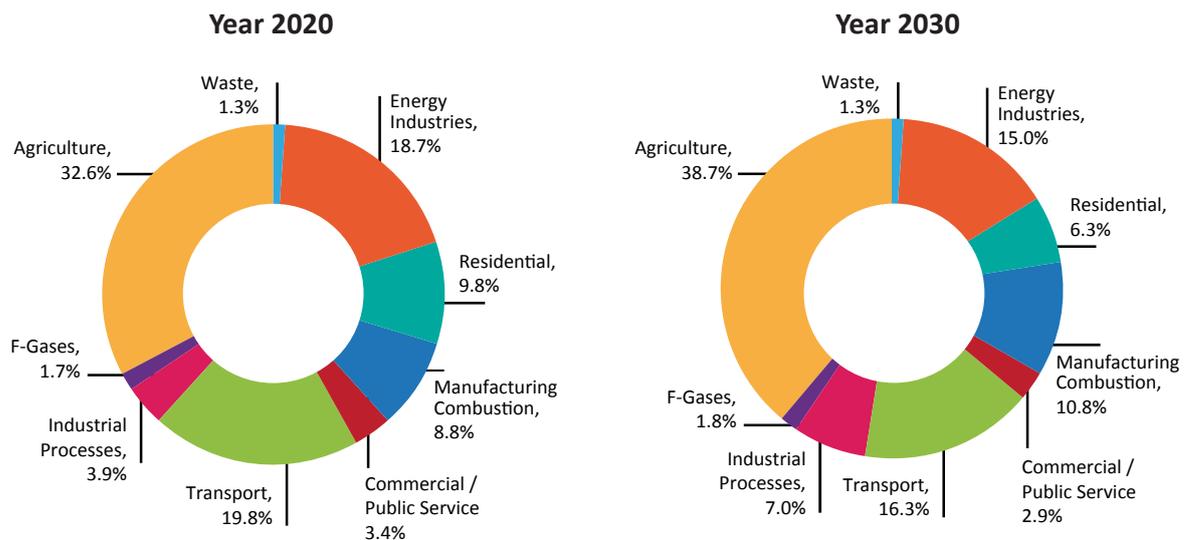
Figure 2 shows the sectoral percentage share throughout the projected time period under the *With Additional Measures* scenario. Under this scenario, emissions from Agriculture, Transport and Energy Industries, which are key sectors with the largest share of emissions, are projected to decrease by 12.4%, 37.8% and 34.0% respectively over the period 2019 to 2030. In 2020 the sectors with the largest contribution of emissions are Agriculture, Transport and Energy Industries with 32.6%, 19.8% and 18.7% share in total emissions respectively. In 2030 this is projected to change to 38.7%, 16.3% and 15% for these sectors respectively as shown in Figure 3.

The increased proportion in 2030 from Agriculture (which is predominately a source of Methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O)) is largely a consequence of the projected reduction in fuel combustion (and therefore mainly CO<sub>2</sub>) in the other sectors of the economy. Reducing emissions in the agriculture sector is challenging however significant reductions can be delivered as set out in Teagasc's Marginal Abatement Cost Curve.

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

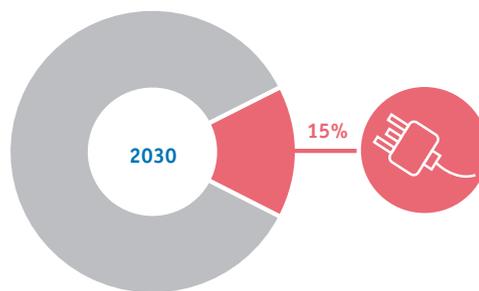


**Figure 3: Total Greenhouse Gas Emissions Projections by sector share under the *With Additional Measures* scenario in in the year 2020 and 2030**

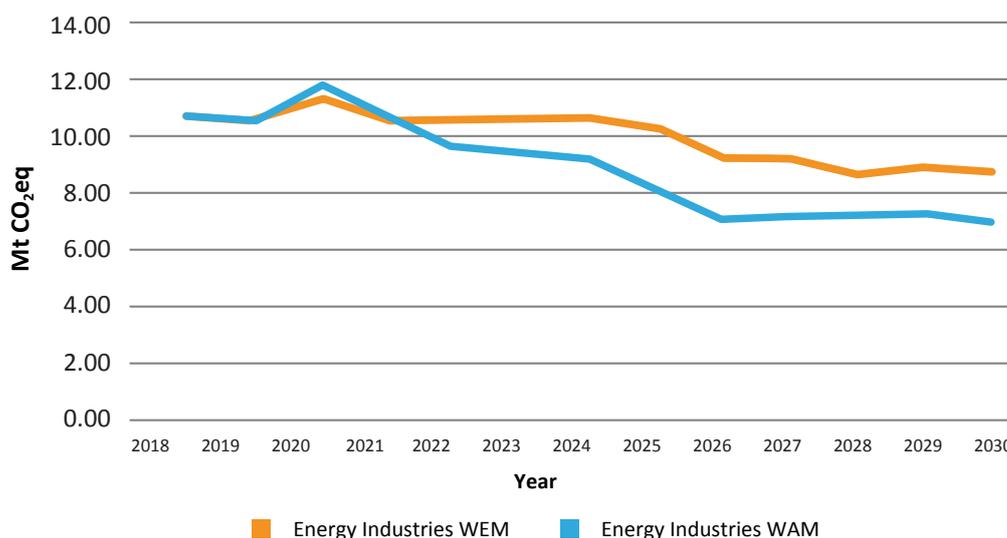


### 3.1 Energy Industries

The majority of emissions within Energy industries come from power generation and are largely covered by the EU Emissions Trading Scheme (ETS). In addition emissions from solid fuels, petroleum refining (largely included within ETS) and fugitive emissions are included. This sector contributed over 17.4% of Ireland's total emissions in 2018. Figure 4 below shows the projected trend in emissions from energy industries out to 2030 under the *With Existing Measures* and *With Additional Measures* scenario.



**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**



#### With Existing Measures scenario

- Under the *With Existing Measures* scenario, emissions from the energy industries sector are projected to decrease by 18% to 8.7 Mt CO<sub>2</sub> eq over the period 2019 to 2030.
- In terms of the renewable energy generated this scenario projects Ireland reaching approximately 37.6% 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 are included in the assumptions<sup>9</sup> underpinning the energy projections. The use of peat and biomass in these peat stations is determined

<sup>9</sup> Assumptions are based on anticipated progress of implementation of policies and measures as determined by Government Departments during the preparation of the energy projections which was coordinated by the SEAI.

by the plants operation in the electricity market that take into account supports (Public Service Obligation (PSO)/REFIT 3<sup>10</sup>) and maximum levels of peat likely to be permitted under planning permission. REFIT 3 is designed to incentivise the addition of renewable electricity capacity to the Irish grid which includes biomass combustion and biomass co-firing.

