Ireland's Fourth Biennial Report to the UNFCCC 2020

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1. Introduction

As a party to the United Nations Framework Convention on Climate Change (UNFCCC), Ireland is required to report regularly on its implementation of the Convention via National Communications every four years. Ireland's most recent National Communication (NC7) was submitted in 2018 and included Ireland's Third Biennial Report (BR3) as an annex in accordance with UNFCCC guidelines.[1]

In 2010 at the 16th Conference of the Parties (COP16) to the Convention in Cancun, Parties decided to enhance reporting progress in achieving emissions reductions and on the provision of financial, technology and capacity building support, through a biennial reporting process. COP16 also decided to develop a Common Tabular Format (CTF) for the electronic reporting of information. At COP17 in Durban, in Decision 2/CP.17, Parties adopted the guidelines for this enhanced reporting and the following year, COP18 in Doha adopted the CTF contained in FCCC/CP/8/Add.3 through Decision 19/CP.18.

This is Ireland's Fourth Biennial Report (BR4) under the UNFCCC and has been elaborated in accordance with the Decisions 2/CP.17 and 19/CP18. The electronic information contained in the CTF is submitted separately.

COP17 also agreed the modalities and procedures for the International Assessment and Review of emissions and removals in a rigorous, robust and transparent manner with a view to promoting comparability and building confidence. The Review process consists of a Technical Expert Review of reported information and participation in a multilateral assessment process. This Biennial Report is informed by lessons learned from Ireland's second and third biennial reports submitted in 2016 and 2018 respectively their subsequent Technical Expert Reviews, resulting reports, and Multilateral Assessments.[2] The period under review for this report is 2016 - 2019, with further specified timeframes within this period identified for each of the reporting chapters in accordance with UNFCCC guidelines, as outlined below.

1.1 Structure of Report

The report is structured as follows:

Chapter 2: Information on greenhouse gas (GHG) emissions and trends presents information on the Ireland's GHG inventory, covering emissions estimates for the period 1990-2017, and the national system established to produce and quality assure the Ireland's GHG inventory. This information is consistent with Ireland's greenhouse gas inventory submission for 2019.[3] This was the fourth submission of the inventory under the Revision of the UNFCCC Inventory Reporting Guidelines on annual inventories for Parties included in Annex I to the Convention adopted by COP at Warsaw (Decision 24/CP.19);

[1] https://unfccc.int/sites/default/files/resource/63014825_Ireland-NC7-BR3-1-Seventh%20National%20Communication%20Ireland.pdf
[2] Report on the technical review of BR2: https://unfccc.int/sites/default/files/resource/docs/2016/trr/irl.pdf
Report on the technical review of NC7: https://unfccc.int/sites/default/files/resource/IDR7_IRL_complete.pdf
Report on the technical review of BR3: https://unfccc.int/sites/default/files/resource/trr.3_IRL.pdf
[3] http://www.epa.ie/pubs/reports/air/airemissions/ghg/nir2019/Ireland%20NIR%202019_Final.pdf

Chapter 3: Quantified economy-wide emission reduction targets presents the Ireland's quantified economy-wide emission reduction target, including any conditions or assumptions that are relevant to the attainment of that target;

Chapter 4: Progress in achievement of quantified economy-wide emission reduction targets provides information on the Ireland's mitigation actions, including on the policies and measures implemented or plans to implement since its last Biennial Report to achieve the Ireland's economy-wide emission reduction target;

Chapter 5: Projections reports on updated projected Irish GHG emissions out to 2040 using two scenarios: a *With Measures* scenario and a *With Additional Measures* scenario;

Chapter 6: Provision of financial, technological and capacity-building support to developing country Parties details the Ireland's contributions to non-Annex I Parties consistent with the requirements of Biennial Reports;

The EU and its Member States (MS) are committed to a joint quantified economy-wide emission reduction target of 20% by 2020 compared to 1990 levels. Therefore Ireland and other MS of the EU have not submitted individual economy-wide emission reduction targets to the UNFCCC secretariat. The details of the EU joint target under the UNFCCC are clarified in the document *Additional information relating to the quantified economy-wide emission reduction targets* contained in document FCCC/SB/2011/INF.1/Rev.1 (FCCC/AWGLCA/2012/MISC.1).[4]

[4] FCCC/SB/2011/INF.1/Rev.1: https://unfccc.int/resource/docs/2011/sb/eng/inf01r01.pdf ; FCCC/AWGLCA/2012/MISC.1: https://unfccc.int/resource/docs/2012/awglca15/eng/misc01a02.pdf

2. Information on GHG emissions and trends, GHG inventory including information on inventory system

This chapter outlines the process by which Ireland's emissions are measured and reported. It explains the rationale behind the methodologies used and gives summary information on emissions and trends over the period 1990 to 2017.

2.1 Introduction and summary information on national GHG inventory

In 2017, total emissions of greenhouse gases including indirect emissions from solvent use (without *LULUCF*) in Ireland were 60,743.73 kt CO_2 equivalent, which is 9.6% higher than emissions in 1990 as presented in **Figure 2.1**. Total greenhouse gas emissions excluding indirect emissions from solvent use, reported in the *Industrial Processes and Product Use* (IPPU) sector, in Ireland were 60,644.18 kt CO_2 equivalent. The total for 2017 is 13.8% lower than the peak of 70,475.26 kt CO_2 equivalent in 2001 when emissions reached a maximum following a period of unprecedented economic growth. The *Energy* sector accounted for 60.5% of total emissions in 2017, *Agriculture* contributed 32.2% while a further 5.7% emanated from *IPPU* and 1.5% was due to *Waste*. Emissions of CO_2 accounted for 63.8% of the national total in 2017, with CH_4 and N_2O contributing 23.1% and 11.1%, respectively. The combined emissions of HFC, PFC, SF_6 and NF_3 accounted for 2.0% of total emissions in 2017.

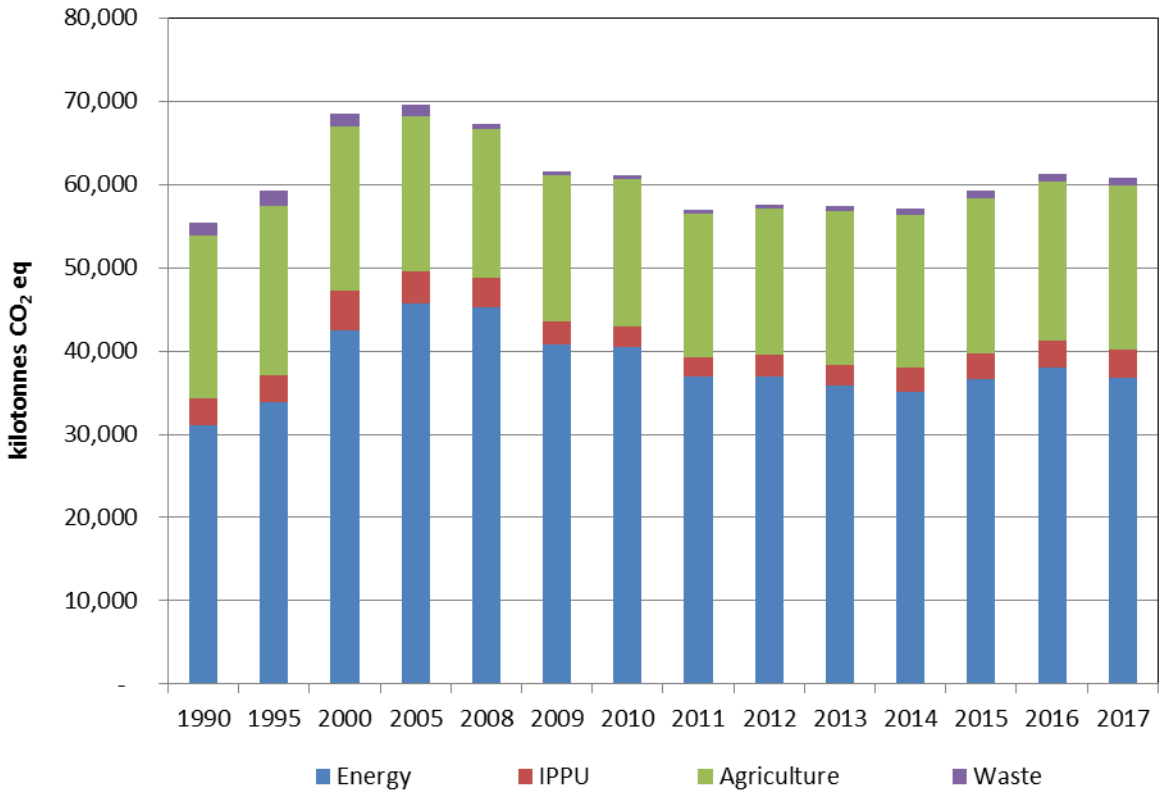

FIGURE 2.1 NATIONAL TOTAL GREENHOUSE GAS EMISSIONS (EXCLUDING LULUCF) 1990-2017

Total emissions of the seven greenhouse gases in Ireland (including indirect CO_2 emissions without land use, land use change and forestry) increased steadily from 55,417.1 kt CO_2 eq in 1990 to 70,475.3 kt CO_2 eq in 2001, which is the highest level of GHG emissions ever reported in Ireland. Emissions then plateaued until 2008 with estimates ranging from 67,301.8 kt CO_2 eq to 69,495.0 kt CO_2 eq. There was then a sharp decrease from 67,301.8 kt CO_2 eq in 2008 to 56,989.2 kt CO_2 eq in 2011. Emissions then plateaued again between 2011 and 2014. There was a rise in emissions between 2014 and 2015 of 3.7% to 59,211.8 kt CO_2 eq, and there was a further increase between 2015 and 2016 of 3.5% to 61,270.2 kt CO_2 eq which is the third largest annual growth rate ever reported in Ireland. Emissions in 2017 are 0.9% lower than 2016.

The largest annual change occurred from 2008 to 2009 when emissions decreased by 5,754.6 kt CO_2 eq from 67,301.8 kt CO_2 eq to 61,547.2 kt CO_2 eq a reduction of 8.6%. Total emissions in 2017 were 9.6% higher than in 1990 and 13.8% lower than the peak level in 2001.

2.1.1 Trends by Sector

The Energy sector accounted for the bulk of the CO_2 emissions in 2017 (93.3%), IPPU and Agriculture sectors contributed further 5.7% and 0.9%, respectively and Waste contributed the remainder 0.1%. CH_4 emissions are produced mainly in the Agriculture sector (92.4%) and Waste sector (5.8%); the Energy sector contributed the remainder 1.8%. Most of the N_2O emissions are generated in Agriculture (92.5%) and Energy (5.3%) with Waste and IPPU contributing a further 1.6% and 0.6%, respectively. IPPU sector is responsible for 100% of F-gas emissions.

The large increase in emissions during the period 1990-2001 was clearly driven by the growth in CO_2 emissions from energy use. CO_2 from the Energy sector increased its share of national total emissions from 54.4% in 1990 to 62.2% share in 2001. The bulk of this increase occurred in the years between 1994 and 2001, during which Ireland experienced a period of unprecedented economic growth with energy CO_2 emissions increasing by an average of 4.4% annually.

The rate of economic growth slowed down from 2002 to 2004, which, together with the closure of ammonia and nitric acid production plants and the continued decline in cattle populations and fertiliser use, resulted in a reduction in the emission levels in the period 2002 to 2004.

The increase in emissions in 2005 was largely due to increased emissions from road transport and from electricity generation from two new peat-fired stations.

The declining trend between 2005 and 2008 is largely attributable to decreases in the agriculture and waste sectors, and in 2008 due to reduced emissions from mineral products in the industrial processes sector. In addition, the sustained increase in transport emissions, the major contributor to the trend, came to an end in 2008 and together with the economic downturn caused a major decrease in emissions in 2009 to 2011, before rising in 2012 and decreasing in 2013 and 2014.

The increase seen in 2015, continued in 2016, and was due to increased emissions from almost all IPCC sectors. The most significant contributors were energy use categories, including road transport, and emissions from enteric fermentation. In 2017 emissions decreased by 0.9% mainly due to

reduced coal consumption in electricity generation whilst agriculture emissions continue to increase.

2.1.2 Trends by Gas

Emissions of CO_2 accounted for 63.8% of the total (excluding LULUCF) of 60,743.7 kt CO_2 equivalent in 2017, with CH_4 and N_2O contributing 23.1% and 11.1%, respectively. The combined emissions of HFC, PFC, SF_6 and NF_3 accounted for 2.0% of total emissions in 2017. In 1990 emissions of CO_2, CH_4, N_2O and the combined emissions of HFCs, PFCs, SF_6 and NF_3 accounted for 59.4, 26.6, 13.9 and less than 0.1%, respectively of total emissions of 55,417.1 kt CO_2 equivalent as presented in **Figure 2.2**.

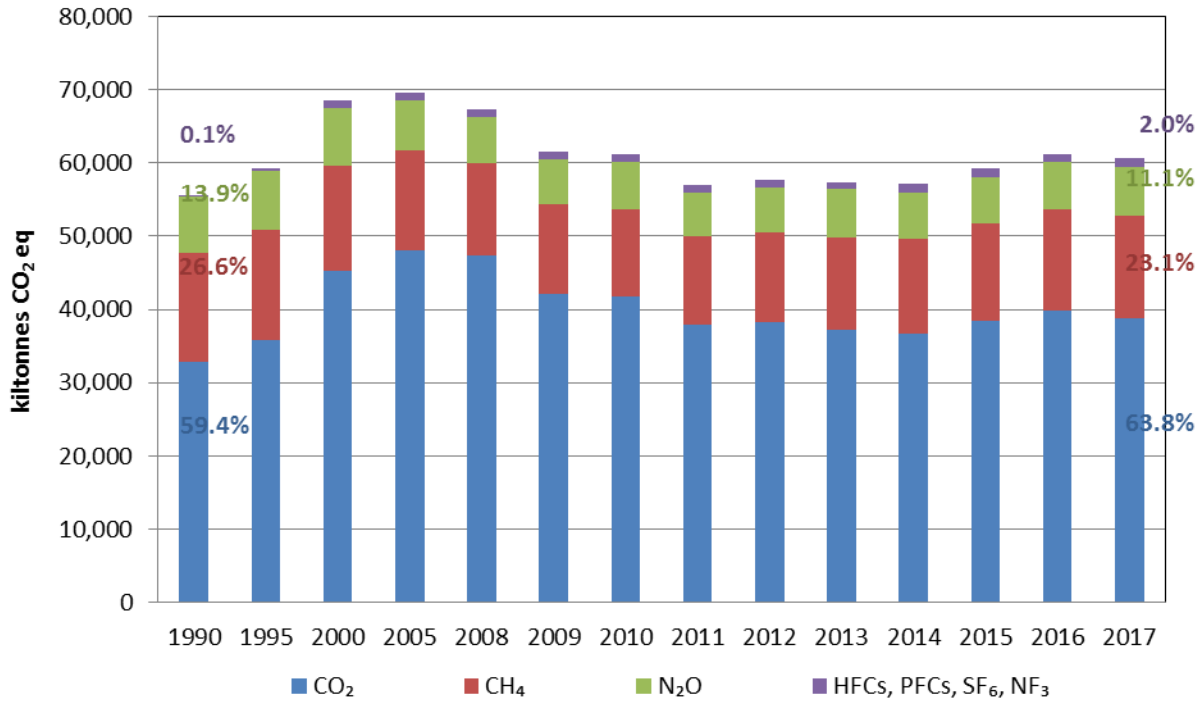

FIGURE 2.2 GREENHOUSE GAS EMISSIONS-BY GAS (EXCLUDING LULUCF) 1990-2017

2.1.2.1 Trends in Carbon Dioxide

CO_2 is the most significant contributor to the greenhouse gas emissions with 1.A.1 Energy Industries and 1.A.3 Transport sectors responsible for 29.7% and 30.6% of total CO_2 emissions (excluding LULUCF) in 2017, respectively.[5] 1.A.4 Other Sectors represents a share of 21.0%, 1.A.2 Manufacturing Industries and Construction has a 12.0% share and the remainder of CO_2 emissions (6.7% share) fall into other categories.

[5] Key categories approach 1, as identified by the 2006 IPCC guidelines, was used for undertaking the analysis of key categories to further highlight which sources of emissions are the most important to Ireland. Further information can be found in Section 1.6 *Overview of Key Categories* in Ireland's National Inventory report 2019:
https://www.epa.ie/pubs/reports/air/airemissions/ghg/nir2019/Ireland%20NIR%202019_Final.pdf

Emissions of CO_2 increased from 32,891.2 kt in 1990 to 38,727.6 kt in 2017, which equates to an increase of 17.7%. The main driver behind this increase in emissions is primarily fuel combustion in Transport, followed by Energy Industries. Over the period 1990-2017, emissions of CO_2 from transport, predominantly road traffic in Ireland, increased by 135.6%. This trend is exaggerated somewhat in later years by so-called fuel-tourism. In 2017 it is estimated that -0.4% of petrol and 5.7% of diesel sold in Ireland was used in vehicles in the UK and other countries.

Over the time-series, emissions of CO_2 from 1.A.1 Energy Industries increased in the first decade by 54.7% until they peaked in 2001 and decreased by 33.3% to 2017, showing an overall increase of 3.2% CO_2 over the 1990-2017 period. In addition, even though Ireland has only a small number of energy intensive industries, CO_2 emissions from combustion in the industrial sector 1.A.2 Manufacturing Industries and Construction increased by 17.7% between 1990 and 2017.

2.1.2.2 Trends in Methane

Methane is the second most significant contributor to greenhouse gas emissions in Ireland which is due to the large population of cattle. In 2017 emissions of CH_4 were 14,034.2 kt CO_2 equivalent, indicating a decrease of 4.9% on the 1990 level of 14,761.0 kt CO_2 equivalent. Emissions of CH_4 increased progressively from 1990, reaching a peak in 1998 of 15,441.5 kt CO_2 equivalent, which reflects an increase in livestock numbers and therefore increased emissions from source categories 3.A Enteric Fermentation and 3.B Manure Management.

Between 1998 and 2011, CH_4 emissions decreased as a result of falling livestock numbers due to reform of the Common Agricultural Policy (CAP). However, total CH_4 emissions in the period 2001-2014 fluctuated to some extent on a yearly basis. This trend is a direct result of fluctuating CH_4 emissions from 1.A.4 Other Sectors and 1.B Fugitive Emissions from Fuels. The main contributor to the CH_4 trend has been Agriculture and in 2017 the sector accounted for 92.4% of the total methane emissions (compared to 86.5% share in 1990 when emissions from Waste had a larger share in the methane trend). The sectoral methane emissions from Agriculture increased by 1.6% between 1990 (12,763.0 kt CO_2 equivalent) and 2017 (12,967.0 kt CO_2 equivalent).

Another significant source of methane emissions is the Waste sector, especially from landfill gas in category 5.A Solid Waste Disposal on Land. CH_4 emissions from Waste decreased from 8.9% share of total methane emissions (1,318.1 kt CO_2 equivalent) in 1990 to 5.7% share (741.8 kt CO_2 equivalent) in 2017. This decrease is a result of improved management of landfill facilities, including increased recovery of landfill gas utilised for electricity generation and flaring.

2.1.2.3 Trends in Nitrous Oxide

Nitrous oxide emissions decreased by 12.7% from their 1990 level of 7,729.7 kt CO_2 equivalent in 1990 to 6,750.9 kt CO_2 equivalent in 2017. Similar to CH_4, emissions of N_2O increased during the 1990s to reach a peak level of 8,512.0 kt CO_2 equivalent in 1998 reflecting an increase in the use of synthetic fertilisers and increased amounts of animal manures associated with increasing animal numbers over that period. Emissions of N_2O subsequently show a clear downward trend following reductions in synthetic fertiliser use and organic nitrogen applications on land as a result of the

effect of the CAP reform on animal numbers as well as the closure of Ireland's only nitric acid plant in 2002.

The largest contributor to the trend is the Agriculture sector with 92.5% share of the total N_2O emissions (6,246.6 kt CO_2 equivalent) in 2017. This reflects an increase from 82.4% share (6,371.3 kt CO_2 equivalent) in 1990, despite being a lower absolute number. Emissions from Industrial Processes and Product Use (IPPU) in chemical industry used to be the second largest contributor to the trend, contributing 12.9% to total N_2O emissions in 1990 and an average of 10.1% share to the trend between 1990 and 2000, before falling to 3.9% share in 2002 – the year that the nitric acid plant closed.

Energy and Waste sectors contribute 10.3% and 3.0%, respectively to total N_2O emissions in 2017.

2.1.2.4 Trends in Fluorinated Gases (HFCs, PFCs, SF_6, NF_3)

Emissions of F-gases (HFCs, PFCs, SF_6 and NF_3) were 1,231.0 kt CO_2 equivalent in 2017 compared to 35.2 kt CO_2 equivalent in 1990, a 34 fold increase over the time series. However, F-gas emissions only account for 2.0% of the national total in 2017. F-gases include a wide range of substances that are used in a diverse range of products and manufacturing processes. While it can be difficult to identify the factors contributing to actual trends in emissions over time, it is possible to establish the main contributory sub-categories underlying these trends.

The main causative factor of the increase in F-gas emissions has been the growth in HFC emissions from 2.F.1 Refrigeration and Air Conditioning through their use as replacement refrigerants across virtually all refrigeration sub-categories since 1996. Increased use of HFCs in 2.F.4 categories: Metered Dose Inhalers (MDIs) and Aerosols is also an important component of the trend. On the other hand, following a 2013 study on F-gases, emissions from 2.F.2 Foams were proven not to be occurring in manufacturing processes and consequently were removed from the whole time series.[6] Similar was the finding in 2.F.3 Fire extinguishers between 1990-1996 (incl.) and significant emission reductions for the following years in the trend have been applied. Sector 2.E.1 Semiconductor Manufacture was the only source in 1990 until 2.F.4 Aerosols entered the market in 1990, followed by 2.F.1 MAC in 1993, 2.F.1 Refrigeration and Air Conditioning in 1995 and both 2.F.3 Fire extinguishers and 2.F.4 MDIs in 1996. Emissions from HFCs increased steadily from 1.2 kt CO_2 equivalent in 1990 to 1,143.3 kt CO_2 in 2017.

Emissions of PFCs increased from 0.12 kt CO_2 equivalent in 1990 up to their peak of 397.8 kt CO_2 equivalent in 2000 through their use in the semiconductor manufacturing process in 2.E.1 Semiconductor Manufacture. Semiconductor manufacturers continue to investigate various reduction initiatives through gas substitution and new process technologies which is reflected in the downward trend in PFC emissions between 2000 and 2017 (47.2 kt CO_2 equivalent in 2017).

SF_6 is used in a diverse number or products and processes and is therefore included in a number of IPCC source sub-categories including 2.E.1 Semiconductor Manufacture, 2.G.1 Electrical Equipment and four subcategories under 2.G.2 Other. Emissions of SF_6 were 33.9 kt CO_2 equivalent and 39.2 kt

[6] Goodwin J., Gschrey B. and Salisbury E., (2013), Emission Inventories for HFCs, PFCs and SF6 for inclusion in Ireland's submission to the EU under Decision 280/2004/EC and the United Nations Framework Convention on Climate Change

CO_2 equivalent in 1990 and 2017, respectively. However, total emissions of SF_6 across the time series vary considerably, primarily because the two largest sources (Semiconductor Manufacture and Electrical Equipment) vary considerably from year to year. Emissions of SF_6 grew steadily from 1990, peaking at 126.1 kt CO_2 equivalent in 1997. The increase over the period 1990-1997 was largely due to increased use of SF_6 in Semiconductor Manufacture. Emissions from both Semiconductor Manufacture and Electrical Equipment then show a steady decline across the time series (although there are peaks in 2003 and 2005 due to elevated emissions from Semiconductor Manufacture). Similar to PFCs, semiconductor manufacturers have undertaken to reduce the use of SF_6 through gas substitution and new process technologies. In 2.E.1 Electrical Equipment, where SF_6 is used for electrical insulation, arc quenching and current interruption, a leak reduction programme has been in place since 1997, when peak emissions are observed.

NF_3 are solely released from 2.E.1 Semiconductor Manufacture. Emissions of NF_3 were reported since 1995 (4.37 kt CO_2 eq.) when use of this gas commenced in the industry. This peaked in 2000 (49.2 kt CO_2 eq.), followed by fluctuations until 2008 when NF_3 was phased out from Semiconductor Manufacture for four consecutive years. Since 2012 small amounts of NF_3 were used again in Semiconductor Manufacture resulting in low emission levels averaging 0.97 kt CO_2 eq per year.

2.2 National inventory arrangements

The Environmental Protection Agency, hereafter referred to as the EPA, has the overall responsibility for the national greenhouse gas inventory in Ireland's national system of recording emissions. This was established in 2007 under Article 5 of the Kyoto Protocol and is described in more detail in section 2.2.1. The Office of Environmental Sustainability (OES) in the EPA performs the role of inventory agency in Ireland and undertakes all aspects of inventory preparation and management as well as the reporting of Ireland's submissions annually in accordance with the requirements Regulation (EU) No. 525/2013 of the European Parliament and of the Council and the UNFCCC. [7]

The EPA is required to establish and maintain databases of information on the environment and to disseminate such information to interested parties (Section 52 of the Environmental Protection Agency Act of 1992.[8] The Act states that the EPA must provide, of its own volition or upon request, information and advice to Ministers of the Government of Ireland in the performance of their duties (Section 55 of the Act)[9]. This includes making available such data and materials as are necessary to comply with Ireland's reporting obligations and commitments within the framework of international agreements. These requirements are the regulatory basis on which the EPA prepares annual inventories of greenhouse gases and other important emissions to air in Ireland. It is in this context that in 1995 the then Department of Environment, Community and Local Government (DECLG) designated the EPA as the inventory agency with responsibility for the submission of emissions data to the UNFCCC Secretariat and to the Secretariat for the Convention on Long-Range Transboundary Air Pollution (CLRTAP).

[7] 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

[8] http://www.irishstatutebook.ie/eli/1992/act/7/section/52/enacted/en/html#sec52

[9] http://www.irishstatutebook.ie/eli/1992/act/7/section/55/enacted/en/html

2.2.1 Summary information on national inventory arrangements

The establishment of Ireland's national inventory system was completed by Government Decision in early 2007, building on the framework that had been applied for many years. The EPA's Office of Environmental Sustainability (OES) is the designated inventory agency and the EPA is also designated as the single national entity with overall responsibility for the annual greenhouse gas inventory. Within the OES, the Sustainable Production and Consumption Programme (SPCP), compiles the national greenhouse gas emission inventories for submission on behalf of the Ireland under the Framework Convention on Climate Change and Regulation (EU) 525/2013 (OJ L 165, 18.6.2013*)*, the latter being the basis for EU Member State reporting under the Convention and the Kyoto Protocol. [10] All formal mechanisms together with the QA/QC procedures are fully operational since they were established in the 2007 reporting cycle.

Following establishment of the national system, institutional arrangements directed towards national inventory reporting that involve the EPA, DCCAE and other stakeholders were reorganised, extended and legally consolidated across all participating institutions to strengthen inventory capacity within the EPA. This ensured that more formal and comprehensive mechanisms of data collection and processing were established and maintained for long term implementation. In particular, the system puts in place formal procedures for the planning, preparation and management of the national atmospheric inventory and identifies the roles and responsibilities of all the organisations involved in its compilation. This was achieved through the adoption of Memoranda of Understanding (MOU) between the key data providers and the inventory agency. These MOUs stipulate the scope, timing and quality of the inputs necessary for inventory compilation in accordance with the guidelines for national systems. Secondary MOU are, in turn, used by some key data providers to formalise the receipt of data from their own particular sources. **Table 2.1** lists the key data providers and indicates the range of data covered by MOU in the national system. A QA/QC plan is an integral part of the national system.

In addition to the primary data received from the key data providers, the inventory team draws on various other data streams available within the EPA, such as the National Waste Database, reports on wastewater treatment, Annual Environmental Reports from companies subject to Integrated Pollution Prevention Control (IPPC), Industrial Emissions Directive 2010/75/EU (IED) and submissions prepared under the European Pollutant Release and Transfer Register (E-PRTR) and also obtains information from other diverse sources to prepare the inventories for fluorinated gases and solvent use. The inventory team also draws on national research related to greenhouse gas emissions and special studies undertaken from time to time to acquire the information needed to improve the estimates for particular categories and gases.

[10] 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. See full text here: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580472617683&uri=CELEX:32013R0525

The Emissions Trading Unit (ETU), also within the EPA's OES, is a key component of the national system. The ETU are responsible for administering the EUETS, under Directive 2003/87/EC (OJ L 275 25.10.2003), in Ireland and, as such, provide annual verified emissions data to the inventory team.[11]

The estimates of emissions and removals for forest lands under the Convention, as well as those in respect of Article 3, paragraphs 3 and 4, activities under the Kyoto Protocol, are prepared by consultants contracted to the Department of Agriculture, Food and the Marine (DAFM). These are delivered to the inventory agency under a MOU between DAFM and OES.

The approval of the completed annual inventory involves sign-off by the QA/QC manager and the inventory manager before it is transmitted to the Board of the EPA via the Programme Manager of the SPCP in OES. Any issues arising from the Board's examination of the estimates are communicated to the inventory experts for resolution before final adoption of the inventory. The results for the inventory year are normally released at national level in autumn of the following year. This is in advance of their official submission to the European Commission in accordance with Regulation (EU) 525/2013 in January and March of the reporting year and subsequently to the UNFCCC secretariat in April.[12] The national system is also exploited for the purpose of parallel inventory preparation and reporting of air pollutants under the LRTAP Convention ensuring efficiency and consistency in the compilation of emission inventories for a wide range of substances using common datasets and inputs.

[11] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1580844379942&uri=CELEX:32003L0087

[12] The full report on Ireland's Final Greenhouse Gas Emissions 1990-2017 can be found here: http://www.epa.ie/pubs/reports/air/airemissions/ghgemissions2017/Report_GHG%201990-2017%20April%202019_Website.pdf

TABLE 2.1 KEY DATA PROVIDERS AND INFORMATION COVERED BY MOU

Key Data Provider	Data Supplied	Deadline	Sector in which data are used
Sustainable Energy Authority of Ireland	National Energy Balance; Detailed national energy consumption disaggregated by economic sector and fuel	30 Sept.	Energy, Waste
Department of Agriculture, Food and Marine	Statistical data for cattle compiled under the Animal Identification and Movement (AIM) scheme Fertiliser and lime statistics Poultry statistics Sheep statistics	30 Sept.	Agriculture
Department of Agriculture, Food and Marine (Forest Sector Development Division)	GHG emission/removal estimates from all pools for forest lands under the Convention Statistical data on Afforestation, Reforestation, Deforestation and harvesting for forest land lands under Article 3.3 of KP GHG emission/removal estimates from all biomass pools for KP Article 3.3 and elected activities under Article 3, paragraph 4, of the Kyoto Protocol (Cropland management and Grazing land management).	30 Sept.	LULUCF and Article 3.3 and 3.4 of the Kyoto Protocol
Central Statistics Office	Annual population, livestock populations, crop statistics, housing survey data	30 Sept.	Agriculture, IPPU, Waste
Gas Networks Ireland	Analysis results for indigenous and imported natural gas	30 Sept.	Energy
Marine Institute	Annual Report on Discharges, Spills and Emissions from Offshore Gas Production Installations	30 Oct.	Energy
EPA Emissions Trading Unit	Verified CO_2 estimates and related fuel and production data for installations covered by the EU ETS1	30 April	Energy, IPPU
*Department of Communications, Climate Action and Environment	National Oil Balance (as a component of the Energy Balance)	30 Sept.	Energy
*Road Safety Authority	Road transport statistics from the National Car Test (NCT)	30 April	Energy
**Forest Service	(i) GIS data base on premiums and grants afforestation areas (iFORIS) with associated attributes (II) NFI database	30 Sept. 2007, 2012, 2017	LULUCF and Article 3.3 & 3.4 activities
**Coillte	GIS data base of intersected of NFI permanent sample plot points (Coillte-NFI plots) with sub-compartment and management unit data.	30 Sept.	LULUCF and Article 3.3 & 3.4 activities

* These bodies have MOUs with SEAI rather than with OES

** These bodies have MOUs with the Department of Agriculture, Food and the Marine rather than with OES

2.2.2 Summary information on changes to national inventory arrangements since the last National Communication or Biennial Report

There has been no change in the national inventory arrangements since the previous National Communication and Biennial Report submission in March 2018. The inventory team is part of the SPCP within the OES in the EPA. The OES is the designated inventory agency as of 1 January 2016.

3. Quantified economy-wide emission reduction target

Ireland is a Member State (MS) of the European Union (EU). In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20% compared to 1990 levels (FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011). In addition the EU provided additional information relating to its quantified economy-wide emission reduction target in a submission as part of the process of clarifying the developed country Parties' targets in 2012 (FCCC/AWGLCA/2012/MISC.1). Summary information on the target can be found in **Table 3.1.**

TABLE 3.1: JOINT QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET OF THE EU AND ITS MEMBER STATES

Parameter	**Target**
Base Year	1990
Target Year	2020
Emissions Reduction Target	20% reduction relative to 1990
Gases Covered	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
Global Warming Potential	AR4
Sectors Covered	Energy, Transport, Buildings, Industrial processes, Agriculture, Waste (intra-EEA aviation to the extent it is included in the EU ETS)
Land Use, Land Use Change and Forestry (LULUCF)	Excluded
Use of international credits (JI and CDM)	Possible subject to qualitative and quantitative limits

As this target under the Convention has only been submitted by EU-28 and not by each of its MS, there are no specified Convention targets for single MS. Due to this, Ireland as part of the EU-28, takes on a quantified economy-wide emission reduction target jointly with all MS.

