

CLIMATE
CHANGE
ADVISORY
COUNCIL



Annual Review 2017



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Climate Change Advisory Council

The Climate Change Advisory Council is an independent advisory body tasked with assessing and advising on how Ireland can achieve the transition to a low-carbon, climate-resilient and environmentally sustainable economy.

The Climate Change Advisory Council was established on 18 January 2016 under the Climate Action and Low Carbon Development Act 2015.

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Executive Summary

The Climate Change Advisory Council is an independent advisory body tasked with reviewing national climate policy, progress on the achievement of the national transition objective and progress towards compliance with existing EU and international obligations of the State. As set out in the legislation, a key task of the Council is to conduct an Annual Review of progress made over the previous year in reducing greenhouse gas emissions and furthering transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050.

Key Messages

The Council's assessment of progress to date on meeting our climate change commitments clearly shows that Ireland will miss its agreed emissions reduction target for 2020 by a substantial margin. Without major new policies and measures, Ireland will also miss both its proposed 2030 EU target and its objective of reducing emissions of carbon dioxide by at least 80% (relative to 1990 levels) by 2050 by a very large margin. Both the pace and scale of emissions reduction need to be accelerated across all sectors.

In its *First Report* and *Periodic Review Report*, the Council pointed to the urgent requirement for new policies and measures, beyond what is committed to in the National Mitigation Plan, if Ireland is to move onto a sustainable path to meet its 2030 and 2050 targets for tackling climate change.

These new measures should include a planned and substantial increase in the carbon tax in the coming years, a phasing out of coal and peat for both residential heating and power generation and, in particular, ending the subsidy for peat-fired electricity generation. Future investments in the public transport fleet should avoid fossil fuel lock-in. Rebalancing spending away from roads and towards public transport would make a significant contribution to minimising future emissions. Planning and incentivising the take-up of electric vehicles over the coming decade will be vital in moving Ireland to a sustainable growth path. The implementation of a system of planning that will minimise commuting in the future is also important. All cost-effective measures to reduce emissions in the agriculture and land sector should be adopted, and there remains a pressing need to define what is meant by carbon neutrality.

It is important that this low-carbon transition be carried out in a cost-effective manner. The Council will monitor the cost-effectiveness of policies to reduce emissions each year. It also recommends that the government report annually on the costs and impacts of planned and implemented measures in the National Mitigation Plan.

Greenhouse Gas Emissions

Ireland's greenhouse gas emissions increased by 3.7%, or 2.1 million tonnes of carbon dioxide equivalent, in 2015, according to greenhouse gas data published by the Environmental Protection Agency (EPA). While Ireland's emissions in the years 2013, 2014 and 2015 were below the annual targets agreed with the European Union (EU), projections indicate that emissions will exceed annual limits in 2016 and in each year up to and including 2020. Economic growth has been the main driver of the growth in emissions in recent years, demonstrating that Ireland's economy and emissions are still coupled.

There were increases in emissions across all the main sectors in 2015, with the largest increases coming from energy industries and transport. Emissions from both the agriculture and residential sectors also increased.

Projections

In the absence of significant additional measures to reduce emissions, the EPA's projections indicate that there will be strong growth in emissions nationally and across key sectors to 2030. Emissions from transport are projected to increase by between 10% and 12% by 2020, relative to 2015 levels, reflecting strong economic growth. In agriculture, emissions are expected to rise by between 4% and 5% by 2020, reflecting expansion in this sector. By 2020, transport and agriculture are projected to account for 74% of emissions outside of electricity generation and heavy industry. Simply put, Ireland will miss its target of reducing emissions by 20% by 2020 by a large margin.

Compliance with Existing Obligations

New policies and measures that break the link between greenhouse gas emissions and economic growth are essential if targets for reducing emissions are to be achieved. Ireland's emissions of carbon dioxide need to be reduced each year by approximately 2.4%, or 0.9 million tonnes of carbon dioxide equivalent, to achieve the national objective of at least an 80% reduction by 2050, relative to 1990 levels.

While Ireland can comply with its EU Effort Sharing Decision targets for 2020 by purchasing emissions units, this use of public funds will leave Ireland with a bigger and more expensive task to meet its future targets to 2030 and beyond.

Current Trends

While some progress has been made in the built environment and the energy sectors, Ireland has the third highest emissions per capita for residential energy use in the EU, reflecting a high dependency on fossil fuels, such as coal and peat, and minimal deployment of renewable and district heating.

Transport emissions have been increasing with a return to economic growth, driven by a rise in private vehicle and freight traffic. Addressing emissions from transport can bring additional benefits for air quality and human health as well as reducing congestion. Future investments, including in public transport fleets, need to avoid fossil fuel lock-in. A more ambitious approach, capitalising on recent technology and market developments, should be taken in transport to move Ireland to a sustainable path to decarbonisation by 2050.

While some progress has been made in improving the greenhouse gas efficiency of food production, it has not resulted in a reduction in absolute emissions. The agriculture and land sector must first adopt all available cost-effective measures to reduce emissions and enhance removals within the sector. This should involve more efficient use of inputs and changes in land use. There remains a pressing need to define what is meant by carbon neutrality with respect to agriculture and land use, and to implement policies to ensure delivery on this objective.

Decarbonisation of electricity generation will require the phasing out of coal and peat burning for power generation. To this end, the subsidy for peat-fired electricity generation should be ended as soon as the current Public Service Obligation expires in 2019.

Ireland is still over-reliant on solid fossil fuels, which have significant implications for both greenhouse gas emissions and air quality, with associated impacts on health. A clear medium-term strategy to phase out fossil fuels in the electricity, transport and residential sectors is required.

Cost-effectiveness

As part of the *Annual Review 2017*, the Council has laid out a number of principles it will employ to review cost-effectiveness in future Annual Reviews. These principles include assessing the impact and effectiveness of existing measures, employing updated marginal abatement cost curves, pursuing co-benefits (such as improvements to health) to increase the effectiveness of policies, integrating behavioural responses in the design of policies, and enabling and encouraging innovative responses.

The Council recommends that the government monitor and report annually on the costs and impacts of planned and implemented policies, measures and actions included in the National Mitigation Plan.

The Council also stresses the importance of integrating measures introduced in the annual budget into a strategy for reducing Ireland's greenhouse gas emissions.

European Policy

Ireland's involvement in the development at EU level of proposals on the governance of the Energy Union, on the Emissions Trading Scheme, on the Effort Sharing Regulation, and on flexibilities in land use and land-use change and associated accounting rules is important to ensure consistency with the National Policy Position.

Conclusion

Ireland is not on a pathway to economy-wide decarbonisation by 2050. Proposed actions under the National Mitigation Plan need to be prioritised to allow urgent implementation of the most significant actions. However, to achieve Ireland's objective of decarbonisation, major new policies and measures, along with changes in current practices are required.

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1. Introduction

The Climate Change Advisory Council is an independent advisory body tasked with reviewing national climate policy, progress on the achievement of the national transition objective and progress towards compliance with existing EU and international obligations of the State. A key task of the Council, mandated under the Climate Action and Low Carbon Development Act 2015,¹ is to conduct an Annual Review of the progress made during the previous year in achieving greenhouse gas emissions reductions and in furthering the transition to a low-carbon, climate-resilient and environmentally sustainable economy. This report describes the results of the Annual Review 2017.

The structure of this report reflects the requirements set out in legislation. Chapter 2 presents an overview of the 1990–2015 greenhouse gas emissions inventory data provided by the Environmental Protection Agency (EPA), submitted to the European Union (EU) and United Nations Framework Convention on Climate Change (UNFCCC), and focuses on the changes that occurred in 2015. Chapter 3 presents an overview of the most recent greenhouse gas emissions projections for the period 2016 to 2035; developments in the main sectors responsible for these emissions are outlined. Chapter 4 describes progress in meeting the EU 2020 emissions reduction target in 2015 and the cumulative emissions target for the period 2013 to 2020, and provides an assessment of progress towards the 2050 national transition objective. Chapter 5 explores progress in transition across the sectors and presents some potential indicators for transition. Advice and recommendations are provided on the achievement of the national transition objective. Chapter 6 presents principles and approaches that the Council will employ in future Annual Reviews to assess and provide advice on the cost-effectiveness of climate action. Some recommendations are provided on actions that can be taken in the short term to enhance cost-effectiveness. Chapter 7 has a special focus on the EU and describes the most recent climate change policy developments. Chapter 8 documents the activities of the Council in 2016.

As the National Adaptation Framework is not expected to be finalised until late 2017, issues related to climate resilience are not considered here.

2. A Summary of the National Greenhouse Gas Emissions Inventory

Key Messages

- ▲ Emissions of greenhouse gases increased by 3.7%, or 2.1 million tonnes of carbon dioxide equivalent, in 2015.
- ▲ Economic growth has been the main driver of the growth in emissions in recent years, demonstrating that Ireland's economy and emissions have not undergone the level of decoupling required to put us on a pathway to a low-carbon transition.
- ▲ Increases in greenhouse gas emissions were recorded in all the main sectors.

The Climate Action and Low Carbon Development Act 2015 tasked the Council, as part of its Annual Review, to provide a summary of the findings as set out in the national greenhouse gas emissions inventory prepared by the EPA. Ireland's greenhouse gas emissions inventory in 2015 is provided below. The inventory is the quantitative basis for the Council's review of progress made in achieving greenhouse gas emissions reductions to enable the achievement of the national transition objective.

2.1 Ireland's Greenhouse Gas Emissions Inventory

The annual greenhouse gas emissions inventory is central to the development of national climate change mitigation policy. It reflects the effectiveness of measures taken to achieve policy goals. Each year the EPA prepares and publishes Ireland's official greenhouse gas emissions inventory. The inventory is reported to the EU and the UNFCCC and is subject to in-depth international review. The current inventory, which provides data from 1990 to 2015, was submitted to the EU on 15 March 2017 and to the UNFCCC on 12 April 2017.

According to the inventory data, Ireland's greenhouse gas emissions increased by 3.7%, or 2.1 million tonnes of carbon dioxide equivalent, from 57.8 million tonnes of carbon dioxide equivalent in 2014 to 59.9 million tonnes of carbon dioxide equivalent in 2015. † In the period 2006 to 2015 some of the most significant emissions reductions were recorded in three years during the financial recession. These reductions were largely the result of the downturn in Ireland's economy over the period 2009 to 2011. Data for 2015, showing an increase in emissions, demonstrate that the growth of Ireland's economy and emissions of greenhouse gases remain coupled.²

† Carbon dioxide equivalent is a measure used to compare the emissions from various greenhouse gases based on their global warming potential.

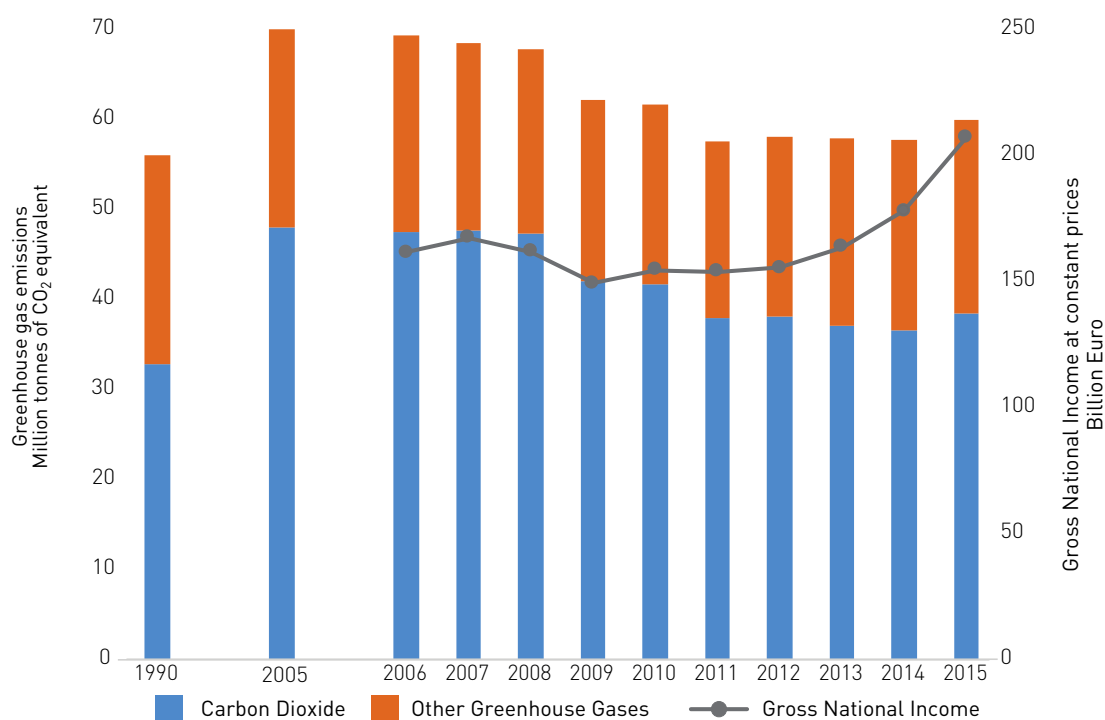


Figure 2.1: Greenhouse gas emissions for base years 1990 (National Policy Position) and 2005 (EU 2020 targets) and the decade 2006 to 2015 showing carbon dioxide (in blue) and other greenhouse gases (in orange) in units of million tonnes of carbon dioxide equivalent (Mt CO₂e). Gross National Income at constant prices (grey line) in billions of euros is also shown (right-hand scale). **Data source:** EPA National Emissions Inventory 2017³ and Central Statistics Office, National Accounts 2017.⁴

2.2 Sectoral Greenhouse Gas Emissions

The EPA provides inventory data broken down into 10 sectors. A summary of data for greenhouse gas emissions from these sectors in 2015 is listed in Table 2.1. Changes in sectoral greenhouse gas emissions and how each of those sectors contributed to the overall increase in 2015 is shown in Figure 2.2. Increases are evident across all the main sectors, with the largest increase shown in energy industries at 0.6 million tonnes of carbon dioxide equivalent, followed by transport at 0.5 million tonnes of carbon dioxide equivalent. Agriculture and residential sectors are next at 0.3 million tonnes of carbon dioxide equivalent each. Increases in carbon dioxide emissions were recorded in all the main sectors.