- In the assumptions underpinning the *With Existing Measures*, scenario, two peat stations are eligible for PSO support for peat up to the end of 2019 and REFIT 3 for 30% biomass cofiring up to the end of 2030. A third peat station is eligible for REFIT 3 30% biomass cofiring up to the end of 2030.
- The following are the assumptions on the maximum levels of peat use for two peat stations:
  - 2019 up to 100% peat
  - 2020-2024: up to 60% peat
  - 2025-2027: up to 40% peat
  - 2028 onwards: 0% peat

The following are the assumptions on the maximum level of peat use at the third peat station:

- 2019-2024: up to 60% peat
- 2025-2027: up to 40% peat
- 2028 onwards: 0% peat
- 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.

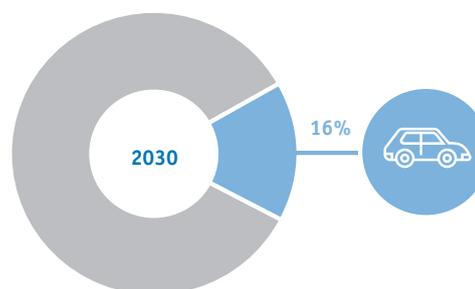
### With Additional Measures scenario

- Under the *With Additional Measures* scenario, emissions from the energy industries sector are projected to decrease by 34% to 7 Mt CO<sub>2</sub> eq over the period 2019 to 2030.
- In this scenario it is assumed that for 2020 there is a 36.3% 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* scenario two peat stations are assumed to run on 100% peat to the end of 2020 but PSO support finishes at the end of 2019. For 2020 the operation of the peat plants is determined by the electricity market. The third peat station operates to the end of 2023 with 30% cofiring.
- 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 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.

<sup>10</sup> <https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/electricity/renewable-electricity-supports/refit/Pages/REFIT-3.aspx>

## 3.2 Transport

The main source of emissions from the transport sector is road transport, accounting for approximately 96% of transport emissions in 2018. 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 2018.



### With Existing Measures scenario

- Under the *With Existing Measures* scenario, transport emissions are projected to decrease by 7.6% over the period 2019-2030 to 11.2 Mt CO<sub>2</sub> eq.
- The main policy instruments impacting transport emissions in this scenario are the Biofuels Obligations Scheme<sup>11</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 11% from 1<sup>st</sup> January 2019 under the Biofuels Obligation Scheme is assumed. This increases to approximately 12% from 1<sup>st</sup> 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<sup>9</sup>.

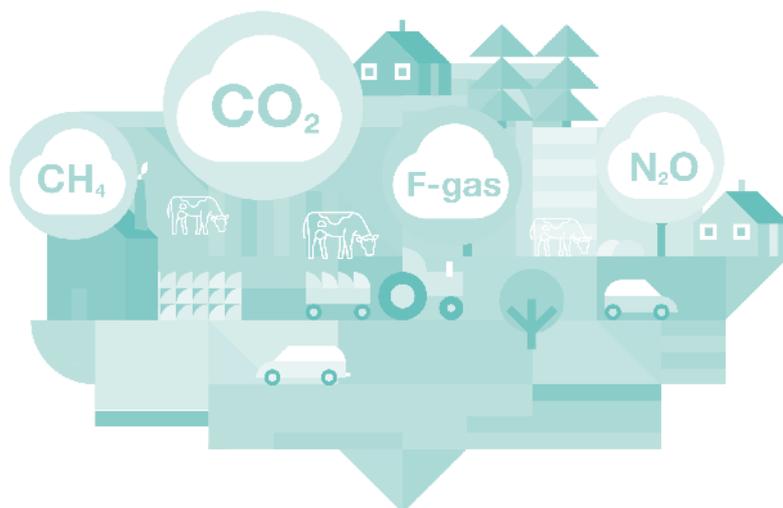
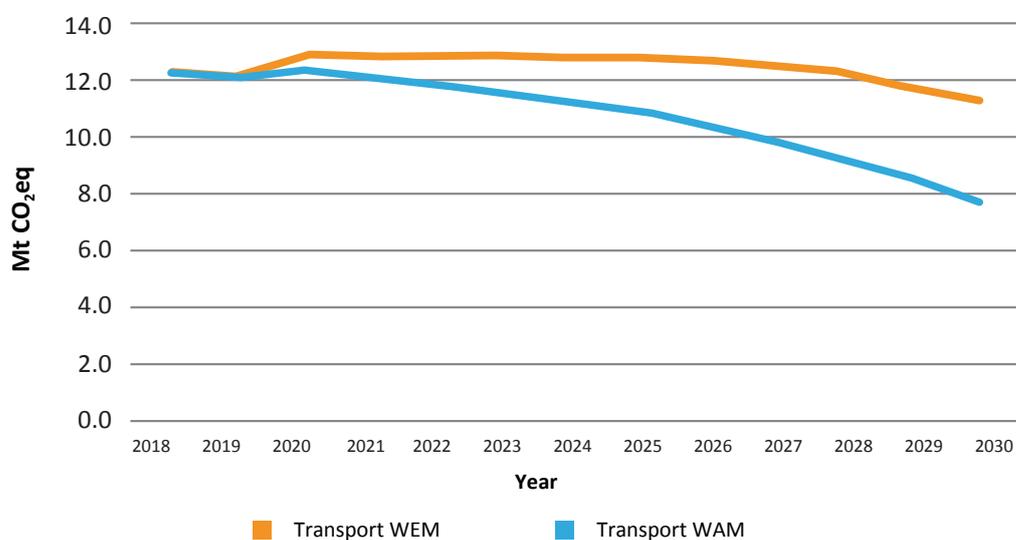
### With Additional Measures scenario

- Under the *With Additional Measures* scenario, transport emissions are projected to decrease by 37.8% over the period 2019 to 2030 to 7.6 Mt CO<sub>2</sub> eq.
- 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 935,000 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.

11 <https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/transport/biofuels/Pages/Biofuels.aspx>

- 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>12</sup>. Figure 5 below shows the projected trend in emissions from the transport sector out to 2030 under the *With Existing Measures* and *With Additional Measures* scenarios. This shows the extent of the impact of additional measures included in the Climate Action Plan projected emissions over the period.