With the 2020 climate and energy package the EU has set internal rules which underpin the implementation of the target under the Convention. The 2020 climate and energy package introduced a clear approach to achieving the 20% reduction of total GHG emissions from 1990 levels, which is equivalent to a 14% reduction compared to 2005 levels. This 14% reduction objective is divided between two sub-targets, a 21% reduction target for those sectors covered by the European Union Emissions Trading System (EU ETS), and a 10% reduction target for sectors outside the scheme.

Under the revised EU ETS Directive, one single cap covers the EU MS and the three participating non-EU MS (Norway, Iceland and Liechtenstein), i.e. there are no further differentiated caps by country. [13] For allowances allocated to the EU ETS sectors, annual caps have been set for the period from 2013 to 2020; these decrease by 1.74% annually, starting from the average level of allowances

[13] Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community (OJ L 140, 05.06.2009, p. 63).
See Directive here: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:en:PDF

issued by MS for the second trading period (2008–2012). The annual caps imply interim targets for emission reductions in sectors covered by the EU ETS for each year until 2020.

In the year 2017 verified emission of installations covered under the EU ETS in Ireland totalled 16.91 Mt CO_2 eq. This is 24.5% lower than the equivalent figure for 2005. Whilst some of these reductions are directly attributable to a reduction in economic activity, the increasing penetration of renewable technologies, primarily in relation to power generation, also plays an important role. The share of total final consumption of electricity provided by renewables has increased fourfold - from 7.2% to 30.1% - between 2005 and 2017. [14]

Non-ETS emissions are addressed under the Effort Sharing Decision (ESD) (Decision No 406/2009/EC). The ESD covers emissions from all sources outside the EU ETS, except for emissions from international maritime, domestic and intra-EEA aviation (which were included in the EU ETS from 1 January 2012) and emissions and removals from land use, land-use change and forestry (LULUCF). It thus includes a diverse range of small-scale emitters in a wide range of sectors: agriculture, transport, the built environment, small industrial installations, fugitive emissions from the energy sector, emissions of fluorinated gases from appliances and other sources, and waste. Such sources currently account for about 61% of total GHG emissions in the EU, but approximately 74% of emissions in Ireland (2018 data).[15]

While the EU ETS target is to be achieved by the EU as a whole, the ESD target was divided into national targets to be achieved individually by each MS. In the ESD national emission targets for 2020 are set, expressed as percentage changes from 2005 levels. These changes have been transferred into binding quantified annual reduction targets for the period from 2013 to, expressed in Annual Emission Allocations (AEAs). [16] The quantified annual reduction targets 2013-2020 for Ireland are tightened from about 4% below 2005 levels in 2013 to 20% below 2005 levels by 2020 along a linear pathway. [17]

ESD Compliance cycles take place over a four month period, determined annually by a Commission Implementing Decision. Before the end of the four month period for each ESD compliance year, Ireland must have demonstrated compliance by holding sufficient allowances in the relevant year's ESD Account to account for the relevant year's ESD emissions.

Generally, the compliance period for any given year is calculated 18 months after the year in question. For example, the 2019 compliance period is due to run from July 2021 - November 2021. During this four month period Ireland must demonstrate compliance by holding sufficient allowances in the 2019 ESD Account to account for its 2019 ESD emissions.

Ireland's emissions were lower than annual targets for the years 2013-2015. In addition, Ireland will be able to comply with 2016-2018 targets through banking surplus allowances carried forward from

[14] See https://www.seai.ie/publications/Energy-in-Ireland-2018.pdf
[15] 61%: Fig. 3: ETS, ESD, LULUCF and aviation emission trends and projections, 1990-2035, https://www.eea.europa.eu/data-and-maps/indicators/greenhouse-gas-emission-trends-6/assessment-3
74%: https://www.epa.ie/pubs/reports/air/airemissions/ghgprovemissions2018/Report_GHG%201990-2018%20Provisional%20Inventory%20October%202019.pdf
[16] https://ec.europa.eu/clima/policies/effort/framework_en
[17] Figures are based on recalculations of the likely targets based on the new GWP and Good Practice Guidelines. Earlier European Commission Decisions detailing MS annual targets were formulated using the old methodologies and GWP values.

the 2013-2015 period. However, Ireland is projected to cumulatively exceed its compliance obligations under the ESD from 2019. As a consequence, any surplus allowances 'banked' from earlier years in the compliance period will be insufficient to meet Ireland's obligations. Therefore it will be necessary for Ireland to purchase additional allowances to cover Ireland's obligations for the years 2019 and 2020.

The compliance and monitoring process is harmonized for all European MS, especially laid down in the Monitoring Mechanism Regulation. [18]

[18] Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 repealing Decision No 280/2004/EC; and the related implementing Regulation (EU) No 749/2014 of 30 June 2014 pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council

4. Progress in achievement of the quantified economy-wide emission reduction targets

This chapter provides an overview of the policies Ireland has put in place which contribute to meeting the EU emission reduction targets, as outlined in Section 3 above, along with other issues such as assessments of economic or social consequences. In particular it focuses on updates or changes to the policies and measures at a national level since Ireland's 7th National Communication (NC7) and 3rd Biennial Report (BR3), but does not attempt to include a comprehensive background to each policy, for which links to further information are provided as necessary.

4.1 Mitigation actions and their effects

4.1.1 Domestic Arrangements

The National Policy Position on Climate Action and Low Carbon Development (2014) sets out the fundamental national objective of transitioning to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050. Ireland's Climate Action and Low Carbon Development Act 2015 (the 2015 Act) provides a statutory recognition of this 'national transition objective', and provides for the development and submission to Government for approval, of a series of successive National Mitigation Plans which will lead to the achievement of the national transition objective by 2050.[19] In addition, the 2015 Act established an independent Climate Change Advisory Council and Oireachtas (National Parliament) accountability arrangements.

Ireland's policy-making process in the area of climate action and climate mitigation has undergone a significant evolution, in recognition of the need for a coordinated whole of Government approach to reduce Ireland's GHG emissions. Included in this progression in climate policy was Ireland's First Statutory National Mitigation Plan, published in July 2017 pursuant to the 2015 Act, as outlined in detail in Ireland's 7th National Communication.[20]

4.1.1.1 Development of Ireland's new Climate Action Plan 2019

Under Ireland's Programme for a Partnership Government, published in 2016, a Citizen's Assembly was established to examine the challenge of climate change, resulting in a collection of recommendations that signposted the way for radical reforms.[21] In addition, an all Party climate change committee was created, which held extensive hearings and resulted in a comprehensive report of further recommendations to enhance Ireland's response to the challenge of climate change.[22] Following some initial debate, this report was subsequently unanimously endorsed by Dáil Éireann in May 2019, which at the same time declared a Climate and Biodiversity Emergency.

[19] See http://www.irishstatutebook.ie/eli/2015/act/46/section/14/enacted/en/html#sec14

[20] Ireland's 7th National Communication can be found here: https://unfccc.int/sites/default/files/resource/63014825_Ireland-NC7-BR3-1-Seventh%20National%20Communication%20Ireland.pdf

[21] See https://assets.gov.ie/3221/231118100655-5c803e6351b84155a21ca9fe4e64ce5a.pdf

[22] Final report: https://www.citizensassembly.ie/en/how-the-state-can-make-ireland-a-leader-in-tackling-climate-change/final-report-on-how-the-state-can-make-ireland-a-leader-in-tackling-climate-change/final-report-on-how-the-state-can-make-ireland-a-leader-in-tackling-climate-change.html

This was a strong foundation on which to build the new Climate Action Plan 2019 To Tackle Climate Breakdown, which was published by Government on the 17th June 2019.[23] The Plan contains 183 actions, broken down into 619 individual measures, which will underpin the delivery of targeted abatement ambition in the key greenhouse gas emitting sectors for Ireland to meet our EU 2030 targets and puts Ireland on a pathway to net-zero greenhouse gas emissions by 2050. The climate actions identified will be implemented by 13 Government Departments and 40 agencies under the remit of those Departments, requiring a deep level of collaboration across Government.

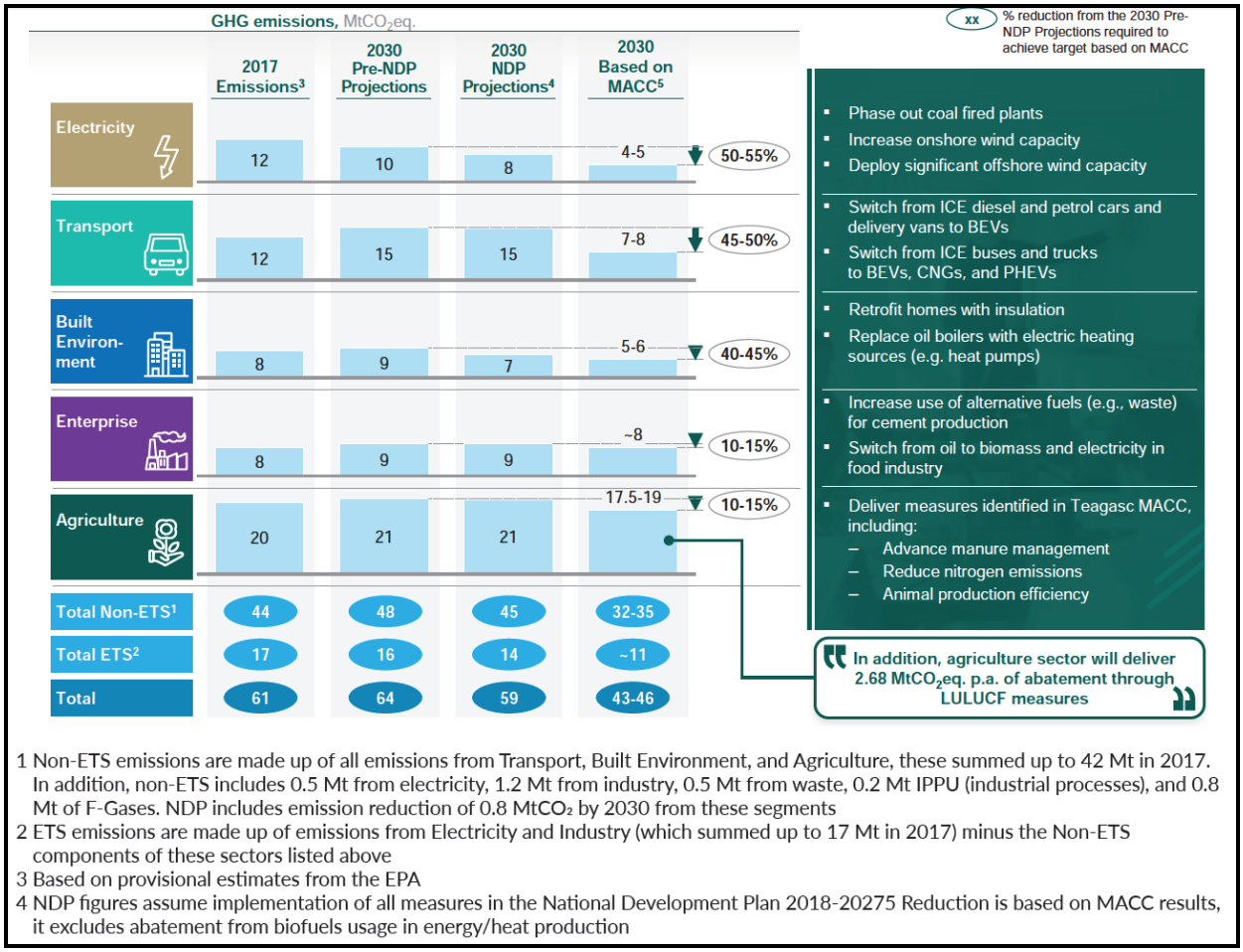

FIGURE 4.1 INDICATIVE SECTORAL TARGETS FOR IRELAND TO 2030

The Climate Action Plan anticipates the establishment of strengthened governance arrangements for the implementation of climate policy in Ireland, and has seen the establishment of a Climate Action Delivery Board within the Department of An Taoiseach which holds designated bodies to account.[24] The governance process also includes the publication of quarterly progress reports on delivery against targets set out in the Plan. The first report was published in October 2019.[25]

The new Plan will be updated annually and includes actions to ensure that citizens become engaged and mobilised to take climate action, while ensuring that the necessary societal and economic

[23] See full Climate Action Plan and Annex of Actions here: https://dccae.gov.ie/en-ie/climate-action/topics/climate-action-plan/Pages/climate-action.aspx
[24] An Taoiseach is the Prime Minister and Head of Government of Ireland.
[25] See full progress report here: https://www.dccae.gov.ie/documents/Climate_Action_Plan_First_Progress_Report.pdf

transition we make is both sensible and fair selecting areas which represent the least burden to our society in making the adjustment.

In addition to the above, the Climate Action Plan commits to the preparation of a Climate Action (Amendment) Bill to amend the Climate Action and Low Carbon Development Act 2015. The objective of the Bill is to significantly strengthen the statutory framework for governance of the climate challenge, and ensure delivery of successive Climate Action Plans and Long-term Climate Strategies, supported by a system of carbon budgeting and sectoral targets with appropriate oversight by Government, the Oireachtas and a new Climate Action Council. The CAP identifies a number of provisions to be incorporated in the new Bill including:

- Establishing the 2050 target in law
- Making the adoption of carbon budgets a legal requirement
- Requiring the Government to set a decarbonisation target range for each sector, with the Minister with primary responsibility for each sector identified being accountable for delivering the relevant actions to meet the sectoral targets
- Establishing the Climate Action Council as a successor organisation to the Climate Change Advisory Council with a strengthened role to advise on carbon budgets
- Establishing that the Climate Action Plan shall be updated annually with targeted actions in all relevant sectors
- Giving the Oireachtas a central role in overseeing the delivery of actions and carbon budgets
- Banning the sale of fossil fuel cars by 2030
- Establishing that a Long-Term Climate Strategy, to match the period covered by the three five year carbon budgets, shall be published

The final scheme for the new Climate Action legislation was approved by Government Approval on 17 December 2019 submitted to the Office of the Parliamentary Council for priority drafting.

4.1.1.2 Financing the Low Carbon Transition

The step-up in ambition in each of the sectors covered by the Plan will require investment across the entire economy. Overall, through the mix of technologies and measures identified, the Plan sets out the pathway that represents the least-cost burden to the economy as a whole. A significant portion of the technologies and measures set out in the Plan will result also in net lifetime cost savings to the economy as a whole.

In terms of costs to the Exchequer and other public funding, the Plan will be funded through the National Development Plan 2018-2027 as part of Project Ireland 2040 (more information in Section

4.1.2 below) which provides €30 billion for low carbon and sustainable mobility investments in the period to 2027.

Many of the actions in the Plan do not require public funding. The actions contained in this Plan fall broadly into four categories:

- Exchequer public funding provided in the annual estimates process as part of Project Ireland 2040
- measures such as setting a long-term trajectory for the carbon tax, in order to change long-term behaviour and decisions to encourage investment in more sustainable choices
- new regulatory measures to end certain practices (e.g. phasing out oil and gas boilers in homes)
- actions to promote public and community engagement and participation in reducing our emissions

In addition to the core Project Ireland 2040 allocations for low carbon and sustainable mobility investments, the four Project Ireland 2040 funds, comprising the Climate Action Fund, Disruptive Technologies Innovation Fund, the Urban Regeneration and Development Fund, and the Rural Regeneration and Development Fund, will have a collective budget amounting to an estimated €4 billion over the ten-year period of Project Ireland 2040. Each of the four funds has been established to pursue distinct objectives, which must also be aligned with the strategic investment priorities and the National Strategic Outcomes of Project Ireland 2040. In addition, and beginning in Budget 2020, the Government has begun to ring-fence a portion of the annual revenue raised from carbon taxation to funding measures and programmes to reduce greenhouse gas emissions.

4.1.1.3 Just Transition

The Climate Action Plan identifies the need to plan appropriately to ensure that those most affected by our transition to a low-carbon, climate resilient society are supported and equipped to contribute to this transition.

The Climate Action Plan recognises that the level of change required to decarbonise Ireland's economy cannot be avoided and nor can the taxpayer compensate for all the many actions which will have to be taken. However, it is essential that the burdens borne are seen to be fair and that every group is seen to be making an appropriate and fair level of effort. This will be essential to maintaining the high level of political and civic consensus which has been built through the work of the Citizens' Assembly and the Oireachtas Committee on Climate Action.

The Irish Government recognises that the accelerated exit from peat-fired power in the Midlands Region of the country will have a significant impact on the workers in carbon-intensive sectors, on their families and on the Midlands as a whole. The Government has therefore committed to delivering a whole-of-Government approach to addressing this challenge, and to working with local stakeholders, to ensuring that people impacted can be best be supported.

In this context, the Government has prioritised a number of initiatives in the context of Budget 2020 including:

- €6 million for a Just Transition Fund, targeted at the Midlands, to support the retraining and reskilling of workers and to assist local communities and businesses in the region to adjust to the low carbon transition. In recognition of their longstanding relationship with communities in the Midlands, the ESB has agreed to contribute an additional €5 million to this fund, bringing its total value to €11 million

- €5 million for a National Parks and Wildlife Service bog restoration and rehabilitation programme to restore 1,800 hectares of bog to their natural habitat, ensuring the return of these bogs to carbons sinks once again and creating 70 to 100 jobs

- €20 million targeted at the Midlands, to deliver a new model to group housing upgrades, as set out in the Climate Action Plan, which will support an estimated 400 direct and indirect jobs, as well as significantly upgrading the social housing stock in the region

4.1.1.4 European Union Policy Developments

Overview

Ireland's domestic climate policies are strongly underpinned by EU policy and legislation, which sets specific emissions reductions targets for EU Member States, requires Member States to adopt measures in specific sectors and which impose obligations in respect of monitoring, reporting and verification of emissions levels and future trends.

Progress towards the economy-wide emission reduction target of the EU can only be evaluated at Union level. To this end, the EU Monitoring Mechanism Regulation (Regulation (EU) No 525/2013) requires Member States to report to the EU annually on GHG emissions and related data and biennially on projections and policies and measures. Evaluation of this reporting is done by the European Environment Agency and European Commission.

2020 climate and energy package

The 2020 package is a set of binding legislation to ensure the EU meets its climate and energy targets for the year 2020. The package sets three key targets:

- 20% cut in greenhouse gas emissions (from 1990 levels)

- 20% of EU energy from renewables

- 20% improvement in energy efficiency

The 20% cut in greenhouse gas emissions will be met through commitments in both the EU Emissions Trading System (ETS) and non-ETS sectors.

The EU Emissions Trading System (ETS) is the EU's key tool for cutting greenhouse gas emissions from large-scale facilities in the power and industry sectors, as well as the aviation sector. The ETS covers around 45% of the EU's greenhouse gas emissions. In 2020, the target is for the emissions from these sectors to be 21% lower than in 2005.

EU countries have taken on binding annual targets until 2020 for cutting emissions in the Non-ETS sectors under the Effort Sharing Decision (ESD). This covers the sectors not included in the ETS – accounting for some 55% of total EU emissions – such as housing, agriculture, waste, and transport (excluding aviation). Non-ETS sectors need to cut emissions by 20% (compared to 2005).

2030 climate and energy framework

The 2030 climate and energy framework builds on the 2020 climate and energy package, and sets three key targets for the year 2030 at EU level:

- At least 40% cuts in greenhouse gas emissions (from 1990 levels)
- At least 32% share for renewable energy
- At least 32.5% improvement in energy efficiency

The 40% emission reduction target will enable the EU to take cost-effective steps towards meeting the objectives of the Paris Agreement. To achieve the at least 40% target:

- ETS sectors would have to cut emissions by 43% (compared to 2005), to be achieved through the revised ETS Directive for the period 2013-2020, and;
- non-ETS sectors would need to cut emissions by 30% (compared to 2005), to be achieved via the Effort Sharing Regulation (ESR), which sets binding annual emission targets for Member States for the period 2021-2030.

EU Emissions Trading System

The European Union Emissions Trading System (ETS) is one of the key policy measures in the EU to reduce power generation and industrial greenhouse gas emissions in a cost-effective manner. The ETS includes some 11,000 stationary installations across the EU Member States plus Iceland, Liechtenstein and Norway. In the Irish context, 103 Irish installations fall within the ETS (as of August 2018) including installations in the power generation, dairy, food processing and pharmaceuticals sectors.

Emission trading is a 'cap and trade' scheme whereby an EU- wide limit or cap is set for participating installations. The cap is reduced over time so that total emissions across the EU are reduced. Within that limit, allowances for emissions are auctioned or allocated for free, depending on the sector in which the installation is located. Individual installations must report their CO_2 emissions each year and surrender sufficient allowances to cover their emissions. If emissions exceed available

allowances, an installation must purchase allowances. If an installation has succeeded in reducing its emissions, it can sell its leftover surplus allowances or retain these for a later compliance period.

The ETS is designed to bring about reductions in emissions at least cost, while incentivising decarbonisation across major EU industries, and to date has played an increasingly important role in incentivising the European power generation and industry sectors to implement the emissions reductions required to meet the EU objective of achieving a 20% reduction of greenhouse gas emissions on 2005 levels by 2020. The ETS came into being in 2005, with Phase I introduced as a three-year pilot which ran until 2007. Phase II operated between 2008 and 2012, and Phase III from 2013 until 2020.

Significant reforms to Phase IV of the EU ETS, which will run from 2021 to 2030, have been agreed and were adopted on 14th March 2018. [26] This reform of the ETS will see a significantly strengthened ETS with higher carbon prices anticipated. It also allows for significant funding to be made available for low-carbon and innovative technologies.

EU Effort Sharing Decision

Progress, and projected headway, towards compliance with the 2009 Effort Sharing Decision (ESD) targets is measured by the EPA in their annual greenhouse gas inventory and greenhouse gas projections respectively and this is addressed in chapter 7.

For each year between 2013 and 2020, Ireland has a greenhouse gas emission reduction target under the 2009 ESD. For the year 2020 itself, the target set for Ireland is that non-ETS emissions should be 20% below their value in 2005. This is jointly the most demanding 2020 reduction target allocated under the ESD and one shared only by Denmark and Luxembourg.

The latest EPA projections of emissions for the period to 2020, published in June 2019, indicate that Ireland's non-ETS emissions in 2020 could be in the range of 5-6% below 2005 levels under the 'With Existing Measures' and 'With Additional Measures' scenarios respectively. It should be noted that these projections are based on an EU-wide reference scenario for oil prices which are higher than currently observed in the market. Sensitivity analysis using a low fuel price scenario indicates an outturn in non-ETS emissions of between 0% and 1% below 2005 levels by 2020.

To facilitate compliance under the ESD, any overachievement of the binding emission limit in a particular year can be banked and used towards compliance in a later year. In Ireland's case, the overachievement against annual limits in the period 2013-2015, has resulted in the banking of surplus allowances for use in later years. On the basis of current projections, Ireland is expected to have insufficient banked allowances for 2019 and 2020 and will need to purchase additional allowances to cover compliance requirements in these years.

[26] Directive (EU) 2018/410 to enhance cost-effective emission reductions and low-carbon investments ("ETS revision") was published in the Official Journal on 19 March 2018: L 76 2018 page(s) 3-27
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2018:076:0003:0027:EN:PDF

4.1.2 Information on mitigation actions, including on policies and measures implemented or planned since BR3

As outlined above, Ireland's policy-making process in the area of mitigation has progressed significantly in recent years, in particular with the development of the Climate Action Plan to Tackle Climate Disruption in 2019. This section provides a detailed overview of measures in place or planned since Ireland's BR3, with the vast majority of these relating to the Climate Action Plan itself. An overview of the range of policies and measures implemented or planned at sectoral level since BR3 is provided under section 5.6 of this report.

Progress on actions in Climate Action Plan 2019

he first progress report of the new Climate Action Plan was launched on 31 October 2019 and shows that 85%, or 149 of the actions due for delivery in Quarter 2 and 3 of 2019 have been delivered, with the remaining to be reported on in future progress reports.

The first progress report records a number of significant milestones reached since publication of the Climate Action Plan:

- New Scheme for 1,200 on-street public charge points for electric vehicles, led by local authorities
- First Luas tram extension delivered
- New requirements to ensure all new homes are Nearly Zero Energy Buildings (NZEB) standard
- New energy efficiency regulations for home renovations over a certain size
- Commitment to support net zero emissions at EU level
- Local Authority Climate Action Charter signed with all 31 local authorities, driving forward meaningful change in their local areas
- €31 million secured in Budget 2020 for new measures to address just transition in Midlands
- New rules for public procurement, meaning €12 billion of state investment each year will be invested sustainably
- A climate action focused Budget 2020, including an increase in carbon tax to €26 per tonne for 2020, ring-fencing all related proceeds for climate action, to protect the vulnerable, to enable a Just Transition and to fund new climate activity
- A Government commitment to achieving an €80 carbon tax by 2030
- Retrofit taskforce established to design a new delivery model for retrofitting homes and drive the achievement of the targets for retrofitting set out in the Climate Action Plan

- Secured €530 million from the EU to deliver the Ireland – France Celtic Interconnector, which will link the Irish and French electricity grids and is vital to increasing renewable electricity from 30% to 70%

- Climate Advisory Council advice accepted to ban all new oil exploration off Irish coastal waters

- 8 Town Hall meetings across the country to engage with local communities about climate action

Quantifications of the policy impacts on GHG emission reduction are attached in **Table 3** of the Common Tabular Format (CTF), which comprises a summary table on Ireland's portfolio of mitigation actions organised by sector along with information on which gases are affected by the measures. **Section 5.6** of this report also provides an overview of the range of policies and measures implemented at a sectoral level and their impact on emission in the projections scenarios as outlined in Ireland's 2019 Projections Report.[27]

4.1.2.1 Overarching policies and measures

Project Ireland 2040

Project Ireland 2040 is the Irish Government's long-term overarching strategy to make Ireland a better country for all of its citizens.[28] Project Ireland 2040 focuses on changing how Ireland invests in public infrastructure through a clearly thought out and defined strategy.

National Planning Framework

The National Planning Framework, published in 2018 under Project Ireland 2040, addresses a broad range of issues in relation to planning for Ireland's future over the period to 2040.[29] The Framework coordinates key areas such as housing, jobs, health, transport, environment, energy and communications into an overall coherent strategy. It has statutory underpinning and provides the overarching strategy from which other, more detailed plans, including city and county development plans and regional strategies, will take their lead. The publication of the Framework provided a key opportunity to ensure that the climate implications of Ireland's spatial choices are fully considered and addressed. Climate considerations were considered extensively during the drafting of the Framework with an entire chapter dedicated to climate change and sustainability.[30]

[27] This information constitutes the latest published projections and reported information on the impacts of policies and measures included in those projections, as reported under the EU Monitoring Mechanism Regulation in 2019 - projections that include the impact of the Climate Action Plan are currently under development and as such are not included in this report.

[28] See https://www.gov.ie/en/policy/project-ireland-2040-policy/
[29] National Planning Framework: http://npf.ie/
[30] See Chapter 9: Realising Our Sustainable Future here: http://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf

The National Planning Framework commitments which will support the achievement of Ireland's climate policy objectives include:

- integrating climate considerations into statutory plans and guidelines in order to reduce vulnerability to negative effects and avoid inappropriate forms of development in vulnerable areas

- more energy efficient development through the location of housing and employment along public transport corridors, where people can choose to use less energy intensive public transport, rather than being dependent on the car

- the promotion of protection and enhancement of carbon pools such as forests, peatlands and permanent grasslands in planning-related decision making processes

- grey adaptation which typically involves technical or engineering-oriented responses to climatic impacts, such as the construction of sea walls in response to a sea-level rise

- green adaptation which seeks to use ecological properties to enhance the resilience of human and natural systems in the face of climate change, such as creation of green spaces and parks to enable better management of urban micro-climates

A top priority of the National Planning Framework is for compact and sustainable growth. Ireland's five cities are targeted for 50% of overall growth by 2040, with the four cities Cork, Limerick, Galway and Waterford each targeted to grow by at least 50% within that period. This will mean increasing the proportion of more compact forms of growth in the development of settlements of all sizes, with a focus on urban infill and the re-use of brownfield lands. 'Brownfield' targets are to deliver at least 40% of all new homes nationally within the built-up footprint of existing settlements, comprised of at least 50% of all new homes in the five cities and at least 30% of all new homes in settlements elsewhere.

Changing the pattern of development in this manner will need to be supported by new policy tools in the planning system. It will ensure that more people will be living within the existing built-up footprint of cities and towns and will support achieving the objectives of the Climate Action Plan through:

- Reduced travel distances and greater proximity to employment and services, which will enable a greater proportion of journeys by bike or on foot (zero emissions)

- Greater urban density, which when combined with the point above, will ensure more viable public transport (less emissions per person than by individual vehicle)

- Greater sustainable mode share, which will enable cities and towns to densify, as development will not be dependent on road capacity nor car parking requirements, and less land will be required for the latter

- Higher density residential development, which tends to comprise smaller units and therefore require less energy to heat. NPF targets require the proportion of apartments to treble, from 13% in 2019, to 39% by 2030

- Closer proximity of multi-storey and terraced buildings, which will require less energy and make renewables-based systems of energy distribution such as district heating, or area-wide technology upgrades, more feasible

Ireland's National Development Plan 2018

The National Development Plan (NDP) covering the period 2018-2027 was published on 16 February 2018 as part of Project 2040 and includes the transition to a low-carbon and climate-resilient society as a strategic investment priority for this period[31].

Ireland's NDP will direct almost €22 billion to renewable energy and energy efficiency investments across multiple sectors. A further €8.6 billion funding investment in sustainable mobility will mean that over €1 in every €5 spent under the National Development Plan will fund climate action.

4.1.2.2 Other Cross-cutting policies and measures

Carbon Pricing

The Climate Action Plan sets out the Government's commitment to carbon pricing playing a key role in the transition to a low-carbon economy.

Carbon pricing has been recognised by the Climate Change Advisory Council as an important tool for Ireland to achieve its decarbonisation objective in a cost-effective manner by 2050.

Ireland is one of a minority of countries globally to have already implemented economy-wide carbon pricing through the EU Emissions Trading System (ETS) and the carbon tax. The Government is committed to carbon pricing as a core element of the suite of policy measures to reduce greenhouse gas emissions in a sustained manner over time. Recent reforms to the EU ETS are working to increase the effectiveness of the price signals in that sector, and will complement our initiatives to reduce emissions in the electricity and industry sectors.

Under the Climate Action Plan 2019, the Government is committed to implement a carbon tax rate of at least €80 per tonne by 2030, accompanied by a trajectory of increases over successive annual Budgets. This could raise an additional €6 billion that could be invested in decarbonising the economy while also protecting the most vulnerable from the increases in living costs associated with the carbon tax. This commitment will send a strong signal to householders and firms of the need to invest in low-carbon alternatives, where possible.

Budget 2020 confirmed a €6 increase in the carbon tax for 2020.[32] This is projected to raise €90 million in 2020, all of which will be ring-fenced to support climate action and protect those most vulnerable, as set out in **Table 4.1** below.

[31] National Strategic Outcome on the transition to a low-carbon and climate-resilient economy can be found in full here: https://www.gov.ie/pdf/?file=https://assets.gov.ie/37937/12baa8fe0dcb43a78122fb316dc51277.pdf#page=76

Table 4.1: Disbursement of Additional Carbon Tax Receipts in 2020

Increased Carbon Tax Spending – 2020	**Revenue €m - 2020**	**Expenditure €m - 2020**
Revenue Raised by a €6 carbon tax increase	*90*	
Protecting the Vulnerable		
1. Fuel Allowance		21
2. Energy Poverty Efficiency Upgrades		13
A Just Transition		
3. Aggregated Housing Upgrade Scheme		20
4. Peatlands Rehabilitation		5
5. Just Transition Fund		6
Investing in the Low Carbon Transition		
6. Greenways/Urban Cycling		9
7. Continuation of Electric Vehicle Grants		8
8. Further Investment in EV Charging Infrastructure		3
9. ODA - Green Climate Fund		2
10. Green Agricultural Pilots		3
Total Expenditure		**90**

Research and Development

The Climate Action Plan identifies a need to ensure that the best scientific evidence and advice is available to underpin Government policy and support the implementation of actions set out in the Plan.

Ireland updated its national research policies for 2018 to 2023, reflecting the increased urgency of the need to address climate change.[33] This update includes a new research theme focusing on Energy, Climate Action and Sustainability with two priority areas concentrating on decarbonising the energy system and sustainable living.

In addition the cross sectoral and societal nature of climate action and sustainability is reflected in its representation throughout the remaining priority themes including Food, and Manufacturing and Materials in priority areas such as smart and sustainable food production and processing and advanced and smart manufacturing.

Ireland has strategically programmed and built a strong climate research and innovation infrastructure in recent years, with funding provided to Ireland's research-producing organisations to carry out science and policy-relevant research, as well as establishing dedicated units within Enterprise Ireland Technology Centres and Science Foundation Ireland (SFI) research centres.

[32] The Department of Public Expenditure and Reform produced a paper entitled *The Use of Carbon Tax Funds 2020* which can be found at this link: https://igees.gov.ie/wp-content/uploads/2020/01/The-Use-of-Carbon-Tax-Funds-2020.pdf

[33] Ireland's Research Priority Areas 2018-2023: https://dbei.gov.ie/en/Publications/Publication-files/Research-Priority-Areas-2018-to-2023.pdf

4.1.2.3 Sectoral policies and measures: Energy

Recent Sectoral Developments

The Energy White Paper, Ireland's Transition to a Low Carbon Energy Future 2015-2030, was launched in December 2015. [34] It sets out a vision and framework to guide Irish energy policy up to 2030. The White Paper restates the three pillars of energy policy – 'sustainability', 'security of supply' and 'competitiveness' - and the actions identified have been informed by the national transition objective. The overall aim of the White Paper is to transition to a low carbon energy system which provides secure supplies of competitive and affordable energy to citizens and businesses.

It recognises that a radical transformation of our energy system is required to meet national, EU and international climate objectives, including greenhouse gas emissions reductions in the energy sector in the range of 80% to 95% compared to 1990 levels by 2050.

