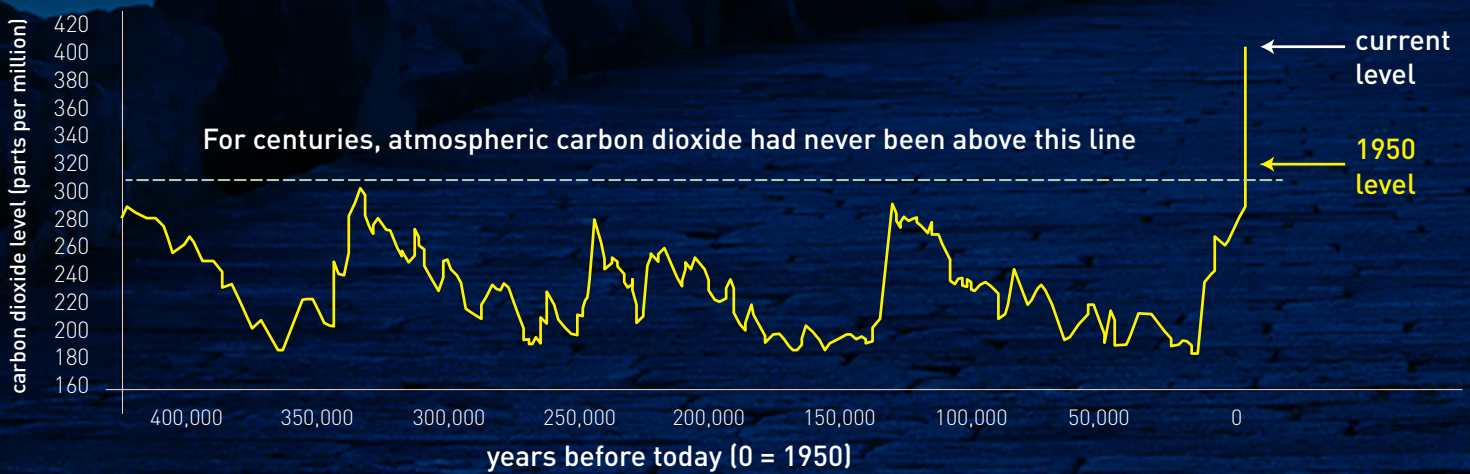


CLIMATE  
CHANGE  
ADVISORY  
COUNCIL



First Report





# FIRST REPORT

November 2016

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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 the 18th January 2016 under the Climate Action and Low Carbon Development Act 2015.

### **Climate Change Advisory Council Members:**

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Prof. Alan Barrett

Prof. Gerry Boyle

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## Climate Change Advisory Council – Adaptation Committee

At its meeting on the 6th April 2016, the Climate Change Advisory Council established an Adaptation Committee to consider matters relating to climate change adaptation.

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## Executive summary

The Climate Change Advisory Council was established under the 2015 Climate Action and Low Carbon Development Act. The task of the Council is to review national climate policy and advise the government on how Ireland can best move to a low carbon, climate resilient and environmentally sustainable economy by 2050. The Council does not make policy: that is the role of government.

The Council will advise on the development of both the National Mitigation Plan and the National Adaptation Framework. However, in this First Report we focus on key issues that should underpin the forthcoming National Mitigation Plan.

The Council recognises the compelling messages on climate change from science and welcomes the fact that these are reflected in the Paris Agreement, the EU Climate and Energy Package and the National Policy Position.

The task we face is to ensure that, by the middle of this century, Ireland should have no further negative influence on the Earth's climate system. This challenge of moving to a carbon neutral economy and society must be met while simultaneously adapting to the adverse impacts of climate change.

The transformation required in the Irish economy and society to meet this objective represents a different and more difficult task than any other area of public policy. The costs of inaction will fall much more heavily on future generations. The current generation in Ireland, and elsewhere, will have to be leaders in transforming the economy and society to halt the rise in global temperature, the most well-known measure of climate change.

The National Mitigation Plan should provide a roadmap to achieve the National 2050 mitigation objective and, in doing so, identify policies and measures to meet intermediate targets agreed at EU level for 2020 and 2030. It should establish the required stable policy framework at sectoral level needed to achieve the 2050 objective in a cost-effective manner. This framework should take account of other important environmental goals and it should support economic and social development.