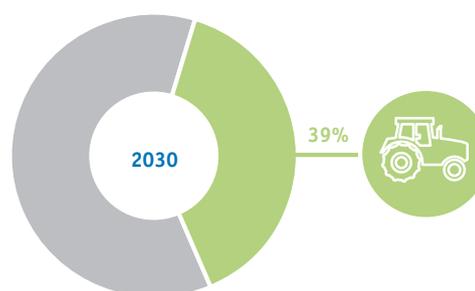
**Figure 5: Greenhouse Gas Emissions Projections from the Transport Sector under the *With Existing Measures (WEM)* and *With Additional Measures (WAM)* scenarios out to 2030**



<sup>12</sup> <https://busconnects.ie/>

### 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 33.8% of Ireland's total emissions in 2018.



The data underpinning the agriculture projections was supplied by Teagasc to the EPA in November 2019 and includes projected animal numbers, crop areas and nitrogen fertiliser application to soils. The 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.

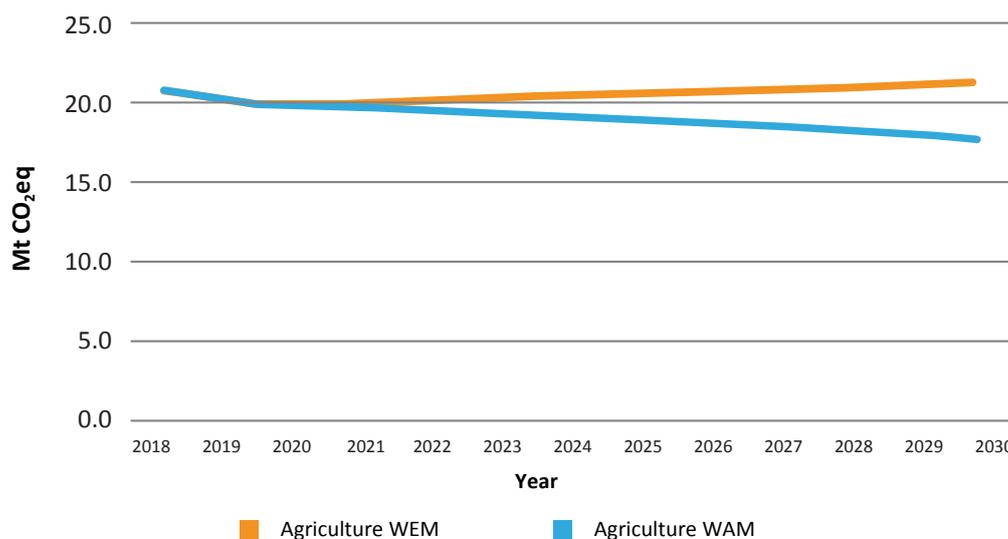
#### With Existing Measures scenario

- Total emissions from agriculture are projected to increase by 2.5% over the period 2019-2030 to 21.1 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 (S1). Under this scenario dairy cow numbers are projected to increase reflecting the continuing profitability of dairy production in Ireland. Dairy cow numbers in 2030 reach 1.636 million. This represents a 15% increase relative to 2018. In contrast, the continuing low levels of profitability of beef cow production systems is reflected in a projected contraction of beef cow numbers which are projected to decline to 0.76 million in 2030. This represent a 25% decrease relative to 2018. Total cattle in 2030 are projected to be 7.1 million. This represent a 2% decrease relative to 2018.
- Even though total cattle numbers are relatively stable over the projected period, projected growth in dairy cow numbers and contraction in beef cow numbers leads to a change in the composition of the Irish bovine inventory and in the intensity of grassland use. 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 398,000 tonnes. This represent a 3% decrease relative to 2018. Due to adverse weather in 2018, fertiliser use in that year was particularly elevated.
- Irish ewe and total sheep numbers are projected to contract over the period to 2030. By 2030 total Irish sheep numbers are projected to decline to 4.65 million. This represent a 10% decrease relative to 2018. This contraction reflects the low profitability of this farming activity on a per hectare basis.
- 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 2018.

### With Additional Measures scenario

- Under the *With Additional Measures* scenario emissions are projected to decrease to approximately 18.1 Mt CO<sub>2</sub> eq by 2030 which is a 12.4% reduction over the period 2019-2030.
- 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>13</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.
- Figure 6 below shows the projected trend in emissions from the agriculture sector out to 2030 under the *With Existing Measures* and *With Additional Measures* scenario. This 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 reduction 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 based on alternative projected activity data scenarios provided by Teagasc. Two alternative scenarios are presented. One looks at the potential impact of a hard BREXIT and the other looks at stronger growth in agricultural activity levels. The resulting emissions for all three scenarios are presented in Figure 7 which shows hard BREXIT scenario leading to lower emissions compared to the *With Existing Measures* scenario and the stronger growth scenario leading to higher emissions over the projected period.

<sup>13</sup> <https://www.teagasc.ie/media/website/publications/2018/An-Analysis-of-Abatement-Potential-of-Greenhouse-Gas-Emissions-in-Irish-Agriculture-2021-2030.pdf>

## Scenario 2 (Hard BREXIT)

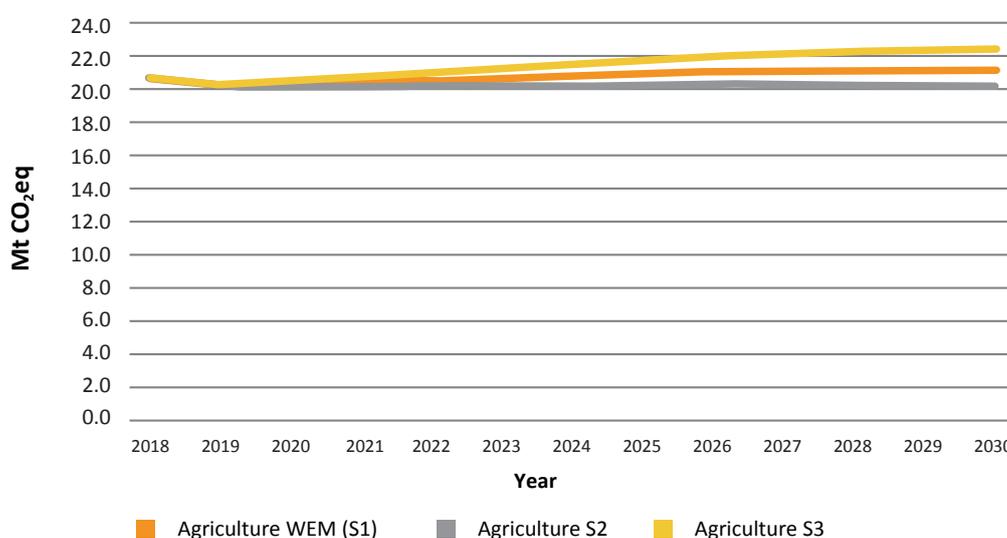
- Under this Scenario a hard BREXIT is assumed to take place with EU-UK trade relationship governed by the EU Third Country applied tariff schedule and the announced UK temporary tariff schedule. Greenhouse gas emissions from Scenario 2 result in 7.2 Mt CO<sub>2</sub> eq less emissions over the 2021-2030 period compared to the *With Existing Measures* scenario.
- This scenario projects Irish dairy cow numbers to increase relative to observed levels in 2018, reflecting continuing profitability of dairy production. Dairy cow numbers in 2030 are projected to reach 1.562 million which is a 10% increase relative to 2018 but a decline relative to the projected activity for 2030 under the *With Existing Measures* scenario.
- Under a hard BREXIT the Irish beef sector is the most exposed of Ireland's major agricultural sub-sectors and beef cow numbers in 2030 are projected to decline by 32% relative to 2018. Total cattle numbers in 2030 are 6.618 million in this scenario, a 9% decrease relative to 2018. Nitrogen fertiliser use declines initially in this scenario but recovers over the period 2025 to 2030. In 2030 the total use of nitrogen fertiliser is 370,000 tonnes, representing a 9% decrease relative to 2018.