Since the publication of the Energy White Paper, significant progress has been made in the implementation of measures, including:

- enactment of the Energy Act 2016[35]
- publication of a Strategy to Combat Energy Poverty in Ireland (February 2016)[36]
- development of new Public Sector Energy Efficiency Action Plan[37]
- publication of a National Policy Framework on Alternative Fuels Infrastructure (May 2017)[38]
- The detailed design of the Renewable Electricity Support Scheme (RESS) was approved by Government in November 2019 subject to the EU State Aid Approval. The draft terms and conditions of the RESS scheme were published for public consultation and the RESS qualification process commenced in December 2019[39]
- commencement of a Support Scheme for Renewable Heat[40]

Renewable Energy Feed-in Tariff (REFIT) Schemes

The current primary support mechanisms for renewable electricity are the Renewable Energy Feed-in Tariff (REFIT) schemes. The schemes are designed to provide certainty to renewable electricity generators by providing them with a minimum price for each unit of electricity exported to the grid over a 15 year period. The schemes provide support for onshore wind, hydro and biomass technologies.

[34] See further information at: https://www.dccae.gov.ie/en-ie/energy/topics/Energy-Initiatives/energy-policy-framework/white-paper/Pages/White-Paper-on-Energy-Policy-in-Ireland-.aspx
[35] See http://www.irishstatutebook.ie/eli/2016/act/12/enacted/en/html
[36] See https://www.dccae.gov.ie/en-ie/energy/publications/Documents/5/A%20Strategy%20to%20Combat%20Energy%20Poverty%20-%20Web%20Version.pdf
[37] See https://www.dccae.gov.ie/documents/Public%20Sector%20Energy%20Efficiency%20Strategy.pdf
[38] See https://assets.gov.ie/26377/3075c29a37b84b10acae95da89d756ea.PDF
[39] See https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/electricity/renewable-electricity-supports/ress/Pages/default.aspx
[40] See https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/heat/Pages/Heat.aspx

Renewable Electricity Support Scheme (RESS)

The RESS qualification commenced in December 2019. The RESS will provide pathways for delivering on the 2015 Energy White Paper commitment to ensure communities and citizens are at the centre of the future energy transition in Ireland. Communities are effectively being designed into the fabric of the new scheme and a comprehensive set of policies and support measures to increase community ownership from renewable electricity projects have been proposed. The new scheme will also deliver a broad range of policy objectives including broadening the renewable electricity mix and increasing energy security, energy sustainability and ensuring the cost effectiveness of energy policy. The scheme will provide for a renewable electricity (RES-E) ambition of up to a maximum of 70% by 2030.

Onshore Renewable Energy Generation

To facilitate the development of onshore wind, the Department of Housing, Planning and Local Government (DHPLG) commenced a public consultation on draft Wind Energy Guidelines on 12 December 2019 which will run until 19 February 2020. [41] A review of planning guidelines is currently underway in relation to planning guidelines for photovoltaics/solar panels.

Offshore Renewable Energy Generation

In order to achieve the Climate Action Plans commitment to connecting at least 3.5GW of Offshore Wind by 2030 the Department of Communications, Climate Action and Environment is working closely with the Department of Housing, Planning and Local Government on the development of the Marine Planning and Development Management Bill (MPDM). The MPDM is a new, streamlined consenting regime for offshore renewable energy which will modernise and streamline the marine development management and enforcements systems.

The draft National Marine Planning Framework was published for public consultation in November 2019.

A review of the Offshore Renewable Energy Development Plan (OREDP) is to commence in 2020. This will follow the OREDP published in 2014 and the more recent 2018 Interim Review. Both plans set out the Government's policy for the sustainable development of our abundant offshore renewable energy resources. The Plans also provide for Exchequer support for ocean research, development and demonstration.

Interconnection

Ireland's energy policy emphasises the important role of interconnection in the transition to a low carbon energy future. The Climate Action Plan 2019 also states the importance of developing further interconnection to facilitate Ireland's 2030 target of 70% renewable electricity.

The European Council Conclusions of October 2014 set out that Member States "will take urgent measures in order to ensure the achievement of a minimum target of 10% of electricity interconnections".

[41] See further details here: https://www.housing.gov.ie/guidelines/wind-energy/public-consultation-revised-wind-energy-development-guidelines

There is also a proposed target of 15% for electricity interconnection by 2030. Currently Ireland has 7.4% interconnection but as all current interconnection is with the UK, post-Brexit Ireland will have zero interconnection with another EU Member State. Meeting the objective of the European Council Conclusions will therefore depend on the future relationship between the EU and UK, and Ireland's interconnection with the UK being contributing towards meeting the target.

In July 2018, DCCAE published a policy statement on Electricity Interconnection. It outlines the many drivers and benefits of interconnection, as well as the potential impacts electricity interconnection may have on the wider energy market. It helps to guide potential developers in better understanding the range of national policy drivers and the Commission for Regulation of Utilities in determining its regulatory approach to electricity interconnection, by drawing attention to key policy parameters for consideration in its evaluation of interconnection applications from project promoters.

In October 2019, the Government confirmed a €530 million investment in the Celtic Interconnector by the European Commission to link Ireland with Europe's energy grid.[42] The €1 billion Celtic Interconnector will connect Ireland's electricity network to France via an underwater connection. Once built, its 700 megawatts capacity will power 450,000 households, and help Ireland to switch to 70% renewable energy as set out in the Government's Climate Action Plan.

Progress on Renewable Energy Targets

With regard to Ireland's renewable energy targets, the EU Renewable Energy Directive 2009/28/EC set Ireland a legally binding target of meeting 16% of our energy demand from renewable sources by 2020.

Ireland is committed to achieving this target through meeting 40% of electricity demand, 12% of heat and 10% of transport from renewable sources of energy, with the latter transport target also being legally binding. The Sustainable Energy Authority of Ireland (SEAI) has advised that while good progress has been made to date, with 11% of Ireland's overall energy requirements in 2018 were met from renewable sources, meeting the 16% target remains challenging. Details of progress towards the electricity and other sub-targets are set out in **Table 4.2** below.

Table 4.2 Progress towards Renewable Energy Targets in 2018

Sector / Sub-sector	2020 target %	2018 achieved %
RES-E (Electricity)	40	33.2
RES-H (Heat)	12	6.5
RES-T (Transport)	10	7.2
RES Overall	**16.0**	**11.0**

In respect of Ireland's renewable energy ambition beyond 2020, the 2018 recast EU Renewable Energy Directive sets a binding renewable energy target for the EU for 2030 of 32%. It takes a

[42] See https://dccae.gov.ie/en-ie/news-and-media/press-releases/Pages/Press-Release-Government-Secures-%E2%82%AC530m-EU-grant-for-Celtic-Interconnector.aspx

fundamentally different approach to the existing Renewable Energy Directive as it does not seek to set individual Member State level targets. Ireland's contribution to these EU-level targets will be confirmed in its National Energy and Climate Plan which at the time of reporting was being finalised.[43]

Transition Away from coal and peat electricity generation

Coal Based Generation

The Moneypoint electricity generation plant in County Clare is a 900 MW plant, comprising three 305 MW coal fired units. It is owned by ESB Power Generation. Government policy is that coal-fired electricity generation should cease by 2025. Any final decision to replace coal-fired electricity generation must be consistent with stated Government energy and climate policy.

Peat Based Generation

There are three electricity generating plants in the Midlands – Edenderry, owned and operated by Bord na Mona, and Lough Ree Power and West Offaly Power, owned and operated by ESB. All three have been planning for some time to reduce and eliminate the use of peat at the plants. Bord na Móna currently co-fires Edenderry with 30% biomass. The decision by the planning authority in July 2019 to refuse permission for co-firing of peat with biomass at the West Offaly Plant has accelerated the timetable for exit from peat for electricity generation.

Details of the Government's response to these developments are set out in *Section 4.1.1* above on Just Transition.

4.1.2.4 Sectoral policies and measures: Transport

Changes in Transport Journeys and Future Investment in Infrastructure

The transport sector has a critical and challenging role to play in the national carbon reduction effort. It is a sector where fossil fuel use is firmly embedded and travel demand is growing significantly due to our economic recovery and growing population. The scale of transition required is substantial; significant changes in how we travel and the types of fuels we use are needed. In 2017, transport emissions fell (by 2.4%) for the first time in four years. While this decrease was welcomed it was likely driven by fluctuations in fuel tourism activities and so is not an efficient way to reduce emissions; further measures and additional actions are required to decarbonise the sector.

In 2018, transport emissions increased by 1.7%. There has been no significant decarbonisation of the fuel mix used for transport which remains almost entirely dependent on oil products. Further measures and additional actions are required to shift activity to sustainable modes of transport including public transport and active travel, and also to diversify the mix of fuels used in the sector.

[43] In accordance with the Governance of the Energy Union and Climate Action Regulation (*OJ L328 21.12.2018)*, Ireland is required to develop a 10-year National Energy and Climate Plan for the period 2021 to 2030. The NECP covers the areas of energy efficiency, renewables, emissions reductions, interconnections and research and innovation.

Central to decarbonising the transport sector is the provision of meaningful alternatives to the private car (which accounted for *c.*52% of all land transport emissions in 2018). A key focus is being placed on supporting modal shift to encourage more passenger car journeys to be replaced by public transport or active travel; as such under the Climate Action Plan Ireland has committed to an additional 500,000 public transport and active travel journeys daily by 2035. Continued investment in improving sustainable transport capacity and promoting modal shift is therefore a key policy focus.

In 2018, just under €411m was invested in public and sustainable transport infrastructure of which just over €3m was spent on greenways; while over €295m was invested in funding the operation of public transport and rural services. In addition, capital funding for cycling and walking infrastructure in Ireland is set to increase three-fold between 2018 and 2021 with over €110m allocated for a multi-annual urban cycling and walking infrastructure investment package in our main cities, which will provide safe, alternative, active travel routes to help alleviate congestion by providing viable alternatives and connectivity with existing public transport infrastructure. Furthermore, under the *BusConnects* programme over 200km of segregated cycle tracks/lanes will be built or improved in the Greater Dublin Area alone.[44] This level of investment has seen an additional 18.73 million public transport passenger journeys made in 2018 compared to 2017 and levels of walking and cycling trips are remaining steady within the Dublin area. Significant future investments totalling €8.6 billion have also been earmarked for public and sustainable transport measures until 2027 under the NDP. Proposed projects include *MetroLink, BusConnects* and the DART Expansion Programme.[45] This substantial investment will transform the future public transport network and enable more people to choose sustainable options as their preferred mode of transport.

Ireland is also dedicated to transitioning public transport fleets to lower emitting alternatives. Government policy has required no further purchases of diesel-only buses for the urban public service obligation bus fleets from July 2019. On the Luas network, the first of the extensions to the Luas Green Line has entered service with the remaining 25 extensions entering service on a rolling basis and 8 additional trams have also been ordered as part the Luas Green Line Capacity Enhancement Project. There have also been improvements to on and off peak-time heavy rail services, and the Government has approved the purchase of 41 additional InterCity Railcars. A 10-year procurement framework for electric and battery-electric train units is being established which will greatly expand the fleet. Collectively these measures will increase public transport capacity to help meet the increased demand across the network as well as playing an important role in reducing transport emissions by providing viable alternatives to private car travel.

Promotion of Sustainable Transport and Low Emission Alternative Vehicles

It is not always possible to provide substitute modes of transport (public or active travel) to the private car, especially in rural areas; therefore the State has provided incentives to lower the cost of and encourage the transition away from conventional fossil fuelled vehicles towards lower CO_2 emitting fuels and technologies. The *Low Emission Vehicle (LEV) Taskforce* was established in

[44] Further information can be found here: https://busconnects.ie/
[45] MetroLink: https://www.metrolink.ie/#/home ; BusConnects: https://busconnects.ie/initiatives/dublin-area-bus-network-redesign/ Dart Expansion Programme: https://www.nationaltransport.ie/transport-investment/dart-expansion/ and https://www.irishrail.ie/about-us/iarnrod-eireann-projects-and-investments/dart-expansion-programme

December 2016 to consider the measures and options available to Government to accelerate the take-up of low-carbon technologies in the road transport sector. [46] Phase 1 of the *Taskforce* focused on electric vehicles (EVs). The *Taskforce* made recommendations to Government ahead of Budgets 2018 and 2019, which resulted in the introduction and continuation of a range of measures to promote the uptake of EVs. [47] The following suite of incentives clearly reflects the Government's determination to promote lower emitting vehicles:

- VRT relief of up to €5,000 for new battery electric vehicles (BEVs) and up to €2,500 for new plug-in hybrid electric vehicles (PHEVs) to the end of 2020
- A purchase grant of up to €5,000 for new BEVs and PHEVs
- A Benefit-in-Kind rate of 0% for BEVs
- A grant of up to €600 to support the installation of a home charger for purchasers of new and second-hand EVs
- A 50% toll discount for BEVs and 25% for PHEVs up to a maximum amount of €500 per year with greater reductions off-peak on the M50
- A grant of up to €7,000 for EVs in the taxi/hackney/limousine sector
- Low motor tax of €120 for BEVs
- A public recharging network of approximately 750 charge points across the country, of which almost 100 are fast chargers. Under the *Climate Action Fund* €10m is being provided to expand the network to facilitate large-scale EV uptake. It is proposed to install over one hundred high powered (150kW) chargers at key locations on the national road network between 2020 and 2022. In addition, subject to planning permission and approval, it is intended to replace one hundred 50kW fast chargers and also to refurbish up to 200 standard (22kW) chargers
- A grant for Local Authorities to support the rollout of up to 2,000 on-street public charge points over the next 5 years. This grant scheme is designed to support residents without access to off-street parking who would like to switch their petrol or diesel car for an EV but lack access to local charging infrastructure
- €1.5 million to support the development of a dedicated recharging network for taxis, hackneys and limousines at transport hubs around the country
- Accelerated Capital Allowances for EVs and charging infrastructure

[46] Following on from a commitment in the Programme for Partnership Government, a Low Emission Vehicle (LEV) Taskforce is established to accelerate the deployment of low carbon transport technologies. The Taskforce was co-chaired by the Department of Communications, Climate Action and Environment and the Department of Transport, Tourism and Sport.
[47] See further details here: https://assets.gov.ie/16450/01fde41d5f484164b9f961d7cabc0250.pdf

- An EV awareness campaign (launched in April 2018 by SEAI) and a dedicated website, www.DrivingElectric.ie, to act as a repository for consumer information[48]

- The introduction of a NOx tax in Budget 2020. Under this taxation measure a charge of €5 per mg will be placed on a vehicle's first 60mg/km of NOx emissions, between 61-80mg/km the charge increases to €15 per mg, and above 81mg/km it rises to €25 per mg. The NOx charge will be capped at a maximum of €4,850 for diesel vehicles and €600 for other vehicles

The impact of these incentives is clearly seen with significant growth in EV sales in recent years. As of the end of 2019, there are nearly 16,000 BEVs and PHEVs under taxation in Ireland; this is more than double the amount on the roads at the end of 2018. The Climate Action Plan sets an ambitious target of almost 1 million EVs by 2030.

Phase 2 of the LEV Taskforce focused on other alternative fuels such as compressed and liquefied natural gas (CNG and LNG), biomethane and hydrogen. [49] Similarly to Phase 1, a number of recommendations were made to Government ahead of Budget 2020 which has resulted a number of actions in the alternative fuel space, including:

- the extension of the reduced toll scheme to alternatively fuelled heavy duty vehicles (HDVs)

- support for indigenous biomethane (for use in CNG and LNG vehicles) and renewable hydrogen in the transport sector as a core element of the development of *the Biofuels Obligation Scheme* for the period 2021-2030

- it is anticipated that a purchase grant for alternatively fuelled HDVs will also be introduced in 2020

These new measures, in conjunction with existing measures, such as minimum excise duty on gas and the expansion of the accelerated capital allowances (ACA) scheme to include CNG/LNG-propelled vehicles and refuelling equipment, should help accelerate the deployment of lower emitting alternatives in the HDV sector. In parallel, the roll out of publically accessible CNG refuelling stations continues as well as the welcome introduction of Ireland's first renewable gas injection facility.

Biofuels Obligation Scheme

The Biofuels Obligation Scheme places an obligation on fuel suppliers to include a proportion of biofuels in fuel supplied to the road transport sector. Under the Scheme, mineral oil suppliers are required to ensure that 11% (by volume) of motor fuels placed on the Irish market is produced from renewable sources. The scheme is being incrementally increased on a sustainable basis to assist meeting renewable transport targets. In April 2018, a policy statement on the Scheme was published which set out how the Scheme will continue to be developed in line with European energy

[48] See here for further information: https://www.seai.ie/technologies/electric-vehicles/
[49] See further details here: https://assets.gov.ie/41922/2ae81cbfca3340dbb69647b34e582555.pdf

policy with, progressive increases in the level of obligation post 2020. In 2018 it is estimated that biofuel use saved over 517kT of carbon emissions, which equates to a 4.3% transport emission saving. A public consultation on the future of the scheme, post-2020, recently concluded.

Demand Drivers and Management

Ireland's population and economic performance are projected to grow leading to rising travel demand; as such, Ireland has committed under the Climate Action Plan to examining a range of demand management measures for Irish cities through commissioning a Demand Management Study. The purpose of the study is to understand what measures are available to help address the impacts of growing transport levels in Dublin, Cork, Limerick, Galway and Waterford. The study will look at a range of factors (including congestion levels and air quality issues) and ultimately should recommend options on how travel demand might be better managed in urban areas.

4.1.2.5 Sectoral policies and measures: Enterprise / Industry / industrial processes

Enterprise plays a pivotal role in Ireland's GHG emissions transition, and it will continue to impact our ability to fulfil this transition and meet our 2030 and 2050 targets. It shapes the way materials are managed, from raw states to final consumption and disposal. It manages large transport flows. It builds and uses a large share of our buildings and it influences a vast supply chain by the priorities it sets. However, emissions from enterprise in the EPA greenhouse gas emissions inventory include only those associated with production processes, i.e. manufacturing combustion, industrial processes and F-gases. The largest share of enterprise emissions comes from the manufacturing sector, mostly chemicals, food processing, beverages, and cement, the majority of which are covered by the EU ETS. Emissions from enterprise that fall outside the EU ETS are highly diverse, with a large proportion arising from Small Medium Enterprises (SMEs), especially those working with industrial gases (also known as fluorinated or F-Gases). These are gases with high global warming potential used in refrigeration, air conditioning and semiconductor manufacturing. According to the CSO, the total population of enterprises in Ireland was approximately 250,000 in 2016, with SMEs accounting for 99.8% of the total.

Enterprise Emissions Reduction Targets

Irish Enterprise will be required to implement a detailed agenda of transition and change if it is to ensure that our sectors are climate resilient and can remain competitive in a decarbonising world.

This agenda will include:

- Improving energy efficiency of processes, buildings and transport
- Replacing fossil fuel with renewables in their processes, buildings and transport
- Improving the way in which resources are used in their supply chain to reduce emissions and conform to circular economy principles
- Being innovative across production, distribution, and marketing to realise the opportunities arising

- Developing the new skills and techniques necessary
- Developing measures of the climate and environmental impact of activities which will become more widely expected in the marketplace

This will require leadership from within enterprise, but also the capacity to build networks of good practice within sectors.

The enterprise facing state and local agencies, having regard to their statutory mandates, will be prioritising decarbonisation as part of their strategies.

The focus of programmes emphasising management development, start-up, lean productivity improvement, training, marketing and innovation will all increasingly emphasise this urgent agenda for climate resilience in our sectors. Each of these agencies shall, as part of this Plan, be adjusting their suite of programmes in line with this national priority. The use of audits and benchmarks can become a valuable tool in helping enterprise adapt.

It is encouraging to see many companies and some sectors already stepping forward with clear commitments to cut-emissions, to go renewable, to electrify their fleets and to manage waste in a different way. It is important that all sector associations and local chambers recognise and support their members so that networks quickly form to follow the pioneers. Public bodies will be encouraged to form partnerships so that shared endeavour can deliver more. We need to see the emergence of clusters within which the sector's efforts can be aggregated and scaled.

Measures to Deliver Enterprise Targets

There are differing cohorts of enterprises operating in the economy that face distinctive needs and challenges in decarbonising. Approximately 5,500 client companies of Enterprise Ireland and IDA Ireland, which represent firms in key growth and emerging sectors of the economy, will be targeted for specific support, either through enterprise agencies with which they already have relationships, or through specialist agencies, such as SEAI and the EPA. However, there is also a highly diverse population of other enterprises, mostly SMEs, often with limited internal capacity to take action to reduce emissions, which we shall work to support, using other networks, including local enterprise offices and sectoral agencies, such as Bord na Móna, Bord Bia, Teagasc, and Bord Fáilte.

We already have a number of policy measures in place to support decarbonising the enterprise sector. While continued effort in further developing, enhancing, and implementing these measures is essential, the enterprise sector must do more. Entire sectors of the economy will undergo radical changes, and new types of enterprises and jobs will be created as economies across the world transition to low-carbon, bio- and circular economies. Irish companies will have a pivotal role to play in leading this transition, firstly within their own activities, but then also through the supply chain which they influence. This will require attention at Chief Executive level, and from key associations that can shape sectoral development. The important role of Government and enterprise to encourage, develop and adopt innovative technologies, products and services that increase efficiencies, reduce waste and deliver sustainable development must be recognised. For enterprise, the following measures will be critical to our success:

1. **Emissions Trading System**

- As outlined in *Section 4.1.2.1 Overarching policies and measures* above, the key industry measure addressing greenhouse gases is the EU ETS. Ireland is committed to continuing to work proactively with our EU partners to ensure the ETS can effectively deliver reductions in greenhouse gas emissions, while addressing the challenges faced by sectors most exposed to international competition

- Working with sectors with significant potential for cost-effective abatement, for example the cement sector, will be essential in identifying any additional measures that could support them in achieving emissions abatement over the coming decade

2. **Carbon Pricing**

- Enterprise sectors outside the ETS will be incentivised by the general carbon price trajectory set by Government in successive budgets, but will also be exposed to carbon price movements within the ETS in circumstances where such prices can be passed on by ETS sectors. As we progressively decarbonise our economy, policy must prevent a large gap emerging between carbon pricing in ETS and non-ETS sectors to ensure an ongoing strong signalling effect for decarbonisation. Revisions to the ETS including the possible addition of sectors to the ETS may help to bridge this potential gap

3. **SEAI Initiatives**

- The Large Industry Energy Network (LIEN), a network of 200 large enterprises (some of which are in the ETS), together consume 20% of the entire energy demand in Ireland. These are supported by SEAI through mentoring, energy management systems, training and networking and compliance with legal requirements. Many LIEN members have ambitious decarbonisation plans, driven by economic and Corporate Social Responsibility (CSR) rationales. Some leaders in this sector have achieved significant decarbonisation through energy efficiency, on-site renewable generation and green energy purchases. Through SEAI, we will support and promote decarbonisation by the members of this network

- Building on the LIEN, SEAI will develop a network of 15 to 20 of the largest energy users in Ireland to drive and monitor a public commitment to decarbonisation over the 2020 to 2030 period

- In 2019 SEAI, working with the enterprise agencies, will prioritise preparatory work on the following actions:

    - Accelerate the roll out of renewable energy, Combined Heat and Power (CHP) technologies and Power Purchase Agreements (PPAs)

    - Develop a strategy for waste heat recovery from industrial processes

- Support the adoption of renewable heat for process and space heating
- Support industry to test and demonstrate scalable and replicable innovative approaches to decarbonisation
- Support large businesses with the installation of charging infrastructure for electric vehicles, the conversion of fleets and the piloting of new vehicles
- Develop proposals for mandatory audits for large industry
- Expand the use of energy performance contracts
- Enhance the value of the EXEED programme for large industry with reference to relevant international benchmarks

· SEAI will also expand the EXEED programme in 2019 to deliver new best practices in energy efficient design management in at least 80 companies

4. Regulation

· Emissions from industrial gases and refrigerants are controlled by EU Regulation (No.517/2014) on *Fluorinated Greenhouse Gases*, which is projected to reduce emissions from these sources by 38% between 2017 and 2030 by restricting the availability of products on the market

5. Future Jobs Ireland 2019 - New Areas of Opportunity

The move to a climate resilient enterprise sector will create many business opportunities. Many of these are already with us but will expand rapidly, such as:

· Renewables - as the installed renewable power capacity goes from 3.5 GW to 17.5 GW huge opportunities will emerge

· Offshore technologies are only applied at a very small level in Ireland now, however the scale of the opportunity has been estimated at 70 GW

· The 25,000 homes currently participating in energy retrofits represent an estimated €150m for the retrofit sector. This sector is expected to quadruple in size

· Many new technologies - microgeneration, anaerobic digestion, biomass, heat recovery, carbon capture, biomethane - will come to maturity, bringing new business opportunities

As set out in Future Jobs Ireland 2019, these opportunities will require clear planning by sectors and agencies. [50] The education and training agencies will be required to develop the professional expertise, the apprenticeship and traineeship and the certification capacity to turn the needs of the decarbonisation transition into new start-ups and good livelihoods

[50] See full strategy here: https://dbei.gov.ie/en/Publications/Publication-files/Future-Jobs-Ireland-2019.pdf

6. Enterprise Agency Leadership

- Existing enterprise agency programmes, such as Enterprise Ireland's (EI) Green Supports and IDA's Go Green, already encourage client companies to develop a high level of environmental management capability and become more environmentally efficient and sustainable. Client companies are also supported in efforts to apply international environmental best practices to a level compatible with ISO standards

- Decarbonisation of enterprise is about far more than supporting the introduction of energy efficiency measures. It is fundamentally about decarbonising processes which are adopted by industry to produce goods and services. EI and the IDA will work to further integrate climate change considerations into their overall strategies and the specific supports provided to client firms over the coming period of radical transition:

    - Under the Climate Action Plan, EI will expand its supports to a larger cohort of client companies. It will also identify further opportunities to engage with specific sectors with common challenges to develop more tailored supports for companies in those sectors. In this context, the agencies will also give specific attention to management development for creating the low-carbon business model of the future, and to the key role of top management in driving low-carbon organisation-wide transformation

    - IDA will use its new strategy for 2020 to 2024 to fully integrate decarbonisation objectives across its portfolio of clients and other relevant stakeholders. Building on the 2018 *Government Policy Statement on The Role of Data Centres in Ireland's Enterprise Strategy*, the new IDA Strategy will seek to ensure new large-scale enterprise investments in Ireland, including consideration of factors such as location, energy storage opportunities and PPA opportunities are made consistent with this Plan and aligned with the build-out of the grid to maximise renewable sources[51]

7. Sectoral Networks and Decarbonisation Strategies

- All Government agencies will support the development of sectoral networks to drive this agenda as part of the new mandate that will apply to all public bodies:

    - SEAI will develop, in partnership with relevant State agencies (such as EI, IDA, LEOs, BIM, Bord Bia), decarbonisation programmes in key sectors. These programmes will involve the development of audit tools, standards and certification, and supply chain management so that participating enterprises can show a real competitive advantage

[51] See full strategy here: https://dbei.gov.ie/en/Publications/Publication-files/Government-Statement-Data-Centres-Enterprise-Strategy.pdf

- A priority for 2020 will be to establish networks in key sectors, including data centres, pharmaceuticals and food and drink, to promote industry-led sectoral plans. We shall work with sectoral associations to realise this
- Support the development of such networks through a targeted call under the Climate Action Fund
- We will use the CSR Stakeholder Forum to encourage businesses to address the impact of their operations on the environment and to promote action through individual supply chains

8. Enterprise Leadership in the Wider Community

- Enterprises can play a prominent role as leaders beyond their immediate business activities. Government will promote their active participation. This will include:
  - Participation in wider community initiatives, such as Sustainable Energy Communities and Better Energy Communities[52]
  - Support for business networks of SMEs where experience could be shared, for example through local chambers of commerce[53]
  - Support for employees to actively contribute to decarbonisation in work and their wider lives
  - Work with industry-led initiatives, such as Business in the Community Ireland, to support decarbonisation programmes, such as low carbon pledges[54]
- The resource of the Climate Action Fund, and other NDP funds, will act as a catalyst to the transition.

4.1.2.6 Sectoral policies and measures: Agriculture

. As part of the Climate Action Plan, the agriculture, forestry and land use sector has 34 key actions with over 120 sub-actions.

The Plan sets ambitious targets for the agriculture, forestry and land use sector as follows:

- Emissions from the sector in 2030 to be between 17.5 – 19.0 Mt CO_2 eq by achieving between 16.5 -18.5 Mt CO_2 eq cumulative abatement over the period 2021 – 2030
- Achieve 26.8 Mt CO_2 eq abatement through LULUCF actions

[52] See here for further information: Sustainable Energy Communities: https://www.seai.ie/community-energy/sustainable-energy-communities/community-network/ ; Better Energy Communities https://www.seai.ie/grants/community-grants/
[53] Small to Medium Enterprises (SMEs)
[54] See here: https://www.bitc.ie/

- the management of existing forests and planting 8,000 ha of new planted forest per annum

- maintain an annual average (2021-2030) of 40,000 ha of reduced management intensity of grasslands on drained organic soils

- Set a target for the level of energy to be supplied by indigenous biomethane injection in 2030

The main policy framework and much of the resources that will enable these abatement measures to happen will flow from the successful design and implementation of the next Common Agricultural Policy (CAP) at EU level, which will operate in the period post -2020. At least 40% of the overall budget of the new CAP at EU level with the potential for greater allocation will contribute to environmental or climate action.

To date the CAP, through the Rural Development Programme has delivered a number of significant climate friendly measures in the agriculture sector such as; GLAS, BDGP and TAMS. Relevant actions in the current GLAS programme include, initiatives such as the provision of support for farmers to use low emission slurry equipment (LESS), support for the planting of new hedgerows, support for organic farming and for low input pasture. The Beef Data and Genomics Programme (BDGP) is directly targeted at reducing the GHG emissions of 24,000 beef farmers. The Targeted Agricultural Modernisation Schemes (TAMS) supports investment in low emissions slurry spreading equipment, farm nutrient storage and renewable energy and energy efficiency.

'Ag-Climatise' – A Draft National Climate & Air Roadmap for the Agriculture Sector to 2030 and Beyond

The ambitious targets set out in the All-of-Government Climate Action for the agriculture, forest and land use sector will require early adoption and high levels of take up on the actions identified in the Plan to meet this ambition and demonstrate that the sector is willing to play its part in the decarbonisation of Irelands' economy and society. A key deliverable and identified as one of the top ten impactful actions for 2019 was the development of the draft a National Climate & Air Roadmap for the Agriculture Sector to 2030 and Beyond.

'Ag Climatise' will take these targets and translate them into a draft sectoral plan for the agriculture sector. The consultation document, published in November 2019 proposes a number of ambitious and challenging actions and targets which will require not only ongoing concerted effort, but a step-up right across the sector from primary producer through to the processor. The challenge is to change the trajectory of emissions from agriculture so that the absolute emissions count is reducing.

Some of the proposed measures outlined in the consultation document are as follows:

- Enhance soil fertility and nutrient efficiency to reduce nutrient loss to the environment, through new low emissions slurry spreading targets, on-line nutrient management planning, requirement to incorporate clover (and mixed species) in all grass reseeds, and targets for covering external slurry stores

- Promote the use of protected nitrogen products
- Develop enhanced dairy and beef breeding programs, that; (i) increase our rate of genetic gain for key indicators linked to profitability, sustainability and climate efficiency, (ii) promote greater herd and animal performance recording and (iii) help achieve a reduction in our overall GHG output at a national level, within a 6-year timeframe
- Develop a charter with animal feed manufacturers on crude protein content of livestock feeding stuffs to minimise ammonia loss
- Review the National Forestry programme with the aim of delivering 8,000 ha of newly planted forestry, including agroforestry per annum
- Deliver the balance of agriculture commitments under carbon sequestration and through the better management of peatlands and soils

The Nitrates Directive and Agricultural Catchments Programme

The current Nitrates Action Programme (NAP) takes account of pressures on water quality and contains new strengthened water protection measures to break nutrient and transport pathways. The NAP also has a new collaborative approach for improved implementation and a focus on improving soil fertility for better nutrient use efficiency.

In 2019 the Department of Agriculture, Food and the Marine undertook a voluntary Nitrates Derogation Review; recommendations were made in relation to how derogation farmers can improve their nutrient use efficiency (NUE) and environmental footprint. Recommendations include:

- compulsory adoption of farm scale liming programmes
- mandatory environmental training
- mandatory use of low emission equipment
- grassland measurement and recording of grass production
- inclusion of clover when reseeding
- exclusion of commonage/rough grazing from derogation
- reducing crude protein in concentrate feeds
- the adoption of biodiversity measure on derogation farms

The measures recommended will be implemented from 1st January 2020 and this will allow farmers sufficient time to plan for 2020 and beyond.

The Agricultural Catchments Programme (ACP) which monitors the effectiveness of measures to protect and review water quality under the implementation of the Nitrates regulations and

contribute to meeting monitoring requirements in the Nitrates derogation. The ACP works in partnership with over 300 farmers in six intensively farmed catchments.

The continuation of the ACP for a further four year period to 2023 has been announced. Following three successful phases of the ACP, Phase 4 of the programme will now also collect data on greenhouse gases emissions, ammonia emissions and soil carbon sequestration, as well as extending the current baseline monitoring of water quality. These new developments will significantly enhance the monitoring of impacts of agriculture on our environment and aid the Department in achieving our targets under the Climate Action Plan.

Code of Good Agricultural Practice to reduce Ammonia Emissions from Agriculture

Agricultural activities account for over 99% of the national ammonia emissions. A Code of Good Agricultural Practice for reducing Ammonia Emissions from Agriculture was published in 2019. This is a guidance document that outlines the best practice actions to help reduce ammonia emissions associated with agricultural activities. The objective of the Code is to help farmers identify appropriate measures for their individual farm enterprise that will reduce ammonia emissions. The measures in the Code will complement good agricultural practices for the protection of water bodies.