Table 2.1: Greenhouse gas emissions for base years 1990 (National Policy Position) and 2005 (EU 2020 targets), and for 2013, 2014 and 2015, broken down by sector and detailing the change in emissions in 2015, relative to 1990, 2005 and 2014. **Data source:** EPA National Emissions Inventory 2017.⁵

Sector (% of total greenhouse gas emissions in 2015)	Greenhouse gas emission inventory					Change in 2015 relative to 1990		Change in 2015 relative to 2005		Change in 2015 relative to 2014		Key drivers relative to 2014 as identified in the EPA National Emissions Inventory 2017
	1990	2005	2013	2014	2015	Absolute Mt CO ₂ e	%	Absolute Mt CO ₂ e	%	Absolute Mt CO ₂ e	%	
	Mt CO ₂ e											
Agriculture (33.1%)	21.0	20.3	19.6	19.5	19.8	-1.2	-5.5	-0.5	-2.7	0.3	1.6	Increased dairy cow numbers
Transport (19.8%)	5.1	13.1	11.1	11.3	11.8	6.7	130.3	-1.3	-9.9	0.5	4.2	Increased passenger diesel cars
Energy industries (19.7%)	11.4	15.9	11.4	11.2	11.8	0.4	3.2	-4.1	-25.8	0.6	5.4	Increased coal use for electricity generation and decreased gas use
Residential (10.1%)	7.5	7.3	6.4	5.7	6.0	-1.5	-19.7	-1.2	-16.9	0.3	5.2	Increased oil, gas and kerosene consumption
Manufacturing combustion (7.6%)	4.0	5.9	4.2	4.3	4.5	0.6	14.8	-1.3	-22.5	0.2	5.2	Increased use of natural gas and petroleum coke
Industrial processes (3.3%)	3.2	2.7	1.5	1.8	2.0	-1.2	-38.4	-0.8	-27.5	0.2	10.2	Increased cement production
F-gases (1.9%)	0.04	1.0	1.1	1.2	1.1	1.1	3,143	0.1	12.0	-0.1	-4.3	Impact of Directive 2006/40/EC†
Waste (1.6%)	1.6	1.3	0.7	0.9	1.0	-0.6	-37.8	-0.3	-25.9	0.1	10.9	Decreased methane recovery
Commercial services (1.6%)	1.1	1.5	1.1	1.0	0.9	-0.2	-13.7	-0.5	-36.7	-0.02	-2.3	Reduction of gasoil use
Public services (1.3%)	1.2	1.0	0.9	0.8	0.8	-0.4	-30.5	-0.1	-15.4	-0.01	-1.2	Reduction of gasoil use
Total	56.1	70.0	57.9	57.8	59.9	3.8	6.7	-10.1	-14.4	2.1	3.7	

† Directive 2006/40/EC relating to emissions from air-conditioning systems in motor vehicles and amending Council Directive 70/15/EEC. F-gases, fluorinated gases; Mt CO₂ e, million tonnes of carbon dioxide equivalent.

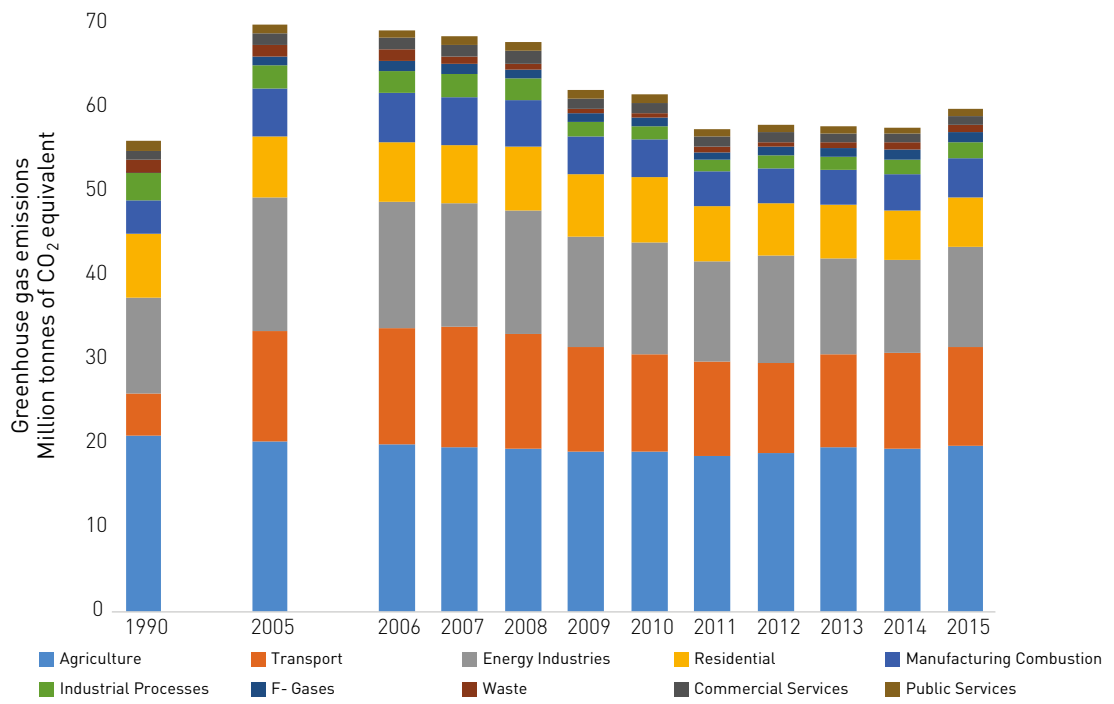


Figure 2.2: Greenhouse gas emissions for base years 1990 (National Policy Position) and 2005 (EU 2020 targets) and the last decade, 2006 to 2015, presented by sector in units of million tonnes of carbon dioxide equivalent. **Data source:** EPA, National Emissions Inventory 2017.⁶

3. A Summary of Future Greenhouse Gas Emissions

Key Messages

- ▲ Projections indicate strong growth in emissions nationally and across key sectors in the coming decades in the absence of significant additional measures.
- ▲ The most significant increases in emissions are projected to come in the transport and agriculture sectors.

The Climate Action and Low Carbon Development Act 2015 tasked the Council, as part of its Annual Review, to provide a summary of the most recent projections of greenhouse gas emissions prepared by the EPA. In this chapter, Ireland's future greenhouse gas emissions are provided below. They are considered in the light of the EU Effort Sharing Decision emission reduction targets to 2020. Official projections of greenhouse gas emissions based on policies and measures applied to these sectors are provided for the period 2016 to 2030.

3.1 Ireland's Greenhouse Gas Emissions Projections

Every year, the EPA releases greenhouse gas projections for Ireland. Every second year, these projections are submitted to the EU in accordance with reporting requirements. These biennial projections are reported to the EU, as part of the Monitoring Mechanism Regulation, and to the UNFCCC every four years. As with the greenhouse gas inventory, the projections are subject to in-depth international review. The current set of projections, which provide two scenarios 'with existing measures' and 'with additional measures'† from 2015 to 2035, were submitted to the EU on 25 April 2017.

The 'with existing measures' scenario assumes that no additional policies and measures, beyond those already in place by the end of 2015, are implemented. The 'with additional measures' scenario assumes that the policies and measures in the 'with existing measures' scenario have been implemented and includes further implementation of the renewable and energy efficiency targets for 2020 as described in the National Energy Efficiency Action Plan and the National Renewable Energy Action Plan. It accounts for the shortfall expected in achieving Ireland's energy efficiency targets and renewable energy targets for electricity, transport and heat to 2020.

Greenhouse gas emissions projections are prepared using data from several key sources. The energy forecast is provided by the Sustainable Energy Authority of Ireland (SEAI). This information was prepared with the Economic and Social Research Institute (ESRI) and University College Cork (UCC). The ESRI uses macro-economic projections produced by the Core Structural Model of the Irish Economy (COSMO) model.⁷ Projections of global economic activity are based on the National Institute's Global Econometric Model (NiGEM) from the National Institute of Economic and Social Research in the UK.⁸ Agricultural forecasts are provided by Teagasc. These include data on animal numbers, crop areas and fertiliser use.

† It should be noted that in some sectors projections under 'with existing measures' and 'with additional measures' use identical policies and that measures are implemented to the same degree in both. In these sectors, there is no difference between the scenarios. The sectors in which identical policies and measures are implemented to the same degree are F-gases and waste. The industrial processes sector has similar numbers for both scenarios but not identical levels of implementation.

Ireland's target under the Effort Sharing Decision is a 20% reduction in greenhouse gas emissions by 2020, relative to 2005 levels. The EPA's emissions projections indicate that between 2013 and 2020, the period that the Effort Sharing Decision covers, a reduction of between 4% and 6% will be achieved. Simply put, Ireland will achieve, at most, one-third of its Effort Sharing Decision 2020 target. Projections indicate strong growth in emissions nationally and across key sectors in the coming decade, in the absence of significant additional measures.

3.2 Future Sectoral Greenhouse Gas Emissions

The EPA provides projections broken down into sectors like those in the inventories. A summary of the projected emissions of greenhouse gases from these sectors for 2020 and 2030 is shown in Table 3.1. In 2020, the transport and agriculture sectors account for 57%, or 33.7 million tonnes of carbon dioxide equivalent, of total emissions and dominate emissions in the Effort Sharing Decision sector under the 'with additional measures' scenario.

Emissions from transport are projected to increase between 10% and 12%, or 1.2 to 1.5 million tonnes of carbon dioxide equivalent, by 2020, relative to 2015 levels. This increase reflects the strong economic growth predicted out to 2020. Agricultural emissions are projected to increase by between 4% and 5%, or between 0.8 and 1 million tonnes of carbon dioxide equivalent, by 2020, relative to 2015, as a result of increased production. Emissions projections from this sector already reflect efficiency gains associated with fertiliser use under the 'with additional measures' scenario. Other sectors that predict emissions increases include residential, manufacturing combustion and industrial processes.

Emissions reductions of 26%, or 3.1 million tonnes of carbon dioxide equivalent, relative to 2015, are projected in the energy industries sector by 2020 under the 'with additional measures' scenario. Emissions decreases are also predicted for f-gases, for waste and in the commercial and public service sectors. Projections for both 'with existing measures' and 'with additional measures', broken down by sector, are shown in Table 3.1 and Figure 3.1.

Table 3.1: Projections of total greenhouse gas by sector from 2015 to 2020 and 2030 under the 'with additional measures' scenario. **Data source:** EPA National Emissions Inventory 2017⁹ and Ireland's Greenhouse Gas Emissions Projections 2016–2035¹⁰

Sector (% of total greenhouse gas emissions in 2015)	Greenhouse gas emission inventory				Greenhouse gas emission projections for 'with additional measures'				Key assumptions as identified in Ireland's Greenhouse Gas Emissions Projections 2016–2035
	1990	2005	2015	2030	Change in 2020 relative to 2015		Change in 2030 relative to 2015		
	Mt CO ₂ e				Absolute Mt CO ₂ e	%	Absolute Mt CO ₂ e	%	
Agriculture (33.1%)	21.0	20.3	19.8	20.2	0.8	4.2	0.4	1.8	Increased dairy cow and nitrogen use
Transport (19.8%)	5.1	13.1	11.8	14.7	1.2	10.5	2.9	24.3	VAT, taxes (motor and carbon), efficiencies in public transport, improved fuel economy, reach 5.5% of Renewable Energy Sources for transport by 2020
Energy industries (19.7%)	11.4	15.9	11.8	10.5	-3.1	-26.2	-1.3	-11.1	Impact of increased renewables
Residential (10.1%)	7.5	7.3	6.0	6.1	0.02	0.3	0.1	0.9	Increased renewables in heating, increased energy efficiency
Manufacturing combustion (7.6%)	4.0	5.9	4.5	5.4	0.6	13.3	0.9	18.8	Increased renewables in heating, increased energy efficiency
Industrial processes (3.3%)	3.2	2.7	2.0	3.0	0.3	16.9	1.0	50.5	Based on gross domestic product increase (identical scenarios)
F-gases (1.9%)	0.0	1.0	1.1	0.7	-0.2	-19.9	-0.4	-36.9	Impact of Directive 2006/40/EC [†] (identical scenarios)
Waste (1.6%)	1.6	1.3	1.0	0.5	-0.4	-36.1	-0.5	-48.7	Decrease in methane recovery (identical scenarios)
Commercial and public (2.9%)	2.2	2.4	1.7	1.8	-0.2	-8.5	-0.1	4.8	Impact of energy efficiency measures
Total	56.1	70.0	59.9	62.9	-0.8	-1.3	3.0	5.0	

[†]Directive 2006/40/EC relating to emissions from air-conditioning systems in motor vehicles and amending Council Directive 70/15/EEC.
Mt CO₂ e, million tonnes of carbon dioxide equivalent.

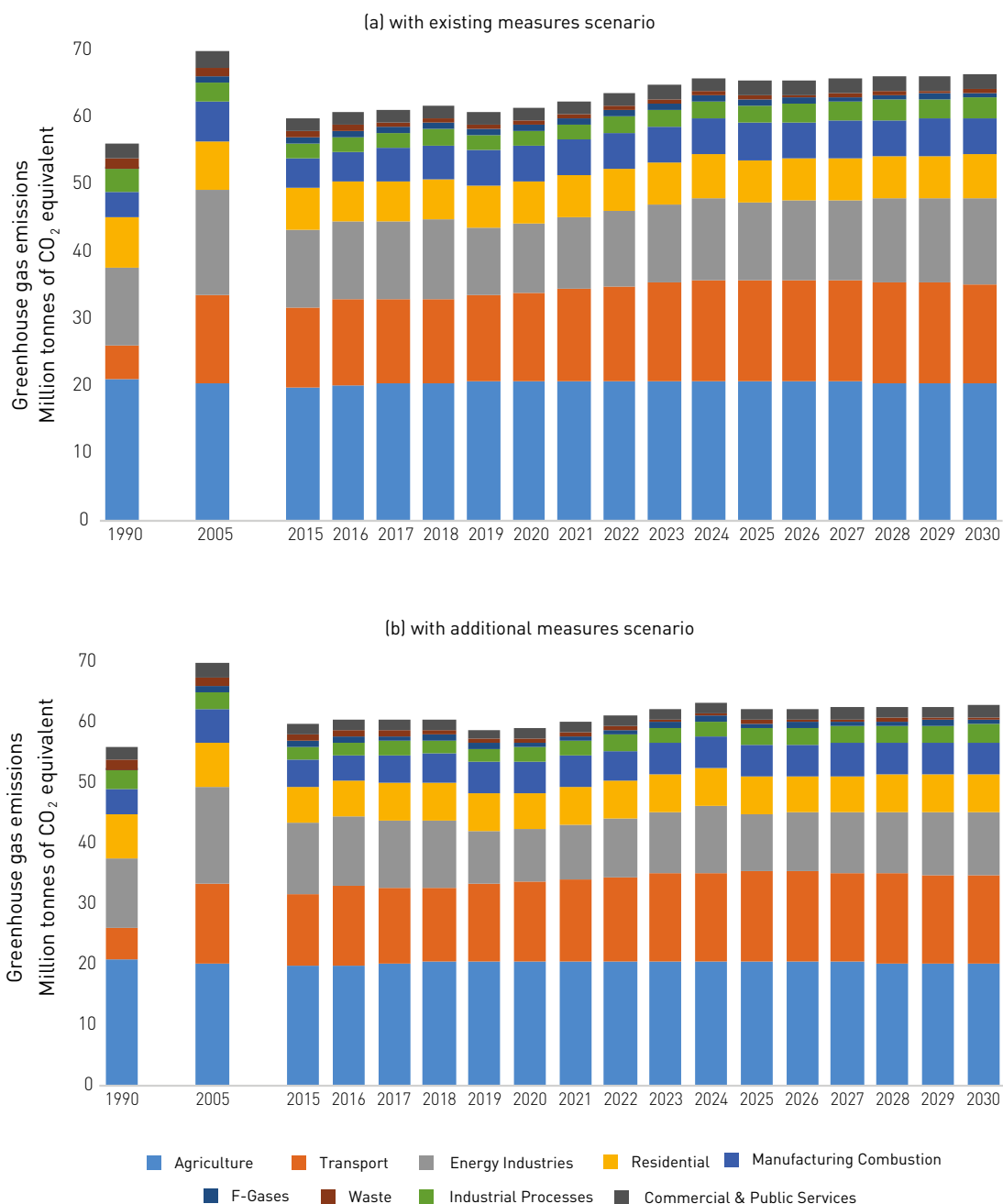


Figure 3.1: Greenhouse gas emissions for ‘(a) with existing measures and (b) with additional measures’ scenarios, base years 1990 (National Policy Position) and 2005 (EU 2020 targets), 2015 data and projections to 2020 and 2030, broken down by sector in units of million tonnes of carbon dioxide equivalent. **Data source:** EPA National Emissions Inventory 2017¹¹ and Ireland’s Greenhouse Gas Emissions Projections 2016–2035.¹²