## Scenario 3 (stronger growth in agricultural activity levels)

This scenario is based on stronger growth in agriculture activity levels. It assumes continued growth in the dairy herd accompanied by a stable, rather than contracting beef cow herd. Greenhouse gas emissions from Scenario 3 result in 8.5 Mt CO<sub>2</sub> eq more emissions over the 2021-2030 period compared to the *With Existing Measures* scenario. Under this scenario, dairy cow numbers in 2030 are projected to reach 1.738 million representing a 22% increase relative to 2018.

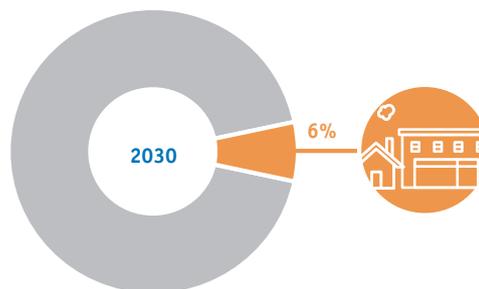
By 2030, Irish beef cow numbers reach 0.909 million. This represents a 10% decrease relative to 2018. By 2030 projected total cattle inventories are projected to be 7.64 million, representing a 5% increase relative to 2018. The higher stocking rate is reflected in a higher level of nitrogen use per hectare and in total nitrogen use over the period to 2030. In 2030 the total use of nitrogen is projected to be 431,000 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. This sector contributed over 10.1% of Ireland's total emissions in 2018.



#### With Existing Measures scenario

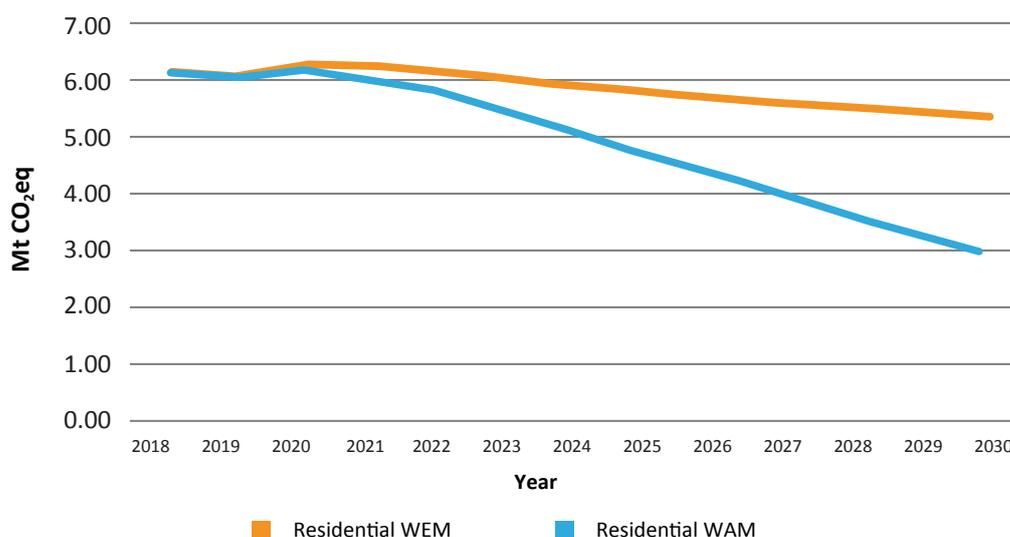
- Under the *With Existing Measures* scenario, emissions from the residential sector are projected to decrease by 14.1% between 2019 and 2030 to 5.3 Mt CO<sub>2</sub> eq.
- The *With Existing Measures* scenario assumes implementation of a range of residential energy efficiency programmes including, for example, Greener Homes, Better Energy Homes and Warmer Homes Schemes, Better Energy Communities Programme and the impact of building regulations.

#### With Additional Measures scenario

- Under the *With Additional Measures* scenario, emissions are projected to decrease by 52.6% between 2019 and 2030 to 2.9 Mt CO<sub>2</sub> eq. This scenario assumes full implementation of the Climate Action Plan that includes upgrades to homes, deep retrofit and significant supports for domestic heat pumps.

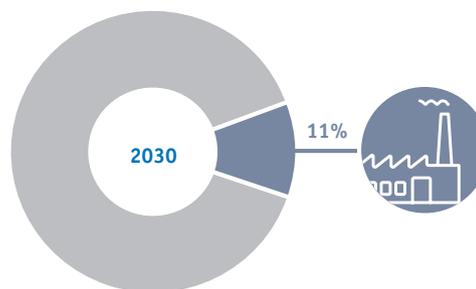
Figure 8 below shows the projected trend in emissions from the residential sector out to 2030 under the *With Existing Measures* and *With Additional Measures* scenario. This difference between both scenarios is attributed to the implementation of additional measures committed to in the Climate Action 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**



### 3.5 Manufacturing Combustion

Fuel combustion in manufacturing contributed over 7.7% of Ireland's total emissions in 2018. Two scenarios are presented for this sector.



#### With Existing Measures scenario

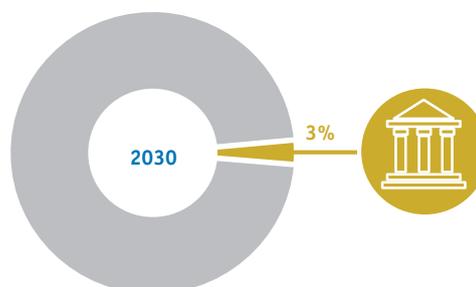
- Under the *With Existing Measures* scenario, emissions from manufacturing combustion are projected to increase by 28.3% between 2019 and 2030 to 6 Mt CO<sub>2</sub> eq. This scenario assumes implementation of existing energy efficiency programmes such as the SEAI Large Industry Programmes, Accelerated 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 6.5% between 2019 and 2030 to 5 Mt CO<sub>2</sub> eq. This scenario assumes further roll out of energy efficiency programmes including those listed above.