Sustainable Energy and the Bioeconomy

The Agriculture sector has a key role to play in the supply of sustainably sourced bioenergy feedstocks needed to meet a projected growing demand as our energy system decarbonises. These range from biomass in the form of wood products such as forest thinning and wood fuel, Animal By Products (ABP) or other agri-food by-products such as straw, slurries, and processing waste, e.g. whey from cheese-making. Other sources of biomass include energy crops or grass silage. The production of indigenous biomass has a crucial role to play in helping Ireland meet renewable energy targets. As such, there has been significant improvement in forest grant and premium rates for a range of species and knowledge transfer measures, including forest road construction which will facilitate the mobilisation of biomass.

The Department of Agriculture, Food and the Marine (DAFM) supports the improvement of energy efficiency and the adoption of renewable heat technologies at farm level in the form of various TAMS supports such as new dairy equipment which is more energy efficient than older technology, biomass boilers under the Pig and Poultry Investment Scheme (PPIS) and the Young Farmer Capital Investment Scheme (YFCIS). Air-source heat pumps are currently supported under PPIS and YFCIS schemes and they may be used as part of a water heater under the Dairy Equipment Scheme. Grant aid is now also available across all investment schemes with a €10m fund for solar panels used for electricity production (photovoltaic) and the use of LED lighting which was announced in April 2019.

Forestry related Measures to Reduce Sectoral Emissions

Forests play an important role in climate change mitigation as they have the potential to sequester and store large amounts of carbon dioxide from the atmosphere which can then be harvested as wood products that continue to store carbon over the long term and employed as a sustainable source of fuel. In this way forests and wood products directly sequester carbon and substitute other materials that are associated with higher levels of emissions, such as steel, concrete and fossil fuels.

DAFM supports the enhancement and protection of forest sinks through the afforestation scheme, regulation of felling and other policies, and supports the development of the forest and wood processing sector, including the promotion of a greater use of wood in the wider economy.

Forests will play an important role in meeting EU emissions reductions targets during the 2021 to 2030 period. Based on the accounting rules of the LULUCF Regulation agreed in 2018, up to 2.0 Mt of CO_2 per annum is forecast to be accountable against Ireland's ESR targets from afforested land. Ensuring this figure is attained will require ongoing support for sustainable forest management and the protection of Irish forests, avoiding deforestation and continued afforestation efforts. In 2019, 3,550 ha of new forests were planted in Ireland by private landowners under the afforestation scheme. In addition, over 90km of forest roads were grant aided through the forest road scheme. Based on the most recent National Inventory Report to the UNFCCC, forests in Ireland sequestered over 4.3 Mt of CO_2 in 2017 which includes the contribution of the carbon pool in harvested wood products.

As part of the Forestry Programme 2014-2020, €103 million has been made available for forestry measures in 2020. This allocation reflects commitments to an average planting target of 8,000ha per year as contained in the Climate Action Plan. The budget also provides funding for the direct implementation of a number of other actions under the Climate Action Plan including the mobilisation of the private timber resource in Ireland, a substantial investment in forest roads, continued support for Knowledge Transfer groups and the promotion of timber products

The overall target is to expand Ireland's forest estate from 11% to 18%. A mid-term review of the Forestry Programme was completed and published in 2018. The review focused on meeting the targets of the programme and a set of recommendations have been agreed and implemented. These include increases in the rate of financial support across all categories with larger increases for broadleaf planting, an increase in the proportion of broadleaf planting in all applications to 15% and new initiatives to promote alternative silvicultural practices. A change in supports for road building was also made to further assist landowners with the mobilisation of the existing forest estate.

Peatlands under agricultural management

Ireland recognises wetlands and peat soils as an important carbon pool in the Irish landscape. Reducing emissions by water table manipulation has the potential to significantly reduce GHG emissions from these soils and is a means to positively contribute to our climate change mitigation ambitions. This is an important part of the Department of Agriculture, Food and the Marine's contribution to the emission reductions and is set out in the All of Government Climate Action Plan as highlighted in the targets set for the Agriculture, Forestry and Land-use sector.

As part of a special allocation of €3 million in Ireland's Budget 2020 to fund additional pilot projects aimed specifically at climate measures in agriculture, a call for a new pilot European Innovation Partnership (EIP) project on reduced management of farmed peatlands will be announced in due course. This is designed to increase carbon sequestration and contribute to meeting our commitments as part of the Government's climate action plan.

The Department of Agriculture, Food and the Marine is working closely with other shareholders such as Ordnance Survey Ireland, Teagasc, the Environmental Protection Agency, Bord na Mona and

others gain an understanding of the current state of play with regards to the mapping of Ireland's soil and the work to be undertaken to precisely identify grasslands on carbon rich or drained peatlands that are suitable for water table management to reduce carbon losses. Accurate peatland maps will be part of the requirements to scale up lessons learned from the EIP pilot project into a larger agri-environment programme in advance of Ireland's next Common Agricultural Policy.

In addition, it is planned to overlay the peatlands map with the locations of current GLAS measures such as Breeding Waders management areas to determine priority areas and identify symbiotic beneficial measures and actions. Research will continue into the potential of rewetted peatlands to retain and sequester carbon while remaining in productive use will be led by Teagasc with input from Bord na Móna.

Bord na Móna has already rehabilitated 15,000 hectares of peatland and is developing new plans that will involve the enhanced rehabilitation of a greater area of peatland by 2025. Bord na Móna has recently announced a €1.6 billion investment plan which includes an accelerated peatland rehabilitation programme and while these activities will take place on non-agricultural soils DAFM will be eager to learn from the knowledge gained by Bord na Móna`s efforts in this area.

4.1.2.7 Sectoral policies and measures: Waste

Ireland recognises the need to focus on designing out waste, prioritising prevention of waste at every opportunity through eco-design, reuse and repair, taxation and levies. Ireland's material consumption is well above the EU average, and continues to rise as the economy recovers and grows. This indicates that there is scope for savings in greenhouse gas emissions through maximising the efficiency of our material usage.

In Ireland, domestic food waste has a significant negative emissions impact whether composted, landfilled or incinerated, and is harmful to the environment and human health. 300k/tonnes of plastic packaging waste in Ireland will have a carbon footprint of over 10 $MtCO_2eq$. More effective policies on prevention, choice of material and recycling could reduce this footprint.

With regards to the formal GHG inventory, it is only the direct emissions from enterprises handling waste which are entered under the Waste heading (i.e. principally methane from landfill CO_2eq. used in collecting and processing within Ireland).

The gains in reducing material use and replacing virgin material with recycled will be credited back up the supply chain. However, improving recycling and reuse to displace exports of waste can, somewhat perversely, result in higher emissions. In this narrow sense material management which generates waste accounts for just 1.5%of Ireland's total greenhouse gases in 2017.

Waste emissions on a per capita basis are lower in Ireland compared to the EU average. Emissions have also fallen since 2005, but not as much as in other MS or compared to the EU average.

Ireland has made significant progress in managing waste streams, particularly in improving recycling rates and diversion from landfill.

Ambitious targets have been adopted for the coming decades:

Landfill Reliance Target[55]:

- Limit diversion of biodegradable municipal waste to landfill to maximum limit of 427k tonnes by 2020 and for every year after
- Reduce diversion of municipal waste to 10% by 2035

Recycling:

- Recycle 65% of municipal waste by 2035[56]
- Recycle 70% of packaging waste by 2030[57]
- Recycle 55% of plastic packaging waste by 2030[58]
- Separate collection obligations extended to include hazardous household waste (by end 2022), bio-waste (by end 2023), and textiles (by end 2025)[59]

Food Waste:

- Reduce food waste by 50% by 2030[60]

Plastic Single-Use Items[61]:

- Ban specific single-use plastic convenience items including polystyrene food containers, cups and drinks containers in line with Single Use Plastics Directive
- Provide for 90% collection of plastic drinks containers by 2029
- Determine and introduce reduction targets and measures no later than 2022 to be achieved by 2026
- Ensure all plastic packaging is reusable or recyclable by 2030

Waste policy measures currently in place will have a significant effect on projected emissions over the next decade. Emissions reductions are primarily attributable to reduced methane emissions from landfill over the period, in line with the projected reduction in waste going to landfill.

[55] Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste (LFD)
[56] Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (WFD)
[57] Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste (PPD)
[58] PPD
[59] WFD
[60] WFD
[61] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (SUP)

Measures to Deliver Targets

Irish and regional waste policy is based on a waste hierarchy: waste prevention; preparing for reuse; recycling; and energy recovery; with disposal, namely landfill, being the least desirable option. It is implemented by the Government, local authorities and the EPA. Its present strategic plan (2014 - 2020) is called Towards a Resource Efficient Ireland and is backed by three Regional Waste Management Plans (2015-2021). [62] A replacement plan, with a working title of 'Waste Policy for a Circular Economy' will be published in 2020 and will be followed by revised Regional plans.

Ireland now plans to transform our approach to waste in line with modern, circular economy principles. The significance of the Circular Economy in delivering sustainable growth and promoting climate change mitigation is reflected in international policy frameworks. Goal 12 of the UN SDGs (Sustainable Production and Consumption) sets out a series of targets that include resource efficiency, wasted food, waste management, reuse and recycling, public procurement, education, and removal of fossil fuel subsidies. The EU Circular Economy Action Plan, Closing the Loop, adopted in 2015, includes an ambitious new legislative framework for waste management, as well as Eco-design proposals to improve product durability; food waste reduction actions; and proposals for reuse of water and bio-nutrients.[63]

4.1.2.8 Sectoral policies and measures: Built Environment

Progress on Improving Ireland's Energy Efficiency

Improving energy efficiency is central to our transition to a low carbon economy and is a key theme in the Climate Action Plan. The Climate Action Plan raises the level of ambition for investing in energy efficiency than was previously the case. Higher targets have been set for building renovation with 500,000 homes to be retrofitted to a 'B' Building Energy Efficiency (BER) rating or cost optimal or carbon equivalent. A higher level of ambition has also been set for the public sector which now has a new 50% energy efficiency target for 2030.

To support this ambition the level of investment is being scaled up. In 2019, DCCAE invested €117million in targeted measures to achieve Ireland's energy efficiency objectives in the built environment, in line with national objectives. This will be increased further in 2020 with funding of €146million to be invested in energy efficiency and sustainable energy projects in 24,000 more buildings, saving at least 110,000 tonnes in carbon emissions every year and supporting around 4,000 jobs, while also reducing Ireland's dependence on imported fossil fuels.

In addition to the continuation and expansion of several energy efficiency schemes funded by DCCAE and operated through SEAI to support improved energy efficiency, key developments to improve energy efficiency in the built environment during 2019 include:

- Establishment of the new Retrofit Task Force
- The development of the new enhanced BER Advisory Report

[62] Further information can be found here: http://www.epa.ie/pubs/reports/waste/prevention/reports/towardsaresourceefficientireland.html
[63] Further information here: https://eurlex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0012.02/DOC_1&format=PDF

- Provision of accredited training programmes in the new NZEB buildings standards
- Expansion of the EXEED programme to support more businesses
- Suite of online training modules for SMEs developed
- Options to help improve energy efficiency in rented properties formulated and public consultation launched
- Public Sector energy efficiency continues to improve steadily with 27% improvement achieved by end 2018
- Capacity development workshop delivered for all Departmental Energy performance Groups

The Minister for Housing, Planning and Local Government is providing funding of €25 million in 2020 to improve the energy efficiency of local authority homes through the energy efficiency programme. In addition a further €20 million has been allocated to retrofit homes in the Midlands from revenues arising from the increase in the carbon price.

Support Scheme for Renewable Heat (SSRH)

The Support Scheme for Renewable Heat will stimulate and support the replacement of fossil fuel heating systems with renewable energy and contribute to meeting Ireland's renewable energy and emission reduction targets. The scheme supports commercial, industrial, agricultural, district heating and other non-domestic heat users in the non-ETS sector. The scheme provides two types of support mechanism:

- An on-going operational support (which will be paid for a period up to 15 years) for new installations or installations that currently use a fossil fuel heating system and convert to using biomass heating systems or anaerobic digestion heating systems
- A grant (of up to 30%) to support investment in renewable heating systems that use heat pumps.

Residential Sector Developments in Energy Efficiency

The Climate Action Plan also recognises that attaining the objective of a low carbon future will involve radically changing our behaviour as citizens, businesses and public sector bodies requiring us all to become significantly more energy efficient. The Government's energy efficiency schemes have to date upgraded 400,000 homes throughout Ireland.

Energy efficiency upgrades to the fabric of our buildings by, for example, carrying out works such as insulation and airtightness reduces the amount of energy needed for heating and cooling and reduces the CO_2 emissions connected with our energy use in those homes and workplaces. To actually decarbonise our built environment, a further switch from using fossil fuel as the source for the energy in our buildings is required. The NDP committed to supporting changing out oil fired boilers to heat pumps in 170,000 homes over the lifetime of the NDP. The Climate Action Plan has increased this to a target of 400,000 heat pumps installed in existing homes by 2030.

In the residential sector, work is now progressing to scale up the new levels of ambition to 500,000 homes retrofitted to B2 or cost optimal equivalent by 2030 with 600,000 heat pumps installed in new and existing buildings, and looking at how best to continue the shift towards deeper renovation measures. A new Retrofit Task Force has been established to drive the achievement of the retrofit objectives. The overarching objective of the Taskforce is to oversee the design and development of a new national retrofit delivery model/programme that will deliver 500,000 retrofits to BER B2/cost optimal or carbon equivalent and 400,000 heat pump installations by 2030. In doing so, the Taskforce will:

- Provide strategic leadership in the design, development and implementation of the new integrated retrofit delivery system
- Provide effective oversight for the programme sub-groups
- Consider the experience of other jurisdictions in determining best practice for retrofit financing and delivery
- Ensure the delivery of relevant Climate Action Plan targets through the identification of appropriate resolution pathways for barriers and constraints
- Provide updates as required to the Climate Action Plan Delivery Board
- Identify measures to be implemented in 2020 that will commence the move to an aggregated, area based approach
- Identify and make recommendations to Government on relevant matters including:
- the approach to monitoring and evaluating the new integrated delivery system and financing system
- the appropriate entity to oversee the roll-out of the new model at the local level
- the optimal model(s) for the delivery of retrofits in Ireland
- the best way to transition from the multiple support schemes across different Departments and agencies to the new model
- the best approaches to financing and funding the retrofit programme (including access to affordable finance when a property is transferred and sold as well as easy pay-back methods)
- the best approaches to supporting people on lower incomes to participate in the programme

€13 million in revenues from the increased carbon price will be used to provide an increased allocation to the Warmer Homes Scheme which targets households in energy poverty. This

represents a 33% increase in funding, compared with 2019 spending levels. The total budget for the scheme in 2020 will be approximately €53 million.

The revenues from the increased carbon price will also be used to help to achieve the aggregation of retrofit works called for in the Climate Action Plan. Targeted at the Midlands in 2020, €20 million will be provided to upgrade some of the Local Authority housing stock in the area. The scheme will also aim to allow private homeowners in the areas targeted for upgrades to participate in getting their own homes upgraded.

Other important initiatives in the Climate Action Plan include:

- DCCAE are working with SEAI to identify how to increase the number of homes and businesses with BER certificate or Display Energy Certificates
- SEAI are preparing for the new enhanced BER Advisory report to be introduced in early 2020
- Accredited training programmes in the new NZEB buildings standard have been developed and are being rolled out more widely with the support of SOLAS through the ETBs
- SEAI will explore (through piloting) the use of salary incentive schemes to encourage, facilitate and support people in retrofitting their homes
- The increase in the carbon price in Budget 2020 will provide additional resources to support the energy efficiency improvement objectives. It also provides clear signalling of future trajectory which will also help to encourage and motivate more of the energy retrofit behaviours needed

Commercial Sector Developments in Energy Efficiency / EXEED Programme

The commercial sector has significant potential to contribute to national energy efficiency and climate change objectives. Businesses (both public and private) who participated in the Excellence in Energy Efficient Design (EXEED) pilot programme achieved an average 28% energy efficiency improvement. This level of efficiency improvement also helps to improve the competitiveness and resilience of Irish businesses.

Based on the success of the pilot the EXEED programme was expanded in 2018 and again in 2019 and met the 2019 target of helping 80 businesses or projects improve their energy efficiency. It is envisaged that this number will further increase in 2020. Aside from the project efficiencies delivered, embedding of new design thinking skills within participating businesses has the potential to promote wider future efficiencies.

A number of new business-related objectives substantially aimed at delivering new energy efficiency outcomes are identified in the Climate Action Plan. These include:

- Developing more links between businesses and their communities to assist in capacity building and delivering collaborative energy efficiency projects in communities

- SEAI to provide a suite of supports for businesses to use Energy Performance Contracting to improve their energy efficiency in affordable ways – including project assistance grants for audits and EPC facilitation and guidance

- SEAI are developing a suite of online training modules for SMEs to help them identify and pursue energy efficiency opportunities scheduled to go live in early 2020

In addition, solutions to the retrofitting/energy efficiency problem, stemming from the split incentive in the rental market (residential as well as commercial), are being explored. An Expert Advisory Group was formed and during 2019, they looked at examples of best international practice and have produced a consultation paper which includes examples of approaches used elsewhere and other options for consideration. This paper supports a public consultation launched in Q4 which will help to inform policy recommendations to be made in early 2020.

Public Sector Developments in Energy Efficiency

The public sector has already made a very significant contribution to national energy efficiency objectives, with efficiency gains of 27% achieved by end 2018 - the latest year for which figures are available. The Public Sector Energy Efficiency Strategy, launched in 2017, provides a new governance framework and enhanced supports to enable public sector bodies improve their energy efficiency and achieve the 33% improvement target by 2020. The strategy is proving effective. Following its introduction, measurement of its efficiency by SEAI has shown following a stagnation in progress between 2015 and 2016 (with just under 21% improvement) the sector as a whole improved to 24% efficiency by end 2017 with a further sustained improvement to 27% by end 2018.

With over €1 billion saved (avoided energy spend 2009-17) and 3.56 million tonnes of avoided emissions by end 2017, the public sector have shown what can be achieved. This also places them in a strong position for the higher 50% target for 2030 introduced in the Climate Action Plan. To ensure progress is sustained, DCCAE has continued to provide leadership in 2019. Working with the SEAI and the OPW, DCCAE have delivered a series of capacity development workshops for each Departmental Energy Performance Officer Group.

DCCAE have also continued to co–fund pathfinder partnership projects during 2019. These jointly funded projects focus on retrofit. The schools retrofit is a partnership with Department of Education & Skills. The SEAI & OPW partnership focuses on building retrofits within the OPW building portfolio. In addition to the retrofit improvements for the schools and buildings, a key objective of these projects is to test approaches, build best practice and capacity to develop a scalable retrofit model which can be replicated across all schools and wider public sector once NDP funding becomes available.

Near Zero Energy Buildings (NZEB)

The existing 2018 Energy Performance of Buildings Directive requires that all new buildings (public and private) are Near Zero Energy Buildings (NZEB) by 2020. It also requires that new buildings owned and occupied by public authorities are NZEB after 2018. NZEB is classified as a building that has a very high energy performance and that the nearly zero or very low amount of energy required

should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.

Part L of the Building Regulations for Buildings other than Dwellings was amended in 2017 in order to establish the NZEB performance requirement and this will set a performance level representing an improvement in the order of 60% over current standards. It also includes mandatory renewables on all new buildings and major renovations to a cost optimal level.

Under the previous regulations a typical new dwelling is built to an A3 Building Energy Rating (BER). The NZEB requirements will equate to an A2 BER. To implement NZEB, DHPLG published the EU (Energy Performance of Buildings) Regulations in April 2019.[64]

This represents a 70% improvement in energy efficiency and 70% reduction in CO_2 emissions when compared with 2005 Part L requirements. It also requires 20% renewables as a percentage of total building energy use.

The revised Energy Performance of Buildings Directive was published in May 2018. It promotes the use of smart technology in buildings and streamlines the existing rules. The transposition deadline is March 2020. The most significant implications are the following:

- Installation of Electric Vehicle Charging points for new residential buildings and those undergoing major renovation and for non-residential buildings
- Introduction of Building Automation and Control Systems

Draft legislation to implement these was published for public consultation in December 2019.[65]

New EU 2030 Target for Energy Efficiency

As part of the EU's Clean Energy package revisions to the Energy Efficiency Directive have been agreed at an EU level. This includes a 32.5% headline target for energy efficiency for the EU as a whole in 2030. Ireland will set out its contribution to that target in the first National Energy and Climate Plan.

4.2 Estimates of emissions reductions and removals from use of units from Market Based Mechanisms and Land Use, Land Use Change and Forestry

4.2.1 Market Based Mechanisms

Installations in the ETS are allowed to use a number of international credits from the Clean Development Mechanism and Joint Implementation Mechanism calculated in accordance with the Regulation on International Credit Entitlements (Commission Regulation (EU) No 1123/2013), which covers the period from 2008 to 2020 inclusive. During Phase III of the EU ETS (2013-2020), 4.7 Mt

[64] See further detail here: https://www.housing.gov.ie/housing/building-standards/energy-performance-buildings/energy-performance-buildings ; http://www.irishstatutebook.ie/eli/2019/si/183/made/en/print

[65] See here for further information: https://www.housing.gov.ie/housing/building-standards/energy-performance-buildings/public-consultation-review-building ; https://www.housing.gov.ie/housing/building-standards/building-regulations/getting-ireland-electric-vehicles-ready-minister

CO_2eq of these international credits have been exchanged for Phase III EUAs by Irish installations. These 4.7 Mt CO_2eq of units have been retired.

The revised ETS Directive terminates the use of international credits in Phase IV of the ETS (2021-2030). Thus, for Phase IV, the use of international credits in the ETS will cease to apply.

Ireland's target under the ESD is set out in *Section 3. Quantified economy-wide emission reduction target*. The use of flexible mechanisms is allowed under the ESD. All Member States can surrender up to 3% of their 2005 emissions per annum using units from the Clean Development Mechanism and the Joint Implementation Mechanism. If these rights are not used in one year they can be used later in the commitment period or sold to another Member State. Certain Member States including Ireland can use a further 1% of 2005 emissions per annum, but only if the units are sourced from Least Developed Countries or Small Island Developing States. This right is not transferable between Member States or between years. In total, these provisions could allow Ireland to use up to 12.3Mt CO_2eq of units for compliance with its obligations through the use of flexible mechanisms over the period 2013-2020.

As Ireland has complied with the ESD for the years 2013-2016, and will expect to meet annual targets in 2017 and 2018 through the use of banked allowances from earlier in the period, Ireland has not yet required using any market-based mechanisms for compliance under the ESD. However, the latest emissions projections indicate that Ireland will need to purchase additional allowances to meet shortfalls in 2019 and 2020. Ireland is likely to use up to 12.3Mt CO_2eq of CERs and ERUs to comply with annual ESD targets in 2019 and 2020.

In respect of demonstrating compliance with the first commitment period of the Kyoto Protocol, and in addition to those units mentioned above, Ireland retired 1.2Mt CO_2eq of temporary CERs and 1.9Mt CO_2eq of units which were acquired under the provisions relating to international emissions trading as set out in Article 17 of the Protocol and its subsequent Decisions. CERs and ERUs totalling 5.3Mt CO_2eq and 0.07Mt CO_2eq are being carried forward and may be used for compliance with the provisions of the ESD, as described above. A further 7.8Mt CO_2eq of AAUs will be placed in the Prior Period Surplus Reserve.

4.2.2 Land Use, Land Use Change and Forestry

Information on emissions in the base year and in the reporting years can be found in CTF Table 4. The quantified economy-wide emission reduction target in FCCC/SB/2011/INF.1/Rev.1 does not include emissions/removals from LULUCF.

In respect of demonstrating compliance with its commitments under the first commitment period of the Kyoto Protocol Ireland retired 16.3Mt CO_2eq of RMUs and cancelled a further 1.6Mt CO_2eq in order to address the issue of emissions from deforestation. RMUs cannot be used in the context of the ESD for the years 2013-2020.

4.3 Information on the assessment of the economic and social consequences of response measures

4.3.1 International Impact Assessment Systems

In accordance with Article 3, paragraph 14 of the Kyoto Protocol, Ireland is only required to report changes related to the information on minimizing adverse impacts. However for an improved understanding, this section sets out the context in which the adverse impacts of policies and measures are minimized at an EU level.[66]

Chapter 15 of the Annual Greenhouse Gas Inventories of the European Union outline a wide-ranging impact assessment system which accompanies all new policy initiatives. [67] Measures regarding climate change mitigation and affecting adaptation needs are identified as "measures known to have impacts on developing countries". This procedure is referred to in the Sixth and Seventh National Communications of the European Union as the process whereby adverse social, environmental and economic impacts on developing country parties are minimised. [68]

As a MS of the EU, Ireland's commitments under the Kyoto Protocol are implemented under Decision 2005/166/EC, governing joint fulfilment under Article 4, and Decision 280/2004/EC which covers specific emissions monitoring and reporting requirements. In this context the minimisation of adverse impacts on developing countries is also largely dictated by the European Union's policies on climate change and by its policies and programmes affecting developing countries. Regulation at the European level also controls or influences market conditions, fiscal incentives, tax and duty exemptions and subsidies in all economic sectors in EU Member States.

The impact assessment of new policy initiatives has been established in the EU, which allows their potential adverse social, environmental and economic impacts on various stakeholders, including developing country parties, to be identified and limited at an early stage within the legislative process. Impact Assessment Guidelines specifically address impacts to developing countries and also issues related to international relations.[69] This provides a framework in which MS like Ireland can also ensure a high level of protection of the environment and contribute to the integration of environmental considerations into the preparation and adoption of specified plans and programmes with a view to promoting sustainable development.

Detailed information in this regard is included in Ireland's National Inventory Report 2019, *Chapter 15 Minimisation of Adverse Impacts under Article 3, Paragraph 14.*

[66] Greater detail has been provided in Section 4.3 in accordance with the recommendation contained in the ERT Report on Ireland's 3rd Biennial Report.
[67] See full report here: https://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2019
[68] NC6/BR1 EU:
https://ec.europa.eu/clima/sites/clima/files/strategies/progress/monitoring/docs/ec_6nc_en.pdf
NC7/BR3 EU:
https://unfccc.int/sites/default/files/resource/459381_European%20Union-NC7-BR3-1-NC7%20BR3%20combined%20version.pdf
[69] Further information can be found here: https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/impact-assessments_en

4.3.2 National Impact Assessment Systems

National Public Spending Code

Ireland's Public Spending Code provides a guide to evaluating, planning and managing public investment.[70] The Code underlines how well-planned, well-executed public capital investment can offer a wide range of social and economic benefits: it enhances well-being and quality of life, underpins better connectivity, improves productivity and enables more environmentally sustainable development.

As part of the Public Spending Code guidance package, the Department of Public Expenditure and Reform (DPER) has developed a range of core and technical guidance documents that provide a robust framework of rules and procedures for policy development in Ireland. All Irish public bodies are obliged to treat public funds with care. This includes insuring to the extent possible that a cost-benefit analysis is carried out to assess whether or not the social and economic benefits associated with a proposed project, policy or measure are greater than the social and economic costs.[71]

In November 2018, the DPER published a consultation paper on valuing greenhouse gas emissions in the Public Spending Code, along with a review of the other central technical appraisal parameters used in the Code. [72] The paper concluded that the model currently that was then in use for pricing carbon in the Public Spending Code was outdated. It proposed a new methodology that values future greenhouse gas emissions according to a shadow price of carbon that is based on the estimated marginal cost that will be faced by society in achieving Ireland's legally binding 2030 greenhouse gas emissions target.

In July 2019, DPER published a decision paper responding to the views expressed in the public consultation.[73] This paper concluded that the approach proposed by the Department was the optimal methodology and the use of the revised shadow price of carbon is now mandatory for use by all public bodies.[74] The Circular confirming this decision also updated other technical parameters, including a downward revision of the test discount rate from 5% to 4% and allowing the use of hyperbolic discounting in the evaluation of projects with a long expected lifespan. In December 2019 a guidance paper was published to give public bodes practical assistance in the valuation of the greenhouse gas emissions that might be associated with a project under evaluation.[75]

Finally, in December 2019, a fully updated *Public Spending Code: A Guide to Evaluating, Planning and Managing Public Investment* was published.

The revised Code is a based on a review of the Code, informed by an extensive consultation process involving engagement with public officials and an examination of international best practice.

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[70] See full Public Spending Code and supplementary guidance for the management of public investment here: https://www.gov.ie/en/publication/public-spending-code/

[71] To be applied in the appraisal of each non-commercial investment proposal valued over €20m. See Public Spending Code: A Guide to Evaluating, Planning and Managing Current Expenditure for information on the appraisal of projects valued at less than €20m https://www.gov.ie/en/publication/public-spending-code/

[72] https://igees.gov.ie/wp-content/uploads/2018/11/Valuing-Greenhouse-Gas-Emissions.pdf

[73] https://assets.gov.ie/19749/77936e6f1cb144d68c1553c3f9ddb197.pdf

[74] https://assets.gov.ie/43554/70a378231f1540b0a09a0560dc9dd26f.pdf

[75] https://assets.gov.ie/45078/b7dbf515ad694c3e8b2c37f1094b7dca.pdf

Importantly, the Code also incorporates learnings from capital projects in Ireland on a wide range of projects including the National Children's Hospital.

The update to the Code specifically strengthens the existing guidance to better reflect the realities of project delivery with a particular focus on financial appraisal, cost estimation and risk management.

The updated Code will:

- Support public bodies in delivering greater Value For Money;
- Provide greater clarity on roles and responsibilities;
- Revise the project lifecycle to reflect the realities of project delivery;
- Strengthen guidance; and
- Increase transparency through publication of business cases and evaluation reports.

Distributional impacts of Ireland's Carbon Tax

The Programme for Partnership Government provides a commitment to developing a process of budget and policy proofing as means of advancing equality, reducing poverty and strengthening economic and social rights.

As part of Ireland's Budget 2020, the Minister for Finance announced that the projected funds raised by a €6 increase of the carbon tax in 2020 will be ring-fenced to protect those most exposed to higher fuel and energy costs, to support a just transition for displaced workers and to invest in new climate action.

Research by the Economic and Social Research Institute (ESRI) has demonstrated that the projected impact of small increases in the carbon tax on household costs is extremely limited. However, the burden falls unequally. [76] Since their income is lower, energy costs typically represent a higher proportion of overall household costs for the less well-off in society. In addition, low income households are far more likely to live in a home with poor energy efficiency. This suggests that increasing the carbon tax without taking any compensatory measures is likely to be regressive because it imposes a greater burden (relative to resources) on lower income households.

To counteract this, 38% of the funds raised by the increased carbon tax are devoted to assisting the least well off in society to mitigate the impact of the increase. This funding is split between a €2 increase in fuel allowance payments to assist with the immediate impact of the increased carbon tax on the least well off in society and an increase to the budget of the Warmer Homes which is an energy efficiency measure aimed at those in energy poverty which permanently reduces participating household's energy requirements.

[76] https://www.esri.ie/system/files/publications/QEC2019SUM_SA_Lynch.pdf

The €2 increase in the fuel allowance was based on ESRI research that determined that an increase in the carbon tax of €6 will cost the poorest households an additional €28.08 per annum, rising to €51.17 for those in the third lowest income decile.[77] This is the total cost that will be borne by these households i.e. it includes the projected cost increases these households will face from heating and transport, along with any other projected cost increases. It is also based on a full year's estimated cost, when the increase in the carbon tax will actually only commence in May 2020.

The change to the fuel allowance will boost the incomes of those in receipt of the scheme by €56 a year. Since the fuel allowance is means tested, there should be a reasonable degree of correlation between households in receipt of the fuel allowance and the lowest income deciles. As a result of this change, households in receipt of the fuel allowance are likely to see a net gain in their income arising from the increases to the fuel allowance and the carbon tax. This ensures that the vulnerable in society are protected from the increased carbon tax.

In addition, the Warmer Homes schemes will receive a 33% increase in funding for 2020, as compared with 2019 spending levels. This programme provides free energy efficiency upgrade to people in or at risk of energy poverty and the overall 2020 allocation represents a more than 300% increase in funding for the scheme compared with average spending levels over 2015 – 2017. This will enable the upgrade of at least 4,000 homes to a high energy efficiency standard. This in turn will reduce greenhouse gas emissions and contribute to reduced inequality and improved health outcomes.

Analysis conducted by the Department of Finance, has determined that households in the bottom three income deciles will experience a positive impact in their equivalised disposable income as a result of the Budget 2020.[78] The income of the remaining seven deciles is broadly unchanged, leading to a conclusion by the Department of Finance that Budget 2020 is broadly progressive. In particular, the research work finds that any regressive impact of the carbon tax is outweighed by the increase in social welfare transfers.

To better understand the impact of the carbon tax on the most vulnerable in society, the Department for Employment Affairs and Social Protection will, in early 2020, undertake an impact assessment of the current and projected future increases in carbon tax on low income families and publish a report on this. In addition to the work planned by the Department of Employment Affairs and Social Protection, the Department of Finance will continue to examine the projected impacts of changes to the carbon tax.

[77] https://www.esri.ie/system/files/media/file-uploads/2018-10/RS79.pdf
[78] http://www.budget.gov.ie/Budgets/2020/Documents/Budget/Budget%202020%20Distributional%20Analysis%20for%20publication%20final.pdf

5. Projections

5.1 Introduction

The National Climate Change Strategy (2007) designated the Environmental Protection Agency (EPA) responsible for developing annual national emission projections for greenhouse gases (GHG) for all key sectors of the economy, in collaboration with relevant State and other bodies. In addition to informing national policy development, projections are compiled to meet EU reporting obligations (Monitoring Mechanism Regulation No 525/2013).[79] The latest projections were published in June 2019 and projected Irish GHG emissions out to 2040 using two scenarios: a *With Measures* scenario and a *With Additional Measures* scenario[80]:

- The *With Measures* scenario assumes that no additional policies and measures, beyond those already in place by the end of 2017 (latest national greenhouse gas emission inventory), are implemented.
- The *With Additional Measures* scenario assumes implementation of the *With Measures* scenario in addition to, based on current progress, further implementation of Government renewable and energy efficiency policies and measures including those set out in the National Renewable Energy Action Plan (NREAP) and the National Energy Efficiency Action Plan (NEEAP), the 2017 National Mitigation Plan and the National Development Plan 2018-2027. [81]

Due to timing issues, the 2019 *With Additional Measures* scenario did not include the policies and measures included in the 2019 Climate Action Plan.