4. Compliance with Existing Obligations of the State

Key Messages

- ▲ Emissions in the years 2013, 2014 and 2015 were below the annual limits under the EU Effort Sharing Decision.
- ▲ Projections indicate that emissions will exceed annual limits in 2016 and in each following year up to and including 2020.
- ▲ Projections indicate that, despite existing and planned policies and measures, emissions will continue to increase and targets may be missed by a substantial margin.
- ▲ Carbon dioxide emissions need to be reduced each year by approximately 2.4%, or 0.9 million tonnes of carbon dioxide equivalent, to achieve at least an 80% reduction by 2050, relative to 1990.
- ▲ Implementing measures that break the link between emissions and economic growth is essential if current and future targets are to be met.
- ▲ Without urgent action, Ireland will breach its 2020 targets and face an increasingly difficult and expensive task of decarbonisation in the medium and long terms.

The Climate Action and Low Carbon Development Act 2015 tasked the Council, as part of its Annual Review, to provide advice and recommendations in relation to compliance with existing obligations of the State under the law of the EU or international agreements. Ireland's performance in relation to reducing greenhouse gas emissions in accordance with national, EU and international targets is considered below.

4.1 Climate and Energy Package 2020

The Climate and Energy Package 2020 is a collection of directives and decisions to ensure that the EU meets its climate and energy targets for the year 2020. The package has three key objectives: (1) to cut greenhouse gas emissions by 20%, relative to 1990, (2) to produce 20% of EU energy from renewables and (3) to improve energy efficiency by 20% by 2020. There are two areas that relate directly to the objective to reduce emissions of greenhouse gases, namely the Emissions Trading Scheme and the Effort Sharing Decision. Under the Emissions Trading Scheme, the EU aims to reduce emissions from large industrial and institutional facilities, especially electricity generation. The Emissions Trading Scheme covers 45% of the EU's greenhouse gas emissions and aims to reduce these emissions to 20% below 2005 levels by 2020. The Effort Sharing Decision covers emissions that are not covered in the Emissions Trading Scheme. Each Member State has binding targets for reducing emissions in the non-Emissions Trading Scheme sector between 2013 and 2020.

4.1.1 Emissions Trading Scheme and Effort Sharing Decision

The increase in Ireland's greenhouse gas emissions from 2014 to 2015 is observed in both the Emissions Trading Scheme and Effort Sharing Decision sectors (see Figure 4.1). Emissions of greenhouse gases under the Emissions Trading Scheme increased by 5.4%, or 0.9 million tonnes

of carbon dioxide equivalent from 2014 to 2015. Emissions from sectors covered by the Effort Sharing Decision increased in total by 3%, or 1.3 million tonnes of carbon dioxide equivalent. In Ireland, the Emissions Trading Scheme covers 28%, or 16.8 million tonnes of carbon dioxide equivalent, of Ireland's total greenhouse gas emissions, while the majority, 72%, or 43.1 million tonnes of carbon dioxide equivalent, is covered by the Effort Sharing Decision. The EU Commission, which manages the Emissions Trading Scheme, has key responsibility for ensuring a reduction in emissions through the Emissions Trading Scheme sector. The Irish Government has primary responsibility for achieving the targets in the non-Emissions Trading Scheme sector.

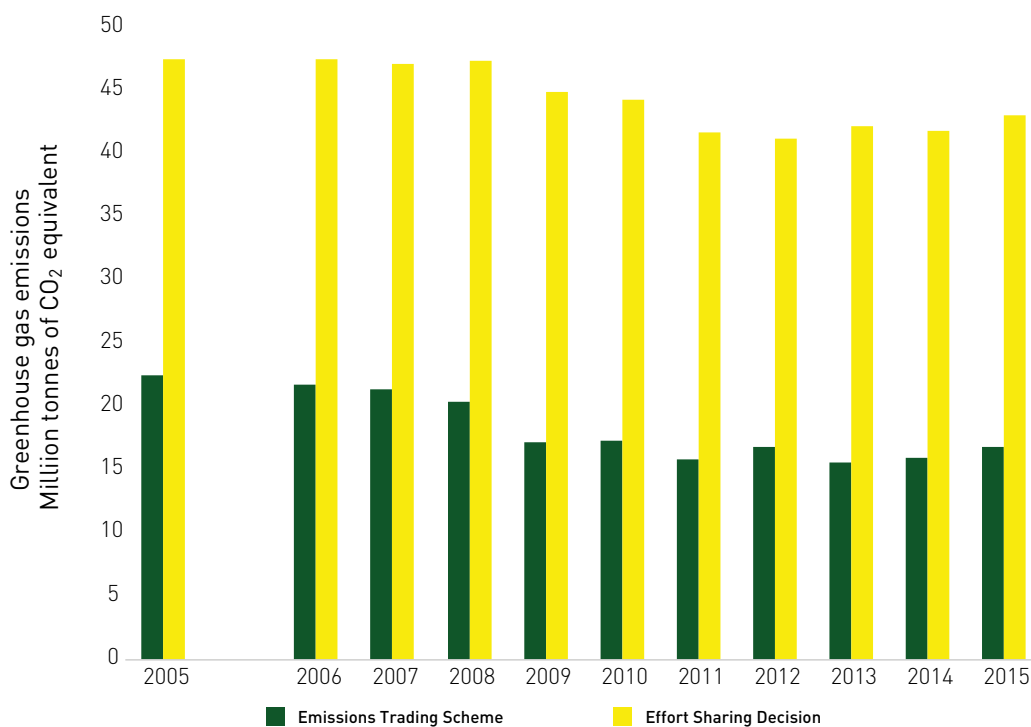


Figure 4.1: Greenhouse gas emissions for the Emissions Trading Scheme (in dark green) and the Effort Sharing Decision (in yellow) over the period 2006 to 2015 and the base year 2005 of EU Climate and Energy 2020 targets in units of million tonnes of carbon dioxide equivalent. **Data source:** EPA National Emissions Inventory 2017.¹³

4.1.2 Effort Sharing Decision: Targets to 2020

Under the EU Effort Sharing Decision, Ireland has both annual targets and a cumulative target for greenhouse gas emission reduction from 2013 to 2020. Emissions in the years 2013, 2014 and 2015, were below the annual targets (see Figure 4.2). Emission savings accrued in these years may contribute to meeting future annual targets to 2020 and the cumulative target from 2013 to 2020.

Projections for both 'with existing measures' and 'with additional measures' scenarios indicate that emissions will exceed the annual targets from 2016 onwards (see Figure 4.2 and Table 4.1). Over the period 2013 to 2020, greenhouse gas emissions are projected to exceed annual limits by a cumulative total of between 11.6 million tonnes of carbon dioxide equivalent and 13.8 million tonnes of carbon dioxide equivalent. This takes into consideration emissions savings accrued from 2013 to 2015. These projections indicate that, despite existing and planned additional policies and measures, greenhouse gas emissions continue to increase, suggesting that our targets may be missed by a substantial margin.

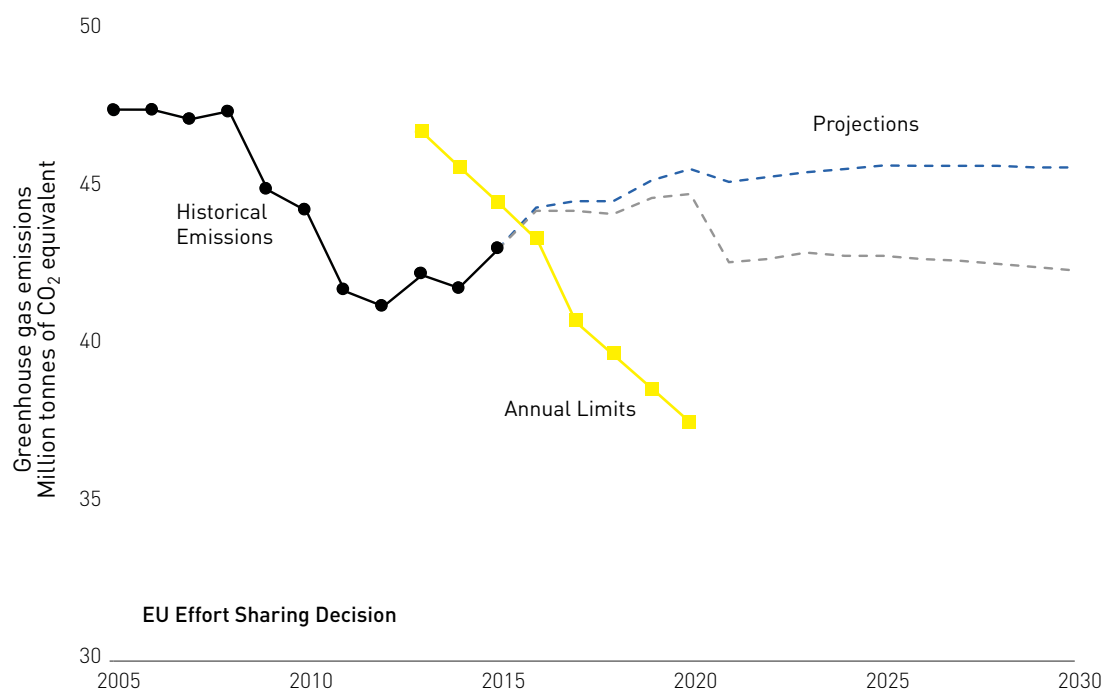


Figure 4.2: Ireland's greenhouse gas emissions (black line) from 2005 to 2015. Annual targets (yellow line) as included under the Effort Sharing Decision for the period 2013 to 2020, without use of flexibilities, and emissions projections for 'with existing measures' (dashed blue line) and 'with additional measures' (dashed grey line) are presented here in units of million tonnes of carbon dioxide equivalent. **Data source:** EPA National Emissions Inventory 2017,¹⁴ Ireland's Greenhouse Gas Emissions Projections 2016–2035¹⁵ and European Commission Decision (EU) 2017/1471 2017.¹⁶

Table 4.1: Actual (black *italics*) and projected (blue and grey text) greenhouse gas emissions, covered under the EU Effort Sharing Decision targets, relative to annual totals and total cumulative emissions targets. **Data source:** EPA National Emissions Inventory 2017,¹⁷ Ireland's Greenhouse Gas Emissions Projections 2016–2035¹⁸ and European Commission Decision (EU) 2017/1471 2017.¹⁹

Year	Limits Mt CO ₂ e	Emissions Mt CO ₂ e		Distance to target Mt CO ₂ e	
		Actual	Actual	With existing measures	With additional measures
		With existing measures	With additional measures	With existing measures	With additional measures
2013	46.9	42.3		4.6	
2014	45.8	41.8		3.9	
2015	44.6	43.1		1.6	
Cumulative (2013–2015)	137.3	127.2		10.1	
2016	43.5	44.4	44.3	-0.9	-0.8
2017	40.9	44.6	44.3	-3.7	-3.4
2018	39.8	44.6	44.2	-4.8	-4.4
2019	38.7	45.3	44.7	-6.5	-6.0
2020	37.7	45.6	44.8	-8.0	-7.2
Remaining (2016–2020)	200.6	224.5	222.3	—	—
Total	337.9	351.7	349.5	-13.8	-11.6

Mt CO₂ e, million tonnes of carbon dioxide equivalent.

4.1.3 Proposed EU Effort Sharing Regulation 2030

The proposed Effort Sharing Regulation, the successor to the Effort Sharing Decision, is part of EU climate policies and the EU Energy Union strategy. The objective of the Effort Sharing Regulation is to reduce EU-wide emissions in the non-Emissions Trading Scheme sector by 30% by 2030, relative to 2005 levels. It will set annual national limits on Member States' emissions of greenhouse gases in the non-Emissions Trading Scheme sector for the period 2021 to 2030. The proposed national target for Ireland is 30% by 2030, relative to 2005 levels.

As with the Effort Sharing Decision, emissions savings accrued in one year can be carried over to meet annual limits in subsequent years. Member States can transfer or buy annual emission allocations (AEAs) to and from other Member States.

In addition to the existing flexibilities, the proposed Effort Sharing Regulation offers two new flexibilities. The first is a one-off flexibility that allows Member States to achieve their targets using Emissions Trading Scheme allowances that would otherwise be auctioned. The second flexibility acknowledges the difficulty of achieving emissions reductions in agriculture and allows the use of removals within the land use sector to achieve the target. If Ireland uses both these flexibilities, the proposed national target would become 20.5%, relative to 2005 levels. Annual limits for Ireland are presented in Figure 4.3. As these are proposed limits, it is possible that Ireland could receive a more challenging target when the regulations are finalised.