### 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 over 3.4% of Ireland's total emissions in 2018.



#### With Existing Measures scenario

- Under the *With Existing Measures* scenario, emissions from the commercial and public services sector are projected to increase by 5.1% between 2019 and 2030 to 2.2 Mt CO<sub>2</sub> eq. 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 36.2% between 2019 and 2030 to 1.3 Mt CO<sub>2</sub> eq. This scenario assumes full implementation of the Climate Action Plan which includes further delivery of energy efficiency programmes as outlined above.

### Cross cutting measures impacting key energy sectors

There are cross cutting measures that have a significant impact across of number of sectors in terms of energy consumption and a reduction in emissions. These included carbon tax and supports for renewable heat which are described below.

- Carbon tax is a cross cutting measure that applies to industry, residential, commercial services, transport and agriculture fuel. Under the *With Existing Measures* scenario, carbon tax at a rate of €20 per tonne of CO<sub>2</sub> is assumed across the projected period. Under the *With Additional Measures* scenario the carbon tax increases to €80 per tonne of CO<sub>2</sub> by 2030<sup>9</sup>.
- In terms of renewable heat, 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>14</sup>.
- It is also assumed that 175,000 heat pumps replace residential oil boilers by 2030 under the *With Existing Measures* scenario. Under the *With Additional Measures* scenario it is assumed that 385,000 existing residential oil boilers, gas boilers and electric heaters are replaced with heat pumps. District heating in Dublin is also assumed to be deployed (additional 120 GWh by 2028 growing linearly from 2023).
- Under the *With Additional Measures* scenario, a total of 1,600GWh of biogas use across the heat and transport sectors by 2030 is assumed (linear increase from 2025 is assumed).

### 3.7 Emissions from remaining sectors

The following is a brief overview of (non energy related) projected emissions from the Industrial Processes sector, the Waste sector and Fluorinated gas emissions.

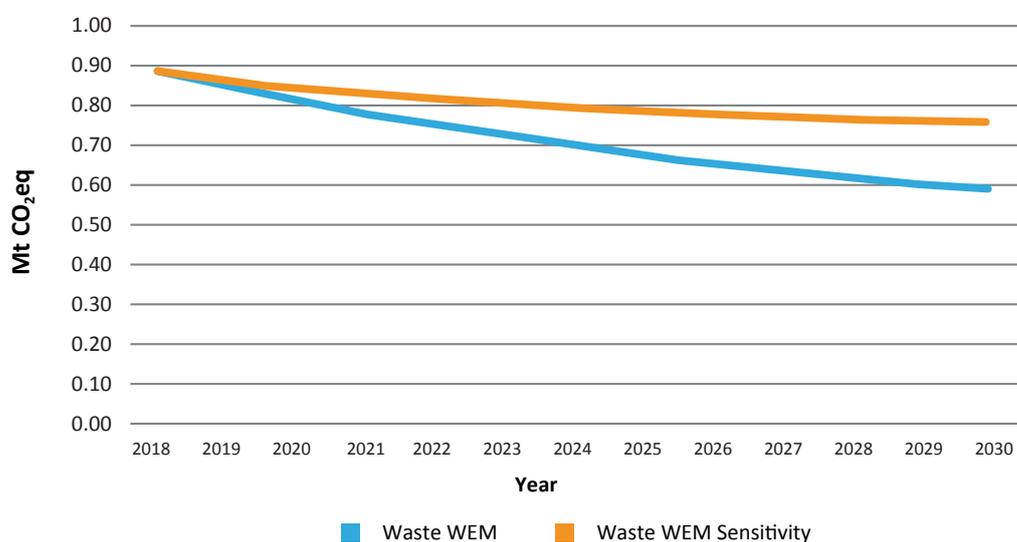
The Industrial Processes and Waste sector contributed 3.8% and 1.5% of Ireland's total emissions in 2018 respectively. There is only one scenario (*With Existing Measures*) for greenhouse gas emissions projections from the Waste sector and Industrial Processes sector based on available data.

- Emissions from **Industrial Processes** include process emissions from mineral, chemical, metal industries, non-energy products and solvents. Emissions are projected to increase by 40.5% between 2019 and 2030 to 3.2 Mt CO<sub>2</sub> eq. The majority of emissions come from cement and lime industries and projections are largely underpinned by projected GDP growth.
- **Waste sector** emissions are projected to decrease by 33.6% between 2019 and 2030 to 0.59 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 reduces significantly over the projected period in line with the projected reduction in waste going to landfill. 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.
- Figure 9 below shows the projected trend in emissions from the Waste sector out to 2030 under the *With Existing Measures* scenario. The graph also shows a sensitivity assessment performed on the *With Existing Measures* scenario which is based on a scenario where an additional 350,000 tonnes of waste per year requires landfill management. This has the impact of increasing emissions by approximately 1.2 Mt CO<sub>2</sub> eq over the 2019-2030 projected period.

<sup>14</sup> <https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/>

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

**Figure 9: Greenhouse Gas Emissions Projections from the Waste Sector under the With Existing Measures scenario, including a sensitivity assessment**



### Fluorinated-Gas emissions

Fluorinated gases accounted for approximately 2% of Ireland's total national greenhouse gas emissions in 2018. 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 16.5% to 0.99 Mt CO<sub>2</sub> eq between 2019 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 31.1% between 2019 and 2030 to 0.81 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>16</sup>.

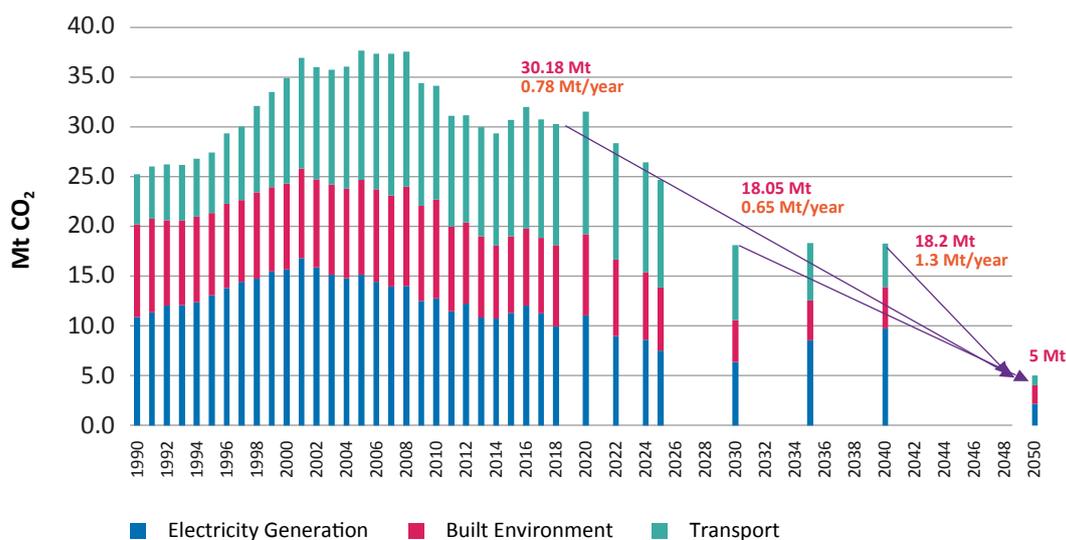
<sup>16</sup> Assumptions are based on consultation with industry at the time of the preparation of the projections.