For the projections in the BR4 Ireland has not developed a 'without measures' scenario or estimated indirect GHG projections for carbon monoxide, nitrogen oxides, non-methane volatile organic compounds, and sulphur oxides for the BR4. *The preparation of a 'without measures' scenario and projections for indirect GHG projections for carbon monoxide, nitrogen oxides, non-methane volatile organic compounds, and sulphur oxides is being kept under consideration*

5.2 Projections of Greenhouse Gas Emissions

Figure 5.1 shows historical and projected greenhouse gas emissions for the '*With Measures*' and '*With Additional Measures*' scenarios (without LULUCF).

[79] National Climate Change Strategy 2007-2012. Department of Environment, Heritage and Local Government. (2007) http://www.askaboutireland.ie/aai-files/assets/Environment/Climate%20C/Change/national-climate-change-strategy-2007-2012.pdf

[80] For 2017 reporting the Monitoring Mechanism Regulation (Regulation (EU)) No. 525/2013) requires Member States to report greenhouse gas emission projections out to 2035. For the purpose of this chapter emissions projections are presented out to 2035. See also reporting submission which includes projection out to 2040 at the following link: https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14_lcds_pams_projections/projections/envxlxagq/MMR_Template_IRArticle23_table1_2019IE16042019v2.xlsx/manage_document

[81] NREAP: http://www.dcenr.gov.ie/energy/en-ie/Renewable-Energy/Pages/Action-Plan.aspx
NEEAP: https://www.dccae.gov.ie/en-ie/energy/topics/Energy-Efficiency/energy-efficiency-directive/national-energy-efficiency-action-plan-(neeap)/Pages/National-Energy-Efficiency-Action-Plan-(NEEAP).aspx
National Development Plan 2018-2027: https://www.gov.ie/en/campaigns/09022006-project-ireland-2040/

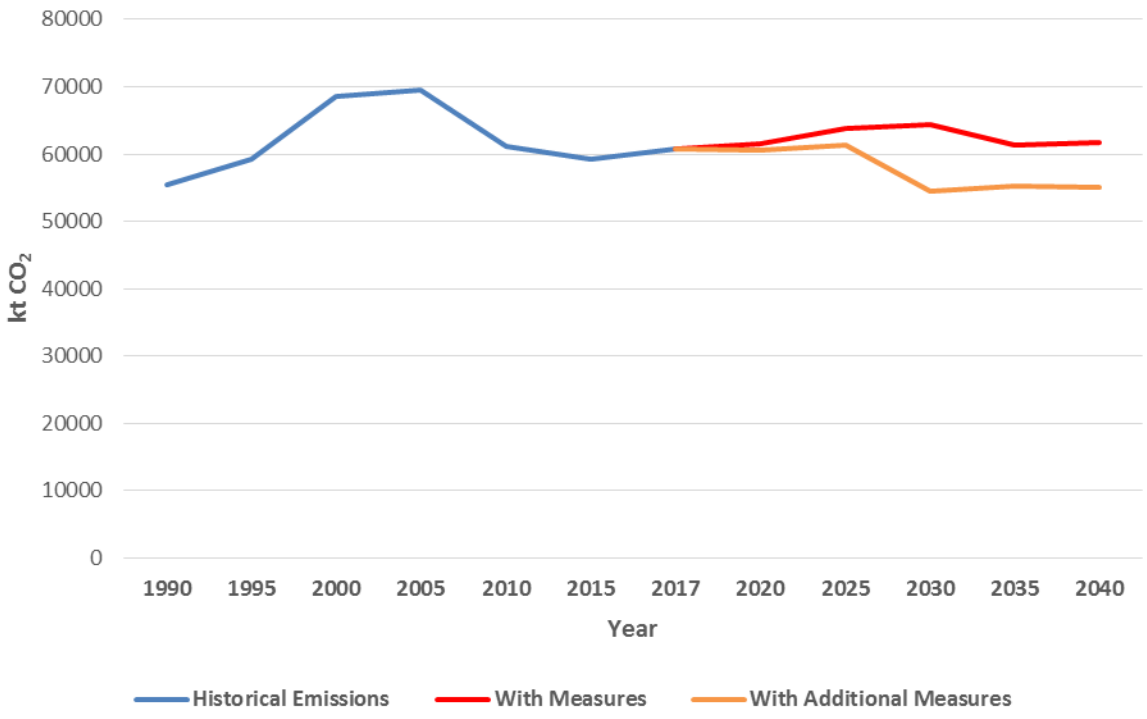

FIGURE 5.1 - HISTORICAL AND PROJECTED GREENHOUSE GAS EMISSIONS FOR THE 'WITH MEASURES' AND 'WITH ADDITIONAL MEASURES' SCENARIOS. [82]

2019 greenhouse gas emissions projections show total emissions increasing from current levels by 1% by 2020 and by 6% by 2030 under the *With Measures* scenario. Under the *With Additional Measures* emissions are estimated to decrease by 0.4% and 10% by 2020 and 2030 respectively.

Figure 5.2 shows historical (2013-2017) and projected emission levels (2018-2020) for ESD sector emissions under the *With Measures* and *With Additional Measures* scenarios. In addition, it shows the annual compliance/non-compliance in relation to the annual emission limits.

Ireland's ESD emissions are projected to be 5% and 6% below 2005 levels in 2020 under the *With Measures* and *With Additional Measures* scenarios, respectively. The target for Ireland is a 20% reduction. Ireland has exceeded its annual binding limits for the first time in 2016 and has again exceeded the annual binding limit in 2017. Further information on the 1990-2017 inventory is available. [83]

[82] Total without LULUCF
[83] http://www.epa.ie/pubs/reports/air/airemissions/ghgemissions2017/

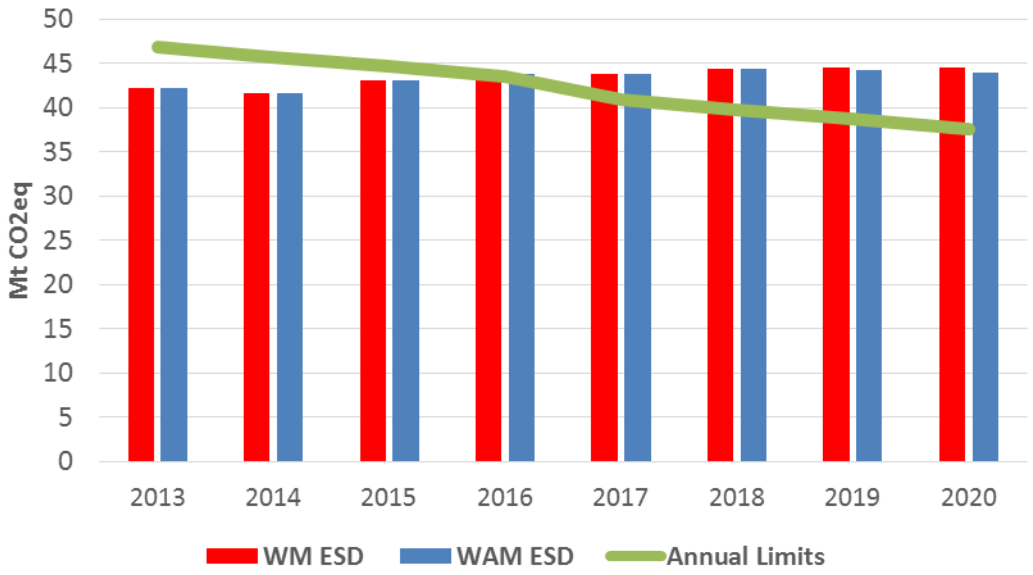

FIGURE 5.2 WITH MEASURES AND WITH ADDITIONAL MEASURES GREENHOUSE GAS EMISSION PROJECTIONS AND COMPARISON WITH THE LINEAR REDUCTION PATHWAY REQUIRED BETWEEN 2013 AND 2020.[84]

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 is expected to have insufficient banked allowances for 2019 and 2020 and will need to purchase additional allowances to cover compliance requirements in these years.

On 14 May 2018, the European Council adopted the Effort Sharing Regulation (ESR) (*OJ L 156, 19.6.2018)* on greenhouse gas emission reductions. The Regulation sets out annual binding emission reduction targets for Member States in sectors falling outside the scope of the EU Emissions Trading System for the period 2021-2030. The final agreement sets Ireland an emissions reduction target of 30% reduction by 2030 compared to 2005 levels. The 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.[85] CO_2CO_2

5.3 Projections by Sector

5.3.1 Projections by Sector (*With Measures Scenario*)

Sectoral emissions in this Chapter are presented in line with the sectoral breakdown as published in the most recent national EPA greenhouse gas emission projections publication. [86] See Appendix in this national publication for further explanation of the categories, as based on the EPA's

[84] 1 Mt = 1,000,000 tonnes

[85] Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance) - https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32018R0842

[86] http://www.epa.ie/pubs/reports/air/airemissions/ghgprojections2018-2040/

interpretation of the categorisation of the sectors that are included in Ireland's National Policy Position and how they are estimated to align with IPCC reporting categories..

Sectoral shares for the '*With Measures*' scenario are presented in **Table 5.1** for historical and projected years. The single largest source of emissions in 2017 was the agriculture sector which contributed to 33% of total national emissions (excluding LULUCF). By 2020 its share is projected to continue to be 33%. The second largest source of emissions in 2017 is the Transport sector accounting for 19.8% of total national emissions. In 2020 it is projected to account for nearly 21%.

Table 5.1 Sectoral share (*With Measures* scenario)

	1990	1995	2000	2005	2010	2015	2017	2020	2025	2030	2035
Energy Industries	20.4%	22.8%	23.7%	22.9%	22.0%	20.1%	19.3%	20.0%	23.2%	24.0%	20.4%
Residential	13.6%	10.9%	9.4%	10.5%	12.8%	10.2%	9.5%	10.6%	9.5%	8.6%	8.4%
Manufacturing Combustion	7.1%	7.3%	8.2%	8.4%	7.3%	7.6%	7.7%	6.4%	5.9%	5.6%	6.0%
Commercial/Public Services	4.0%	3.6%	3.5%	3.5%	3.8%	3.0%	3.3%	2.2%	2.0%	1.8%	1.9%
Transport	9.3%	10.6%	15.8%	18.9%	18.9%	19.9%	19.8%	21.0%	20.4%	20.8%	21.2%
Industrial Processes	5.9%	5.1%	5.5%	4.0%	2.4%	3.4%	3.7%	3.9%	4.2%	4.7%	5.6%
F-Gases	0.1%	0.5%	1.4%	1.5%	1.6%	1.9%	2.0%	1.6%	1.4%	1.2%	1.3%
Agriculture	36.7%	36.2%	30.3%	28.5%	30.4%	32.3%	33.3%	33.3%	32.7%	32.7%	34.5%
Waste	2.8%	3.1%	2.2%	1.9%	0.8%	1.6%	1.5%	0.9%	0.8%	0.7%	0.7%

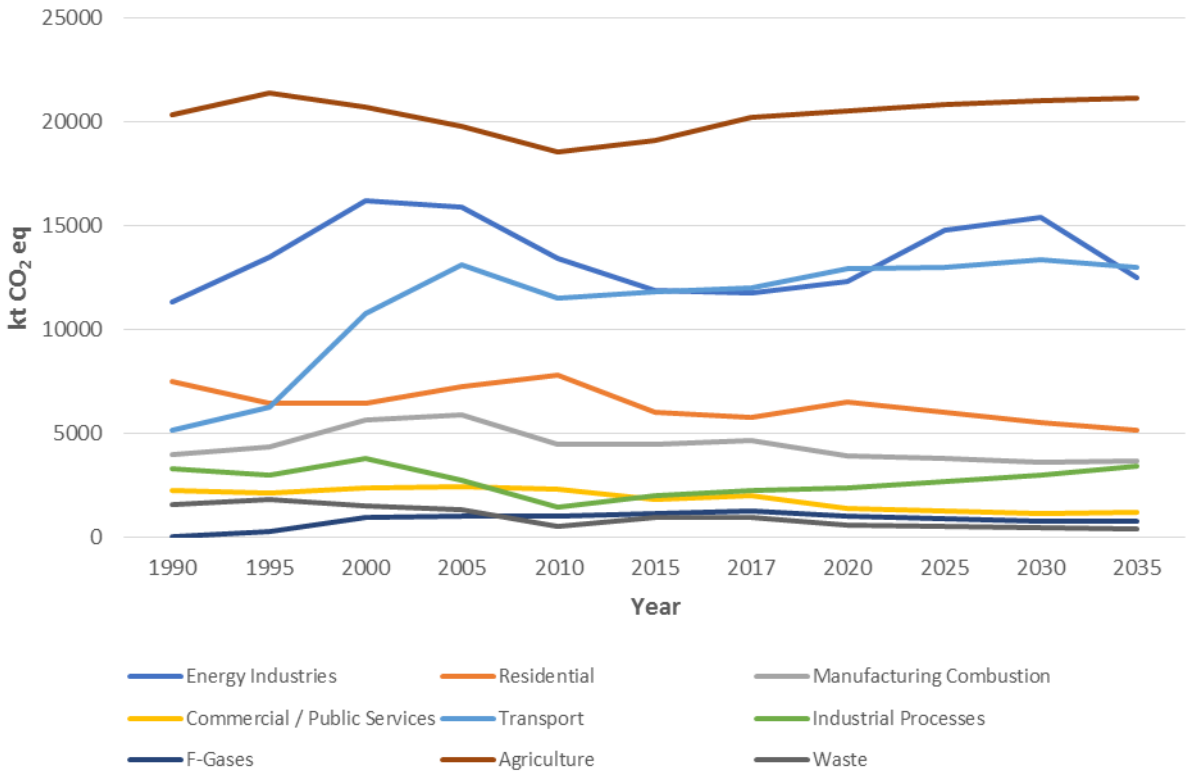

FIGURE 5.4: WITH MEASURES GHG EMISSIONS BREAKDOWN BY SECTOR 1990-2035

The Energy industries sector is the third largest source of emissions in 2017 accounting for 19.3% of emissions. By 2020 its sectoral share is projected to be 20%. Emissions from Manufacturing Combustion accounted for 7.7% of total emissions in 2017 and are projected to decrease to 6.4% and 5.6% share of total emissions in 2020 and 2030 respectively.

Emissions from Industrial Processes accounted for 3.7% of total emissions in 2017 and the projected share is projected to be 3.9% and 4.7% in 2020 and 2030 respectively.

Emissions from Commercial and Public Services accounted for 3.3% of total emissions in 2017 and are projected to decrease to 2.2% and 1.8% share of total emissions in 2020 and 2030 respectively.

Emissions from Residential Sector accounted for 9.5% of total emissions in 2017 and are projected to be 10.6% and 8.6% share of total emissions in 2020 and 2030 respectively. In 2017 the waste sector accounted for 1.5% of national total emissions, and is projected to account for 0.9% and 0.7% in 2020 and 2030 respectively.

In 2017 the ETS accounted for 27.8% of national total emissions and is projected to account for 27.5% and 31.5% of total emissions in 2020 and 2030 respectively.

5.3.2 Projections by Sector (With Additional Measures Scenario)

Sectoral shares for the '*With Additional Measures*' scenario are presented in **Table 5.2** for historical and projected years. The single largest source of emissions in 2017 was Agriculture when it contributed to 33.3% of total national emissions (excluding LULUCF). Under the *With Additional Measures* scenario the share of emissions from agriculture is projected to be 33.4%. The second largest source of emissions in 2017 (Transport sector) is projected to account for 20.8% of emissions in 2020.

Table 5.2 Sectoral share (*With Additional Measures* scenario)

	1990	1995	2000	2005	2010	2015	2017	2020	2025	2030	2035
Energy Industries	20.4%	22.8%	23.7%	22.9%	22.0%	20.1%	19.3%	20.2%	22.2%	15.8%	18.8%
Residential	13.6%	10.9%	9.4%	10.5%	12.8%	10.2%	9.5%	10.6%	9.2%	8.3%	6.8%
Manufacturing Combustion	7.1%	7.3%	8.2%	8.4%	7.3%	7.6%	7.7%	6.3%	6.0%	6.3%	6.4%
Commercial/Public Services	4.0%	3.6%	3.5%	3.5%	3.8%	3.0%	3.3%	2.2%	1.9%	1.8%	1.7%
Transport	9.3%	10.6%	15.8%	18.9%	18.9%	19.9%	19.8%	20.8%	20.3%	21.7%	19.9%
Industrial Processes	5.9%	5.1%	5.5%	4.0%	2.4%	3.4%	3.7%	3.9%	4.3%	5.5%	6.2%
F-Gases	0.1%	0.5%	1.4%	1.5%	1.6%	1.9%	2.0%	1.6%	1.5%	1.4%	1.4%
Agriculture	36.7%	36.2%	30.3%	28.5%	30.4%	32.3%	33.3%	33.4%	33.6%	38.2%	38.0%
Waste	2.8%	3.1%	2.2%	1.9%	0.8%	1.6%	1.5%	1.0%	0.8%	0.8%	0.8%

The Energy industries sector is the third largest source of emissions in 2017. By 2020 its sectoral share is projected to be 20.2% in 2020 following by a decrease to 15.8% in 2030 under the *With Additional Measures* Scenario. Emissions from Manufacturing Combustion accounted for 7.7% of total emissions in 2017 and are projected to decrease to 6.3% share of total emissions in 2020 and 2030 respectively.

The projected share from Industrial Processes is projected to be 3.9% and 5.5% in 2020 and 2030 respectively.

Emissions from Commercial and Public Services accounted for 3.3% of total emissions in 2017 and the projected share is projected to be 2.2% and 1.8% in 2020 and 2030 respectively.

Emissions from Residential Sector accounted for 9.5% of total emissions in 2017 and the projected sectoral share is projected to be 10.6% and 8.3% share of total emissions in 2020 and 2030 respectively. In 2017 the waste sector accounted for 1.5% of national total emissions, and is projected to account for 1% and 0.8% share in 2020 and 2030 respectively under the *With Additional Measures* Scenario.

In 2017 the ETS accounted for 27.8% of national total emissions and is projected to account for 27.3% and 24.6% of total emissions in 2020 and 2030 respectively under the *With Additional Measures* Scenario. **Table 5.3** presents the breakdown of greenhouse gas emissions by ETS and non ETS sector for the period 2005 to 2035.

Table 5.3 Breakdown of greenhouse gas emissions by ETS and non ETS sector for the period 2005 to 2035

ETS/Non ETS Breakdown under *With Measures* Scenario								
Year	**2005**	**2010**	**2015**	**2017**	**2020**	**2025**	**2030**	**2035**
ETS Total (kt CO_2e)	22396.2	17354.7	16848.4	16913.3	16933.2	19512.5	20306.0	17893.2
Non ETS Total (kt CO_2e)	47098.8	43750.0	42363.4	43830.3	44599.2	44295.1	44020.6	43425.8
ETS/Non ETS Breakdown under *With Additional Measures* Scenario								
Year	**2005**	**2010**	**2015**	**2017**	**2020**	**2025**	**2030**	**2035**
ETS Total (kt CO_2e)	22396.2	17354.7	16848.4	16913.3	16524.1	18352.9	13448.2	15671.8
Non ETS Total (kt CO_2e)	47098.8	43750.0	42363.4	43830.3	44008.7	43077.9	41107.1	39530.8

5.4 Projections by Gas

Projections by gas are only discussed for the '*With Measures*' scenario. Emissions by gas for the '*With Additional Measures*' scenario is presented in the Annex of this report.

5.4.1 Projections by Gas (*With Measures Scenario*)

CO_2 emissions accounted for 63.7% of national total (excluding LULUCF) emissions in 2017, with CH_4 and N_2O contributing 23.1% and 11.1%, respectively. The combined emissions of HFC, PFC, SF_6 and NF_3 accounted for approximately 2% of total emissions in 2017. By 2020 emissions of CO_2 are projected to be 64.6% of national total emissions, with CH_4 and N_2O accounting for 22.5% and 11.2% respectively. By 2030 emissions of CO_2 are projected to be 65.8% of national total emissions, with CH_4 and N_2O accounting for 21.7% and 11.1% respectively. **Table 5.4** provides historical emissions and projections by gas for the '*With Measures*' scenario.

Table 5.4: Historical emissions and projections by gas for the *With Measures* scenario (Mt CO_2 eq) (excluding LULUCF)

Gas	1990	1995	2000	2005	2010	2015	2017	2020	2025	2030	2035
Carbon Dioxide	32.89	35.80	45.20	48.12	41.68	38.43	38.73	39.76	41.85	42.37	39.33
Methane	14.76	15.00	14.35	13.59	12.07	13.32	14.03	13.89	14.03	13.97	13.89
Nitrous Oxide	7.73	8.08	7.96	6.76	6.35	6.36	6.75	6.90	7.01	7.19	7.33
F-gases	0.04	0.29	0.97	1.02	1.01	1.10	1.23	0.99	0.91	0.79	0.78
Total	**55.42**	**59.18**	**68.48**	**69.50**	**61.10**	**59.21**	**60.74**	**61.53**	**63.81**	**64.33**	**61.32**

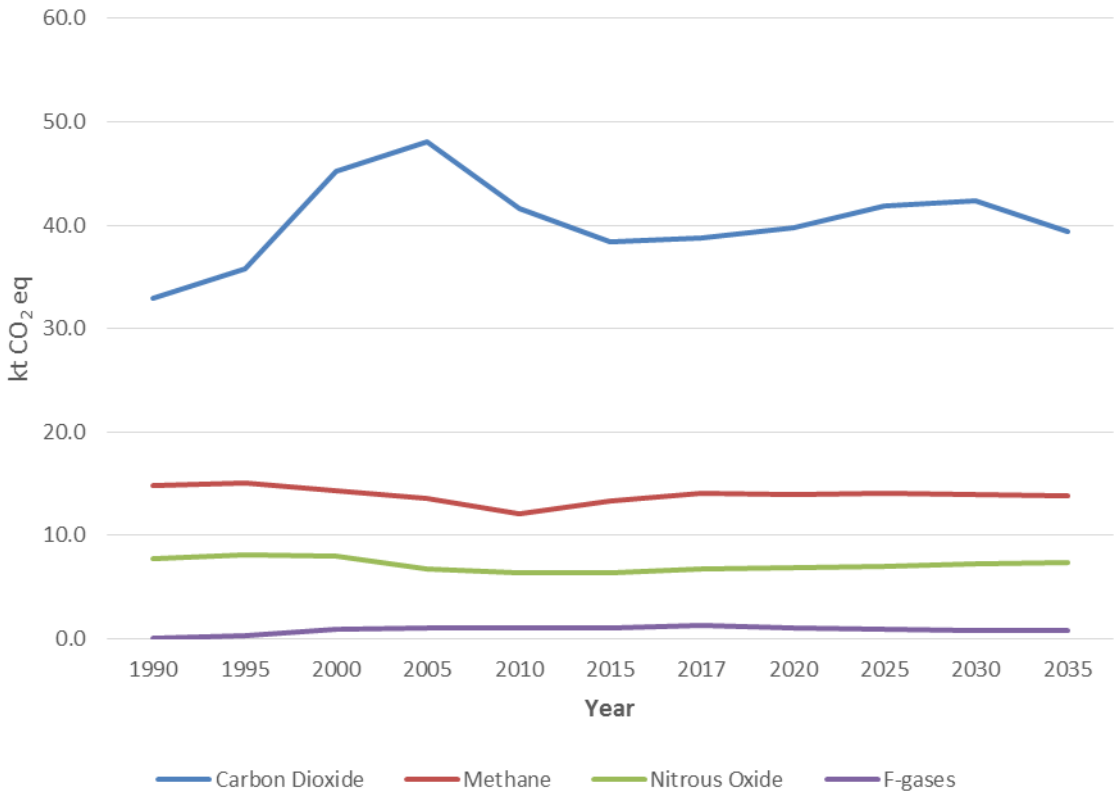

FIGURE 5.5: WITH MEASURES GHG EMISSIONS BREAKDOWN BY GAS 1990-2035

In 2017 the largest source of CO_2 emissions was Transport accounting for 30.6%. The second most significant contributor to greenhouse gas emissions in Ireland is CH_4 accounting for 23.1% of emissions in 2017 and 22.5% and 21.7% of emissions in 2020 and 2030 respectively. The main driver behind CH_4 emissions in Ireland is CH_4 emissions from cattle from enteric fermentation and manure management. Emissions from the agriculture sector are projected to increase as a result of expansion plans in the sector. [87]

Similar to emissions of CH_4, the agriculture sector is the largest source of N_2O emissions in Ireland reflecting the significant quantities of nitrogen from animal manures and synthetic fertilizers applied to agricultural soils. Nitrous oxide emissions accounted for 11.1% of national total emissions in 2017 and are projected to account for 11.2% and 11.1% in 2020 and 2030 respectively.

[87] Food Wise 2025. A 10-year vision for Irish agri-industry. Department of Agriculture, Food and the Marine, 2015. https://www.agriculture.gov.ie/foodwise2025/

Emissions of the F-gases (HFCs, PFCs, SF_6 and NF_3) were 1231 kt CO_2 equivalent in 2017. F-gas emissions account for approximately 2% of the national total in 2017 and are projected to decrease to 987 Kt CO_2 equivalent and 799 Kt CO_2 equivalent in 2020 and 2030 respectively. **Table 5.5** provides historical and projected emissions of F-gas in the *With Measures* scenario.

Table 5.5 Historical emissions and projections by F-gas for the *With Measures* scenario (kt CO_2eq)

F-gas	1990	1995	2000	2005	2010	2015	2017	2020	2025	2030	2035
HFCs	1.2	104.4	469.7	679.9	928.4	1035.9	1143.3	902.0	820.4	689.9	662.3
PFCs	0.1	97.6	397.8	216.4	46.6	20.5	47.2	51.2	58.1	66.7	77.3
SF_6	33.9	79.1	51.8	96.8	33.1	44.5	39.2	32.4	29.2	31.3	34.9
NF_3	NO	4.4	49.2	28.4	NO	1.0	1.3	1.4	1.6	1.8	2.1

5.5 Methodological Approach

National energy projections showing future energy trends are published by Sustainable Energy Authority of Ireland (SEAI). [88] Energy projections underpinning the 2019 emissions projections were prepared by SEAI in conjunction with the Economic and Social Research Institute (ESRI) and University College Cork. The ESRI use macro-economic projections which are produced using the COSMO model. [89] Energy projections, most recently completed in 2017 & 2018, form the basis for almost all energy-related emission projections discussed in this document.

SEAI compile two energy projections scenarios, which are used in national emission projections out to 2040:

- The *Baseline* energy projections projects forward Ireland's energy demand, incorporating the expected impacts of policies and measures that were in place (e.g. legislatively provided for) by the end of 2017. It represents a hypothetical future scenario in which no further policy actions or measures have been taken.
- The *Advanced* energy projections presents an alternative view of future energy demand that accounts for further implementation of the *With Measures* scenario in addition to further implementation of Government policies and measures including those set out in Ireland's NREAP and the NEEAP and more recently Ireland's National Development Plan 2018-2027.

The *Baseline* energy projection underpins the *With Measures* emission projection for the energy sector and the *Advanced* energy projection underpins the *With Additional Measures* projection for the energy sector.

The *Baseline* energy projections compiled by SEAI provide future energy demand to 2040 for the following sectors: 1.A.1.a, 1.A.2, 1.A.3.b, 1.A.3.e, 1.A.4.a, 1.A.4.b and 1.A.4.c. The *Advanced* energy projections provides future energy demand for the above sectors to 2040 whilst accounting for implementation of policies and measures presented in Ireland's NEEAP and NREAP and policies and measures included in Ireland's National Development Plan 2018-2027. NEEAP and NREAP measures are also included in the *Baseline* Scenario to a large extent.

[88] https://www.seai.ie/resources/publications/
[89] https://www.esri.ie/projects/modelling-the-irish-economy/

For the *Baseline* energy projections, the Economic and Social Research Institute (ESRI) use macro-economic projections which are produced using the COSMO model.

Projections from the COSMO model were used to produce projections of the energy demand. Annual electricity demand, which is an output of the electricity demand equations/COSMO was transferred, as well as fuel prices and capacity and policy assumptions, as an input into an electricity dispatch model to determine fuels used at an hourly level to service aggregate electricity demand. This process provides a high level of accuracy on the fuels used in the electricity sector. The software used to model the Irish Electricity Market is PLEXOS.

The energy projections include sectoral output figures and other relevant key variables such as price, economic growth, population and housing stock. 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 2017 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 further implementation of additional policies and measures outlined in the NEEAP and NREAP and Ireland's National Development Plan 2018-2027.

The EU Reference Scenario 2016 (constant 2013) fuel prices were used for the ESRI macro-economic projections on which the SEAI energy projections are based. For the BioHEAT Modelling the SEAI decided to linearly interpolate between 2018-2025, starting from the observed 2018 spot price and ending with the 2025 EU reference price projection. This was carried out to smooth out disparities between current prices and short term prices in the EU Reference Scenario 2016.

Table 5.6 shows key parameters underlying the macroeconomic outlook and therefore the *With Measures* and *With Additional Measures* emission projections scenarios.

The model input assumptions for the latest SEAI Energy Projections were finalised in Q3 and Q4 of 2018. Determination of anticipated progress in the implementation of policies and measures was coordinated by the SEAI in discussion with the relevant Government Departments.

Further details on the models used for preparing the energy projections (i.e. COSMO, PLEXOS Integrated Energy Model, SEAI's Energy Scenario Tool, and SEAI BioHEAT Model) are included in the 2019 submission made under Article 14 of the Monitoring Mechanism Regulation (Regulation 525/2013). This is available at the following link:

https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14_lcds_pams_projections/projections/envxlxagq/

Table 5.6. Key assumptions underpinning the energy projections

	2017 – 2020	2021-2025	2026-2030	2031-2035
Average Annual% Growth Rate				
GDP	+3.30%	+2.58%	+2.77%	+3.01%
GNP	+5.06%	+5.09%	+4.99%	+5.02%
Personal Consumption	+3.12%	+1.94%	+1.52%	+1.52%
	2020	**2025**	**2030**	**2035**
Housing Stock ('000)	2,059	2,237	2,344	2,455
Population ('000)	4,866	5,077	5,276	5,484
EUETS: Carbon $€_{2013}/tCO_2$	15	22.5	33.5	42.0
Coal $\$_{2013}$/boe	17.7	22.9	27.6	29.2
Oil $\$_{2013}$/boe	74.9	85.1	93.6	97.5
Gas $\$_{2013}$/boe	59.7	69.8	76.5	81.7
Peat €/MWh	25	25	25	25

Note the macro-economic projections of energy demand by fuel and by sector from COSMO end in 2035. To extend the time series to 2040 the same trends (growth rates) as the period 2030 to 2035 were used for the period 2036 to 2040.

The energy projections completed in 2018, which follow the 2017 national energy balance, form the basis for the majority of Fuel combustion activities (1.A) emissions projections namely[90]:

- Energy Industries (1.A.1.a)
- Manufacturing Industries and Construction (1.A.2)
- Road transportation (1.A.3.b)
- Other transport (1.A.3.e)
- Commercial /Institutional (1.A.4.a)
- Residential (1.A.4.b)
- Agriculture/Forestry/Fishing (1.A.4.c)

Emission projections for the remaining fuel combustion activities (i.e. oil refining (1.A.1.b), peat briquetting (1.A.1.c), rail transport (1.A.3.c), domestic aviation (1.A.3.a), and navigation (1.A.3.d)) are calculated separately and are based on data provided by individual operators to the EPA and from EPA databases. Emissions from 1.A.5 (Non-Specified) combustion are reported as "IE" (Included elsewhere) as emissions from combustion are accounted for in the other sectors as listed above.

Non-energy related emissions cover the following sectors:

- Agriculture (3.A, 3.B, 3.D, 3.G and 3.H)
- Waste (5.A, 5.B, 5.C & 5.D)
- Industrial processes (2.A.)
- 2D Non-Energy Products from Fuels and Non-Energy Products from Fuels and Solvent Use
- Fluorinated gases (2.E, 2.F and 2.G) and
- Land Use, Land Use Change and Forestry (4.A – 4.D)

[90] https://www.seai.ie/resources/publications/Energy%20Balance%202016

The LULUCF sector includes greenhouse gas emissions and removals due to land use and land use change. It consists of six subcategories: Forest Land (4.A), Cropland (4.B), Grassland (4.C), Wetlands (4.D), Settlements (4.E) and Other Land (4.F). The approach taken in estimating greenhouse gas emission and removals from the sector utilises the latest national inventory estimates (1990-2017) in conjunction with a projected land use and land use change matrix.

Emissions and removals from the sector follow a hierarchical approach in line with the GHG Projections Guidelines (page 182 Grade 1 emission factors projections, Alternative 1 approach (emission factors for future years is based on the average of previous ten years). In Ireland, projected forest land areas are the most developed, followed by wetland areas and areas under settlement. Projected cropland and grassland areas are supplied by Teagasc in conjunction with the activity data supplied for the agriculture sector. Other land accounts for the remainder for each year of the projected time series.

In general, CO_2, CH_4 and N_2O emission factors are those used in historical emission inventories (1990-2017). These are either plant specific, country specific or default emission factors from IPCC guidelines. Carbon dioxide emissions from the combustion of biogenic carbon are not included in the calculation of projected emissions (in accordance with IPCC Guidelines for compiling greenhouse gas inventories).[91] The global warming potentials used come from the Fourth Assessment Report of the IPCC.