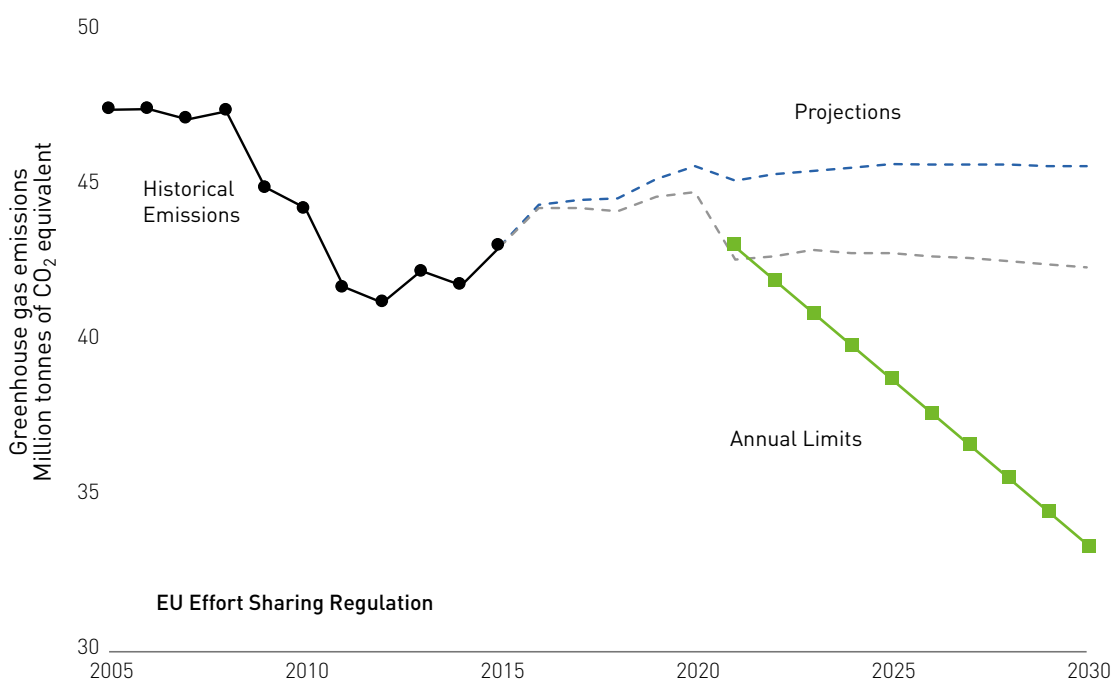


Figure 4.3: Ireland's greenhouse gas emissions (black line) from 2005 to 2015. Annual targets as included under the Effort Sharing Regulation (green line) for the period 2021 to 2030 and emissions projections for 'with existing measures' (dashed blue line) and 'with additional measures' (dashed grey line) are presented here in units of million tonnes of carbon dioxide equivalent. **Data source:** EPA National Emissions Inventory 2017,²⁰ Ireland's Greenhouse Gas Emissions Projections 2016–2035²¹ and European Commission Fact Sheet on the proposed Effort Sharing Regulation 2016.²²

4.2 International Agreements

Ireland is a Party to the UNFCCC and has ratified both the Kyoto Protocol and the Paris Agreement under the Convention. The Kyoto Protocol, agreed in 1997, sets legally binding emission limitation and reduction targets based on levels of greenhouse gas emissions in 1990. As a Member State of the EU, Ireland participates in meeting the EU Emission Reduction Target. There are two distinct commitment periods, namely from 2008 to 2012 and from 2013 to 2020. The EU met its 2012 binding greenhouse gas emissions reduction target and is on track to meet its binding greenhouse gas emissions reduction targets to 2020.

The Paris Agreement was adopted in 2015 and entered into force in 2016. The Paris Agreement requires countries to submit nationally determined contributions, which, for developed countries, include emissions reduction targets to 2025 or 2030. As a Member State of the EU, Ireland's contribution to the Paris Agreement is captured in the EU's Nationally Determined Contribution. The EU contribution to the Paris Agreement reflects the EU-wide ambition and targets as set out in section 4.1.

4.3 National Policy Position

Ireland's national transition objective, as defined in the National Policy Position²³ and Climate Action and Low Carbon Development Act 2015, is to transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050. In terms of mitigation, it is broken down into two components. The first aims to reduce emissions of carbon dioxide in three key sectors — electricity generation, the built environment and transport — by 80% by 2050, relative to 1990 levels. The second is related to agriculture, land use and forestry. It identifies “an approach to carbon neutrality” without compromising sustainable food production as its primary objective.

The level of ambition expressed in relation to mitigation in the National Policy Position is broadly in line with European and international objectives. The National Policy Position gives particular focus to carbon dioxide emissions from fossil fuel sources. This recognises the importance of reducing carbon dioxide emissions that will continue to warm the planet long into the future. The targets under the National Policy Position are not legally binding.

4.3.1 Emissions of Carbon Dioxide

In 2015, greenhouse gas emissions increased by 3.7%, or 2.1 million tonnes of carbon dioxide equivalent, relative to 2014, while emissions of carbon dioxide increased by 4.8%, or 1.8 million tonnes of carbon dioxide equivalent. Although emissions of carbon dioxide peaked at 48 million tonnes of carbon dioxide equivalent in 2005, they have not yet dropped below 1990 levels and are currently around 17%, or 5.5 million tonnes of carbon dioxide equivalent, higher than in 1990. While some years have seen reductions, these have for the most part been associated with the economic downturn. Annual carbon dioxide emissions reductions of the order of 2.4%, or 0.9 million tonnes of carbon dioxide equivalent, per year, relative to 2015, will be required to achieve an at least 80% reduction in carbon dioxide emissions by 2050. This would bring Ireland onto a pathway that is consistent with the low-carbon transition as described in the National Policy Position (see Figure 4.4).

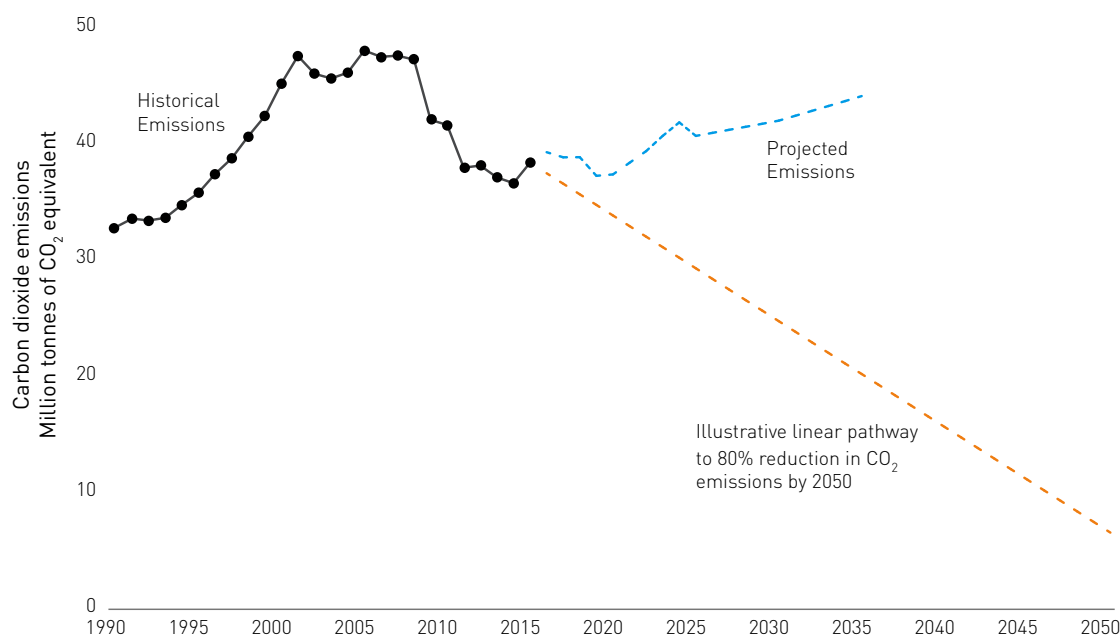


Figure 4.4: Emissions of carbon dioxide in Ireland from 1990 to 2015 (solid black line) and projections from 2016 to 2035 (blue dashed line). An illustrative linear pathway for achievement of the low-carbon transition to 2050 (orange dashed line) is shown here in units of million tonnes of carbon dioxide equivalent. **Data source:** EPA National Emissions Inventory 2017²⁴ and Ireland's Greenhouse Gas Emissions Projections 2016–2035.²⁵

4.4 Advice and Recommendations

Projections indicate continued growth in emissions nationally and across key sectors in the coming decade despite the current and envisaged policies and measures. Designing and implementing policies and measures that break the link between greenhouse gas emissions and economic growth is essential if current and future targets are to be achieved.

Ireland may comply with its EU Effort Sharing Decision targets through the purchase of emissions units. This would represent a use of public funds to meet targets that would produce no local co-benefits or national investment in the low-carbon transition. Achieving compliance in this manner does not avoid the costs of emission reduction but rather delays the cost to the post-2020 period, when further emissions reductions are required, and increases the challenge of achieving our emissions reduction objective for 2030.

Putting Ireland on track to a low-carbon transition for 2050 that is in line with the Paris Agreement requires decarbonisation of all sectors of the economy. The National Policy Position, with respect to electricity generation, the built environment, transport, agriculture and land sectors, is an excellent starting point. Any sector that has not been addressed in the National Mitigation Plan, for example waste, should be included in future plans, and its inclusion should be based on inventories compiled by the EPA.

Understanding the gap to target will require better monitoring of progress through a coherent set of actions, data and analysis nationally and across all sectors. It will also require the ability to map and understand low-carbon pathways and uncertainties, for example those associated with technology, behaviour and changes in practice, for 2050. This can be achieved through creating and assessing a suite of suitable scenarios and developing policies and measures that deliver

emissions reductions in all sectors that are compatible with Ireland's own 2050 targets and represent the most cost-efficient means of meeting our national objective on climate change.

Without urgent action, Ireland will not only exceed its 2020 emissions reduction targets but will also have an increasingly difficult and expensive task of decarbonisation to complete in the medium and long term. Reliance on technological breakthroughs and significantly reduced costs to enable rapid, substantial and sustained emissions reductions to put us on track to a low-carbon society and economy by 2050 is a high-risk strategy. Decisions need to be based on sound analytical assessments that also address the increased cost and associated pressures that accompany such rapid decarbonisation.

5. Progress Made in Furthering Transition

Key Messages

- ▲ The Council will monitor progress annually in implementation of the National Mitigation Plan.
- ▲ To assess progress on low-carbon transition, the Council will monitor trends, technology deployment, public engagement and behaviour change, as well as a range of other indicators.
- ▲ There has been some progress in the built environment and the energy sectors but little progress in reducing emissions from transport.
- ▲ It is unclear if progress is being made in achieving neutrality in agriculture. Initiatives are in place; however, data are lacking and overall emissions are increasing.
- ▲ There has been some progress in institutions and in community engagement in transition; however, much more is required.
- ▲ A strategy for phasing out peat and coal in both the electricity and residential sectors is required.
- ▲ A more ambitious approach in transport will bring clear co-benefits and avoid fossil lock-in, while agriculture should move to define neutrality and adopt all cost-effective reduction measures to that end.
- ▲ The overall direction of travel is not in line with reaching our 2050 transition objective under the National Policy Position.

The Climate Action and Low Carbon Development Act 2015 tasked the Council, as part of its Annual Review, to assess progress made in furthering transition to a low-carbon, climate-resilient and environmentally sustainable economy.

It is the Council's intention to monitor and review implementation of the National Mitigation Plan each year, as it is the primary statutory instrument supporting national transition. The first National Mitigation Plan under the Climate Action and Low Carbon Development Act 2015 was published on 17 July 2017. The National Mitigation Plan contains 106 actions; however, the Council is concerned at the lack of specific detail or commitment on new policies and measures. In particular, the Council would like to see the actions linked to expected outcomes or impacts, to allow effective monitoring of implementation and progress. Given the large number of actions contained in the National Mitigation Plan, prioritisation will be required to advance implementation of the National Mitigation Plan in a cost-effective manner.

This is the first Annual Review by the Council. Given the very recent publication of the National Mitigation Plan, it is too early to review its implementation. Therefore, this year we offer a high-level review of progress made across the sectors in the year under review, including progress in public engagement, institutions and governance, before finally presenting a potential range of indicators for transition in the sectors. The indicators offer one perspective on progress

made in furthering transition by looking at progress in behavioural, technical, structural and infrastructural change that are key to long-term achievement of the national transition objective.

Future Annual Reviews will assess progress in implementation of the National Mitigation Plan, including progress on the agreed actions contained therein. They will also continue to consider sectoral progress, transition indicators and broader policy developments with significance for greenhouse gas emissions, compliance with obligations of the State in respect of climate change, and the transition to a low-carbon, climate-resilient and environmentally sustainable economy.

5.1 Progress Across the Sectors

5.1.1 Electricity Generation

There has been some progress in reducing greenhouse gas emissions from electricity generation, with an almost 50% reduction in the carbon intensity of electricity production between 1990 and 2015. More recently, this is evidenced by the contribution of renewable electricity to gross electricity consumption, increasing from 22.9% in 2014 to 25.3% in 2015 (see Table 5.1). However, in 2015, emissions associated with electricity generation increased by 5.4%, or 0.6 million tonnes of carbon dioxide equivalent, relative to 2014 levels. The emissions intensity of electricity generation also increased from 456 to 468 thousand tonnes (kilotonnes; kt) of carbon dioxide equivalent between 2014 and 2015 (see Table 5.1). The increase in the carbon intensity of emissions and in absolute emissions from this sector in 2015 was largely caused by the increased use of coal in electricity generation. Emissions from burning peat and coal increased from 8,505 to 9,200 kilotonnes of carbon dioxide equivalent from 2014 to 2015 (see Table 5.1). Electricity consumption in Ireland increased between 2014 and 2015, while net imports of electricity decreased. While Ireland is close to the EU average when it comes to the proportion of renewables in electricity generation, there is a reliance on imported fossil fuels to meet electricity generation demands. Ongoing use of peat and coal for electricity generation will continue to keep per capita emissions in this sector well above the EU average.

The pace of decarbonisation of the electricity generation sector is not currently compatible with a low-carbon transition to 2050. The electricity sector is covered under the EU Emissions Trading Scheme, which sets an EU-wide cap on emissions in the covered sectors. So far the Emissions Trading Scheme has failed to deliver a carbon price signal strong enough to drive down emissions from electricity generation. For this reason, the Council has recommended that the Irish government support reform of the Emissions Trading Scheme to make it an effective tool for driving decarbonisation. The Council recommends that an EU-wide carbon floor price, that is a minimum price for carbon in the emissions-trading sector, to incentivise decarbonisation of electricity generation should be considered.

The current Public Service Obligation subsidy for the burning of peat in electricity generation exacerbates this problem. The Public Service Obligation subsidy supports a peat generation capacity of 250 megawatts at an estimated cost of €110 million, compared to supports for a renewable generation capacity of 3,334 megawatts at an estimated cost of €351 million.²⁶ In the absence of an adequately performing EU Emissions Trading Scheme, coal and peat will probably continue to be used in electricity generation in Ireland. The decarbonisation of electricity generation will require the phasing out of peat and coal burning for electricity generation. The National Mitigation Plan has initiated a process to identify the best option for replacing Moneypoint power station as well as commissioning a report on Bord na Móna's peat generation plants.

These reports will need to address decarbonisation and identify options to replace this capacity. It should address co-benefits, such as improved air quality, health and wellbeing.²⁷ In the case of peat, it is not necessary to wait for further studies to determine the best course of action. The subsidy for peat should be ended as soon as the current Public Service Obligation expires.