The Council emphasises that meeting emissions targets to 2020 and 2030 is intrinsically linked to the overall 2050 transition and these should be considered together when analysing the overall costs of actions or of delaying actions.

**Meeting 2020 targets and sectoral issues:** The Council is concerned that official projections of greenhouse gas emissions indicate that Ireland will not meet its 2020 emissions targets. This will represent a significant deviation from the necessary path to decarbonising the economy by 2050. There is an urgent need to enhance implementation of existing policies and measures and to identify additional policies and measures to return the economy to a path towards sustainability.

## **1. Cross-cutting issues for mitigation**

### **1.1. Pricing carbon emissions**

The Council emphasises the importance of an effective price signal for carbon emissions. The Council is concerned that the EU Emissions Trading Scheme has, to date, failed to deliver the price signal that is essential to advance decarbonisation of the electricity sector in Ireland and across Europe. The recent increase in the carbon intensity of electricity generation in Ireland reflects the defective nature of the current EU Emissions Trading Scheme. In June, the Council advised the government on the need to advance reforms of the EU Emissions Trading Scheme, including the establishment of an adequate price floor.

The introduction of a national carbon tax was a major step forward in putting a price on carbon for the rest of the domestic economy. This price must evolve to reflect the cost of achieving decarbonisation. The Council expects that the National Mitigation Plan will address the effectiveness of the current national carbon price and its future development.

### **1.2. Non-price interventions**

Price signals alone are not enough to incentivise sufficient decarbonisation. Individuals and companies respond in different ways to different policy instruments. As a result, a range of additional policies and measures are required to address behavioural barriers and promote the necessary behavioural change. These may include regulations, standards, education initiatives and targeted information campaigns.

### **1.3. Addressing fossil fuel subsidies**

There are many supports which either directly or indirectly subsidise the continued use of fossil fuels. The National Mitigation Plan should identify these subsidies and plan for their removal. In particular, the Council recommends that price supports for electricity generation from peat be removed as soon as possible, while also providing support for communities that may be adversely affected.

## **2. Sector-specific issues**

### **2.1. Renewable energy**

Policies to enable renewable energy deployment are essential. Wind energy deployment has progressed at considerable pace, with 2,400 megawatts (MW) installed by 2015; there is a requirement for a further 1,600 megawatts to be installed before 2020. This requires an increased pace of installation. Policies enabling increased community engagement and more efficient and effective planning and regulation may aid timely deployment.

### **2.2. Home heating and retrofits**

The Sustainable Energy Authority Ireland has estimated that, in order to achieve 2020 Energy Efficiency targets, around 75,000 homes per year will need energy efficiency upgrades between now and 2020. Factoring health and quality of life benefits into analysis of the cost of retrofitting of homes makes such investments more attractive.



### **2.3. Transport and taxation**

Progress in tackling transport emissions has been very limited. While an appropriate price signal is essential, many other supporting measures will be needed to address the factors that influence transport choices. The Council recommends that health and wider societal costs, such as congestion costs, should be factored into decision making on transport.

Lessons learned from the restructuring of motor and vehicle registration tax systems in the past point to how changes in the tax system can produce significant changes in behaviour, while also being revenue neutral.

### **2.4. Agriculture, forestry and land use**

The agriculture sector in combination with forestry and other land use categories will need to outline a pathway to achieve its contribution to the 2050 national mitigation objective. This should include actions to significantly reduce emissions and to enhance carbon uptake in soils and biomass through sustainable forestry and improved land management. Sustainable afforestation can make an important contribution to climate actions and have wider ecological, economic and societal benefits. These actions will need to be implemented in a measurable, reportable and verifiable manner. The Council recognises that more research and development is needed; however, land management practices will require change. A timeline for expected delivery of solutions from such investment should be provided in the National Mitigation Plan. Research has shown that a switch to lower emission fertilisers would be effective in reducing greenhouse gas emissions. This switch should be made.

## **3. Adaptation**

Ownership, responsibility and governance are essential for implementation of the National Adaptation Framework process. The National Adaptation Framework should provide clarity on these issues. It should also identify adaptation priorities and provide a common framework for investment decision making.

### **Authoritative Information – Climate Ireland**

It is essential that adaptation planning under the National Adaptation Framework is supported by authoritative and relevant information over the range of climate scenarios that are relevant for Ireland. The Climate Ireland platform should be used to provide such information for planning by sectors and local authorities. The Council considers that this should evolve from research to an operational mode in order to support the development of the National Adaptation Framework and implementation of adaptation actions under this framework.