Further information on emission factors and methodologies used in in compiling the 1990-2017 National Inventory Report are available at the following link:

https://cdr.eionet.europa.eu/ie/eu/mmr/art07_inventory/ghg_inventory/envxiof9g/

[91] e.g. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 2. Energy. Chapters 2 & 3.

5.6 Sectoral Analysis and Total Effects of Policies and Measures

This section presents a sectoral analysis of the effects of policies and measures implemented or planned since Ireland's BR3, and their impacts on emissions as set out under the latest published projection scenarios. The latest greenhouse gas emissions projections scenarios are provided in the EPA 2019 report, however these projections do not include the policies and measures included in the Climate Action Plan which was only published in June 2019. As a consequence, the provided projections should be read as reflecting Government policy prior to the publication of the Climate Action Plan. Projections including the Climate Action Plan will be included in the final NECP and in the 2020 projection scenarios report.

5.6.1 Energy Industries (IPCC sector 1.A.1)

The impact of the EU Emissions Trading Scheme (EU-ETS) in the power generation sector is included in the energy projections underlying the emissions projections by including a price for carbon in the SEAI Plexos_Ireland model which is used to model the power generation (1.A.1.a) sector. [92]

The energy industries sector is sub-divided into (i) power generation (1.A.1.a) (ii) oil refining (1.A.1.b) (iii) solid fuel manufacture (1.A.1.c). Emissions projections were developed for each sub-sector, covering all combustion sources of CO_2, CH_4 and N_2O. Some key assumptions are described below.

Power generation covers all electricity generation including electricity generated from renewable sources. The Plexos_Ireland model was used to model electricity generation. As an electrical systems model, the core input data comprises technical details of generators, transmission lines and loads as well as fuel costs, operational costs and emission reduction rates and costs.

In the *Baseline* energy projection the renewable energy generated shows Ireland reaching approximately 39% of electricity consumption from renewable energy by 2020. Renewable electricity generation capacity is dominated by wind. In 2030 it is estimated that renewable energy generation increases to approximately 41% of electricity consumption.

Three peat stations are assumed to run. Two of these peat stations are assumed to run as 100% peat until the end of 2019 with biomass co-firing share of 30 per cent of capacity from 2020 to end of 2030 is projected. They are then assumed to close permanently. The third peat station is assumed to run with co-firing of 30% of the total capacity until the end of 2030 and then to close permanently. Coal fired electricity generation is assumed to remain on the system until 2030. It is also assumed there will be a roll out of approximately 2.25 million smart meters by 2024, on a phased basis starting in 2019.

In the *Advanced* energy projection (and therefore the *With Additional Measures* emissions scenario) it is assumed that for 2020 there is a 39% share of renewable energy in electricity generation. In 2030 it is estimated that renewable energy generation increases to approximately 54% of electricity consumption. This is mainly a result of additional expansion in wind energy. In terms of the three peat stations, it is assumed that there is 30 per cent biomass co-firing from 2020 to end of 2023 in this scenario. Biomass co-firing share of at least 51 per cent from 2023 to 2030 is projected with all

[92] http://ec.europa.eu/clima/policies/ets/index_en.htm

3 plants assumed to run at 100 per cent biomass from 2030. However output is based on biomass price (without subsidy) therefore low level output and contribution to renewables in electricity is projected. It is assumed that peat ceases by the end of 2030. In addition coal fired power generation is assumed to cease at the end of 2025 in this scenario. 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.

Projections for oil refining and solid fuel manufacture are based on data provided by the relevant operators as energy demand from these sectors is not covered in SEAI's energy projections. The oil refining sector (1.A.1.b) in Ireland consists of a single installation. Carbon dioxide emission projections, provided by the operator, are based on assumptions about future product specifications, crude oil qualities and market demand.

With respect to solid fuel manufacture (1.A.1.c), one large operator produces a range of peat based fuels for domestic and industrial customers including the electricity generation sector. Carbon dioxide emission projections for solid fuel manufacture are provided to the EPA by the operator.

The main source of emissions from the energy industries sector (1.A.1) is power generation, accounting for over 18% of emissions in 2017. Projected emissions from solid fuel manufacture and oil refining remain static with emissions projected to be 335 and 100 kt CO_2eq from 2020 onwards respectively.

Projected greenhouse gas emissions from Energy Industries

Under the *With Measures*, emissions from power generation are projected to increase by 5% between 2017 and 2020. Over the period 2020 to 2035, emissions from the energy industries sector are projected to increase by 1.6%.

Under the *With Additional Measures*, emissions from power generation are projected to increase by 1.8% between 2017 and 2020. The projections assume replacement of coal fired electricity generation at the end of 2025 with natural gas. Emissions from the energy industries sector are projected to decrease by 13.4% between 2020 and 2035.

Existing and planned policies and measures that will impact the power generation sector are listed in **Table 5.7** with the anticipated emissions savings included.

Table 5.7 Emissions savings due to policies and measures included in the *With Measures* and *With Additional Measures* scenarios for the power generation sector

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Measures				
Reduced electricity demand from energy efficiency measures	707.49	859.61	955.72	660.43
Domestic Lighting (Eco-Design Directive) – *included in reduced electricity demand from energy efficiency measures above*	60.00	56.23	52.64	35.66
Smart Meter Roll-Out - Household - included in reduced electricity demand from energy efficiency measures above	13.44	36.40	37.82	28.42
RES-E	4,207.09	4,582.88	5,425.76	3,593.96
Total	**4,914.59**	**5,442.49**	**6,381.47**	**4,254.38**
With Additional Measures				
Reduced electricity demand from additional energy efficiency measures in industry, services and residential	1.42	69.77	97.88	153.70
Smart Meter Roll-Out - Household - included in reduced electricity demand from energy efficiency measures above	0.02	0.67	1.45	1.80
Replacement of coal fired generation with natural gas	0	0	2165.85	0
RES-E	361.78	1,043.13	4,511.27	1,993.97
Total	**363.20**	**1112.90**	**6775.00**	**2147.67**

5.6.2 Manufacturing Industries and Construction (IPCC sector 1.A.2)

The *Baseline* energy projection underpins the *With Measures* emission projection for the industrial sector. The *Advanced* energy projection underpins the *With Additional Measures* emission projection.

The following policies and measures are included in the *Baseline* Projection:

- SEAI Large Industry Programme
- Accelerated Capital Allowances - Industry
- CHP
- Excellence in Energy Efficiency Design (EXEED) Industry

The *Advanced* Projection includes an extension of the following polices and measures:

- SEAI Large Industry Programme
- Accelerated Capital Allowances – Industry
- CHP
- Excellence in Energy Efficiency Design (EXEED) Industry

Projected greenhouse gas emissions from Manufacturing Industries and Construction

Under the *With Measures* emission projection, emissions from industrial combustion in this sector are projected to decrease by 15.7% between 2017 and 2020. Emissions in 2035 are projected to be 7% lower than emissions in 2020.

Under the *With Additional Measures* emission projection, emissions from industrial combustion are projected to decrease by 17.2% between 2017 and 2020. In 2035 emissions from industrial combustion are projected to be 8.8% lower than in 2020.

Table 5.8 shows the estimated impact of existing and additional policies and measures in the Manufacturing Industries and Construction sector

Table 5.8 Emissions savings due to policies and measures included in the *With Measures* and *With Additional Measures* scenarios for the Manufacturing Industries and Construction sector

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Measures				
SEAI Large Industry Programme	354.37	363.06	363.06	363.06
Accelerated Capital Allowances - Industry	2.81	3.03	3.03	3.03
CHP	105.28	108.92	108.92	108.92
Excellence in Energy Efficiency Design (EXEED) Industry	8.43	10.12	10.12	10.12
Total	**470.89**	**485.13**	**485.13**	**485.13**
With Additional Measures				
SEAI Large Industry Programme	-	34.76	78.21	121.66
Accelerated Capital Allowances - Industry	-	0.86	1.94	3.02
CHP	-	14.59	32.82	51.06
Excellence in Energy Efficiency Design (EXEED) Industry	-	6.75	15.18	23.62
Total	**-**	**56.96**	**128.15**	**199.35**

5.6.3 Transport (IPCC sector 1.A.3)

Transport emissions cover (i) Road Transportation (ii) Rail (iii) Domestic and International Aviation (iv) Navigation and (v) Other transportation (Pipeline Compressors). The *With Measures* and *With Additional Measures* emissions projections for road transportation and gas transmission are based on the *Baseline* and *Advanced* energy projections, respectively, provided by SEAI. Energy projections for the aviation sector were developed separately in consultation with the relevant bodies i.e. individual Airport Authorities.

Road transportation

The transport sector is a large energy using sector and is reliant on imported fossil fuels in the form of petroleum products and biofuels. Freight transport energy demand is strongly influenced by the level of commercial activity in the economy. Personal transport energy demand is influenced by both the level of employment as well as the oil price. Biofuel uptake in Ireland is driven primarily

through the Biofuel Obligation Scheme, an obligation on fuel suppliers to blend an increasing percentage of biofuel with their fuel. [93]

In terms of biofuels used in road transport fuel in the *Baseline* energy projection it is assumed that the Statutory target remains at current level of 8.696%.

For the *Advanced* energy projection it is assumed that the Biofuel Obligations Scheme places a statutory target of approximately 11% from 1 January 2019 on fuel suppliers and approximately 12% from 1 January 2020. Blending levels reaching a 10% blend of ethanol and gasoline (E10) and a 12% blend of biodiesel (B12) by 2030 with statutory blend increasing in two year increments is assumed. This scenario also assumes 500,000 Electric Vehicles on the road by 2030, as outlined in the National Development Plan, with 75% comprising battery electric vehicles and 25% plug in hybrid electric vehicles. Other key policies and measures assumed in the projections include Vehicle Registration Tax and Motor Tax Rebalancing.

Rail

It is assumed that fuel use in the sector will remain constant at 2017 levels for each year.

Domestic aviation

Forecasted data, where available, related to aircraft movements were provided to the EPA by the management authorities of Ireland's main airports (Dublin, Cork and Shannon). In terms of domestic aircraft movements from other minor airports in Ireland, they are assumed to remain static at 2017 levels for each projected year.

Navigation

Projected fuel combustion from navigation is assumed to be equal that combusted in the sector in 2017 for each projected year.

Other transport

Emissions in this sub-sector refer to the use of natural gas in pipeline compressor stations. Future gas demand for "own use and transformation" is inferred based on forecast gas demand in the residential, commercial and industrial sectors in both the *Baseline* and *Advanced* energy projection. Subtracting the amount of gas estimated to be lost from the distribution network allows "own use" gas demand and associated emissions to be estimated for the *With Measures* and *With Additional Measures* scenarios.

Projected greenhouse gas emissions from the Transport sector

The main source of emissions from the transport sector is road transportation, accounting for approximately 96% of emissions in 2017. Under the *With Measures* emission projection, emissions from transport are projected to increase by 7.5% between 2017 and 2020. Emissions are projected to increase by less than 1% between 2020 and 2035.

Under the *With Additional Measures* emission projection, emissions from transport are projected to increase by 5.7% between 2017 and 2020. With respect to 2035, emissions are projected to

[93] https://www.dccae.gov.ie/en-ie/energy/topics/Renewable-Energy/transport/biofuels/Pages/Biofuels.aspx

decrease by 13.3% between 2020 and 2035. The lower level of increase in emissions relative to the *With Measures* emission projections is primarily attributable to increased biofuel penetration and electric vehicles.

Table 5.9 Emissions savings due to policies and measures included in the *With Measures* and *With Additional Measures* scenarios for the Transport sector

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Measures				
Electric Vehicle Deployment	5.29	39.62	280.19	602.52
VRT and Motor Tax Rebalancing	257.03	158.13	59.27	-
Aviation Efficiency	66.74	66.73	66.70	66.72
Supplier Obligation Non-Grant - Non-Residential Transport	70.61	129.33	187.98	188.05
RES-T	543.94	551.42	568.82	555.53
Total	**943.62**	**945.23**	**1,162.96**	**1,412.81**
With Additional Measures				
Electric Vehicle Deployment	3.20	24.51	205.61	501.85
RES-T	160.69	419.27	1050.94	1262.15
Total	**163.89**	**443.79**	**1,256.55**	**1,764.00**

5.6.4 Commercial/Institutional/Services sector (IPCC sector 1.A.4.a)

The *Baseline* energy projection underpins the *With Measures* emission projection for the commercial services sector. The *Advanced* energy projection underpins the *With Additional Measures* emission projection.

The following policies and measures are included in the *Baseline energy p*rojection:

- ReHeat
- Public Sector Programme
- Public Sector Capital Exemplars
- Small and Medium Enterprises (SME) Programme
- Accelerated Capital Allowances - Services
- Supports for Exemplar Energy Efficiency Projects (SEEEP) and Energy Efficiency Retrofit Fund (EERF) and Better Energy Workplaces
- 2005/2008 Building Regulations - Buildings other than dwellings
- 2018 Building Regulations - Buildings other than dwellings
- Excellence in Energy Efficiency Design (EXEED) - Services
- Better Energy Communities - Services
- Supplier Obligation Non-Grant - Non-Residential
- Heat Pump Supports - Non-Domestic

The *Advanced energy* Projection includes an extension of the following polices and measures:

- Public Sector Programme
- Public Sector Capital Exemplars
- SME Programme
- Accelerated Capital Allowances – Services
- EXEED - Services
- Better Energy Communities - Services
- Supplier Obligation Non-Grant - Non-Residential
- Heat Pump Supports - Non-Domestic

Projected greenhouse gas emissions from the Commercial/Services Sector

Under the *With Measures* emission projection, emissions from the commercial services are projected to decrease by 30.4% between 2017 and 2020. It is projected that emissions from the commercial service sector will decrease by 14.3% between 2020 and 2035.

Under the *With Additional Measures* emission projection, commercial services sector emissions are projected to decrease by 33.3% between 2017 and 2020. Between 2020 and 2035 emissions are projected to decrease by 27.9%.

Table 5.10 Emissions savings due to policies and measures included in the *With Measures* and *With Additional Measures* scenarios for the Commercial/Services Sector

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Measures				
ReHeat	68.89	68.89	68.89	68.89
Public Sector Programme	346.31	438.43	530.35	530.35
Public Sector Capital Exemplars	3.78	4.83	4.83	4.83
Small and Medium Enterprises (SME) Programme	33.94	35.37	35.37	35.37
Accelerated Capital Allowances - Services	2.73	2.94	2.94	2.94
Supports for Exemplar Energy Efficiency Projects (SEEEP) and Energy Efficiency Retrofit Fund (EERF) and Better Energy Workplaces	63.01	63.01	63.01	63.01
2005/2008 Building Regulations - Buildings other than dwellings	260.21	319.18	378.14	437.11
2018 Building Regulations - Buildings other than dwellings	13.53	81.17	148.81	216.45
Excellence in Energy Efficiency Design (EXEED) - Services	8.23	9.87	9.87	9.87
Better Energy Communities - Services	38.17	43.99	43.99	43.99
Supplier Obligation Non-Grant - Non-Residential	378.53	693.50	1008.46	1008.46
Total	**1,217.33**	**1,761.18**	**2,294.67**	**2,421.27**
With Additional Measures				
Public Sector Programme	-	0.81	1.81	94.74
Public Sector Capital Exemplars	-	4.21	9.48	14.74
SME Programme	-	5.71	12.84	19.98
Accelerated Capital Allowances - Services	-	0.84	1.88	2.93
EXEED - Services	-	6.58	14.81	23.04
Better Energy Communities - Services	-	23.27	52.37	81.46
Total	**-**	**41.42**	**93.19**	**236.89**

5.6.5 Residential sector (IPCC sector 1.A.4.b)

The *Baseline* energy projection underpins the *With Measures* emission projection for the residential sector. The *Advanced* energy projection underpins the *With Additional Measures* emission projection.

The following policies and measures are included in the *Baseline* energy projection:

- 2002 Building Regulations -Dwellings
- 2008 Building Regulations -Dwellings
- 2011 Building Regulations -Dwellings
- 2019 (proposed) Building Regulations - Dwellings
- Greener Homes Scheme
- Energy Efficient Boiler Regulation
- Domestic Lighting
- Warmer Homes Scheme
- Warmth and Wellbeing Pilot
- Deep Retrofit Pilot
- Better Energy Communities - Household
- Better Energy Homes
- Major Renovations - Dwellings
- Smart Meter Roll-Out - Household
- Supplier Obligation Non-Grant - Residential
- Heat Pump Supports – Domestic

The *Advanced energy* projection includes an extension of the following polices and measures:

- Warmer Homes Scheme
- Warmth and Wellbeing Pilot
- Deep Retrofit Pilot
- Better Energy Communities - Household
- Better Energy Homes
- Smart Meter Roll-Out – Household
- Heat Pump Supports – Domestic

Projected greenhouse gas emissions from the Residential sector (IPCC sector 1.A.4.b)

Under the *With Measures* emission projection, residential sector emissions are projected to increase by 13.6% between 2017 and 2020 with a decrease in emissions over the period 2020-2035 by over 21%.

Under the *With Additional Measures* emission projection, in 2020 residential sector emissions are projected to increase by 12% between 2017 and 2020 with a decrease in emissions over the period 2020-2035 by 41.5%.

Table 5.11 Emissions savings due to policies and measures included in the *With Measures* and *With Additional Measures* scenarios for the Residential Sector

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Measures				
2002 Building Regulations -Dwellings	540.01	785.24	1015.74	1266.78
2008 Building Regulations -Dwellings	341.68	787.56	1206.64	1663.09
2011 Building Regulations -Dwellings	141.83	364.77	574.31	802.54
2019 (proposed) Building Regulations - Dwellings	4.42	108.56	211.24	323.07
Greener Homes Scheme	24.70	24.70	24.70	24.70
Energy Efficient Boiler Regulation	278.98	313.85	313.85	313.85
Warmer Homes Scheme	89.26	95.64	95.64	95.64
Warmth and Wellbeing Pilot	3.57	4.48	4.48	4.48
Deep Retrofit Pilot	4.12	5.49	5.49	5.49
Better Energy Communities - Household	69.33	79.90	79.90	79.90
Better Energy Homes	325.08	398.64	460.18	460.18
Major Renovations - Dwellings	2.83	9.90	16.98	24.05
Smart Meter Roll-Out - Household	0.00	0.00	0.00	0.00
Supplier Obligation Non-Grant - Residential	133.31	215.39	297.47	297.47
Total	**1,959.11**	**3,194.13**	**4,306.61**	**5,361.24**
With Additional Measures				
Warmer Homes Scheme	-	25.54	57.48	89.41
Warmth and Wellbeing Pilot	-	3.66	8.23	12.81
Deep Retrofit Pilot	-	5.49	12.35	19.21
Better Energy Communities - Household	-	42.27	95.11	147.95
Better Energy Homes	39.89	283.41	548.17	874.46
Total	**39.89**	**360.37**	**721.34**	**1,143.84**

Other measures impacting sectors

Carbon tax is a cross cutting measure that applies to industry, residential, commercial services, transport and agriculture fuel. The current rate of carbon tax (€20 per tonne of CO_2) is assumed across the projected period.

In terms of Heat, the *With Additional Measures* Scenario assumes 1,600GWh of additional renewable heat by early 2020s in addition to 1,600GWh of biomethane injection by 2030. It is also assumed that 170,000 heat pumps replace oil boilers by 2030 under this scenario. District heating in Dublin is also assumed to be deployed (additional 120 GWh by 2028 growing linearly from 2023).

Table 5.12 Emissions savings due to sectoral cross cutting policies and measures included in the *With Measures* and *With Additional Measures* scenarios

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Measures				
Carbon Tax	355.87	339.00	323.87	311.93
Total	**355.87**	**339.00**	**323.87**	**311.93**
With Additional Measures				
Carbon Tax	35.28	86.12	175.76	281.74
RES-H	149.92	72.68	304.50	70.55
Total	**185.20**	**158.80**	**480.26**	**352.28**

5.6.6 Fugitive emissions from Fuels (IPCC Sector 1.B.2)

Fugitive emissions of greenhouse gases cover those associated with natural gas distribution and production (1.B.2) and historical coal mining (1.B.1).

In determining future emissions from domestic gas production, it is assumed that approximately 46% of gas demand in 2020 comes from domestic sources and 25% in 2030. Coal mining ceased in Ireland in 1995, however emissions can still occur. Emissions from this sector are estimated using the default methodology as presented in the 2006 IPCC Guidelines and follows the approach undertaken in the national greenhouse gas emission inventory.

In the *With Measures* Scenario, emissions from Sector 1B are projected to increase by less than 1% between 2017 and 2020 and 4.1% between 2020 and 2035. In the *With Additional Measures* Scenario, emissions from Sector 1B are projected to decrease by less than 1% between 2017 and 2020 and decrease by 4.4% between 2020 and 2035.

5.6.7 Industrial Processes and Product Use (IPCC Sector 2)

Industrial Processes and Product use includes cement and lime production, other product use of carbonates, non-energy products from fuels and the use of fluorinated gases. Major industrial processes within the chemical sector and metal production are no longer undertaken in Ireland. The main source of emissions from the emissions trading sector in the industrial processes sector (2.A.1) is modelled using projected GDP growth.

Mineral Industries (IPCC sector 2.A)

Process emission projections were developed for the cement and lime industries (2.A.1 and 2.A.2) and other process use of carbonates (2.A.4) only. Only one projected scenario was developed for these sectors. The other industrial process emission source glass production (2.A.3) is no longer undertaken in Ireland therefore projected emissions are not estimated. Projected emissions from the cement industries are estimated using projected GDP data which is one of the macroeconomic inputs to the SEAI energy projections. Projected emissions from lime production are assumed to remain at 2017 levels.

Process emissions from mineral industries are projected to increase by 7.6% between 2017 and 2020 under both the *With Measures* scenario, and *With Additional Measures* scenarios. Emissions are projected to grow by 46.4% between 2020 and 2035.

Non-Energy Products from Fuels and Non-Energy Products from Fuels and Solvent Use (IPCC sector 2.D)

Emissions projections of CO_2eq from solvent use for the following activities were developed:

- Paraffin wax use (candles and other uses)
- Lubricant use
- Solvent use

Projected emissions from Paraffin wax use (candles and other uses) and Lubricant use are assumed to remain at 2017 levels.

Only one scenario was developed for solvent use which uses the rate of population growth in determining projected emissions. Emissions of CO_2eq from solvent use are projected to increase by 2.5% between 2017 and 2020 and increases by 11.7% between 2020 and 2035.

Fluorinated-gases (IPCC sector 2.E, 2.F, 2.G) and N_2O from Product Uses

Only one Fluorinated-gas emission projection outlook is developed and used in the two scenarios: *With Measures* and *With Additional Measures*. Fluorinated gases accounted for approximately 2% of Ireland's total national greenhouse gas emissions in 2017. The relevant source of fluorinated gas emissions in Ireland is production, use and disposal of equipment containing these fluids (e.g. refrigerators, mobile air conditioning systems, metered dose inhalers and electrical switch-gear).

Projections were developed for four fluorinated gases: HFC, PFC, SF_6 and NF_3. In 2017, HFCs accounted for approximately 93% of total fluorinated gas emissions with approximately 85% of HFC emissions estimated to come from refrigeration and air conditioning systems. Perfluorinated compounds, used in semi-conductor manufacturing, accounted for approximately 3.8% of total fluorinated gas emissions in 2017 while SF_6 accounted for 3.1 and NF_3 accounted for less than 0.1%.

Projections were developed for all four fluorinated gases and for all the sources reported in the national greenhouse gas inventory. **Table 5.13** summarises the basis for developing projections for each F-gas from the relevant sector.

In the *With Measures* and *With Additional Measures* emission projection, the impact of Directive 2006/40/EC relating to emissions from air-conditioning systems in motor vehicles is estimated as a result of SI No. 127 of 2009.[94] Under the *With Measures* and *With Additional Measures* emission projections, fluorinated-gas emissions are projected to decrease by 19.8% between 2017 and 2020 and are estimated to reduce by over 21% between 2020 and 2035.

[94] Directive 2006/40/EC. Relating to emissions from air-conditioning systems in motor vehicles and amending Council Directive 70/15/EEC; Statutory Instruments. S.I. No 127. European Communities (Motor Vehicles Type Approval) Regulations 2009

Table 5.13 Key assumptions underlying the F-gas projections

Sector	F-gases	Basis for projection
Refrigeration and air conditioning	HFC	Table 34 page 126 Emission Projections Guidelines
Mobile Air Conditioning (MAC)	HFC	Projected new car registrations and introduction of low (< 150) GWP fluids
Fire-extinguishers	HFC	Current disposal factor maintained with no net growth in the number of units installed as older units are replaced
Aerosols	HFC	Pro-rata basis using UK emission projections and UK and Irish population projections
Metered dose inhalers	HFC	Population projections and prevalence of asthma in the Irish population
Semi-conductor manufacture	HFC, PFC, SF_6 and NF_3	GDP
Electrical equipment	SF_6	Projected use and stock of SF_6 used in switchgear in the electricity transmission network provided by electricity distribution operator
Window sound-proofing	SF_6	Projections are based on the known current stock of SF_6 in installed windows, annual leakage and disposal factors
Medical Applications	SF_6	The use of SF_6 in Irish hospitals is assumed to remain constant at 2017 levels

Table 5.14 F-Gas Emissions savings included in the *With Measures* and *With Additional Measures* scenarios

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Measures				
Mobile Air Conditioning Directive	33.17	92.48	161.90	175.41
Total	**33.17**	**92.48**	**161.90**	**175.41**

5.6.8 Agriculture (IPCC Sector 3)

Emissions projections for CH_4 and N_2O were developed for the agricultural sector. The agricultural activities of importance in Ireland are:

(i) enteric fermentation
(ii) manure management and
(iii) agricultural soils

The key sources of CH_4 emissions in the agricultural sector are enteric fermentation and manure management. The key sources of N_2O emissions are manure management and agricultural soils. Estimates of historical N_2O emissions from these sources are determined using a Tier 1 or default approach in the inventory. The same methodology is used in developing emission projections.

Two scenarios were developed for agricultural emission projections, a *With Measures* scenario and a *With Additional Measures* scenario. Projected activity data (animal numbers, crop areas and fertiliser use) are provided by Teagasc (The Irish Agriculture and Food Development Authority) to the EPA in order to prepare agricultural emission projections. The emission projections discussed here are based on the activity supplied to the EPA in advance of emissions projections that were prepared in 2018. This includes the proposed national herd, crop areas and fertilizer use to meet the overarching objectives of Food Wise 2025.

The FAPRI-Ireland model was used for preparing agricultural forecast data to underpin the emissions projections. This model is linked to the FAPRI world modelling system and so takes account of and contributes to, the projections for prices obtained and quantities traded on the world markets. The activity data assumes that there is an expansion in the value of Irish agriculture over the period to 2025 to meet the targets set out in "Food Wise 2025" published by the Department of Agriculture, Food and the Marine in 2015. [95] The main growth projections set out in this document are as follows:

- Increasing the value of agri-food exports by 85% to €19 billion.
- Increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.
- Increasing the value of Primary Production by 65% to almost €10 billion.

The *With Additional Measures* scenario includes an estimate of the savings associated with the introduction of nitrification and urease inhibitors in synthetic nitrogen fertilizer to meet nutrient efficiency gains in the Ireland's Rural Development Programme 2014-2020. [96] It is envisaged that under this measure that there will be reduction in the requirement for nitrogen fertilizer by 10,000 tons nitrogen in 2018, increasing linearly to 30,000 tonnes reduction in 2020 and which is maintained at that level thereafter for the remaining projected period.

Enteric Fermentation (IPCC sector 3.A)

The FAPRI-Ireland model provides projected livestock population data for dairy cows and 'other cattle' (i.e. dairy heifers, other heifers, cattle < 1 years, cattle 1-2 years, cattle > 2 years, bulls and beef cows).

Country specific CH_4 emission factors for Irish cattle were developed as part of an in-depth analysis of cattle production systems and associated animal feed and energy required to improve the reporting of CH_4 emissions in the national greenhouse gas inventory. [97] For dairy cows, CH_4 emission factors have been increasing by an average of 0.5% per annum since 1990 which is primarily due to increasing milk yields. In developing the projections, it is assumed that the CH_4 emission factor for dairy cows continues to grow at 0.5% per annum reflecting projected continuing growth in milk yields. For other cattle categories, emission factors are held constant at 2017 levels.

[95] Food Wise 2025. A 10-year vision for Irish agri-industry. Department of Agriculture, Food and the Marine, 2015. https://www.agriculture.gov.ie/foodwise2025/

[96] https://www.agriculture.gov.ie/ruralenvironmentsustainability/ruraldevelopmentprogrammerdp2014-2020/

[97] "Development of Emission Factors for Enteric Fermentation from the Irish Cattle Herd". LS 5.1.1. Frank O'Mara. Environmental Protection Agency. (2006).

FAPRI-Ireland also provide projected animal population for sheep, swine, horses, mules and goats which allowed projected CH_4 emissions from these livestock categories to be calculated. The type of information used to derive Tier 2 CH_4 emission factors for cattle is not available for sheep, swine, horses, mules and goats. Therefore, IPCC default CH_4 emission factors are used, adjusted were necessary to reflect national circumstances (following the approach of the national inventory).

Manure Management (IPCC sector 3.B)

CH_4 Emissions

The decomposition of organic material in animal manures can be a source of CH_4 emissions if anaerobic conditions prevail in the animal waste management systems being used. The estimation of such emissions requires information on the quantity of manure produced from the animal groups concerned, the type of waste management systems employed and the CH_4 production potential of the wastes. Information obtained from a farm facilities survey, and the development of country specific emission factors for enteric fermentation in cattle, mentioned above, are the basis for CH_4 emission factors for manure management used in the greenhouse gas inventory. [98] Emission factors over the projection period are assumed to follow 2017 levels. The calculation of CH_4 emissions from manure management of sheep, swine, horse and poultry were determined using projected animal numbers and IPCC default emission factors (as used in the inventory).

N_2O Emissions

Nitrous oxide emission projections from manure management (i.e. liquid systems, solid storage and dry lot, pit storage, deep bedding and pasture) were determined using information on the allocation of animal manures to different animal waste management systems (taken from the farm facilities survey and the national greenhouse gas inventory), nitrogen excretion rates (included in the national greenhouse gas inventory) and projected animal numbers. Projected N excretion rates are assumed to increase by 1% per year over the projected period. The amount of nitrogen that is lost as N_2O follows the approach of the national inventory.

N_2O Emissions from Agricultural Soils (IPCC sector 3.D)

Nitrous oxide is produced naturally in soils through the processes of nitrification and denitrification. It is a gaseous intermediate in the reaction sequence of denitrification and a by-product of nitrification that leaks from microbial cells into the soil and ultimately into the atmosphere. One of the main controlling factors in this reaction is the availability of inorganic nitrogen in the soil. Estimates of N_2O release from soils in the future are, therefore, based on human-induced net nitrogen additions to soils (e.g. synthetic or organic fertilisers, deposited manure, crop residues, sewage sludge).

Direct N_2O soil emissions are therefore calculated as the sum of

- Amount of fertiliser nitrogen applied to soils, adjusted for the amount that volatilises as NH_3 and NO_x. Projected synthetic nitrogen use was provided by Teagasc. Projected sludge production and the proportion applied on agricultural lands is taken from projected assumption in the treatment of wastewater (IPCC sectors 5.D.1 and 5.D.2).

[98] Farm Facilities Survey – Ireland 2003. Report prepared for the Department of Agriculture by Teagasc, Johnstown Castle.

- Amount of nitrogen fixed by nitrogen-fixing crops. Projected annual production of pulses was provided by Teagasc.
- Amount of nitrogen fixed in crop residues that is returned to the soils. Teagasc provided projected annual production of pulse, potatoes, barley, oats and wheat.

Indirect emissions of N_2O from agricultural soils also occurs through two routes. The first of these pathways is the volatilisation of nitrogen, as NH_3 and oxides of nitrogen (NO_x), following the application of synthetic and organic nitrogen fertilisers and/or manure deposition from grazing animals. These gases and their products are deposited onto soils and the surface of lakes and other waters. The second pathway is the leaching and runoff from land of nitrogen from, for example, synthetic and organic fertiliser additions and manure deposition from grazing animals. Where nitrate is present in the soil in excess of biological demand, e.g. under cattle urine patches, the excess leaches through the soil profile and can be transformed to N_2O.

Indirect N_2O emissions are therefore calculated as the sum of

- Emissions of N_2O from atmospheric nitrogen deposition and fraction of animal manure nitrogen and sewage sludge applied to agricultural land that volatilises.
- Emissions of N_2O from nitrogen leaching. This is assumed to be 10% of available nitrogen and assumed to remain constant over the projection period.

Liming and Urea Application to agricultural soils (IPCC sectors 3.G and 3.H)

Liming (3.G) accounted for approximately 0.33 Mt CO_2 in 2017 as a result of the application of approximately 756 kilo tonnes of lime to agricultural soils in 2017. This level of application is 35% lower than the peak amount applied in 2013. For each projected year it is forecasted that the application of lime to agricultural soils will be at the average application rate historically over a ten year period and result in emissions of 0.33 Mt CO_2 in 2020 and 2035 respectively.

Projected fertilizer use for agricultural soils is provided by Teagasc. However, no information is currently available in relation to the projected breakdown of fertilizer application by product type (i.e. calcium ammonium nitrate, urea etc.). It is assumed that the proportion of urea fertilizer in the latest inventory year (2017) grows in line with the projected fertiliser use over the projected period.