Increasing renewable electricity generation also leads to decarbonisation of electricity generation. Finalisation of planning guidelines for wind, and developing policies that enable the deployment of renewable energy technologies, are essential for decarbonising electricity generation in Ireland. These developments are also crucial in increasing the pace of installation of renewables. A full consideration of emergent technologies, for example electric vehicles and battery storage, and in parallel distributed generation, will be necessary to ensure that renewable electricity generation can be realised at all scales. The associated benefits can be enjoyed by individuals and communities, as well as by state and private sector stakeholders. There is currently opposition to the deployment of renewables and the accompanying infrastructure. Effective engagement with communities to address their concerns is essential.

Decarbonisation of electricity generation is critical for economy-wide decarbonisation, especially in relation to transport and heating. It is crucial that these links be addressed and explored in national planning to ensure a coherent and comprehensive approach to decarbonisation of these important sectors at all levels.

5.1.2 Built Environment

There has been some progress on transition in the built environment in recent years. However, as discussed in Chapter 2, emissions from this sector increased between 2014 and 2015. Moreover, Ireland still has the third highest emissions per capita for residential energy use in the EU. This reflects a high dependency on fossil fuels – coal, peat and oil – for heating and minimal deployment of renewable heating and district heating. New building regulations in the residential and commercial sectors have led to significant improvements in the efficiency of new building stock and will improve uptake of renewables.

More than 350,000 homes have benefited from SEAI's Better Energy Home grants.²⁸ The impact of these grants on emissions is not clear. SEAI is taking steps to improve the monitoring of such outcomes in existing and future programmes. However, it is clear that many of these retrofit interventions do not bring the buildings involved to the Nearly Zero Energy Building (NZEB) standards required for new buildings. Consequently these homes may require additional investment in order to achieve the longer term transition objective. In 2017, the government allocated €5 million for a deep retrofit pilot programme by SEAI, to determine the costs, benefits and effective strategies for achieving the highest standards for the existing building stock. Measuring costs, impacts and outcomes is a key part of the programme. The learning from this pilot programme will be crucial in informing Ireland's transition pathway.

Despite the above progress, EU and Building Energy Ratings (BER) statistics and the 2016 Census all demonstrate the need for urgent action. The BER database shows that 24% of houses achieve poor energy efficiency ratings of E, F and G. The number of households identifying coal and peat as their primary fuel has increased from 157,783 in the 2011 Census to 176,640 in the 2016 Census, which is over 10% of all households. This contrasts with annual energy data, as in Table 5.1, showing a decreasing trend in residential peat and coal use over the same period. Research published by the UK government in 2016 confirmed that the UK had consistently underestimated

domestic wood fuel use by a factor of three partly because of significant levels of sourcing from the 'grey' informal market, that is, from people's own land, with potentially positive implications for greenhouse gas emissions but negative implications for air quality.²⁹ Similar difficulties in data collection pertain to peat burning. There are also potential issues in estimating fuel smuggling, which may have an impact on official data.³⁰ More research is needed to verify the levels of solid fuel use in Irish dwellings. Residential solid fuel use has important implications for health and air quality. Households dependent on burning solid fuel are more likely to experience energy poverty. The prevalence of use of coal and peat is a large part of the reason for Ireland's poor greenhouse gas emission performance in the residential sector compared with other European countries.

There are some indications that, to date, most of the identified deep retrofit activity[†] has been undertaken by more affluent households; it is concentrated in cities, in Leinster and in larger dwellings. It is welcome that recent grant schemes, such as the Better Energy Warmer Homes scheme and the Warmth and Wellbeing Pilot scheme, target homes of the elderly, children suffering from chronic respiratory conditions and the vulnerable. More work is needed to enable fuel-poor households to experience the cost savings and health benefits from deep retrofit, and the cost-effectiveness of these schemes should be continuously monitored.

There are fewer publicly available data on the fuel use and efficiency of commercial and public buildings. Over 45,000 non-domestic buildings have undergone a BER audit. Summary statistics on these data are published by the Central Statistics Office (CSO) and SEAI. Overall, as Table 5.1 shows, 13% of commercial buildings achieved an A or B rating. The data show that schools and colleges have the highest proportion of A and B ratings (50%). Nursing residential homes and hostels also have a high proportion of A and B ratings (46%), while restaurants and public houses have the lowest proportion of A and B ratings (7%). Workshops and maintenance depots have the highest proportion of F and G ratings (31%). The technical guidance document for the building regulations on non-dwelling buildings is due to be updated this year with the aim of establishing an NZEB performance for new non-dwelling buildings. This should represent a significant improvement on existing standards, which have not been updated since 2008.

5.1.3 Transport

There has been little progress in the low-carbon transition in the transport sector in recent years. Emissions fell during the recession but the overall picture in transport is that emissions are increasing significantly with the return to economic growth. Headline measures to drive the transition to a low-carbon economy, such as a switch to electric vehicles in private passenger transport, have been ineffective to date. Key sectoral indicators are pointing in the wrong direction. Transport emissions have been increasing since 2013, with the rate of annual increase more than doubling to 4.2% in 2015. As shown in Table 5.1, the distance travelled by private vehicle per capita rose by over 9% between 2014 and 2015.

Despite growth in the use of public transport as Ireland has emerged from the recession, private passenger vehicle use has increased. Road freight transport has also expanded to handle increased freight volumes. Despite an existing large rail infrastructure, freight transport by rail has experienced a steady decline in recent decades, with little sign of recovery.

The Biofuels Obligation Scheme, aimed at increasing renewable fuel use in transport, has had some success, with 5.7% weighted share of biofuels in road and rail transport energy in 2015.

[†] Dwellings in the BER dataset built before 1980 with a BER rating of A or B.

However, more rapid progress is required in order to achieve the overall target of 10% by 2020. SEAI has pointed to the need to increase the supply of biofuels significantly to bridge this gap.

The pace of transition in the transport sector is not compatible with a low-carbon transition by 2050. In a European context, Ireland is not exceptional either in terms of car ownership (below the EU average) or in terms of the percentage of the population living in rural areas. However, Ireland's estimated emissions from passenger cars, at 1.6 tonnes of carbon dioxide per capita, are among the highest in the EU. Fuel tourism is a feature of Ireland's transport emissions profile. This is strongly influenced by the price differential between jurisdictions but does not explain the relatively high emissions, and the recent change in the value of sterling may reduce this. Improved data are needed, especially on passenger kilometres, that would reflect vehicle occupancy to assess overall trends.

As well as economic growth and higher levels of activity, urban sprawl and spatial planning decisions are causing high levels of emissions and congestion on roads leading to major centres of employment. The lack of penetration of electric vehicles and other alternative fuel vehicles in the national fleet is exacerbating emissions, and an assessment of the adequacy of the current electric vehicle charging network should be undertaken. With a growing population, inadequate investment in public transport is being felt, leaving a modal split dominated by the private car. Freight has moved off rail and transport budgets are still dominated by spending on roads rather than on public transport and infrastructure for more active modes, such as walking and cycling. A range of new measures beyond those committed to in the National Mitigation Plan are required to drive a low-carbon transition in the sector to 2050.

5.1.4 Agriculture and Land Use

Agriculture

Agriculture emissions increased by 5% in 2015 and are projected to increase further. This has largely been driven by the industry taking advantage of market opportunities arising from the removal of quotas on dairy production, in line with Foodwise 2025.

Challenges exist in providing analysis and indicators of progress towards transition within the agriculture and land sector. Many of the actions undertaken to mitigate emissions and improve efficiency cannot be readily reflected in national estimates of emissions and removals. Measures and policies identified in the National Mitigation Plan focus on improving production efficiency and land management. Quantifying these potential emissions reductions is essential for assessing their effectiveness.

A number of programmes provide supports and incentives to farmers and other land owners to enable beneficial environmental outcomes and sustainable management practices. A high-profile initiative has been Bord Bia's Origin Green programme, which provides supports to farm, manufacturing, retail and food service levels to adopt best practice. Knowledge transfer through the Carbon Navigator and other emissions assessment tools is a core feature of the programme, with voluntary actions and targets for participants. Origin Green also includes regular audits and data collection. Participating farms account for 90% of beef production and 70% of dairy production. The 2016 report outlines significant potential for emissions reduction within beef (7%) and dairy (14%) based on successful achievement of the individual improvement targets by the cohort of participating farmers.³¹ Progress in achieving this potential emissions reduction will be important as Origin Green develops.

The EPA-led Smart Farming initiative complements Origin Green, but has a broader environmental scope.³² The EPA has collaborated with key agriculture stakeholders, including the Irish Farming Association, the Department of Agriculture, Food and Marine, Teagasc, SEAI and third-level institutions. The aim of the initiative is to enable farmers to adopt sustainable farming practices, including greenhouse gas mitigation measures, through knowledge transfer, while also achieving significant cost co-benefits and improving farm environmental and economic sustainability. In its 2017 report, the Smart Farming programme estimated a 10% average potential greenhouse gas emissions reduction on participating farms.

Analysis by the National Farm Survey suggests that nitrogen fertiliser use on grazing farms declined in the period 2005 to 2008,³³ in response to the EU Nitrates Directive, but has remained constant across other farm systems since 2010. However, fertiliser use on farms with high stocking rates appears to have continued to decline. Fertiliser use for silage and cereals has not seen a similar decline. The analysis also shows a clear difference in nitrogen use on those farms participating in environmental schemes in most years, although this could reflect the greater incentive for lower-intensity farms with lower fertiliser use to participate in these schemes.



Figure 5.1: Comparison of nitrogen usage rates on grasslands between participants in agri-environmental schemes (in green) and non-participants (in red). **Data source:** based on Wall and Dillon, 2017.³⁴

Land Use

There is a clear need for an appropriate national land use policy to help move land management to a more sustainable pathway. This must also address emerging demands from the bio-economy and renewable energy, as well as more conventional demands on land, such as agriculture, forestry, built environment, habitat and ecosystem services. The Council considers that development of a comprehensive land use strategy, with inclusion of all land uses, is essential.

Forestry policy has an ambitious target to increase national forest cover from the current 11% to 18% by 2050. This requires a sustained net increase in forest area of approximately 15,000 hectares per year. In the period 2006 to 2015, the average afforestation rate was 6,800 hectares per year. Significant additional effort is required over the medium term to realise this policy ambition.

Peatlands continue to represent a major source of greenhouse gas emissions, with a steady increase in drained organic soils reported (see Table 5.1). The increase is largely driven by ongoing peat extraction, for domestic, electricity generation and horticultural use, and also drainage to enable grassland and forestry activities. The reported increase in drained areas has occurred despite successful rewetting and restoration activities on specific sites. Policies and incentives to enable improved management of organic soils across all land uses are required.

It is important that policy developments in the agriculture and land use sector continue to consider mitigation options across all source activities and all land uses.

5.2 Public Participation

Public participation is key to a successful and smooth transition. There have been significant developments towards furthering public participation in Ireland in recent months. The Programme for a Partnership Government 2016 included a commitment to the National Dialogue on Climate Action.

The primary goal of the National Dialogue on Climate Action is to ensure an inclusive process of engagement and consensus building across society towards enabling the transformation to a low-carbon and climate-resilient future. The National Dialogue on Climate Action was also included in the National Mitigation Plan published in July 2017.

The Citizens' Assembly was tasked with considering "How the State can make Ireland a leader in tackling climate change" and discussed this topic at meetings in September and November 2017. The Assembly vote indicated overwhelming support in Ireland to take a leadership role in addressing climate change. It made a number of recommendations as to how this might be achieved, including retrofitting public buildings, phasing out subsidies for peat extraction and increasing community ownership in renewable energy projects. Their conclusions will form the basis of a report that will be submitted to the Houses of the Oireachtas for further debate.

In 2015, the EPA provided funding for nine climate leaders in Ireland to undertake climate communications training under the Climate Reality Project³⁵ to improve climate change awareness in their local communities. Building on this capacity, the EPA, with the Cool Planet Experience, initiated the Climate Ambassadors programme and is recruiting up to 26 members of the public to become climate advocates in their local areas and counties.

A complementary programme for climate ambassadors in schools and colleges was launched by An Taisce in 2017 with support from the Department of Communication, Climate Action and Environment to train and support individuals taking action on climate issues and to help them lead action at a local level.

Community activity on energy and climate change has increased significantly in recent years. SEAI administers the Better Energy Communities scheme, which aims to encourage community-based partnerships to improve the thermal and electrical efficiency of the building stock, including energy-poor homes and facilities in both the public and private sectors, for domestic and non-domestic buildings. The programme received a 50% increase in funding in 2017, reaching €30 million. The scheme has supported 300 community energy-efficiency projects over the last five years. Understanding the breadth of community activities would be useful to inform future engagement. Synergies with rural development programmes, such as LEADER (links between actions for the development of the rural economy), and urban renewal initiatives should be explored.

Further actions to support public participation in reducing carbon-intensive consumption practices in other areas of everyday life are needed. This includes giving attention to opportunities and challenges in creating a modal shift to low-carbon transport modes and improving food purchasing and consumption practices to reduce food waste. It will be important to work with consumers to identify and communicate the carbon intensity of food that is purchased and consumed.

5.3 Institutions and Governance

The Minister for Communications, Climate Action and Environment, Denis Naughten gave the first Annual Transition Statement to Seanad Éireann on 7 December 2016 and to Dáil Éireann on 8 December 2016. The statement acknowledged that Ireland would not achieve its 2020 emission reduction target set in the 2009 EU Effort Sharing Decision.

The first National Mitigation Plan under the Climate Action and Low Carbon Development Act 2015 was published on 17 July 2017. A strategic environmental assessment was carried out as part of its development. The National Mitigation Plan identified actions that could assist governance and co-ordination of transition. Potentially significant actions include:

- ▲ developing proposals to establish regional climate action offices to co-ordinate local authority responses to climate change;
- ▲ ensuring that climate considerations are fully addressed in the new National Planning Framework;
- ▲ an annual report from the National Climate Research Coordination Group;
- ▲ the Technical Research and Modelling Group (TRAM) to support ongoing development and implementation of the National Mitigation Plan.

The National Mitigation Plan also includes a commitment to establish a National Mitigation Plan High Level Steering Group to drive implementation of the plan. It is essential that this group be established, be led at a senior level and have involvement from a range of stakeholders, including the Department of Finance and the Department of Public Expenditure and Reform.

5.4 Climate Justice

The distributional effects in Ireland of climate action and the transition to a low-carbon, climate-resilient and environmentally sustainable economy by the end of 2050 need to be assessed. As one of the richest countries in the world, Ireland has an obligation not only to ensure climate justice within Ireland but also to support low-income countries in their response to climate change. Climate finance is the main vehicle for delivery of such support and Ireland has signed up for international commitments in this regard. The Council has not yet focused on these issues but will come back to them in future publications.