## **4. Research and systematic observations**

A well-structured and effective climate change research and innovation programme is an essential component of the national response to climate change. Critically this is needed to provide information and analysis for policy. It should also support innovation to develop and deploy climate solutions and services arising from the opportunities that the national and global transition will bring. The Council strongly recommends that there should be continued support for research and innovation, including observation systems, and the further development of these via a well-structured and effective climate change research programme.

The Council is concerned that the necessary modelling tools are not available to support government departments or the Council to do their work effectively. We need suitable models and observation systems in order to assess the true nature of the challenges facing us and to develop effective policies. These tools, along with observational and activity data, provide essential information for policy development over the short, medium and longer terms.

## 1. Introduction

Under the 2015 Climate Action and Low Carbon Development Act,<sup>(1)</sup> establishing the Climate Change Advisory Council, the Council is required to review national climate policy and progress on the achievement of the national transition objective,<sup>†</sup> and on meeting international targets. It is also required to provide regular reports, advice and recommendations to government on the national response to the challenge of climate change. In addressing this mandate the Council recognises the complexity of this objective. In many ways the transformation required in the Irish economy and society represents a different and more difficult task than any other area of public policy: the costs of inaction will fall much more heavily on future generations while the current generation in Ireland, and elsewhere, will have to be leaders in transforming the economy and society.

This transformation is required in Ireland and globally to avoid the likelihood of severe, pervasive and irreversible impacts of climate change, the risk of which increase as the global temperature increases. The impacts of a global temperature increase of 4°C or more are projected to include substantial species extinction, large risks to global food security, and the combination of high temperature and humidity compromising normal human activities over certain periods in areas of the world.<sup>(2)</sup>

Collective actions are required to address climate change. The 2015 Paris Agreement<sup>(3)</sup> provides the framework for actions at a global level. The European Union (EU) commitment to address climate change is hugely important for the achievement of the Paris Agreement goals, which include holding the increase in the global average temperature to well below 2°C above pre-industrial levels. This commitment by one of the key regions of the world, of which Ireland is an integral member, is vital. It makes the task of decarbonisation less difficult and it will help minimise the cost of this transition for all citizens. The EU, acting together, will be far more effective in promoting the essential change required than if Ireland, or any other EU member state, acted on its own. Ireland must also take effective and urgent action to contribute to the global efforts to halt climate change. To be successful, policies adopted in Ireland must be part of a coherent EU and international response. These actions are required in parallel with ensuring appropriate national adaptation and to increase resilience to the diverse global and local changes that are expected to result from climate change.

The Council considers that actions to address climate change should not be seen as contrary to national or sectoral development goals; in reality action to halt climate change is complementary to these objectives. Climate policies and actions to reduce the impact of air pollution on human health and the environment are an example of complementarity. Actions on climate change are also fundamental to realising the globally agreed sustainable development goals (SDGs), which will not be achievable without a stable climate system.

The work of the Council is informed by the scientific evidence. Its focus is on national policies and actions in the anticipated National Mitigation Plan (NMP) and National Adaptation Framework (NAF), which are designed to address the causes and consequences of climate change in Ireland. The necessary transformation should be through cost-effective actions to reduce greenhouse gas emissions, while recognising and maximising the benefits and opportunities to the wider economy,

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<sup>†</sup> The national transition objective is outlined in the 2014 Climate Action and Low Carbon Development National Policy Position and is defined in the 2015 Climate Action and Low Carbon Development Act as 'the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050'; the national transition objective as defined in the legislation is the definition that is used throughout.

society and the environment that such transformational change can bring. The Council interprets costs as including social and environmental as well as economic costs. The Council will, as far as is practicable, take account of or highlight policy synergies and tensions with other national objectives that may arise from these actions.

As this is the first report published by the Council, we outline the background to the establishment of the Council and how we will carry out our designated roles in Section 1. We provide a brief outline of the scientific understanding of climate change in Section 2. We briefly describe the existing international and national policy framework in Section 3. Our initial views on the national transition objective and current policy responses follow in Section 4. We review the adaptation challenges for Ireland in Section 5. We provide our initial analysis and recommendations to address immediate issues and to put Ireland on a transformational pathway to 2050 in Section 6, and provide overall conclusions in Section 7.