Further details on the FAPRI Ireland model is available in the **Table 4 (Model Factsheet)** available at the following link (open the excel file and click on tab 'IRArticle 23T4' for further information on the FAPRI Ireland model (rows 98-116))::

https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14_lcds_pams_projections/projections/envxlxagq/MMR_Template_IRArticle23_table2-3-4-2019IE16042019v2.xlsx/manage_document

Projected greenhouse gas emissions from the Agriculture sector (IPCC sector 3)

In the *With Measures* scenario total emissions from the agricultural sector are projected to increase by 1.9% between 2017 and 2020 and are set to increase by 2.9% between 2020 and 2035.

Dairy cow numbers are projected to increase by 6.6% between 2017 and 2020 and 20.5% between 2020 and 2035. Fertilizer nitrogen use is projected to increase by 5% between 2017 and 2020 and

16% between 2020 and 2035. By 2035 it is estimated that dairy cow numbers will have increased to 1.67 million head and that fertilizer nitrogen use will be approximately 428,500 tonnes in 2035. There is projected to be a contraction (by 5.5%) in animal numbers in the less profitable other cattle sector between 2020 and 2035.

Under the *With Additional Measures* scenario projected total emissions will increase by 0.9% between 2017 and 2020 and 2.9% between 2020 and 2035.

Table 5.14 Emissions savings due to policies and measures included in the With Measures and With Additional Measures scenarios for the Agriculture Sector

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Additional Measures				
Nitrogen Use Efficiency	187.24	187.34	187.47	187.70
Total	**187.24**	**187.34**	**187.47**	**187.70**

5.6.9 Land Use, Land Use Change and Forestry (IPCC Sector 4)

The LULUCF sector includes greenhouse gas emissions and removals due to land use and land use change. It consists of six subcategories: Forest Land (4.A), Cropland (4.B), Grassland (4.C), Wetlands (4.D), Settlements (4.E) and Other Land (4.F).. The approach taken in estimating greenhouse gas emission and removals from the sector utilises the approach used for the national greenhouse gas inventory in conjunction with a projected land use and land use change matrix.

Emissions and removals from the sector follow a hierarchical approach in line with the GHG Projections Guidelines[2] (page 182 Grade 1 emission factors projections, Alternative 1 approach (emission factors for future years is based on the average of previous ten years). In Ireland, projected forest land areas are the most developed, followed by wetland areas and areas under settlement. Projected cropland and grassland areas are supplied by Teagasc in conjunction with the activity data supplied for the agriculture sector. The area converted to Settlements is assumed to grow in line with GDP forecasts. Other land accounts for the remainder in each year.

Forest Land (IPCC sector 4.A)

Projected emission and removal estimates are undertaken for the following activities Forest Land remaining Forest Land (4.A.1) and Land converted to Forest Land (4.A.2), as well as for activities Forest Land converted to Grassland (4.C.2.1), Forest Land converted to Wetlands (4.D.2.1), Forest Land converted to Settlements (4.E.2.1) and Forest Land converted to Other Land (4.F.2.1), Information on projected afforestation and deforestation is provided by the Department of Agriculture, Food and the Marine.

Cropland and Grassland (IPCC sectors 4.B and 4.C)

This section covers both Cropland (CL) and Grassland (GL) land uses as these land uses are closely linked. Projected emission and removal estimates are undertaken for the following activities: Cropland remaining Cropland (4.B.1), Grassland remaining Grassland (4.C.1) and Land converted to

Grassland (4.C.2). In addition, information in relation to, Cropland converted to Settlements (4.E.2.2), Grassland converted to Forest Land (4.A.2.2), and Grassland converted to Settlements (4.E.2.3) is also used. Other conversions are assumed not to occur as is the case in national emission inventory estimates.

Wetlands (IPCC sector 4.D)

Projected emission and removal estimates are undertaken for the following activities 4.D.1 (Wetland remaining Wetland) and 4.D.2 (Land converted to Wetland), as well as for activities 4.A.2.3 (Wetlands converted to Forest Land). Other conversions are assumed not to occur in line with national emission inventory estimates. In addition it is expected that Bord na Mona, will exhaust their current peat reserves prior to 2030, therefore leading to land use change within this sector. [99] The draft National Peatlands Strategy details proposed future uses of peatlands and where relevant these proposed future land uses have been taken into account. [100]

Settlements (IPCC sector 4.E)

As an initial approach the total area of Settlements (both remaining and in transition) has been estimated based on the GDP projections. Projected emission and removal estimates have been undertaken for the following 4.E.1 (Settlements remaining Settlements) and 4.E.2 (Land converted to Settlements). In addition it is assumed that as there is no land use change from Settlements to other lands in the historical national inventory estimates, and that it will not occur into the future. The area under activity 4.E.1 is considered fixed, as in the historical series. Therefore, the increase in areas are disaggregated between the different land uses in 4.E.2 (Land converted to Settlements). Information in relation to deforestation of Forest Lands that convert to Settlements is already included in forest projections. The disaggregation between the remaining activities (4.E.2.2, 4.E.2.3 and 4.E.2.5) has been performed by applying the historical mix.

Other Land (IPCC sector 4.F)

Projected emission and removal estimates are undertaken for the following activities 4.F.1 (Other Lands remaining Other Lands) and 4.D.2 (Land converted to Other Lands), as well as for activities 4.A.2.5 (Other Lands converted to Forest Land) and 4.E.2.5 (Other Lands converted to Settlements). The only source of new Other Lands in the historical series is Forest Land. Deforestation of Forest Lands that convert to Other Lands are provided in forestry projections. In order to estimate the projection of the activity 4.F.1 (Other Land remaining Other Land), it is necessary to estimate the conversions from Other Lands to other land uses. Conversions to Settlements are already estimated and explained in the previous section on Settlements.

Sufficient Information is not currently available for reporting on the total effect of implemented and adopted policies and measures for the LULUCF sector.

5.6.10 Waste (IPCC sector 5)

Emission projections for the waste sector are developed for CO_2, CH_4 and N_2O. Solid waste disposal to landfill (IPCC sector 5.A) is currently the main source of emissions from the waste sector.

[99] http://www.bordnamona.ie/
[100] https://www.npws.ie/sites/default/files/general/Final%20National%20Peatlands%20Strategy.pdf

Methane emissions arise from (i) solid waste disposal in landfill sites and (ii) wastewater and sludge treatment (IPCC sector 5.D), whilst N_2O emissions also arise from the production of human sewage. In addition, CO_2, CH_4 and N_2O emissions arising from the incineration of hazardous wastes (solvents) in the pharmaceutical industry (IPCC sector 5.C) and the mechanical and biological treatment of waste (IPCC sector 5.B) are also estimated. The emissions associated with the incineration of municipal solid waste for electricity generation (WtE) are included in emissions estimates for electricity generation (IPCC sector 1.A.1.a). Only one scenario was developed for the waste sector.

Solid waste disposal in landfill sites (IPCC sector 5.A)

Methane (CH_4) is the important emission from solid waste disposal to landfill. This gas is emitted through the anaerobic decomposition of biodegradable municipal waste (BMW) which is disposed in solid waste disposal sites. BMW is produced largely by households and business. The principal biodegradable components of municipal waste are organic matter, including street cleansings, paper, textiles and wood. The starting point for the estimation of emissions from BMW in landfill is to gain an understanding of the level of this 'active' waste that will go to landfill in the future and the composition of this waste. Progressive targets have been set out in the Landfill Directive to reduce the proportion of BMW going to landfill. Ireland has met all Landfill Directive targets for diversion of BMW from landfill to date. The CH_4 production potential of biodegradable solid wastes is determined by the amount of degradable organic carbon (DOC) in the wastes, which in turn depends on the amount and composition of the waste material. The composition of BMW going to landfill in the future takes into account the status of remaining operating landfills and national waste treatment capacity.

The approach to determine CH_4 emissions from decomposing BMW is the 2006 IPCC Guidelines model and is the same as that used in compiling the annual greenhouse gas emission inventory. Further information on emission factors and methodologies used in in compiling the 1990-2017 National Inventory Report can be found in Ireland's National Inventory Report 2019.

The one model is applied using activity data related to the total municipal solid waste that has historically been landfilled in addition to the total amount that is projected to be landfilled in remaining operating landfills out to 2035. It is assumed that the use of unmanaged sites for the receipt of waste stopped with the advent of waste licences for landfills circa 1998 and that all waste sent to landfill after this time and thus also for projected years is to managed sites. Emissions of CH_4 from landfill are minimised through landfill gas flaring and utilization for energy production. It is estimated that in 2017 there was 60% methane recovery from solid waste disposal. It is assumed that the amount of landfill gas flared and utilised for energy production reaches 75% by 2020 and is maintained at this level for each year in the remaining projected period.

CH_4 Emissions from Wastewater and Sludge (IPCC sector 5.D)

Wastewaters can be a source of CH_4 when treated anaerobically. In compiling the annual greenhouse gas inventory, it is assumed that all domestic and commercial wastewaters (sent to municipal wastewater treatment plants, wastewater treated in septic tanks, and commercial wastewater either treated in municipal wastewater treatment plants or on site) are treated aerobically and therefore result in negligible CH_4 production. Therefore, emissions projections were not developed for this sub-sector. National studies indicate the level of sludge produced in both

industrial wastewater, domestic and commercial wastewater handling, including septic tanks, is treated anaerobically and therefore has the potential to produce CH_4.[101] The projected amount of industrial organic sludge, domestic and commercial organic sludge produced in urban wastewater treatment plants is determined based on population projections. CH_4 emissions are calculated using IPCC default emission factors. Some of this sludge is sent to landfill and is accounted for in the estimate of degradable organic carbon that generates CH_4 in landfills. A portion of the sludge is also spread on agriculture lands where it contributes to N_2O emissions from soils described in the agricultural sector.

N_2O Emissions from Human Sewage (IPCC sector 5.D)

Projections of N_2O emissions from human sewage were calculated based on population forecasts, typical protein intake, IPCC default proportion of the nitrogen content in protein and applying the default emission factors to obtain the quantity of nitrogen in sewage ultimately entering the atmosphere as N_2O.

Hazardous Waste incineration and open burning of waste (IPCC sector 5.C)

There are currently only a small number of facilities based in the pharmaceutical and chemical sectors that operate incinerators or thermal oxidisers for the treatment of hazardous waste, mainly for solvent or liquid/vapour destruction. The facilities that operate these units report data to the EPA as part of licensing requirements. It is assumed the quantities of hazardous waste incinerated remains constant at that reported for 2017 for each future year.

Mechanical and Biological Treatment of Waste (IPCC sector 5.B)

The mechanical treatment of waste aims to reduce the volume of waste disposed of by separating waste material into fractions that will undergo further treatment e.g. composting for organic waste, recycling for plastics etc. Mechanical treatment may also involve shredding and crushing of material.

Biological treatment of organic waste is a source of CH_4 and N_2O. Estimates are undertaken using the emission factors provided in the 2006 IPCC Guidelines and projected quantities of organic waste available for composting.

Projected greenhouse gas emissions from the Waste Sector

Emissions are projected to decrease by 37.1% between 2017 and 2020. Emissions in 2035 are projected to be 28.1% lower than in 2020. Emissions from solid waste disposal at landfill are projected to decrease by 47.4% between 2017 and 2020 and 49.8% between 2020 and 2035.

[101] O' Leary G., Carty G. (1998). Urban Waste Water Discharges in Ireland - *A report for the Years 1996 and 1997.*

Table 5.15 Emissions savings due to policies and measures included in the *With Measures* and *With Additional Measures* scenarios for the Residential Sector

Policy and measure	CO_2eq (kt)			
	2020	2025	2030	2035
With Measures				
Landfill Directive	178.77	277.90	341.11	383.15
Total	**178.77**	**277.90**	**341.11**	**383.15**

5.7 Memo Items

Projected emissions from international maritime transport and international aviation are estimated and methodology and approach is described above in Section 5.6. Please see estimated emissions associated with Memo Items in the tables in Annex of this report.

5.8 Sensitivity Analysis

A sensitivity analysis of the *With Measures* emissions projection is provided below with the sensitivity analysis being carried out on energy projections, agriculture projections and waste projections. In terms of the *Baseline energy projection,* the key parameters in the sensitivity analysis that change compared to the main projections are the fuel prices and macro-economic parameters such as GDP, personal consumption, housing stock.

The coal, oil and gas low price data were all taken from the UK Department for Business, Energy and Industrial (BEIS) Strategy November 2017 publication. [102] **Table 5.16** lists the fuel prices used for the energy projection sensitivity analysis and other key macro-economic parameters.

Table 5.16 Key assumptions underpinning the energy projections sensitivity analysis

	2017 – 2020	2021-2025	2026-2030	2031-2035
Average Annual% Growth Rate				
GDP	+3.74%	+3.53%	+3.26%	+3.31%
Personal Consumption	+3.1%	+2.93%	+2.07%	+2.07%
	2020	**2025**	**2030**	**2035**
Housing Stock ('000)	2,059	2,286	2,490	2,713
Coal $\$_{2013}$/boe	8.3	9.3	10.1	9.5
Oil $\$_{2013}$/boe	42.3	46.8	51.7	57.1
Gas $\$_{2013}$/boe	24.7	25.3	25.7	24.0

For the agriculture sector the sensitivity analysis undertaken assumes a reduction in the national herd (dairy and other cattle) in the *With Measures* scenario by 10%.

[102] https://www.gov.uk/government/publications/fossil-fuel-price-assumptions-2017

In the sensitivity analysis for the waste sector it is assumed that a significant additional quantity of extra waste material is disposed of in solid waste disposal sites in Ireland. For the sensitivity scenario it is assumed that an additional 350,000 tonne of municipal waste requires management in landfills for each future year. This represents an almost 130% increase in the quantity of municipal waste landfilled in 2020.

Sectoral and overall results of the sensitivity analysis split on emissions covered by Decision 406/2009/EC and total emissions included in the scope of the Union's emissions trading scheme established by Directive 2003/87/EC are provided in **Tables 5.17** and **5.18**. In comparison with Table 5.6, there are marked differences in fuel prices in **Table 5.16**, in particular oil prices, with oil prices in the sensitivity analysis substantially lower than those used in the emission projections (e.g. $46.8/boe in 2025 in the sensitivity analysis compared to €85.1/boe in the emissions projections) which inter alia will lead an increase in emission levels in some sectors (e.g. Transport).[103] Coal and gas prices are also significantly lower in the sensitivity scenario. In terms of ETS emissions, overall total emission levels are higher in the sensitivity scenario for 2020 mainly as a result of output from the manufacturing industries and construction sector. Emissions are lower from electricity generation in the sensitivity scenario which can to an extent be attributed the fuel price relationship (e.g. price ratio) between the different fuels and the impact this relationship has on the order of merit.

The resultant emission levels as presented in Table 5.18 show that total non-ETS emissions under the *Sensitivity* scenario are approximately 1.7%, 5.1%, 6.7% and 8% higher in 2020, 2025, 2035 and 2035, respectively than emissions in the *With Measures* non ETS scenario. Increases in emissions are particularly notable in the Manufacturing Industries and Construction, Transport, Commercial/Institutional and residential sectors. Alternatively, reductions in emissions in the agricultural sector amount to approximately 7% lower in the years shown. For the waste sector the management of an additional 350,000 tonnes of municipal waste per annum in solid waste disposal sites leads to a 4.7%, 12.9%, 19.5% and 24.5% increase in emissions from the waste sector in 2020, 2025, 2030 and 2035 respectively.

[103] BOE = Barrel of Oil Equivalent

Table 5.17 Results of sensitivity analysis – ETS emissions (kt CO_2 eq)

	With Measures **ETS (kt CO_2 eq)**			
	2020	**2025**	**2030**	**2035**
Energy Industries	11785.0	14210.1	14823.3	11932.5
Manufacturing Industries and Construction	2918.5	2802.6	2652.8	2714.4
Transport	13.3	14.0	13.5	13.7
Commercial/Institutional	21.2	19.5	17.8	18.2
Industrial Processes and Product Use	2195.2	2466.3	2798.6	3214.3
Total	**16933.3**	**19512.5**	**20306.0**	**17893.2**
	With Measures **Sensitivity ETS (kt CO_2 eq)**			
	2020	**2025**	**2030**	**2035**
Energy Industries	11516.4	11295.5	11523.3	12100.6
Manufacturing Industries and Construction	3450.1	3624.3	3723.8	3977.9
Transport	16.0	18.2	19.1	20.9
Commercial/Institutional	27.3	27.3	26.5	27.5
Industrial Processes and Product Use	2195.2	2466.3	2798.6	3214.3
Total	**17205.0**	**17431.6**	**18091.3**	**19341.2**
	% Difference			
	2020	**2025**	**2030**	**2035**
Energy Industries	-2.3%	-20.5%	-22.3%	1.4%
Manufacturing Industries and Construction	18.2%	29.3%	40.4%	46.5%
Transport	20.1%	30.4%	40.9%	52.3%
Commercial/Institutional	28.5%	39.9%	49.1%	51.1%
Total	**1.6%**	**-10.7%**	**-10.9%**	**8.1%**

Table 5.18. Results of sensitivity analysis Non-ETS emissions (kt CO_2 eq)

	With Measures **Non ETS (kt CO_2 eq)**			
	2020	**2025**	**2030**	**2035**
Energy Industries	436.2	473.2	487.8	486.4
Manufacturing Industries and Construction	1014.2	973.9	921.9	943.3
Transport	12894.7	12987.2	13338.9	13008.6
Commercial/Institutional	1354.8	1246.6	1135.6	1161.0
Residential	6520.7	6043.1	5545.4	5142.5
Agriculture/Forestry/Fishing	556.2	578.8	604.8	641.0
Fugitive Emissions from Fuels	97.8	99.7	98.3	101.8
Industrial Processes and Product Use	1186.2	1114.8	1001.0	994.3
Agriculture	19951.7	20277.6	20436.4	20524.3
Waste	581.9	495.6	446.3	418.2
Total	**44594.6**	**44290.5**	**44016.2**	**43421.6**
	With Measures **Sensitivity Non ETS (kt CO_2 eq)**			
	2020	**2025**	**2030**	**2035**
Energy Industries	436.2	480.8	497.4	487.7
Manufacturing Industries and Construction	1199.0	1259.5	1294.1	1382.4
Transport	14450.2	15535.4	16256.5	16152.6
Commercial/Institutional	1741.3	1743.7	1692.6	1754.7
Residential	6457.8	6203.8	5854.2	5663.2
Agriculture/Forestry/Fishing	672.3	716.3	750.7	781.6
Fugitive Emissions from Fuels	109.6	119.1	123.5	133.6
Industrial Processes and Product Use	1186.2	1114.8	1001.0	994.3
Agriculture	18507.9	18800.3	18952.7	19039.4
Waste	609.0	559.6	533.5	520.7
Total	**45369.5**	**46533.3**	**46956.2**	**46910.1**
	% Difference			
	2020	**2025**	**2030**	**2035**
Energy Industries	0.0%	1.6%	2.0%	0.3%
Manufacturing Industries and Construction	18.2%	29.3%	40.4%	46.5%
Transport	12.1%	19.6%	21.9%	24.2%
Commercial/Institutional	28.5%	39.9%	49.1%	51.1%
Residential	-1.0%	2.7%	5.6%	10.1%
Agriculture/Forestry/Fishing	20.9%	23.7%	24.1%	21.9%
Fugitive Emissions from Fuels	12.1%	19.5%	25.7%	31.1%
Agriculture	-7.3%	-7.3%	-7.3%	-7.3%
Waste	4.7%	12.9%	19.5%	24.5%
Total	**1.7%**	**5.1%**	**6.7%**	**8.0%**

5.9 Key Changes Compared to Emissions Projections in BR3

In terms of key differences between the projections in BR4 compared to BR3, updated activity data have been used for the projections included in this Biennial Report. In general, CO_2, CH_4 and N_2O emission factors are those used in the latest historical emission inventories. The starting point for the latest projections is the latest inventory 1990-2017 whereas the starting point for the projections in the previous Biennial Report was 1990-2015. Different fuel prices were used in the energy projections. A low oil price projection was used for the projections in BR3 whilst a high oil price was used for the projections in BR4 which impacted the projected energy demand (including in transport) that underpinned both sets of projections. **Table 5.19** includes key macroeconomic parameters and international fuel prices that were used for the energy projections that underpin the energy related emissions projections in BR3 and BR4.

In the BR3 projections the *With Additional Measures* scenario assumes implementation of the *With Measures* scenario in addition to, based on progress at the time of the projections compilation, further implementation of Government renewable and energy efficiency targets for 2020, as set out in the NREAP and the NEEAP.

In the BR4 projections the *With Additional Measures* scenario assumes implementation of the *With Measures* scenario in addition to, based on current progress, further implementation of Government renewable and energy efficiency policies and measures including those set out in the NREAP and the NEEAP and more recently Ireland's National Development Plan 2018-2027.

In term of agriculture the projections in both BR3 and BR take into account proposed national herd, crop areas and fertilizer use to meet the overarching objectives of Food Wise 2025. For BR3 projections, the projected activity data for the agriculture sector (animal numbers, crop areas and fertiliser use) was produced by Teagasc in 2015. For BR4 projections the projected activity data for the agriculture sector was produced by Teagasc in 2018.

In terms of projected Industrial Process emissions, different projected growth rates in activity related to cement production are assumed in both BR3 and BR4. Projected emissions from the cement industries are estimated using the historical total clinker production and projected GDP data which is one of the macroeconomic inputs to the energy forecasts (see **Table 5.19** showing the different GDP growth rates).

In terms of projected waste sector emissions, there was difference projected activity data used for both sets of projections. For example more up to date estimates regarding projected waste going to landfill was used for the BR4 projections (e.g. 270K tonnes is assumed to go to landfill in 2020 for the BR4 projections compared to 440 K tonnes of waste is assumed to be landfilled in 2020 for the BR3 projections).

Table 5.20 shows the projected ETS and non ETS emissions under the *With Measures* scenario included in BR3 and BR4.

Table 5.19 Key assumptions underpinning the energy projections for BR3 and BR4

	2020	2025	2030	2035
GDP% growth- BR4	2.17%	2.62%	3.01%	3.01%
GDP% growth – BR3	3.17%	2.89%	2.73%	2.59%
GNP% growth– BR4	4.47%	5.20%	5.02%	5.02%
GNP% growth – BR3	3.61%	3.07%	1.37%	1.97%
Personal Consumption% growth– BR4	2.74%	1.64%	1.67%	1.52%
Personal Consumption% growth– BR3	2.59%	1.55%	1.40%	1.12%
Housing Stock ('000) – BR4	2,059	2,237	2,344	2,455
Housing Stock ('000) – BR3	2,018	2,112	2,206	2,304
Population ('000) – BR4	4,866	5,077	5,276	5,484
Population ('000) – BR3	4,866	5,077	5,276	5,484
EUETS: Carbon €$_{2013}$/tCO_2 – BR4	15	22.5	33.5	42
EUETS: Carbon €2013/tCO_2 – BR3	15	22.5	33.5	42
Coal $\$_{2013}$/boe – BR4	17.68	22.87	27.62	29.24
Coal $\$_{2013}$/boe – BR3	9.86	11.59	10.56	9.73
Oil $\$_{2013}$/boe – BR4	74.95	85.14	93.56	97.55
Oil $\$_{2013}$/boe – BR3	56.84	62.80	69.39	76.66
Gas $\$_{2013}$/boe – BR4	59.72	69.82	76.54	81.66
Gas $\$_{2013}$/boe – BR3	20.42	24.59	27.31	25.19

Further information on the methodological approaches associated with the projections used for BR3 and BR4 are available at the links below:

https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14_lcds_pams_projections/projections/envwotdlg/

https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14_lcds_pams_projections/projections/envxlxagq/

Table 5.20 ETS and Non ETS Breakdown under *With Measures* in BR3 and BR4

ETS Total under *With Measures* Scenario				
Year	**2020**	**2025**	**2030**	**2035**
BR3 ETS Total (kt CO_2eq)	15914.41	17645.87	19345.51	21899.65
BR4 ETS Total (kt CO_2eq)	16524.17	18352.96	13448.26	15671.85
Non ETS Total under *With Measures* Scenario				
Year	**2020**	**2025**	**2030**	**2035**
BR3 Non ETS Total (kt CO_2eq)	45635.55	47736.31	47137.54	47305.03
BR4 Non ETS Total (kt CO_2eq)	44599.21	44295.10	44020.67	43425.81

Further information on the models and parameters associated with the projections used for BR3 and BR4 are available at the links below:

https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14_lcds_pams_projections/projections/envwotdlg/MMR_Template_IRArticle23_table2-3-4-April2017v2.xlsx/manage_document

https://cdr.eionet.europa.eu/ie/eu/mmr/art04-13-14_lcds_pams_projections/projections/envxlxagq/MMR_Template_IRArticle23_table2-3-4-2019IE16042019v2.xlsx/manage_document

5.10 Annex of Tables

5.10.1 Summary of Greenhouse Gas Emissions by sector with the *With Measures* Scenario 1990-2035 (kt CO_2 equivalent)

1990-2040 Inventory Format	1990	1995	2000	2005	2010	2015	2017	2020	2025	2030	2035
Energy Industries	11328.06	13479.88	16204.68	15908.20	13459.60	11891.44	11743.99	12319.04	14782.97	15409.35	12520.80
Residential	7523.66	6452.05	6462.60	7271.61	7800.88	6041.31	5741.51	6520.72	6043.09	5545.44	5142.51
Manufacturing Combustion	3961.75	4347.62	5642.37	5870.42	4476.47	4482.62	4665.07	3932.74	3776.52	3574.66	3657.72
Commercial / Public Services	2244.14	2101.91	2364.13	2428.05	2308.00	1799.37	1978.06	1376.05	1266.17	1153.38	1179.19
Transport	5150.94	6283.81	10801.16	13143.23	11535.07	11812.73	12002.56	12908.01	13001.20	13352.39	13022.36
Industrial Processes	3274.18	2990.54	3788.48	2763.47	1463.40	2005.65	2235.59	2394.41	2671.80	3010.08	3432.05
F-Gases	35.23	285.45	968.41	1021.47	1008.09	1101.83	1230.98	986.97	909.27	789.56	776.65
Agriculture	20352.29	21413.19	20757.48	19797.90	18553.62	19128.12	20212.57	20512.63	20860.99	21045.53	21169.49
Waste	1546.80	1823.02	1489.09	1290.68	499.72	948.75	933.40	581.90	495.60	446.27	418.22
National Total	**55417.06**	**59177.47**	**68478.41**	**69495.03**	**61104.84**	**59211.81**	**60743.73**	**61532.48**	**63807.62**	**64326.67**	**61319.01**
Total (excluding LULUCF)	**55417.06**	**59177.47**	**68478.41**	**69495.03**	**61104.84**	**59211.81**	**60743.73**	**61532.48**	**63807.62**	**64326.67**	**61319.01**
Total (including LULUCF)	**60185.04**	**64091.48**	**74138.24**	**75156.58**	**66426.56**	**63945.19**	**66740.99**	**65492.47**	**70475.40**	**72383.45**	**69293.11**
Memo items											
International Aviation	1077.35	1158.62	1825.07	2507.68	2325.59	2538.12	3,061.75	3199.47	3384.06	3484.97	3564.15
International Maritime Transport	57.36	373.21	482.83	333.69	434.72	496.50	484.64	484.64	484.64	484.64	484.64

5.10.2 Historical Greenhouse Gas Emissions by gas with the *With Measures* Scenario 1990-2035 (kt CO_2 equivalent)

Gas	1990	1995	2000	2005	2010	2015	2017	2020	2025	2030	2035
Carbon Dioxide	32.89	35.80	45.20	48.12	41.68	38.43	38.73	39.76	41.85	42.37	39.33
Methane	14.76	15.00	14.35	13.59	12.07	13.32	14.03	13.89	14.03	13.97	13.89
Nitrous Oxide	7.73	8.08	7.96	6.76	6.35	6.36	6.75	6.90	7.01	7.19	7.33
F-gases	0.04	0.29	0.97	1.02	1.01	1.10	1.23	0.99	0.91	0.79	0.78
Total	**55.42**	**59.18**	**68.48**	**69.50**	**61.10**	**59.21**	**60.74**	**61.53**	**63.81**	**64.33**	**61.32**

5.10.3 Summary of Greenhouse Gas Emissions by sector *With Additional Measure* Scenario 1990-2035 (kt CO_2 equivalent)

2015-2035 Inventory Format	1990	1995	2000	2005	2010	2015	2017	2020	2025	2030	2035
Energy Industries	11328.06	13479.88	16204.68	15908.20	13459.60	11891.44	11743.99	11954.31	13666.74	8626.60	10363.29
Residential	7523.66	6452.05	6462.60	7271.61	7800.88	6041.31	5741.51	6428.92	5668.25	4550.59	3761.95
Manufacturing Combustion	3961.75	4347.62	5642.37	5870.42	4476.47	4482.62	4665.07	3863.42	3703.67	3442.75	3522.13
Commercial / Public Services	2244.14	2101.91	2364.13	2428.05	2308.00	1799.37	1978.06	1319.70	1157.92	972.21	950.92
Transport	5150.94	6283.81	10801.16	13143.23	11535.07	11812.73	12002.56	12682.53	12488.58	11863.74	10999.83
Industrial Processes	3274.18	2990.54	3788.48	2763.47	1463.40	2005.65	2235.59	2394.41	2671.80	3010.08	3432.05
F-Gases	35.23	285.45	968.41	1021.47	1008.09	1101.83	1230.98	986.97	909.27	789.56	776.65
Agriculture	20352.29	21413.19	20757.48	19797.90	18553.62	19128.12	20212.57	20320.74	20669.10	20853.63	20977.60
Waste	1546.80	1823.02	1489.09	1290.68	499.72	948.75	933.40	581.90	495.60	446.27	418.22
National Total	**55417.06**	**59177.47**	**68478.41**	**69495.03**	**61104.84**	**59211.81**	**60743.73**	**60532.91**	**61430.94**	**54555.44**	**55202.65**
Total (excluding LULUCF)	**55417.06**	**59177.47**	**68478.41**	**69495.03**	**61104.84**	**59211.81**	**60743.73**	**60532.91**	**61430.94**	**54555.44**	**55202.65**
Total (excluding LULUCF)	**60185.04**	**64091.48**	**74138.24**	**75156.58**	**66426.56**	**63945.19**	**66740.99**	**64492.90**	**68098.71**	**62612.22**	**63176.75**
Memo items											
International Aviation	1077.35	1158.62	1825.07	2507.68	2325.59	2538.12	3,061.75	3199.47	3384.06	3484.97	3564.15
International Maritime Transport	57.36	373.21	482.83	333.69	434.72	496.50	484.64	484.64	484.64	484.64	484.64

5.10.4 Historical Greenhouse Gas Emissions by gas for the *With Additional Measures* Scenario 1990-2035 (kt CO_2 equivalent)

Gas	1990	1995	2000	2005	2010	2015	2017	2020	2025	2030	2035
Carbon Dioxide	32.89	35.80	45.20	48.12	41.68	38.43	38.73	38.96	39.68	32.83	33.46
Methane	14.76	15.00	14.35	13.59	12.07	13.32	14.03	13.89	14.03	13.97	13.87
Nitrous Oxide	7.73	8.08	7.96	6.76	6.35	6.36	6.75	6.70	6.81	6.97	7.09
F-gases	0.04	0.29	0.97	1.02	1.01	1.10	1.23	0.99	0.91	0.79	0.78
Total	**55.42**	**59.18**	**68.48**	**69.50**	**61.10**	**59.21**	**60.74**	**60.53**	**61.43**	**54.56**	**55.20**

6. Provision of financial, technological and capacity building support to developing country Parties

Ireland continues to meet its obligations to provide financial, technological and capacity building support to assist developing countries to mitigate and adapt to the impacts of climate change. Through its international support, Ireland maintains a strong focus on the climate needs of Least Developed Countries and Small Island Developing States, which are most vulnerable to climate impacts. Irish support consists of multilateral support through international funds, bilateral assistance to partner countries, and support through other mechanisms to enhance the climate capabilities of developing country Parties, and learning about best practice.

6.1 Finance

In 2015, Ireland made a commitment to provide €175m in international climate finance between 2016 and 2020. Since 2016, Irish climate finance has seen a steady increase, meaning the Government has already surpassed this commitment. For the reporting period of Ireland's Biennial Report 2020 (2017 and 2018), Ireland's international climate finance was €69m and €80m in 2017 and 2018 respectively.[104]

In the period 2016 to 2018, Ireland's climate finance has been channelled through the following: Ireland's bilateral programmes; multilateral climate change funds including the Green Climate Fund, the Adaptation Fund, and the Least Developed Countries Fund; UN agencies and bodies such as the UNFCCC and UN Environment Programme (UNEP); Irish NGOs working overseas; international and multilateral financial institutions; and other international organisations that promote climate action and climate justice. [105] In addition, Ireland has made contributions to other complementary mechanisms including IPCC, the NDC-Partnership, which it joined in 2017, and the Great Green Wall Initiative under the United Nations Convention to Combat Desertification.

The vast majority of Irish climate finance (some 99%) counts as Official Development Assistance.

In 2017, Ireland became a member of the Least Developed Countries Expert Group (LEG), actively contributing to the work of the group. In 2017 and 2018, Ireland provided €500,000 per year to the LEG work programme via the UNFCCC Trust Fund for Supplementary Activities, supporting LDCs in their efforts to prepare and formulation National Adaptation Plans

In 2016, 60% of Ireland's climate finance was provided through bilateral programmes in countries where Ireland works. In 2017 and 2018 bilateral programmes represented 50% and 52% of Ireland's climate finance respectively. Ireland's bilateral programmes operate primarily in Sub-Saharan Africa, funded by Irish Official Development Assistance. As with previous biennial report cycles, the following are key characteristics of Irish climate finance:

- Ireland's contributions for the BR period have been entirely in grant form

[104] Climate and Environmental Finance Report 2017 - UNFCCC and OECD Reporting: https://www.climatelearningplatform.org/sites/default/files/resources/climate_finance_report_2017_final.pdf
Ireland's Climate and Environmental Finance Report 2018: https://www.climatelearningplatform.org/sites/default/files/resources/ireland_climate_finance_report_2018.pdf

[105] 2017 and 2018, as part of its climate-specific finance, Ireland contributed €300,000 to the UNFCCC to support the enhanced engagement of non-Party stakeholders in UNFCCC processes and a further €500,000 to the UNFCCC in support of gender responsive climate action.