5.5 Indicators of Transition

In its proposals for an Energy Union Governance regulation, the European Commission identifies the carbon dioxide and greenhouse gas intensity of gross domestic product (GDP) as an indicator of transition.³⁶ These indicators are included in Table 5.1, but on their own they present an

incomplete picture. To assess progress in transition, it is important to understand whether practices and technology deployment are changing or whether we are experiencing continued lock-in of high-carbon technologies and practices. Table 5.1 presents one perspective on the state of transition across the sectors in Ireland. This is not an exhaustive list of indicators. Other indicators can also be informative. This will be an area of further consideration for the Council.

Measuring progress in transition represents a movement away from historical comparisons of emissions against previous performance. Incremental improvements may no longer be enough. Instead, assessing progress in transition means comparing where we are with where we need to be. Unfortunately, our desired endpoint is not always clear. For example, it is clear that, in the long term, petrol and diesel cars in the private car fleet need to be phased out. Similarly, we know that electricity generation needs to decarbonise and that energy coming from coal and peat needs to be phased out rapidly. However, while we may expect that the distance travelled by private vehicle per capita should decrease, with an increase in public transport, cycling and walking, it is not clear how the indicator might reflect decarbonisation where the vehicle stock transitions to a low- or zero-emissions or autonomous fleet. These uncertainties point to the need for a broader basket of indicators to be employed in measuring a low-carbon transition that will cut across all sections of our economy and society.

Table 5.1: Possible indicators of transition across sectors (see Appendix 2 for data sources)

Name	2010	2014	2015	Unit
GHG intensity/GDP	0.37	0.30	0.23	kt CO ₂ e/€M GDP
GHG intensity/GNP	0.44	0.35	0.30	kt CO ₂ e/€M GNP
GHG intensity/GNI*	0.47	0.37	0.35	kt CO ₂ e/€M GNI*
CO ₂ intensity	0.23	0.19	0.16	kt CO ₂ /€M GDP
CO ₂ per capita	9.14	7.95	8.28	t CO ₂ /population
GHG per capita	13.54	12.53	12.92	t CO ₂ e/population
Economy-wide efficiency	€2,551	€3,061	€3,788	GVA/t CO ₂ e €/t CO ₂ e
Total primary energy requirement	171,042	153,970	161,529	Megawatt hour (MWh)
Emissions from peat and coal	8,289	8,505	9,200	kt CO ₂
CO ₂ intensity of electricity	529	456	468	g CO ₂ /kilowatt hour (kWh)
% renewable of gross electricity consumption	14.6	22.9	25.3	%
% renewable heat	4.5	6.6	6.5	%
% residential energy from solid fuel (peat and coal)	15.5	16.5	15.2	%
A and B Building Energy Rating (BER)-rated residential "dwellings"	--	--	13.5	% of BER data set
A and B BER-rated commercial buildings	--	--	13.3	% of non-dwelling BER data set, excluding public and health
Energy efficiency gains in public bodies	--	--	21.0	% improvement from business as usual
Energy consumption of public bodies	--	--	9,343	Gigawatt hours (GWh)
% renewable transport	2.4	3.1	3.3	%
Distance by private vehicles	31,734	31,457	34,609	million km
Distance by private vehicles per capita	6,967	6,824	7,466	km
Distance by goods vehicles	6,870	6,999	7,290	million km
Distance by public service vehicles	1,242	1,242	1,287	million km
Private car new vehicles' fuel type	81,122 (95.5%)	91,157 (98.7%)	119,066 (98.3%)	number of new petrol and diesel vehicles (as % of all new)
New goods vehicles' fuel type	10,490 (99.8%)	16,243 (99.9%)	22,926 (99.9%)	number of new petrol and diesel vehicles (as % of all new)
Forestry cover	731,576	754,565	760,270	hectares
Total area of drained organic soils	798,389	807,402	808,963	hectares
Farming efficiency	€93	€116	€122	GVA/t CO ₂ e €/t CO ₂ e

GHG = greenhouse gas; GVA = Gross Value Added;
GDP = Gross Domestic Product, GNP = Gross National Product and GNI* = modified Gross National Income, all at current market prices.

5.6 Advice and Recommendations

Actions under the National Mitigation Plan need to be prioritised to allow for urgent implementation of the most effective actions. Actions under the plan also need to be linked to expected outcomes and results in terms of emission reduction or transition. This will assist prioritisation of actions and monitoring of implementation.

Ireland is still over-reliant on solid fossil fuels, which have significant implications for both greenhouse gas emissions and air quality, with associated impacts on health. A clear medium-term strategy for phasing out peat and coal in both the electricity and residential sectors is required. The EU Emissions Trading Scheme plays an important role in the electricity sector. However, other instruments should be examined and explored, including the introduction of a carbon floor price in the EU Emissions Trading Scheme sector and changes in the Public Service Obligation. The subsidy for peat should be ended as soon as the current Public Service Obligation agreement expires.

Statistics for residential solid fuel use are inconsistent. Further research is required to resolve inconsistencies and better estimate solid fuel (coal, peat and wood) in Ireland.

Addressing emissions from transport can bring benefits for both air quality and human health, as well as reducing congestion. Future investments, in particular in public transport fleets, need to avoid fossil fuel lock-in. An assessment of the adequacy of the current electric vehicle charging network should be undertaken. A more ambitious approach, capitalising on recent technology and market developments, should be taken to move Ireland to a sustainable path to decarbonisation in the transport sector by 2050.

Progress in improving the greenhouse gas efficiency of food production has not resulted in a reduction in absolute emissions. The agriculture and land sector must adopt all reasonable cost-effective measures to reduce emissions and enhance removals within the sector. With respect to land, there remains a need to define what is meant by carbon neutrality. In addition, it is important to establish appropriate measurement and monitoring systems to demonstrate progress towards carbon neutrality.

To achieve transition, systemic changes – including changes in decision-making, changes in infrastructure and changes in practices – as well as efforts to achieve emissions reductions in the short term need to be specifically addressed. The National Mitigation Plan commitment to review the Public Expenditure Code could be a significant element in supporting transition. Other systemic approaches should be explored.

The National Dialogue on Climate Action could seek to improve active public engagement and participation in planning responses to climate change mitigation and adaptation across the country, building on the momentum of the Citizens' Assembly. A starting point could be to develop an inventory of already existing community initiatives that are contributing to the transition to a decarbonised Ireland.

6. Achieving the National Transition Objective in a Cost-effective Manner

Key Messages

- ▲ The Council intends to monitor the cost-effectiveness of implementation of the National Mitigation Plan and achievement of transition.
- ▲ As it is too early to review implementation of the recently published National Mitigation Plan, the Council presents principles it will employ to review cost-effectiveness in future Annual Reviews.
- ▲ The Council also offers advice on key strategies to achieve cost-effectiveness.
- ▲ The marginal abatement cost curve for Ireland should be updated and the alignment of financial, fiscal, policy and regulatory frameworks in Ireland with climate objectives should be assessed.
- ▲ Valuation of key co-benefits should be included in cost-benefit analyses. Ex-post assessments and monitoring are crucial to measure effectiveness.
- ▲ Policy conflicts, such as continuing fossil fuel subsidies while pursuing climate action, should be avoided.
- ▲ Innovation should be incentivised across the private and public sectors to develop climate solutions.

The Council is mandated as part of the Annual Review to offer recommendations on the most cost-effective manner of achieving reductions in greenhouse gas emissions in order to enable the achievement of the national transition objective. The Council intends to annually review the cost-effectiveness of implementation of the National Mitigation Plan and other policies with impacts on greenhouse gas emissions. From an economic perspective, the less reductions in greenhouse gas emissions cost, the less negative impact there is on the economy and the public finances. From a climate policy point of view, the cheaper it is to reduce emissions, the more we can achieve. Unfortunately, the National Mitigation Plan did not contain sufficient information or data on the costs and effectiveness of existing and potential measures to enable a robust assessment of its cost-effectiveness. Moreover, it is too early to assess the cost-effectiveness of implementation of the National Mitigation Plan. This chapter therefore presents some principles and approaches that the Council will employ to assess the cost-effectiveness of climate action. Recommendations are made regarding actions that can be taken in the short term to enhance cost-effectiveness.

6.1 Assessing a Cost-effective Approach

6.1.1 Monitor Impact and Effectiveness of Measures

In order to pursue the most cost-effective measures to reduce greenhouse gas emissions, it is crucial to understand the performance of existing measures. The Public Spending Code requires that the cost-benefit analysis methodology be used for *ex ante* comparison and

evaluation of different policies and measures. Few data exist on the measured performance of existing measures. However, government departments and agencies are increasingly building mechanisms for the monitoring of impacts and outcomes into the design of policies and measures. This practice needs to be supported and extended. Any resulting data need to be made publicly available. This will assist research and analysis by stakeholders. In future Annual Reviews, the Council will base its advice for cost-effective approaches on an evidence-based understanding of the performance of existing measures.

6.1.2 Marginal Abatement Cost Curve

The Periodic Review Report 2017 described how setting a “target-consistent” carbon price requires knowledge of the marginal abatement cost curve. The marginal abatement cost curve also has a role in informing the prioritisation of policies and measures by showing the relative cost-effectiveness of different options. It is important to recognise that the marginal abatement cost curve should not be used in isolation to prioritise measures or to decide on the extent of support required for individual measures. The marginal abatement cost does not reflect the cost-effectiveness of measures in achieving the long-term goal for which inter-temporal dynamics may be important.³⁷ Prioritisation and policy support also need to be informed by understanding of transaction costs, co-benefits and trade-offs of the policies and measures. Nevertheless, the marginal abatement cost curve captures useful information on policies and measures. The Council will employ the latest knowledge on the marginal abatement cost curve to inform advice and recommendations on the most cost-effective manner to reduce emissions in Ireland. In 2009, SEAI published a marginal abatement cost curve for Ireland developed together with McKinsey & Co.³⁸ The analysis was described as a “work in progress”. In 2012, Teagasc published a marginal abatement cost curve for the agriculture sector.³⁹ A revision of this sectoral analysis is promised. There have been no further updates to the marginal abatement cost curve for Ireland.

6.1.3 Pursue Co-benefits to Increase Effectiveness

The Council noted in a submission to the Department of Communications, Climate Action and Environment that maximising synergies between climate and clean air policy increases their cost-effectiveness.⁴⁰ The Council highlighted that the inclusion of the cost of health impacts from air pollution in official cost-benefit analysis of policies and measures would assist in advancing achievement of climate and air quality objectives. There are other policy objectives where synergies may be achieved with climate action, for example decreasing congestion, promoting active modes of transport and reducing nitrate pollution. Following the advice of the Council, the National Mitigation Plan includes an action for the Department of Public Expenditure and Reform to undertake a review of guidance on public expenditure appraisal and evaluation to ensure their suitability to capturing key costs and benefits of climate measures. In assessing the most cost-effective manner to achieve reductions in greenhouse gas emissions, the Council considers co-benefits to be important factors. Valuation or monetisation of co-benefits can be difficult, but estimates exist and should inform policy. In addition to European and international accepted standards, Irish research has developed values for co-benefits or damages of air pollutants for regions in Ireland.^{41, 42}

6.1.4 Integrate Behavioural and Societal Responses in Design of Policies and Measures

Behavioural and societal responses to policies and measures can significantly affect their cost and effectiveness. If behavioural factors are incorporated into the design and implementation of measures, then the chance of optimal impacts is greatly increased. The Periodic Review Report

2017 found that “the complex barriers to societal and behaviour changes will need to be identified and addressed in a positive and constructive manner in conjunction with relevant societal groups, so that public engagement is enhanced and high uptake or positive response to measures is achieved.”⁴³ In future Annual Reviews, in developing its advice and recommendations on cost-effective approaches to achieving emissions reduction, the Council will consider whether or not behavioural and societal dimensions are being adequately addressed.

6.1.5 Avoid Contradictory or Conflicting Policy

In the context of limited government resources, governments can ill afford to direct funds towards activities and initiatives that are not fully aligned with government policy. Continued support and provision of subsidies for fossil fuels reduces the impact and effectiveness of climate change mitigation efforts. The economic and social aims driving fossil fuel subsidies could be achieved using alternative tools. In 2015, the Organisation for Economic Cooperation and Development (OECD) identified a number of opportunities to improve policy alignment to enhance the climate response. It found that “Core climate policies are essential, and yet not in themselves sufficient to effectively tackle climate change, if our policy and regulatory systems continue to be geared towards fossil fuels.”⁴⁴ As part of future Annual Reviews, the Council will monitor the impact of other policies and measures on the cost-effectiveness of government efforts to reduce greenhouse gas emissions towards the transition objective.

6.1.6 Enable and Encourage Innovative Responses

Climate policy should encourage, enable and incentivise climate action. Innovation should be encouraged by directing incentives towards the final desired outcome (reduced emissions or low-carbon transition) rather than a specific technology or practice. Both the private sector and communities can develop innovative approaches that achieve cost-effectiveness. Ireland’s performance in the green economy sector is better than is perceived publicly,⁴⁵ with the cleantech and green economy not fully valued or appreciated as a resource and opportunity.

Support for research and development as well as long-term carbon price signals will continue to be important. In addition to supporting technical innovation, support for communities will be important to encourage social innovation towards the national transition objective. In developing advice and recommendations on the most cost-effective manner of achieving reductions in greenhouse gas emissions, the Council will look for opportunities for better engagement of the private and community sectors.

6.1.7 Make Best Use of Available Resources

It is crucial that best use be made of scarce government resources, as in any economy the cost of public funds is high. The annual budgetary process represents a key opportunity to support climate action and to consider the broader impacts of government fiscal policy on greenhouse gas emissions, climate resilience and the low-carbon transformation. Other sources of funding should also be explored. The EU Emissions Trading Scheme Directive provides that at least 50% of the revenues generated from the auctioning of allowances (or the equivalent in financial value of these revenues) should be used to support the achievement of specific climate and energy activities. European research programmes can be an important source of support to advance domestic research objectives. The private sector might also be encouraged, through hard or soft measures such as climate risk disclosure, to devote resources to climate action. For example, a total of 202 companies and organisations, headquartered or operating in Ireland, participated

in the Carbon Disclosure Project in 2016, an increase of 16% on 2015. The Carbon Disclosure Project is a global initiative, engaging with over 5,800 companies and representing 60% of global market capitalisation. It looks at ways in which enterprises assess a range of climate risks and impacts and how these are addressed, including actions to reduce greenhouse gas emissions. The initiative is supported in Ireland by the EPA and SEAI.

6.2 Advice and Recommendations

The Council recommends that the government systematically monitor and report annually on the costs and impacts of planned and implemented policies, measures and actions included in the National Mitigation Plan.

Policy should be flexible in responding to lessons learned from implementation of existing policies and measures, so that gaps and imbalances can be addressed, unsuccessful policies curtailed, and successful policies and measures scaled up. In some cases, success can indicate a need to scale back government intervention to avoid crowding out or over-paying for private sector action.