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

Ireland's National Policy Position on Climate Action and Low Carbon Development<sup>17</sup> sets out a low-carbon roadmapping process that will be guided by a long-term vision of 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.

Figure 10 presents the latest historic and projected emissions for CO<sub>2</sub> only (under the *With Additional Measures* scenario) from the electricity generation, built environment and transport sectors, in addition to the 2050 target pathway based on the long-term vision of low-carbon transition as described above.<sup>18</sup> The graph demonstrates the extent of the challenge in meeting national 2050 targets according to the latest projections.

**Figure 10: Historic and projected CO<sub>2</sub> emissions from the electricity generation, built environment and transport (EGBET) sectors**



In parallel, Ireland's long-term vision of low-carbon transition is based on an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

<sup>17</sup> <https://www.dcae.gov.ie/en-ie/climate-action/publications/Documents/5/National%20Climate%20Policy%20Position.pdf>

<sup>18</sup> Presentation of electricity generation, built environment and transport sectors in Figure 10 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

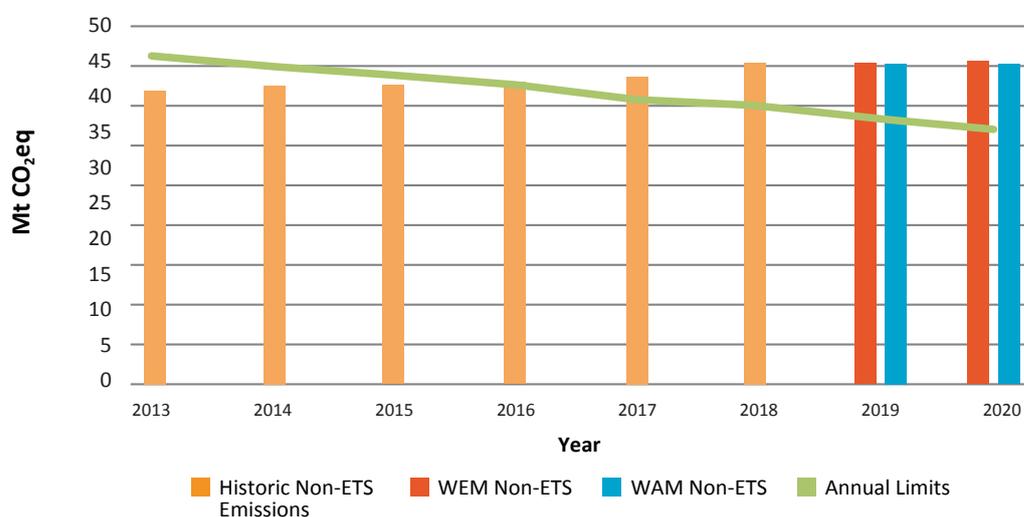
The EU's Effort Sharing Decision (Decision No 406/2009/EC) set 2020 targets for EU Member States including Ireland. These targets cover greenhouse gas emissions from sectors that are not included in the EU Emissions Trading Scheme. For Ireland, these sectors cover agriculture, transport, built environment (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.

In addition, there are annual emission limits for the period 2013-2020 to ensure a gradual move towards the 2020 target.

Figure 11 shows historic (2013-2018) and projected emission levels (2019-2020) for non ETS sector emissions under the *With Existing Measures* and *With Additional Measures* scenarios. 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 2% and 4% below 2005 levels in 2020 under the *With Existing Measures* and *With Additional Measures* scenarios, respectively. The target for Ireland is a 20% reduction. Ireland exceeded its annual binding limits in 2016, 2017 and 2018. Further information on the 1990-2018 inventory is available<sup>19</sup>.

**Figure 11: *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>**



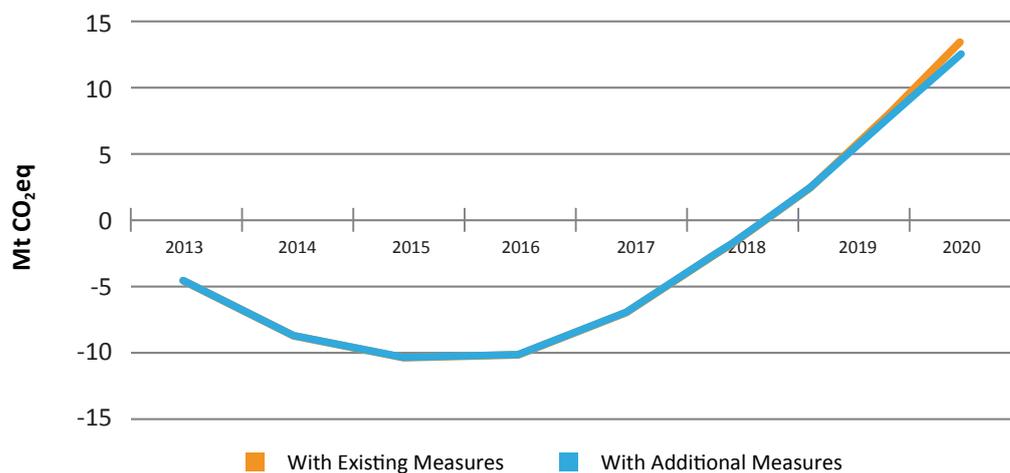
To determine compliance under the Effort Sharing Decision, any overachievement of the binding emission limit in a particular year (between 2013 and 2020) can be banked and used towards compliance in a future year. However, even using this mechanism Ireland will still be in non-compliance according to the latest projections.