- Less than 5% of Irish climate finance for the BR period has been mitigation only- the remainder is either adaptation only, or cross-cutting

- Ireland's contributions for the BR period have been prioritised towards Least Developed Countries, either through direct support via our bilateral assistance programmes, our support to the LDCF and LEG, or through our policy engagement. Ireland's support to climate action through Civil Society Organisations working in-country has also predominantly focused on LDCs and fragile states. This focus on LDCs (as well as Small Island Developing States) has been articulated as an explicit climate policy in the 2019 International Development Policy: '*A Better World*'[106]

Ireland's bilateral support, as well as through our multilateral engagements and policy work on climate change, there has been a consistent focus on key issues of most relevance to the poorest and most vulnerable. This has included a strong focus on adaptation; over the last number of years, including in 2018, over 75% of Ireland's international climate finance was channelled towards climate adaptation and cross-cutting finance that benefitted both adaptation and mitigation.

Financing also targets work on gender and climate, climate-responsive social protection measures, food and nutrition security, and disaster risk reduction. Support that counts as cross-cutting has focused on natural resource management including eco-system protection and conservation, and improving efficient and sustainable energy at the household level, and in particular for refugees and displaced populations.

Highlights of the innovative work that has been supported with Irish climate finance during this time includes:

- The work of the Mary Robinson Foundation – Climate Justice, on gender and climate, on human rights, on strengthening grassroots voices on climate, and on climate displaced peoples. In collaboration with the Foundation, Ireland was able to invite a Ugandan farmer, Constance Okollet, to join the Irish Delegation to COP23 and COP24

- In collaboration with the World Resources Institute, Ireland supported the Adaptation Finance Accountability Initiative, which built systems and mechanisms in government and civil society for tracking adaptation finance effectively[107]

- In collaboration with the International Institute for Environment and Development, Ireland was able to provide technical and other support to the LDC climate negotiation group, as well as support to building mechanisms for decentralised climate finance in Kenya, Tanzania and Mali

- As a significant contributor to the work of the LEG (Least Developed Countries Expert Group), Ireland helped to organise one Global NAP Expo and at least two Regional NAP Expos each in 2017 and 2018, as well as dedicated trainings for LDCs and other developing country Parties,

[106] See full text here: https://www.irishaid.ie/media/irishaid/aboutus/abetterworldirelandspolicyforinternationaldevelopment/A-Better-World-Irelands-Policy-for-International-Development.pdf
[107] See further information here: https://www.wri.org/our-work/project/adaptation-finance-accountability-initiative

preparation of technical supplements to the NAP Technical Guidelines, and support to the work of the Subsidiary Body for Implementation on NAPs

- In 2018, Ireland provided €543,000 in support to the Gender Action Plan, via the UNFCCC Secretariat. €500,000 of this came from the Department of Communications, Climate Action and Environment, and the remaining €43,000 was provided by the Department of Foreign Affairs and Trade (DFAT). This funding has contributed significantly to activities to ensure gender-responsive climate action, at all levels, including technical assistance to Parties, and collaboration with other key bodies under the Convention

- The CGIAR Research Programme on Climate Change, Agriculture and Food Security Programme, with Irish support, has piloted a number of innovations in climate-smart agriculture, as well as key policy products which should guide climate-responsive agriculture investments.[108] These include the Ten Best-bet Innovations for Agriculture in NAPs, and at least seven (African) Climate Smart Agriculture Country Profiles[109]

- In 2018, Ireland provided €1m in technical assistance funding to the Caribbean Catastrophe Risk Insurance Facility (CCRIF), to help expand its portfolio of insurance products, and provide additional support to CCRIF members in building climate resilience into policies and strategies economy-wide

Since 2017, Ireland and partners have placed emphasis on deepening knowledge and learning around our work on adaptation for the poorest. The Climate and Development Learning Platform is a collaboration with the International Institute for Environment and Development to do the following: provide support to Irish Embassies in partner countries seeking to deepen the climate relevance of our assistance programmes; deepen the evidence base around our adaptation work; share knowledge and learning about best practice. Using the Climate and Development Learning Platform website as a basis, but supported by annual meetings of our teams in-country and regular consultations with staff and development specialists, we have deepened the climate relevance of our work which already targets poor people.[110] During 2017 and 2018, Ireland produced two major policy papers based on our work with partners. The first was 'Promoting Climate Resilient Agriculture for Smallholder Farming' in 2017.[111] The second was 'Women as Agents of Change: Towards a Climate and Gender Justice Approach'.[112] 2018 also saw the in-house finalisation of comprehensive Country Climate Risk Assessments for target countries, which have been shared with Government partners.[113]

Specific climate action reports were prepared for most countries where Ireland works for the years 2016 and 2017 respectively. This was in addition to an overall Climate Finance Action Report. [114]

[108] See further details here: https://www.cgiar.org/research/program-platform/climate-change-agriculture-and-food-security/
[109] 10 best-bet innovations for agriculture in the National Adaptation Plans: https://ccafs.cgiar.org/blog/10-best-bet-innovations-agriculture-national-adaptation-plans#.XjnAtv_A2Uk ; Climate Smart Agriculture Profiles: https://ccafs.cgiar.org/publications/csa-country-profiles
[110] See here for further information: https://www.climatelearningplatform.org/
[111] See here for full text of paper: https://www.climatelearningplatform.org/sites/default/files/resources/guidance_note-climate_resilient_agriculture_in_smallholder_farming_final_1.pdf
[112] See here for further details: https://www.climatelearningplatform.org/policy-brief-women-agents-change-towards-climate-and-gender-justice-approach
[113] See here for further details: https://www.climatelearningplatform.org/themes/climate-trends-and-projections
[114] Ethiopia: https://www.climatelearningplatform.org/key-partner-countries/ethiopia
Tanzania: https://www.climatelearningplatform.org/key-partner-countries/tanzania

These are all publicly available on the Learning Platform website. These reports include information on programmes and projects supported by Ireland in that year. Ireland continues to align with the EU position that the mobilisation of Irish climate finance does not undermine or jeopardise the fight against poverty or progress towards Sustainable Development Goals. For this reason, Ireland's climate finance support to both UNISDR and the LEG has emphasised technical assistance to help Parties ensure alignment between the Paris Agreement, the Sendai Framework on Disaster Risk Reduction and the Sustainable Development Goals.

In early 2019, Ireland produced a new International Development Policy, entitled *A Better World.* In recognition of the threat that climate change poses to the achievement of the Sustainable Development Goals, *A Better World* emphasises climate action as a policy priority, and makes a number of bold commitments to additional climate finance, which strongly emphasises the needs of the '*furthest behind*'.

6.1.1 Mitigation and Adaptation

The information included in the CTF tables 7a and 7b clearly shows the breakdown between mitigation and adaptation, with those that target both in equal measure listed as cross-cutting. The majority of bilateral Irish-supported programmes support climate change adaptation while also building capacity in partner countries. This capacity building is inherent to the overall approach to Irish climate cooperation, and any programmes usually include targeted support to Parties to develop the means and expertise to develop and implement their own national adaptation plans, sectoral adaptation plans, or reflect adaptation in their NDCs. In some cases, mitigation projects are also supported.

Total reported funding for mitigation in 2016 and 2017 amounted to €1.3m and €37,736 respectively. This is mainly due to a reinforced focus on adaptation in Ireland's programming, as well as reductions in allocations for specific programmes. In 2018, funding to mitigation was €1.82m. Funding for adaptation in 2017 and 2018 amounted to €26.7m and €10.6m respectively. In recognition of the fact that the Irish approach is to focus the majority of our support on adaptation but with the generation of mitigation co-benefits, a significant amount of Irish climate finance for 2017 and 2018 counted as either adaptation or cross-cutting but a higher ratio of support going to adaptation. These figures are €28.8m and €40.26m respectively. [115] There is also an effort to target poverty reduction in all our climate finance.

6.1.2 Methodology for Reporting

Application of the OECD DAC Rio Markers

Since 1998 the OECD DAC has monitored development finance targeting the objectives of the Rio Conventions. Data are reported by members of the OECD DAC, collected through the Creditor Reporting System (CRS) and identified using "Rio markers", where providers are requested to indicate for each development finance activity whether or not it targets environmental objectives.

Uganda: https://www.climatelearningplatform.org/key-partner-countries/uganda
Zambia: https://www.climatelearningplatform.org/key-partner-countries/zambia
Malawi: https://www.climatelearningplatform.org/key-partner-countries/malawi
Mozambique: https://www.climatelearningplatform.org/key-partner-countries/mozambique

[115] DFAT bilateral/CSO/PU plus DCCAE (2.1m- minus AF, + 800k GGW + 500k Gender)

There are four Rio markers, covering: biodiversity, desertification, climate change mitigation, and climate change adaptation. The Rio markers are descriptive rather than strictly quantitative. They allow for an approximate quantification of financial flows targeting the objectives of the Rio Conventions – climate change adaptation and mitigation (UNFCCC), biodiversity (UNCBD), and desertification (UNCCD).

Ireland uses the OECD DAC Rio marker methodology to identify and score disbursements with climate relevance as well as relevance to biodiversity, desertification, disaster risk reduction, and others. The markers work on a three-score system with relevance or eligibility of projects to the definitions marked in three ways:

- Principal marker: 2
- Significant marker: 1
- Not targeted: 0

The choice of principal, significant or not-targeted relates to hierarchy of objectives in the programme or project design. A principal marker is applied if the marker issue in question is one of the principal objectives of the activity and has a profound impact on the design of the activity. A significant marker is applied if the marker policy is a secondary objective, or a planned co-benefit, in the programme or project design. The zero marker is applied to show that the marker policy was not targeted in the programme or project design. If the programme or project has not been examined for its relevance to the Rio markers, the marker is left blank.

Climate related multi-lateral flows have been addressed in guidance from the OECD DAC ENVIRONET[116]:

a) contributions from donors channelled through multilateral organisations and earmarked for climate purposes are included in bilateral figures, where they are Rio-marked;

b) contributions to multilateral climate funds are counted in their totality as multilateral contributions for climate purposes[117]

c) core contributions to agencies partly active in the climate field are included in multilateral ODA but not Rio-marked, since this would raise comparability issues with different donors scoring contributions to the same multilateral institution differently, and could lead to over-estimation. Instead, “imputed multilateral contributions” are calculated to estimate the climate-related share of these contributions which can be attributed back to donor.

Mapping Methodology: Bilateral Assistance to Partner Countries

Each year, the Department of Foreign Affairs and Trade disseminates a reporting template to Missions in countries with bilateral assistance programmes. The template is informed by the

[116] Treatment of Climate-related Multilateral Flows in DAC Statistics & Status of Reporting – Technical Note prepared for the Joint ENVIRONET and WP-STAT Task Team on OECD Rio markers, environment and development finance statistics - as of November 2015.

[117] Multilateral climate funds (i.e. entirely dedicated to climate) - on the list of ODA-eligible international organisations (Annex 2 of the DAC Statistical Reporting Directives) and whose contributions are counted in their totality as multilateral contributions for climate purposes - include: CIFs (Clean Technology Fund and Strategic Climate Fund), GEF’s LDCF and SCCF, Adaptation Fund

Department's database which contains all ODA expenditure for the previous year, overseen by the Finance Unit. Programming spend within the database is informed by descriptions of when and how a programme or pool of funding can be marked as climate relevant. The use of Rio markers ex-ante is based on the project objective, description, core activities and identified indicators.

Before sharing with Mission counterparts, it is cross-checked by the Climate Unit to ensure that any irrelevant expenditure (e.g. administrative costs) is omitted. The simple table asks counterparts who are most familiar with in-country programming to list all programme disbursement items in the course of the previous year, and apply the Rio markers (from a drop-down list) to each item according to the guidance above.

For each marker applied, a brief narrative (one sentence) is requested to justify the application of a particular score. The template itself then calculates the climate finance accounting weight and the consequent climate finance amount for each activity and the resulting total climate finance amount. This automatic calculation, coupled with drop down lists for marking reduces the number of decision points for the user and thus simplifies the task.

The information provided is then cross-checked for accuracy and consistency by the Climate Unit in the Department of Foreign Affairs and Trade. At this stage, any apparent mistakes or inaccuracies are clarified before finalisation of the figure, and any inclusion or exclusion errors rectified.

In 2018, the preparation of the 2017 figures was outsourced to an external consultancy. For 2019, the Government took on the responsibility of compiling these figures internally. Systems are being reviewed and informed to ensure the process can continue to be improved.

Mapping Methodology: Civil Society Expenditure

Irish Official Development Assistance Expenditure through civil society represents a significant proportion of the assistance programme overall, some 22% in 2017 and 28% in 2018. For this reason, Ireland now reports on climate relevant expenditure channelled through NGOs, since 2016. This is done in close cooperation with the project partners themselves.

Annually, Ireland runs training in the application of the Rio Markers for NGO partners. Thereafter, the process of tracking climate relevant expenditure broadly mirrors that of expenditure through our Embassies abroad. Each year, NGOs in receipt of one-off or multi-annual programme financing receive a reporting template for the year. The reporting of Rio Markers by NGOs has been integrated into the existing reporting requirements, preventing a duplication of work and allowing for further support and information-sharing between DFAT and NGO counterparts.

In a similar approach to the reporting of climate finance by Ireland's respective Missions and Embassies, the reporting template asks counterparts to list all programme disbursement items in the course of the previous year, and apply the Rio Markers (from a drop-down list) to each item according to the guidance above. For each marker applied, the colleague is requested to provide a brief (one sentence) narrative justifying why that score has been applied. The template itself then calculates the climate finance accounting weight and the consequent climate finance amount for each activity and the resulting total climate finance amount. This automatic calculation, coupled with drop down lists for marking reduces the number of decision points for the user and thus simplifies the task.

The information provided is then cross-checked for accuracy and consistency by the Climate Unit in DFAT. At this stage, any apparent mistakes or inaccuracies are clarified before finalisation of the figure, and any inclusion or exclusion errors rectified. In some cases, the Climate Team provides structured feedback on the completion of the exercise to the NGO, so they can continue to improve the accuracy of their reporting.

Multi-lateral expenditure

Ireland makes disbursements to a number of multilateral funds and institutions that support climate related activities, either exclusively or as part of a broader portfolio of programmes and projects.

In 2017 and 2018, Ireland channelled climate finance through the Green Climate Fund, the Global Environment Facility – Least Developed Countries Fund, the Adaptation Fun; we also supported funds within the World Bank – The International Development Agency, Asian Development Bank and the Asian Infrastructure and Investment Bank. In addition, support was provided to specialized UN Funds such as the UN International Strategy for Disaster Risk Reduction.

Throughout 2017 and 2018, the Department of Foreign Affairs and Trade maintained a number of partnerships with other organisations and think tanks which contribute to broader climate action internationally and in the countries where Ireland works – for example, the World Resources Institute and the International Institute for Environment and Development.

6.1.3 How support is New and Additional

Section 6.1.6 of Ireland's Second Biennial Report describes Ireland's climate finance contributions in 2013 and 2014 in the context of economic constraints, advising that no new channels of finance were available at that time. This is built upon in Sections 7.2 to 7.4 of Ireland's Seventh National Communication which set out Ireland's international commitments and identifies channels of bilateral and multilateral funding, some of which were newly introduced.

While these section relate to channels of funding, a definition of "new and additional" in relation to financial resources provided can be considered in the context of Ireland's national budgeting system. Ireland's approach to budgeting for public funding carries no assumption that funding made available in any given year will again be available in a subsequent year. Consequently, with the exception of a few heavily-caveated multiannual funding arrangements, all public climate finance provided by Ireland annually is considered new and additional. Even with regard to those multiannual funding arrangements, support is conditional on the availability of funding in subsequent years.

In practice, since the signing of the Paris Agreement, Irish climate finance has seen a year-on-year percentage increase of 43%, 28% and 14% respectively, representing absolute increases of €15m, €14m, and €9m respectively. Some of those increases have come about due to improvements in the granularity of reporting, in particular for expenditure channelled through Civil Society Organisations as described above. Others have come about due to explicit decisions to increase the allocations, across different Government Departments. In this regard, in practice, these allocations have been new and additional on previous years.

6.1.4 Indicators

As described above, the indicators used to determine climate mitigation, adaptation or cross-cutting expenditure, are drawn from the OECD DAC Rio Marker Methodology. The Climate Unit in DFAT acts as a focal point for providing information and clarification to staff and grant managers on the proper allocation and use of Rio Markers. Ireland does not explicitly apply the Capacity Building marker, but capacity development features as an element of almost all development assistance work done, as will be described below.

6.1.5 Delivery Mechanisms and Allocation Channels

Ireland's reported contributions for the BR period (2017/2018) were entirely in grant form. A number of Government Ministries participate in delivering and allocating climate finance, including the Department of Foreign Affairs and Trade, the Department of Communications, Climate Action and Environment, the Department of Finance, and the Department of Agriculture, Food and the Marine.

The Department of Foreign Affairs and Trade is the main department administering Ireland's Official Development Assistance, principally through the 'Irish Aid' programme. Climate finance features in most key channels of delivery, as illustrated below:

- Bilateral assistance spent by Irish Embassies abroad: This accounted for 50% of Irish climate finance in 2017, and 49% in 2018. The majority of this has been directed at the following countries: Ethiopia, Tanzania, Uganda, Malawi, Mozambique, Zambia, Sierra Leone and Vietnam. For this assistance, priorities are determined by the Irish Country Strategy for the partner country, identified in partnership with Government and other national counterparts. Climate action features either explicitly within the Strategy itself (as is the case, for example in Ethiopia), or the team in-country has worked to identify climate-specific entry points in the existing sectors of intervention, and ensured the programmes delivered have been climate relevant (as is the case, for example in Uganda and Tanzania). From the Embassies themselves, in-country delivery partners are then identified. In some cases, these are UN agencies, or International Financial Institutions. In other cases, they are international or national NGOs. Sometimes, in-country delivery partners can be the Governments themselves, research institutes, or other implementing entities

- Multilateral assistance to UN bodies and the EU. A large amount of Irish development cooperation is channelled through the UN, the EU or International Financial Institutions (56% of total in 2017). The vast majority of this does not get reported against climate finance, but in some cases the imputed percentage has been calculated and reported, according to OECD DAC guidance. In some cases, for example the UNEP Global Environmental Monitoring System programme, or the Climate, Agriculture and Food Security Programme of the CGIAR network, the Irish contribution is earmarked to specific climate-relevant programmes

- Assistance via NGOs. Civil society represents an important partner for Irish cooperation and climate action. Between 22% and 28% of all Irish development and humanitarian assistance is channelled through NGOs that are working overseas. Often this is through strategic Programme Grants, which contain specific areas of outcomes that the partner delivers on.

This can include climate action, more likely in the area of building resilience to climate change

- Partnerships with policy think-tanks and research institutions. Funding to policy and research partners frequently takes place on a long-term basis, with outcomes articulated in terms of capacity developed, or knowledge generated or disseminated. In some cases, these partnerships are explicitly focused on climate change issues, as is the case with, for example, the World Resources Institute, or the International Institute for Environment and Development. In other cases, Ireland provides core support to key think-tanks that have ongoing work in the realm of climate change, such as the Overseas Development Institute

6.1.6 How support responds to country needs

In the case of climate support that is channelled through bilateral assistance, Irish cooperation is governed by each country specific strategy. The Strategy document typically spans 3-5 years, and is prepared involving a broad and deep consultative process with Government, local civil society and private sector counterparts. The Country Strategy preparation involves a series of diagnostic exercises, which cover the key threats and opportunities that form the contextual backdrop of Irish partnership in the country in question. Among these is a series of Climate Risk Assessments, mentioned above. These assessments have been concluded for a large number of Irish bilateral programme countries, and others are in the process of finalisation.

The information contained in the Assessments is used to inform country strategy focus, outcome areas, and specific programming decisions. It is also used as a benchmark against which to assess performance of Irish development cooperation, to inform Mid-Term Reviews during the Strategy cycle.

Irish Ambassadors in bilateral assistance countries maintain a regular and constructive dialogue with interlocutors in partner Governments, including on progress with regards to NDCs and NAPs. Ireland retains a degree of flexibility in programming to ensure we can respond to specific country requests on climate action, as well as the ongoing process of ensuring climate is reflected in existing sectoral programmes, as described above.

A number of Irish funded initiatives are led by local, regional and national institutions which hold expertise in related sectors and areas where enhanced climate action is needed. This further supports an approach that strategically targets the needs at national and sub-national level. For example in Ethiopia, support is channelled through regional agricultural agencies that are building and strengthening resilience to climate change in the agriculture sector. In Mozambique, we collaborated closely with the administrations in Inhambane and Mabote district on local adaptation planning. In Malawi, we worked closely with the Ministry of Energy on their National Cookstove Strategy. In Uganda, we supported the Ministry of Social Protection to address climate issues in their social protection programme.

For support that is not channelled through Irish bilateral assistance programmes, but instead through third-party partners, consultation and ownership of Government and other national counterparts is a key criterion for Irish support. Through internal coordination mechanisms, all non-bilateral support to partner countries is reported on in detail to colleagues in local Embassies, and

every effort is made to ensure partner organisations are in touch with local staff to ensure coherence with other Irish support.

Ensuring country ownership is also a priority for Ireland in terms of support that is provided through large multilateral mechanisms. The Irish representation on the LEG is a helpful means for listening to the real concerns and experiences of Developing Country Government counterparts. A strong understanding of these issues has enabled Ireland to more effectively challenge key service delivery mechanisms such as the NDC-Partnership, UNDP and others in ensuring their support adequately meets country needs.

The governance arrangements in place for communications between Ireland's dedicated Missions, predominantly based in LDCs, work allows for a pragmatic approach to information sharing. This ensures a smooth flow of feedback from the field to the relevant officials working across Government on development aid related issues. This in turn informs an intelligent approach to stakeholder management, at which country needs of LDCs for adaptation is at the heart.

6.1.5 Private Finance Mobilisation

A number of initiatives have been pursued in relation to private finance mobilisation in Ireland, including the launch of the UNEP Financial Centres for Sustainability (FC4S) in Dublin during 2018.[118] The Department of Finance also launched the IFS 2020 Action Plan 2018, which supports initiatives to drive investment towards sustainable finance.[119] The Department of Finance also committed to working with Sustainable Nation Ireland, a partner of the FC4S, to explore linkages between private climate finance and the role that can be played by MDBs.[120] In addition, Ireland co-hosted the European Climate Finance Innovation Summit in Dublin in May 2019, bringing together leading international financial institutions and asset managers, further supporting activities and engagement in this sector.

In 2018, for the first time, Ireland reported €237,500 in climate finance channelled to partnerships that engage private sector actors. Grants were provided to Moyee Coffee Ireland, for sustainable coffee production, including promotion of adaptation farming practices, in Ethiopia, and Bimeda Kenya, for the re-purposing of mango seed husks (a by-product of mango seed milling) as a source of sustainable energy which provides a cost-effective briquette substitute for charcoal. The programmes have respectively generated significant co-benefits for climate adaptation and mitigation. In addition, a key condition of the grants was the use of a leverage ratio of at least 1:1 of Ireland's finance. Therefore, €237,500 in Government financing has leveraged a total of €487,000 in additional private investment in climate-relevant industries.

6.1.6 Information on Ireland's climate finance contributions as reported in CTF

Currency exchange rate

Ireland's climate finance contributions for the BR period (2017 – 2018) are reported in "Euro (€) millions". The currency exchange rate used for conversion to USD $, as required in the CTF, was

[118] See further information here: https://www.fc4s.org/about-us
[119] A copy of the IFS 2020 Action Plan can be downloaded here: https://www.gov.ie/en/publication/791a5a-ifs2020-action-plan-2018/?referrer=/wp-content/uploads/2018/01/180130-ifs2020-action-plan-2018.pdf/
[120] See additional details here: https://www.sustainablenation.ie/

based on the OECD's annual average exchange rate (Euro € to USD $) for 2017 and 2018 respectively.

Pledged / Committed / Provided

Ireland's ODA financial contributions are reported only after they have been provided (disbursed) to partners.

CTF Table 7 – Provision of public financial support: summary information[121]

Allocation channels	Domestic currency					USD				
		Climate-specific					Climate-specific			
	Core/general	Mitigation	Adaptation	Cross-cutting	Other	Core/general	Mitigation	Adaptation	Cross-cutting	Other
2017										
Total contributions through multilateral channels	17,143,579.74	37,736.42	1,740,000.00	9,486,786.45		19,327,598.33	42,543.88	4,961,668.54	10,695,362.36	
Multilateral climate change funds	1,420,000.00		1,300,000.00	2,154,750.00		1,600,901.92		4,465,614.44	2,429,255.92	
Other multilateral climate change funds				154,750.00					174,464.49	
Multilateral financial institutions, including regional development banks	14,586,015.00		90,000.00	6,453,763.00		16,444,210.80		101,465.60	7,275,944.72	
Specialized United Nations bodies	1,137,564.74	37,736.42	350,000.00	878,273.45		1,282,485.61	42,543.88	394,588.50	990,161.72	
Total contributions through bilateral, regional and other channels										
Total	17,143,579.74	37,736.42	1,740,000.00	9,486,786.45		19,327,598.33	42,543.88	4,961,668.54	10,695,362.36	
2018										
Total contributions through multilateral channels	2,792,987.90		1,300,000.00	15,591,450.24		3,297,506.34		1,534,828.76	18,407,851.60	
Multilateral climate change funds	1,420,000.00		1,300,000.00	2,955,138.00		1,676,505.30		1,534,828.76	3,488,946.87	
Other multilateral climate change funds				105,138.00					124,129.87	
Multilateral financial institutions, including regional development banks				9,100,312.24					10,744,170.33	
Specialized United Nations bodies	1,372,987.90			3,536,000.00		1,621,001.04			4,174,734.40	
Total contributions through bilateral, regional and other channels										
Total	2,792,987.90		1,300,000.00	15,591,450.24		3,297,506.34		1,534,828.76	18,407,851.60	

[121] The majority of Ireland's climate finance is focused on adaptation but with the generation of mitigation co-benefits. As such, a significant amount of Irish climate finance for 2017 and 2018 counted as either adaptation or cross-cutting with the higher ratio of cross-cutting support going to adaptation.

6.2 Technology Transfer and Development

The effective development and transfer of environmentally sound technologies is critical in enabling developing countries to pursue their objectives for sustainable development in a climate-friendly manner. The UNFCCC states that 'promoting the effective development and transfer of environmentally sound technologies is critical in enabling developing countries to pursue their objectives for sustainable development in a climate-friendly manner'. Although wider definitions apply to technology in the development sphere, in the UNFCCC context it is often understood to cover physical technologies, knowledge and techniques.

In comparison to larger countries, technology development or transfer has not been a strong feature in Irish support. Notwithstanding this, a number of key programmes that have been supported in 2017 and 2018 have provided technology support to developing country partners. Some highlights of these include:

- Support over a number of years (€343,000 per year) to the UN-GEMs programme. The Global Environmental Monitoring Scheme, implemented by UNEP, provides support to global water flow monitoring. Central to the programme is the development and rollout of the *gemstat* programme which is a tool enabling counterparts in developing countries to track water flow and quality.

- Support to the Climate Change, Agriculture and Food Security Programme of the CGIAR system. Irish support to this programme is in the order of €750,000 per year. The programme provides dedicated support to priority countries as identified by Ireland to build adaptation and mitigation technology and capability into national agricultural strategies. Working under the coordination of CIAT (the International Tropical Agriculture Centre), the programme collaborates with national Agricultural Research Institutions to develop climate-smart agricultural technologies (including drought-resistant varieties), as well as climate information services for farmers.

- For 2017 only, Irish partnership with the World Meteorological Organisation (€246,000 for the phase covering 2017) supported the rollout of agricultural meteorological services targeted to smallholder farmers in Ethiopia's Tigray region. This included the production of a detailed manual for Ethiopian National Meteorological Agency staff at all levels on providing targeted agro-met information services.

6.2.1 Success and Failure examples

With regards to the WMO partnership, some valuable **lessons learned** emerged from the programme. A key success of the project was the field-level work undertaken between Regional Met Agency staff and the strong Agricultural Extension network, to provide appropriate weather information, face-to-face, to farmers, at the right time, and combined with appropriate agronomy advice. Strong evidence was gathered of the impact this had on crop yields in the successive planting seasons. One key lesson learned was the failure to reach out appropriately to women farmers during implementation, which may have revealed more about how to provide appropriate agro-met information. A second lesson relates to institutional strengthening. The Ethiopian National Meteorological Agency was the key recipient of the technology and technical support, in

collaboration with the Tigray Regional Met Agency. However, during design, a key weakness was that the project did not dedicate sufficient resources or planning to the process of institutional strengthening. This relates to basic materials to perform the functions of project (vehicles, equipment, staff, etc), but also to the process of capacity development, and systems and protocols for the Met Agency to collaborate effectively with the Agricultural Bureau. The key lesson here is that technology transfer will have limited effect in the long-term unless combined with intensive processes and resources dedicated to institutional transformation.

6.3 Capacity Building

6.3.1 How capacity building is aligned with overall Irish climate support

The UNFCCC describes capacity building as 'enhancing the ability of individuals, organisations and institutions in developing countries… to identify, plan and implement ways to mitigate and adapt to climate change'. Although the UNFCCC asks countries to report on capacity building support, there is no agreed methodology- the OECD DAC is considering this as an area for future development.

Due to the lack of agreed methodology, it was not possible to extract a final figure for Irish climate finance that constituted capacity building, for the period 2017-2018. Notwithstanding this, capacity building is a major feature of all Irish supported activities, regardless of modality of support. While there were relatively low levels of investment in hard infrastructure, and investment capital within the cooperation programme, there remains a strong emphasis on building human and institutional capacity, across all sectors. In this regard, support to climate (particularly adaptation) is no exception. Below are ten examples of Irish climate finance building capacity to adapt to (or mitigate) climate change, which are illustrative of the approach taken across the board.

1. Through funding to the LEG, and to the Gender Action Plan of the UNFCCC, capacity development support is provided to UNFCCC Focal Points, national counterparts, and Gender and Climate Focal Points on a range of climate issues, as well as specifically on how to formulate and implement NAPs.

2. A significant body of capacity development work is undertaken through the Climate and Development Learning Platform, a partnership with the International Institute for Environment and Development. Some examples include: a) partnership with the Government of Uganda to build climate responsiveness into its social protection programme in Karamoja; b) support to the alignment of food security and nutrition support, and social protection, with Local Adaptation Planning in Mozambique; and c) support to intensive learning and policy implications arising out of a multi-stakeholder Climate Resilient Agriculture programme in Ethiopia.

3. Intensive support was provided to the Agricultural Markets Development Trust in Tanzania, to help them explicitly build climate resilience into agricultural value chain analysis across the national programme, which Ireland is supporting.

4. In 2017 and 2018, Ireland continued to support integrated climate adaptation and mitigation programmes for the poorest in Malawi. The Social Cash Transfer programme also

included support to household adoption of cook-stoves, as well as training in their use and production at community level. Research by the International Institute for Environment and Development (iied) subsequently demonstrated evidence of dramatic reductions in biomass use at community level as a consequence, but a major outcome of the support was the sustainability of low-intensity clean cook-stove production and use, through capacity development.

5. Core Irish support to the International Institute for Environment and Development's work includes a major element of climate-related capacity development. Among these, we include work on supporting sub-national governments in Kenya, Tanzania, and Mali to build systems that can channel climate finance. It also includes support to training members of the LDC Negotiation Bloc in negotiation skills, and in the climate negotiation architecture, with a focus on women negotiators.

6. Through support provided to the World Resources Institute, the Adaptation Finance Accountability Initiative provided substantial capacity building to Government counterparts in Uganda and Ethiopia, as well as CSO umbrella representatives, in the management and transparent reporting of climate finance.

7. In 2017, Ireland joined the NDC Partnership, through which participating members can leverage their resources and expertise to provide countries with the tools they need to implement their NDCs and combat climate change. Since joining, Ireland has made annual contributions totally €250,000 at the time of reporting.

In 2017 and 2018, Ireland also invested heavily in developing the capacity of our staff, with a strong emphasis on staff in Missions overseas, to integrate climate change into development programmes and projects. The support provided by the Regional Climate Advisor allowed for a greater understanding of climate risk, including the production of a number or climate risk assessments in country programmes. It also strengthened the integration of climate change resilience in existing programmes – for example, social protection and agriculture in Sub-Saharan Africa.

In 2017, staff and partners came together for a week of learning and experience exchange in Kampala, with an explicit focus on adaptation at the local level. Participants were also able to benefit from joining the Regional NAP Expo, and the Community Based Adaptation event, occurring in the same week. In 2018, climate-focused staff were joined by colleagues working on agriculture and nutrition, for a week of learning on integrated approaches to building resilience, in Lilongwe. Colleagues also joined the Regional NAP Expo and the Community Based Adaptation event, and undertook field visits to see climate adaptation mainstreaming in action. In 2018, the Irish government also held learning and capacity development workshops with NGO partners, focusing on gender and climate change, and application of the Rio Markers.

Ongoing learning and capacity development among colleagues and partners continues to be supported via the Climate and Development Learning Platform website.[122] The website, and ongoing support provided from iied, helps Irish officials to do the following with their local partners:

[122] See here for further information: https://www.climatelearningplatform.org/

- Capture evidence of what works, in climate change mainstreaming
- Reflect on lessons emerging throughout the programme cycle, and design corrective measures
- Assess strategic entry points for strengthening the climate focus of programming, through various points in the Country Strategy cycle
- Strengthen their core skills in assessing climate data, measuring outcomes, and consideration of climate risks and co-benefits in programming