Measures with significant environmental impacts should be included in a cross-sectoral assessment of the climate and environmental impact of the budget. Such analysis would increase transparency and support better decision-making in line with the National Policy Position on climate change.

A cross-sectoral update of the marginal abatement cost curve for Ireland should be undertaken urgently, and published and updated on a regular basis to ensure that changes in current costs and emerging technologies are included in the analysis.

The cost of health impacts from air pollution should be included in official cost-benefit analysis of such policies and measures, and encourages the consideration of all significant wider costs and benefits in identification, development and prioritisation of policies and measures to address climate change.

Societal and behavioural factors should be considered at the design stage of policy, to increase the impact and effectiveness of policies, measures and actions to reduce greenhouse gas emissions.

The alignment of financial, fiscal, policy and regulatory frameworks in Ireland with climate objectives should be assessed.

The government should make use of the innovative power of the private sector and communities by offering appropriate incentives, support and encouragement. This should happen across all sectors, including farms, small, medium and large enterprises, and industries.

7. Special Focus: European Union Climate Policy

Key Messages

- ▲ European Climate Policy is important in terms of providing global leadership in addressing climate change.
- ▲ Ireland has agreed to targets for emissions reduction and addressing climate change, which contribute to the EU's overall ambition.
- ▲ It is critical that Ireland engage fully and constructively with the development of EU policy.

In this first Annual Review, it is useful to provide an overview of recent developments in EU climate policy. Climate policy is a shared competency between the EU and Member States. This means that the EU has a role in setting climate policy in addition to Member States' setting their own domestic policies. EU directives, regulations and policies have a large impact on the climate ambitions and activities of Member States.

The importance of climate change is reflected in the structures of the EU Commission through the establishment of the Directorate-General for Climate Action (DG CLIMA) in 2010. DG CLIMA is responsible for EU policy on climate action and it leads international climate negotiations for the EU. In addition, the EU Multi-annual Financial Framework is an increasingly important mechanism through which the EU provides supports to climate change actions.

EU climate change mitigation policy aims to put the EU on track towards a low-carbon economy and to reduce EU greenhouse gas emissions by between 80% and 95% by 2050. The EU is on track towards its 2020 climate targets⁴⁶ but to achieve the longer term goals of the EU for 2030 and 2050, new policies and a more fundamental change is needed in the way the EU produces and uses energy, goods and services.

The main EU policy in mitigation has been the Climate and Energy Package, for the period 2013 to 2020. The next iteration will cover the period 2021 to 2030, the Climate and Energy Framework, with new targets still in negotiation. In addition, the Commission's proposal for Governance of the Energy Union would see significant changes in the reporting and monitoring of progress in transition to 2030 and beyond.⁴⁷

The EU has implemented over 60 directives/regulations/decisions related directly to climate change, the F-gases and the protection of the ozone layer, under the following headings (the numbers of relevant directives/regulations/decisions are added in brackets):

- ▲ Greenhouse Gas Monitoring and Reporting (7)
- ▲ EU Emissions Trading System (Scheme) (25)
- ▲ Effort Sharing Decision/Regulation (2)
- ▲ Carbon Capture and Storage (2)
- ▲ Transport/Fuels (7)
- ▲ Ozone Layer Protection (5)
- ▲ Fluorinated Gases (11)
- ▲ Forests and Agriculture (1).

Although important for climate change, initiatives related to ozone and F-gases are not relevant to the national transition objective and will not be elaborated on in this discussion. The EU championed the inclusion of these gases under the amended provisions of the Montreal Protocol as agreed in Kigali in 2016.

7.1 Greenhouse Gas Monitoring and Reporting

Progress of Member States is assessed through the Monitoring Mechanism Regulation. The Monitoring Mechanism Regulation goes beyond simple reporting of emissions. It includes an obligation to produce regular projections of emissions, based on analysis of the performance of existing and proposed new measures within each Member State.

It requires monitoring and reporting on the actions taken by Member States to adapt to the inevitable consequences of climate change in a cost-effective manner. This is important, as adaptation actions themselves are often within the scope of other policy instruments, including the Common Agricultural Policy, Habitat Directive, Water Framework Directive, Strategic Environmental Assessment Directive and Environmental Impact Assessment Directive. The Commission's proposals for Governance of the Energy Union would incorporate the provisions of the Monitoring Mechanism Regulation.

7.2 Governance of the Energy Union

On 30 November 2016, the Commission proposed a regulation on the Governance of the Energy Union.⁴⁷ The goals of the proposed regulation are:

- ▲ to ensure that the objectives of the Energy Union, especially the EU's 2030 energy and climate targets, are achieved, by making sure that national objectives and policies are coherent with EU goals;
- ▲ to promote long-term certainty and predictability for investors;
- ▲ to reduce administrative burdens, in line with the principle of better regulation, through integrating and streamlining current energy and climate planning and reporting requirements of EU countries as well as the Commission's monitoring obligations;
- ▲ to incorporate the provisions of the existing Climate Monitoring Mechanism Regulation and harmonise them with the provisions of the Paris Climate Agreement.

7.2.1 Integrated National Energy and Climate Plans

Under the proposed new rules, EU countries will be required:

- ▲ to develop Integrated National Energy and Climate Plans for the period 2021 to 2030 (and every subsequent 10-year period) based on a common template;
- ▲ to provide regular reporting of progress made in implementation of the integrated plans.

The provision for ongoing development of integrated plans on a 10-year cycle is an important proposal, as it provides certainty in the EU commitment to the long-term objective. This is a strong signal to public and private investors and other stakeholders.

7.3 European Union Climate and Energy Package and Framework

In the run up to the 2009 Copenhagen Conference of Parties to the UNFCCC, the EU adopted a position that it would reduce its greenhouse gas emissions by 20% by 2020, relative to 1990 levels, and increase this commitment up to a potential 30% reduction in the event of a successful outcome in Copenhagen. As the Copenhagen Conference of Parties did not deliver a major global treaty, this step-up was not implemented and the 20% reduction target remained in place. As part of this process, in 2008, Ireland agreed to the EU Climate and Energy Package. This was adopted in 2009 through four directives:

- ▲ the Emissions Trading System Directive,⁴⁸ (also known as the Emissions Trading Scheme) which regulates the single EU-wide cap for the third Emissions Trading Scheme allocation period 2013 to 2020;
- ▲ the Effort Sharing Decision,⁴⁹ which set national reduction targets for sectors not covered by the Emissions Trading Scheme;
- ▲ the Renewable Energy Directive,⁵⁰ which set national targets[†] in electricity, heating and cooling and transport;
- ▲ the Carbon Capture and Storage Directive,⁵¹ which promotes the role of carbon capture and storage in reaching the EU's long-term emissions reduction goal.

In the run up to the 2015 Paris Conference of the Parties to the UNFCCC, the EU adopted the Climate and Energy Framework as part of its contribution to the Paris Agreement to reduce greenhouse gas emissions by 40% by 2030 relative to 1990 levels to be achieved through a reformed Emissions Trading System and an Effort Sharing Regulation.

7.3.1 Emissions Trading System (Scheme)

DG CLIMA implements the EU's Emissions Trading Scheme and promotes its links with other carbon trading systems, with the aim of building a global carbon trading market. Activities within the Emissions Trading Scheme accounted for 45% of total EU greenhouse gas emissions. Participating installations include large energy-intensive installations, including power generation, cement, lime and aluminium production and large companies in the food, drink and pharmaceutical sectors. Approximately 100 industrial and institutional sites in Ireland participate in the Emissions Trading Scheme. Under the regulation, revenues generated through emissions trading are to be used to fund mitigation and adaptation actions and research.

In 2015, Emissions Trading Scheme emissions were 24% below 2005 levels, and it is projected that the 2020 target of a 21% emission reduction, relative to 2005, will comfortably be achieved. The Emissions Trading Scheme now aims to reduce emissions to 43% by 2030. To achieve this, the overall number of emissions allowances will decline at an annual rate of 2.2% per annum from 2021, compared with the current rate of 1.74% per annum.

Proposals currently under negotiation include reform of the rules dealing with carbon leakage and allocation of free allowances for new and developing installations. The negotiation of the Emissions Trading Scheme is at "trilogue" stage, with the EU Presidency chairing discussions between the EU Commission, the EU Parliament and the EU Council to reach final agreement.

[†] The Renewable Energy Directive requires that Ireland's final energy consumption comprise 16% renewable energy by 2020. This is made up of 40% electricity supply, 12% heating and 10% transport.

This is expected to conclude by the end of 2017 or early 2018.

The Council has previously strongly recommended that reform of the EU Emissions Trading Scheme is needed to provide a sufficient price signal to investors to enable decarbonisation of the sector.

7.3.2 Effort Sharing Decision/Regulation and National Emissions

Policies to reduce greenhouse gas emissions from activities not covered under the Emissions Trading Scheme are the responsibility of Member States. Each Member State has agreed emissions reduction targets for 2020.

In October 2014, EU leaders set a binding economy-wide domestic emission reductions target of at least 40% by 2030, relative to 1990. They specified that sectors of the economy not covered by the EU Emissions Trading Scheme must reduce emissions by 30% by 2030, relative to 2005, as their contribution to the overall target. The proposed Effort Sharing Regulation will translate this commitment into binding annual greenhouse gas emission targets for each Member State for the period 2020 to 2030, based on the principles of fairness, cost-effectiveness and environmental integrity. Member State targets for 2030 under the Effort Sharing Regulation are currently under negotiation.

7.3.3 Land Use, Land Use-Change and Forestry and Agriculture

The role of land use and land management to mitigate greenhouse gas emissions is important in the context of the concept of “balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases”, introduced in Article 4.1 of the Paris Agreement.⁵²

Currently, the 2013 to 2020 Climate and Energy Package does not contain a mechanism for the land sector to contribute to Member State emissions reduction targets. The Land Use, Land Use-Change and Forestry Decision 2013⁵³ and the current negotiations on the Energy and Climate Framework 2021 to 2030 seek to provide a mechanism by which mitigation actions within the land use sector can contribute to Member State targets under the Effort Sharing Regulation.

Under the current proposal, Member States will be allowed to use carbon sequestration “credits” generated within selected land use categories to meet Effort Sharing Regulation targets. This flexible mechanism will be capped based on the relative importance of agriculture emissions in total Effort Sharing Regulation emissions. Under the current proposal, Ireland will have the relatively largest access to this flexible mechanism.

In a wider context, the Common Agricultural Policy is a core policy area of the EU and pursues the objectives of a fair standard of living for farmers and to provide a stable and safe food supply at affordable prices. It also seeks new development opportunities, such as sources of renewable energy.

The Common Agricultural Policy was most recently reformed in 2014 after the Irish Presidency of the Council of the EU agreed a number of significant changes, including the ending of the milk and sugar quotas. Climate action has become much more embedded in the priorities of the Common Agriculture Policy. For the first time, climate features as a priority; the sustainable management of natural resources and climate action is one of the three overarching objectives for the Common Agricultural Policy. The budget implications for the sector are substantial. A recent study⁵⁴ found that the achievement of a 20% emissions reduction in the agricultural

sector, without loss of production capacity, would cost €16 billion a year of subsidies on top of the existing payments. Achieving part of this emissions reduction through sequestration would reduce the budgetary cost.

7.4 Adaptation

The Seventh Environment Action Programme calls for decisive progress to be made in adapting to climate change to make Europe more climate resilient. In 2013, the European Commission adopted the communication “An EU Strategy on adaptation to climate change”,⁵⁵ which encourages all Member States to adopt comprehensive adaptation strategies; promotes action in cities (through the Covenant of Mayors for Climate and Energy); aims to mainstream adaptation into relevant EU policies and programmes; provides funding for adaptation actions; and enhances research and information sharing, for example through the European climate adaptation platform Climate-ADAPT.

The EU strategy on adaptation to climate change aims to make Europe more climate resilient. By taking a coherent approach and providing for improved co-ordination, it will enhance the preparedness and capacity at all governance levels to respond to the impacts of climate change.

In 2018, the Commission will present the evaluation of the EU Strategy and will propose a review, if necessary. The report will assess the progress made by Member States, including an adaptation preparedness scoreboard, the progress in mainstreaming at the EU level, and new knowledge and policy demands.

7.5 EU Multi-annual Financial Framework: the EU Budget

In its European Multi-annual Financial Framework (2014 to 2020), the EU Council agreed 20% of the EU budget, for the period 2014 to 2020, be earmarked to address climate change. This was to facilitate integration and represented a renewed focus on low-carbon energy, food security, climate resilience and adaptation, and development assistance.

Under the EU’s Common Agricultural Policy, at least 30% of the rural development funds should be used for climate-related projects. This aims to create real opportunities for investing in climate-smart agriculture.

In the EU’s regional cohesion policy, specific earmarking for energy efficiency of 20% in the most developed regions and 6% for the less developed regions as well as for sustainable urban development should ensure a strong focus on climate change action.

The research and innovation programme Horizon 2020 aims to award 35% of its €63 billion funding to address climate issues (over €22 billion). The Connecting Europe Facility infrastructure instrument will also be climate friendly and will be distributed mainly through transport infrastructure of €23 billion and energy infrastructure of €5 billion.

The LIFE programme (the EU’s Programme for the Environment and Climate Action) budget of over €3 billion includes a sub-programme for climate action with a budget of €760 million.

In its 2016 Special Report No 31, the European Court of Auditors examined progress towards meeting the 20% budget target.⁵⁶ Between 2014 and 2016, 17.6% of the EU budget supported climate action. It concluded that, although ambitious work was under way and progress was evident, there is a serious risk that the target will not be met. To achieve the target, overall funding

will have to increase to 22% in the remaining years of the programme. Notably, the Horizon 2020 research programme has only managed 24% funding to climate issues compared with its overall target of 35%. This suggests that Horizon 2020 will provide additional opportunities for climate-focused research.

7.6 The EU and International Climate Policy

The EU is a Party to the UNFCCC in its own right. The European Commission and the EU Member States agree a common position and this has enabled Member States to act collectively, with one voice, while ensuring that strategic national concerns are addressed. This has allowed the EU and the Member States to provide leadership in the global efforts to address climate change.

7.7 Advice and Recommendations

Engagement at EU level is very important to ensure that European policy developments are consistent with national objectives.

The development of proposals on governance of the Energy Union, the Emissions Trading Scheme, the Effort Sharing Regulation and the flexibilities with land use and land use-change and associated accounting rules are important to ensure consistency with the National Policy Position, especially with respect to neutrality within agriculture and land.

Research in Ireland should aim to maximise the opportunities arising from the Horizon 2020 programme and its strong focus on climate topics. Opportunities under other EU funding streams should also be pursued to support national activities.

8. Activities of the Council

As required under Section 12(f) of the Climate Action and Low Carbon Development Act 2015, the activities of the Council in 2016 are listed here.