19 [http://www.epa.ie/pubs/reports/air/airemissions/ghg2018/Ireland%20GHG%201990-2018%20Final%20Inventory\\_April%202020.pdf](http://www.epa.ie/pubs/reports/air/airemissions/ghg2018/Ireland%20GHG%201990-2018%20Final%20Inventory_April%202020.pdf)

20 1 Mt = 1,000,000 tonnes

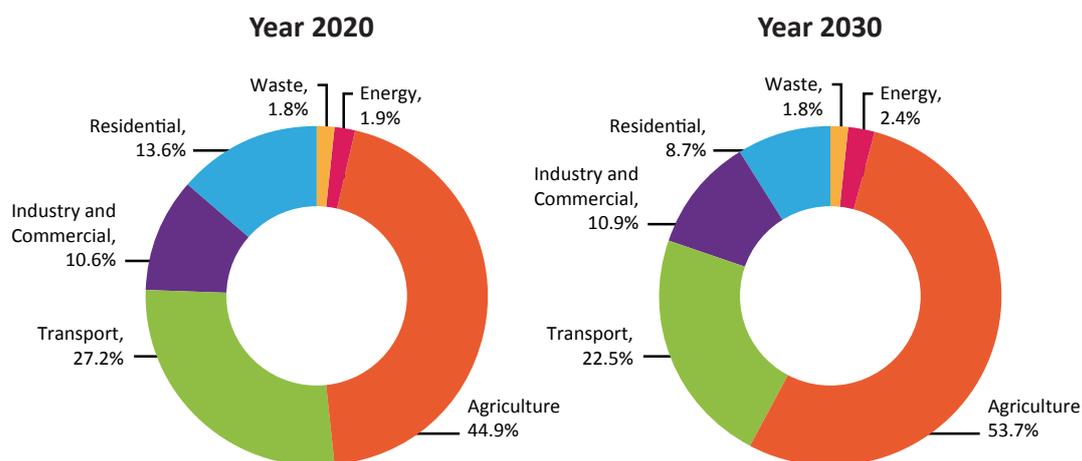
Figure 12 shows that over the period 2013-2020 Ireland is projected to cumulatively exceed its compliance obligations by approximately 13.4 Mt CO<sub>2</sub> eq under the *With Existing Measures* scenario and 12.6 Mt CO<sub>2</sub> eq under the *With Additional Measures* scenario.

**Figure 12: 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 13.

**Figure 13: 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. The 2019 Climate

Action Plan indicates that Ireland intends to avail of the LULUCF flexibility which, over the compliance period, amounts to a credit of 26.8 Mt CO<sub>2</sub> eq.

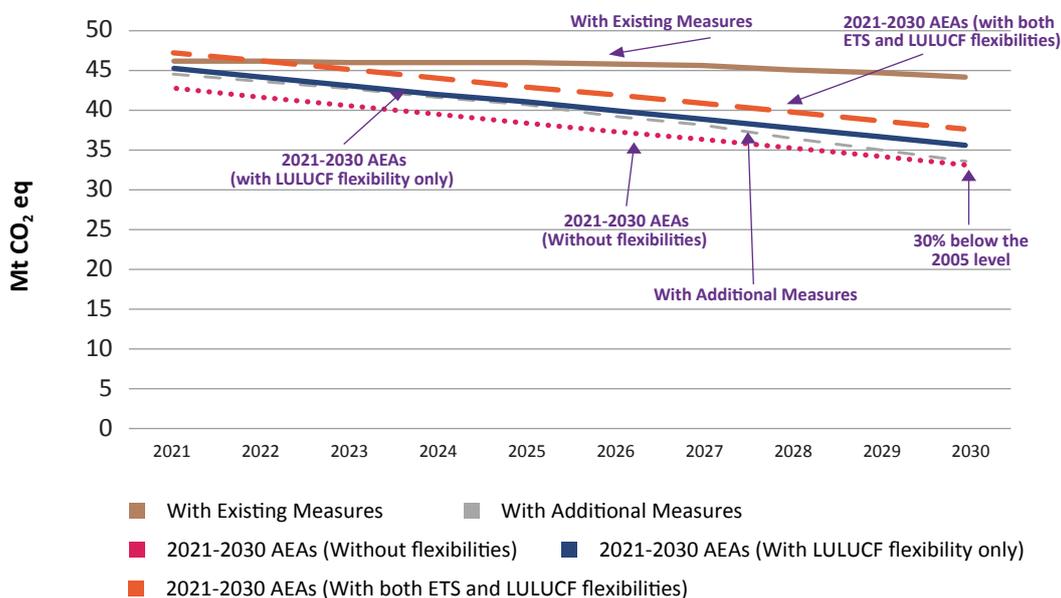
Ireland's non ETS emissions are projected to be 6% and 29% below 2005 levels in 2030 under the *With Existing Measures* and *With Additional Measures* scenarios, respectively. The target for Ireland is a 30% reduction. With the use of the LULUCF flexibility only, emissions are projected to be 12% and 34% below 2005 levels in 2030.

Under the *With Existing Measures* scenario, the projections indicate that Ireland will exceed the carbon budget of 378.3 Mt CO<sub>2</sub> eq by 50.9 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 Mt CO<sub>2</sub> eq.

Under the *With Additional Measures* scenario, the projections indicate that Ireland will have a surplus of approximately 8.9 Mt CO<sub>2</sub> eq over the 2021-2030 period assuming the LULUCF flexibility only as set out in the Effort Sharing Regulation is fully utilised. If the ETS flexibility is also used the surplus would increase to 27.7 Mt CO<sub>2</sub> eq.

Figure 14 below shows 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.

**Figure 14. 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>21</sup>**



See also Table 2.3 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.

<sup>21</sup> Note: The 2021 to 2030 Annual Emission Allocations (AEAs) are affected by the start point which will be based on an average of 2016 to 2018 emissions.

## 6. Conclusion

The EPA's latest emissions projections show a significant shift in terms of decarbonising the Irish economy in the period out to 2030. This is reflected in the EPA's *With Additional Measures* scenario which includes the impact of new climate mitigation policies and measures that formed part of Ireland's Climate Action Plan which was published in June 2019. Full implementation of the measures in the plan will see a reduction in Ireland's total greenhouse gas emissions by up to 23% by 2030.

In the short term, Ireland is set to miss its target for compliance with the EU's Effort Sharing Decision 2020 targets. Ireland's non-Emissions Trading Scheme emissions are projected to be 2% and 4% below 2005 levels in 2020 under the *With Existing Measures* and *With Additional Measures* scenarios, respectively. This compares to the target of 20% below 2005 levels by 2020.

In the longer term, Ireland will meet its 2030 target under the Effort Sharing Regulation as long as there is early and full implementation of the Climate Action Plan measures. Ireland will also need to avail of, at a minimum, Land-use, Land-use Change and Forestry (LULUCF) flexibilities provided for in EU legislation in order to comply.