Date	Purpose	Attendees
08/02/2016	Climate Change Advisory Council Meeting	Prof. John Fitzgerald (Chair), Prof. Alan Barrett (ESRI), Prof. Gerry Boyle (Teagasc), Laura Burke (EPA), Prof. Peter Clinch, Joseph Curtin, Prof. Anna Davies, Prof. Ottmar Edenhofer, Prof. Alan Matthews, William Walsh (SEAI)
		Climate Change Advisory Council Secretariat
		Consultations with: Department of the Environment, Community and Local Government, UCC, EnvEcon/UCD, ESRI, Department of Taoiseach, EPA
06/04/2016	Climate Change Advisory Council Meeting	Prof. John Fitzgerald (Chair), Prof. Alan Barrett (ESRI), Laura Burke (EPA), Prof. Peter Clinch, Prof. Frank Convery, Joseph Curtin, Prof. Anna Davies, Prof. Ottmar Edenhofer, Prof. Alan Matthews, William Walsh (ESRI). Observer: Dr. Frank O'Mara (Teagasc)
		Climate Change Advisory Council Secretariat
		Consultations with: EPA
02/06/2016	Climate Change Advisory Council Meeting	Prof. John FitzGerald (Chair), Laura Burke (EPA), Prof. Frank Convery, Joseph Curtin, Prof. Anna Davies, Prof. Ottmar Edenhofer, Jim Gannon (SEAI), Prof. Alan Matthews. Observer: Dr. Frank O'Mara, (Teagasc)
		Climate Change Advisory Council Secretariat
		Consultations with: Department of the Environment, Community and Local Government
20/06/2016	Climate Change Advisory Council Adaptation Committee Meeting	Prof. John FitzGerald (Chair); Laura Burke (EPA). Observer: Gary Lanigan, (Teagasc)
		Climate Change Advisory Council Secretariat
		Consultations with: CCMA, Department of the Environment, Community and Local Government, UK Adaptation Sub Committee, European Environment Agency, EPA, Clare County Council, Office of Public Works, Met Éireann, Marine Institute
19/07/2016	Climate Change Advisory Council – Agriculture Seminar	Prof. John FitzGerald (Chair), Laura Burke (EPA), Prof. Gerry Boyle (Teagasc), Prof. Alan Matthews
		Climate Change Advisory Council Secretariat
		Consultation with: Teagasc, EPA

Date	Purpose	Attendees
20/07/2016	Climate Change Advisory Council Meeting	Prof. John FitzGerald (Chair), Prof. Alan Barrett (ESRI), Prof. Gerry Boyle (Teagasc), Laura Burke (EPA), Joseph Curtin, Prof. Peter Clinch, Jim Gannon (SEAI), Prof. Alan Matthews
		Climate Change Advisory Council Secretariat
		Consultation with: Department of Communications, Climate Action and Environment
31/08/2016	Climate Change Advisory Council Meeting	Prof. John FitzGerald (Chair), Prof. Alan Barrett (ESRI), Prof. Gerry Boyle (Teagasc), Laura Burke (EPA), Joseph Curtin, Jim Gannon (SEAI), Prof. Ottmar Edenhofer, Prof. Alan Matthews
		Climate Change Advisory Council Secretariat
		Consultation with: EPA, SEAI
21/09/2016	Climate Change Advisory Council Adaptation Committee Meeting	Prof. John FitzGerald (Chair), Mark Adamson (OPW), Laura Burke (EPA), Prof. Robert Devoy (UCC), Jim Gannon (SEAI), Ciarán Hayes (CCMA), Dr. Ina Kelly (HSE), Eoin Moran (Met Éireann), Dr. Conor Murphy (Maynooth University), Roger Street (UKCIP)
		Climate Change Advisory Council Secretariat
		Consultation with: Department of Communications, Climate Action and Environment, Department of Transport Tourism and Sport, ESB Networks, ERI UCC, Irish Water
06/10/2016	Climate Change Advisory Council Meeting	Prof. John FitzGerald (Chair), Prof. Gerry Boyle (Teagasc), Laura Burke (EPA), Prof. Peter Clinch, Joseph Curtin, Prof. Anna Davies, Prof. Ottmar Edenhofer, Prof. Anna Davies
		Climate Change Advisory Council Secretariat
03/11/2016	Launch of First Report 2016	Prof. John FitzGerald, Jim Gannon (SEAI), Climate Change Advisory Council Secretariat
08/12/2016	Climate Change Advisory Council Meeting	Prof. John FitzGerald (Chair), Prof. Gerry Boyle (Teagasc), Laura Burke (EPA), Frank Convery, Joseph Curtin, Prof. Anna Davies, Prof. Alan Matthews
		Climate Change Advisory Council Secretariat
		Consultation with: Department of Communications, Climate Action and Environment, EPA

CCMA, County and City Management Association; ERI UCC, Environmental Research Institute University College Cork; ESRI, Economic and Social Research Institute; HSE, Health Service Executive; IMP, Integrated Modelling Project; OPW, Office of Public Works; UCD, University College Dublin; UKCIP, UK Climate Impacts Programme.

Activities of the Climate Change Advisory Council 2016			
Date	Organisation	Subject	Attendees
01/02/2016	Danish Council on Climate Change (Klimarådet)	Sharing experience	Prof. John FitzGerald, Dr. Frank McGovern, Prof. Alan Matthews
01/02/2016	Danish Economic Council	Discussion of their role on climate change policy	Prof. John FitzGerald
09/02/2016	Wexford Lions	Tackling climate change	Prof. John FitzGerald
23/02/2016	EPA	Tackling climate change, energy and climate change conference	Prof. John FitzGerald
24/02/2016	EPA	Launch of greenhouse gas inventories	Prof. John FitzGerald
02/03/2016	RIA Climate Change Committee	Discussion of task of Council and how RIA can help	Prof. John FitzGerald
31/03/2016	IIEA	Roundtable event: the socio-economics of the energy transition	Prof. John FitzGerald
07/04/2016	NESC	Introductory meeting	Climate Change Advisory Council Secretariat
13/04/2016	NUIG	"Moving to a low carbon Irish Economy" – Whitaker Institute Research Day	Prof. John FitzGerald
25–26/04/2016	UK Committee on Climate Change	Implementing the Paris Agreement and sharing best practice	Prof. John FitzGerald, Joseph Curtin, Council Secretariat
03/05/2016	Department of the Environment, Community and Local Government	Briefing session on Danish climate policy plan and TRAM	Climate Change Advisory Council Secretariat
19/05/2016	UCD	UCD Energy Institute industry panel discussion	Prof. John FitzGerald
15/06/2016	Department of the Environment, Community and Local Government	Sectoral adaptation steering committee	Climate Change Advisory Council Secretariat
22/06/2016	Department of the Environment	Introductory meeting	Prof. John FitzGerald, Climate Change Advisory Council Secretariat
29/06/2016	SEAI	Introduction meeting	Climate Change Advisory Council Secretariat
21/07/2016	National Offshore Wind Association of Ireland	Introductory meeting	Prof. John FitzGerald
26/07/2016	Electricity Association of Ireland	Introductory meeting	Prof. John FitzGerald

Activities of the Climate Change Advisory Council 2016			
Date	Organisation	Subject	Attendees
22/09/2016	EPA/bmf Business Services	Presenting: "A strategy for meeting Ireland's climate change challenge" at Environment Ireland Conference	Prof. John FitzGerald
28/09/2016	Department of Communications, Climate Action and Environment	Meeting with Mark Griffin, Secretary General, Department of Communications, Climate Action and Environment	Prof. John FitzGerald, Climate Change Advisory Council Secretariat
28/09/2016	IBEC	Meeting with IBEC Energy Policy Committee	Prof. John FitzGerald
10–12/11/2016	UCD School of Philosophy and Dublin Institute for Advanced Studies	Climate science, disagreement, and policy: a multidisciplinary investigation – "explaining the importance of halting climate change"	Prof. John FitzGerald
06/12/2016	EPA	2016 modelling workshop	Climate Change Advisory Council Secretariat

IIEA, Institute of International and European Affairs; NESC, National Economic and Social Council; NUIG, National University of Ireland Galway; RIA, Royal Irish Academy; TRAM, Technical Research And Modelling group; UCD, University College Dublin.

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Appendix 1 Legislation on Annual Review Report

Annual Review by, and annual report of, Advisory Council

12. (1) *The Advisory Council shall—*

(a) conduct a review (in this section referred to as the “annual review”) in each year of the progress made during the immediately preceding year in achieving greenhouse gas emissions reductions, and furthering transition to a low carbon, climate resilient and environmentally sustainable economy, and

(b) not later than 30 days after the completion of the annual review, prepare and submit to the Minister a report (in this section referred to as the “annual report”) on its findings and recommendations consequent upon that annual review.

(2) *Without prejudice to the generality of subsection (1), the annual report shall contain—*

(a) a summary of the findings set out in the most recent national greenhouse gas emissions inventory prepared by the Agency,

(b) a summary of the most recent projection of future greenhouse gas emissions prepared by the Agency,

(c) such recommendations, as the Advisory Council considers necessary or appropriate, in relation to the most cost-effective manner of achieving reductions in greenhouse gas emissions in order to enable the achievement of the national transition objective,

(d) such recommendations as the Advisory Council considers necessary or appropriate, in relation to compliance with an existing obligation of the State under the law of the European Union or an international agreement referred to in section 2,

(e) such other recommendations or advice as the Advisory Council considers necessary or appropriate in order to enable the achievement of the national transition objective, and

(f) a summary of—

(i) the activities of the Advisory Council under section 11 (2), and

(ii) any information gathered in accordance with section 11 (2).

(3) *Not more than 30 days after submitting an annual report to the Minister under this section, the Advisory Council shall publish the annual report by such means as the Agency may advise.*

Appendix 2 Data Sources for Transition Indicators

Reference material for Transition Indicators presented in Chapter 5, Table 5.1.

Name	Unit	Sources
GHG intensity (GDP)	kt CO ₂ e/€M GDP	EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online), Department of Finance (2017) Budgetary Statistics 2016
GHG intensity (GNP)	kt CO ₂ e/€M GNP	EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online), Department of Finance (2017) Budgetary Statistics 2016
GHG intensity (GNI*)	kt CO ₂ e/€M GNI*	CSO (2017) Table N1624: Annex 1. Modified Gross National Income at Current Market Prices by Item and Year, EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online), Department of Finance (2017) Budgetary Statistics 2016
CO ₂ intensity	kt CO ₂ /€M GDP	EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online), Department of Finance (2017) Budgetary Statistics 2016
CO ₂ per capita	t CO ₂ /population	CSO (2017) Table PEA01: Population Estimates (Persons in April) by Age Group, Sex and Year, EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online)
Per capita GHG	t CO ₂ e/population	CSO (2017) Table PEA01: Population Estimates (Persons in April) by Age Group, Sex and Year, EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online)
Economy-wide efficiency	GVA/ t CO ₂ e €/t CO ₂ e	CSO (2017) Table T06 National Accounts at Constant Prices, EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online)
Total primary energy requirement	Megawatt hour	SEAI (2016) Ireland's Energy Balance 2016 (online) http://www.seai.ie/resources/publications/Energy-in-Ireland-1990-2015.pdf [Accessed 15 November 2017]
Emissions from coal and peat	kt CO ₂	SEAI (2016) Ireland's Energy Balance 2016, EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online)
CO ₂ Intensity of Electricity	g CO ₂ /kilowatt hour	SEAI (2016) Ireland's Energy Balance 2016, EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online)
% renewable of gross electricity consumption	%	SEAI (2016) Energy In Ireland Report 1990–2015; Table 9
% renewable heat	%	SEAI (2016) Energy In Ireland Report 1990–2015; Table 9
% residential energy from solid fuel (coal and peat)	%	SEAI (2016) Ireland's Energy Balance 2016
A and B BER-rated residential "dwellings"	%	SEAI (2017) BER Research Tool, Online (accessed 7 June 2017)

Name	Unit	Sources
A and B BER-rated commercial buildings	%	CSO (2017) Non-Domestic Buildings Energy Ratings Q1 2017, Online, CSO statistical release 21 April 2017, SEAI (2017) SEAI Reporting "Energy Performance of Buildings Directive (EPBD)" (online; last updated 31 May 2017) https://www.seai.ie/resources/publications/Non_domestic_BER_statistics.pdf
Energy efficiency gains in public bodies	% improvement from business as usual	SEAI (2016) Annual Report 2016 on Public Sector Energy Efficiency Performance; http://www.seai.ie/Publications/Your_Business_Publications/Public_Sector/Annual-Report-2016-on-Public-Sector-Energy-Efficiency-Performance.pdf
Energy consumption of public bodies	Gigawatt hour	SEAI (2016) Annual Report 2016 on Public Sector Energy Efficiency Performance; http://www.seai.ie/Publications/Your_Business_Publications/Public_Sector/Annual-Report-2016-on-Public-Sector-Energy-Efficiency-Performance.pdf
% renewable transport	%	SEAI (2016) Energy In Ireland Report 1990–2015; Table 12
Distance by private vehicles	million km	CSO (2017) Road Traffic Volumes by Type of Vehicle, Year and Statistic, Table THA10 (online)
Distance by private vehicles per capita	km	CSO (2017) Road Traffic Volumes by Type of Vehicle, Year and Statistic, Table THA10 (online), CSO (2017) Population Estimates (Persons in April) by Age Group, Sex and Year; Table PEA01 (online)
Distance by goods vehicles	million km	SEAI (2016) Energy In Ireland Report 1990–2015; Table 12
Distance by PSVs	million km	SEAI (2016) Energy In Ireland Report 1990–2015; Table 12
Private car new vehicles' fuel type	Number of new petrol and diesel vehicles	CSO (2017) New Vehicles Licensed for the First Time by Type of Vehicle Registration, Type of Fuel and Year, Table TEA03; CSO (2017) Road Traffic Volumes by Type of Vehicle, Year and Statistic, Table THA10 (online).
	Number of new petrol and diesel vehicles	
New goods vehicles' fuel type	Number of new petrol and diesel vehicles	CSO (2017) New Vehicles Licensed for the First Time by Type of Vehicle Registration, Type of Fuel and Year, Table TEA03, CSO (2017), Road Traffic Volumes by Type of Vehicle, Year and Statistic, Table THA10 (online)
	Number of new petrol and diesel vehicles	
Forestry cover	hectares	EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online)
Total area of drained organic soils	hectares	EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online)
GHG intensity of farming	GVA/ t CO ₂ e €/t CO ₂ e	CSO (2017) Table T04, Gross Value Added at Constant Basic Prices by Sector, EPA (2017) National Inventory Report and Common Reporting Format, Ireland Submission to the UNFCCC (online)

GHG = greenhouse gas; GVA = Gross Value Added;
GDP = Gross Domestic Product, GNP = Gross National Product and
GNI* = modified Gross National Income, all at current market prices



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