*Electricity generation, agriculture and transport*, which continue to be key sectors that dominate Ireland's emissions profile, are all projected to decline by 2030, based on implementation of the measures in the Climate Action Plan. For *electricity generation*, this will mean scaling up of the contribution of renewable to 70% by 2030. For *agriculture* this will mean implementing measures such as those set out in Teagasc's Marginal Abatement Cost Curve. For *transport*, this will mean almost one million electric vehicles on Irish roads by 2030 and a considerable increase in the use of biofuels.

A significant increase in the installation of heat pumps for domestic and commercial heating and much improved energy efficiency of Ireland's building stock is also necessary in the *residential, commercial/public services* and *manufacturing* sectors.

The latest projections are underpinned by projected strong economic growth. These projections do not include the impact of Covid-19 which will be included in the next round of projections.

## 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 end of 2018.

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>22</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>23</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 2018 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.

Table 2.1 shows key parameters underlying the macroeconomic outlook and therefore the *With Existing Measures* and *With Additional Measures* emission projections scenarios.

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

<sup>23</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/764342/BEIS\\_2018\\_Fossil\\_Fuel\\_Price\\_Assumptions.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/764342/BEIS_2018_Fossil_Fuel_Price_Assumptions.pdf)

**Table 2.1: Key macroeconomic assumptions underlying the projections out to 2040**

	2019 – 2020	2021 – 2025	2026 – 2030	2031 – 2035	2036 – 2040
	Average Annual% Growth Rate				
GDP	3.32	3.32	3.31	3.31	3.31
GNP	3.32	3.32	3.31	3.31	3.31
Personal Consumption	3.34	3.30	3.30	3.30	3.30
	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>	15.5	23.3	34.7	43.5	51.7
Carbon tax €/tCO <sub>2</sub> (WEM Scenario)	20	20	20	20	20
Coal \$ <sub>2016</sub> /boe	11.21	10.88	10.52	9.55	8.67
Oil \$ <sub>2016</sub> /boe	46.30	46.23	45.79	40.74	36.99
Gas \$ <sub>2016</sub> /boe	24.68	23.05	20.93	19.00	17.25

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

- 36.3% renewable electricity (RES-E) share (full target is 40%)
- 7.8% renewable heat (RES-H) share (full target is 12%)
- 11.2% renewable transport (RES-T) share (full target is 10%)
- 12.8% 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:

- 70% renewable electricity (RES-E) share
- 24% renewable heat (RES-H) share
- 33.5% renewable transport (RES-T) share
- 34.1% Overall Renewable Energy (RES) share

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

Agriculture emissions projections are primarily based on agricultural activity projections (animal numbers, nitrogen fertiliser use and crop areas) provided by Teagasc in November 2019.

Table 2.2 shows 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.

**Table 2.2: Historical and projected emissions for the non-ETS and ETS sectors (kt CO<sub>2</sub> eq<sup>24</sup>) for *With Existing Measures* and *With Additional Measures* scenarios**

	Non-ETS sector	ETS sector	Total
2005	47,304.01	22,398.10	69,702.11
2008	47,106.19	20,384.45	67,490.64
2009	44,520.86	17,215.57	61,736.43
2010	43,923.73	17,353.82	61,277.54
2011	41,399.49	15,757.37	57,156.86
2012	40,900.30	16,852.40	57,752.70
2013	41,893.00	15,696.73	57,589.73
2014	41,356.79	15,968.53	57,325.32
2015	42,567.52	16,848.41	59,415.93
2016	43,738.79	17,752.65	61,491.44
2017	44,091.51	16,913.36	61,004.88
2018	45,402.94	15,531.61	60,934.54
<b>With Existing Measures scenario</b>			
2019	45,221.86	15,919.37	61,162.39
2020	46,118.60	17,009.93	63,149.75
2025	45,958.71	16,271.85	62,251.20
2030	44,173.96	15,470.24	59,665.65
2035	43,469.92	19,012.97	62,504.33
2040	43,706.42	21,655.78	65,383.65
<b>With Additional Measures scenario</b>			
2019	45,196.72	15,895.55	61,113.42
2020	45,383.37	17,233.86	62,638.44
2025	40,732.04	13,788.68	54,541.36
2030	33,647.88	13,008.45	46,677.77
2035	32,022.17	16,082.75	48,126.37
2040	31,313.52	18,457.68	49,792.65

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.

24 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 2.3: Projected non-ETS emissions and allowances for the 2021 to 2030 ESR compliance period for *With Existing Measures* and *With Additional Measures* scenarios**

<i>Mt CO<sub>2</sub> equivalent</i>	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Non-ETS Projections - WEM	46.18	46.16	46.06	46.02	45.96	45.86	45.60	45.21	44.78	44.17	<b>456.0</b>
Non-ETS Projections - WAM	44.51	43.66	42.70	41.64	40.73	39.37	38.13	36.66	35.18	33.65	<b>396.2</b>
Projected Annual Emission Allocations (WEM)	42.65	41.58	40.51	39.44	38.37	37.30	36.23	35.16	34.09	33.01	<b>378.3</b>
Gross Exceedance - WEM	3.53	4.58	5.55	6.58	7.59	8.56	9.38	10.05	10.69	11.16	<b>77.7</b>
Gross Exceedance - WAM	1.85	2.08	2.19	2.19	2.36	2.07	1.90	1.50	1.09	0.63	<b>17.9</b>
<b>Total LULUCF Flexibility</b>											<b>26.8</b>
<b>Total ETS Flexibility</b>											<b>18.8</b>
Net Exceedance - WEM	-1.04	0.01	0.98	2.02	3.02	4.00	4.81	5.48	6.12	6.59	<b>32.0</b>
Net Exceedance - WAM	-2.71	-2.49	-2.38	-2.37	-2.20	-2.50	-2.66	-3.07	-3.47	-3.93	<b>-27.7</b>
Net Exceedance - WEM - LULLUCF Flexibility only	0.85	1.90	2.87	3.90	4.91	5.88	6.70	7.37	8.01	8.48	<b>50.9</b>
Net Exceedance - WAM - LULLUCF Flexibility only	-0.83	-0.60	-0.49	-0.49	-0.32	-0.61	-0.78	-1.18	-1.59	-2.05	<b>-8.9</b>
Net Exceedance - WEM - ETS Flexibility only	1.64	2.69	3.66	4.70	5.70	6.68	7.49	8.16	8.80	9.27	<b>58.8</b>
Net Exceedance - WAM - ETS Flexibility only	-0.03	0.19	0.30	0.31	0.48	0.18	0.02	-0.39	-0.79	-1.25	<b>-0.9</b>

## 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>25</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>25</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 tionsclaíoch 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 tionsclaíoch);
- 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 comhshaoil 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. mórphleananna 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 comhshaoil 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 inní agus le comhairle a chur ar an mBord.