## **Background**

The Climate Change Advisory Council is an independent, statutory body established under the 2015 Climate Action and Low Carbon Development Act. The role of the Council is to assess and advise on policy related to climate change rather than to make policy, which is the role of the government. This includes the achievement of the 2050 national transition objective and targets agreed at EU level to 2020 and 2030 under the Effort Sharing Decision, and as part of the shared goal of achieving EU-wide emissions reductions of at least 80% relative to 1990 levels by 2050. The Council will advise on policy developments in pursuit of these objectives, along with measures to adapt to the negative impacts of climate change.

Council recommendations will be informed by a variety of analyses. Significant research has been undertaken on understanding how the climate change challenge can best be tackled. Much of this has been assessed by the Intergovernmental Panel on Climate Change (IPCC). In Ireland important research has been carried out by bodies such as the Environmental Protection Agency (EPA), Sustainable Energy Authority Ireland (SEAI), the Economic and Social Research Institute (ESRI), Teagasc and the wider scientific community. Collectively this is invaluable for the work of the Council.

The Council emphasises the need to maintain and enhance national research and observational capacity to identify and close gaps in both knowledge and understanding in this area. The Council will also highlight the need to avoid a narrow focus on climate actions but rather to take account of the wider societal and sustainable development benefits which climate change policy may bring.

The legislation establishing the Council specifies two key sets of activities and related reports to be produced on a regular basis: Annual Reports and Periodic Review Reports. Considering the time lag before the publication of the first of these reports, which are to be published in 2017, the Council has decided to publish this initial paper, the Council's First Report.

The Annual Reports will consider each year's progress in achieving greenhouse gas emissions reductions and provide recommendations on how to progress with required actions on national, EU and international commitments. Annual Reports will indicate progress in achieving Ireland's national transition objective. These recommendations will be informed by a summary of the Environmental Protection Agency's greenhouse gas emissions inventories and projections, along

with evidence and data available in the wider scientific community. The first Annual Report will be published towards the end of 2017.

The Periodic Review Reports will, in general, be more comprehensive and assess the National Mitigation Plan, the National Adaptation Framework and the National Policy Position<sup>(4)</sup> in the context of progress in achieving national climate policy goals. In accordance with the legislation, the first Periodic Review Report will be published in the first half of 2017. Elements of the first Periodic Review Report are prescribed in the legislation and, as it will be published ahead of the National Adaptation Framework, it will not be able to comment directly on the National Adaptation Framework but will provide guidance for its development. Subsequent Periodic Review Reports are expected to address the National Mitigation Plan and the National Adaptation Framework and provide broader assessments of topics related to national climate policy.

## 2. Scientific understanding

The Council will use the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (AR5) <sup>[5]</sup> as a primary source of scientific information and analysis. The Council will also consider authoritative updates of this report from other UN bodies, as well as major review papers and relevant findings from European and national research including work carried out or funded by the Environmental Protection Agency, the Sustainable Energy Authority Ireland, the Economic and Social Research Institute and Teagasc.

The main findings of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change are well known and the full reports are readily available. <sup>[5]</sup> Warming of the climate system is unequivocal and the human influence is clear. Impacts of this are apparent across all continents and oceans. <sup>[6]</sup> The key driver of climate change is the additional energy being trapped in the Earth's climate system by the build-up of greenhouse gases in the atmosphere. Carbon dioxide, methane and nitrous oxide are the most important greenhouse gases (see **Greenhouse gas emissions**). Global temperature has increased by almost 1°C since pre-industrial times. Future temperature increases will, primarily, be determined by historic, current and future emissions of carbon dioxide <sup>[7]</sup> which build up, or accumulate, in the atmosphere. Even with effective global actions to reduce emissions of greenhouse gases, the impacts of climate change are projected to continue well into this century. Some, such as sea-level rise, are projected to continue into the next century. <sup>[8]</sup>

The extent to which Ireland will experience the impacts of climate change will be determined by the effectiveness of local, EU and global actions to reduce emissions of greenhouse gases and local actions to adapt to the evolving change. In a situation of such uncertainty it is essential to consider the risks associated with a range of greenhouse gas emissions scenarios ranging from successful and ambitious climate policy to 'business as usual' climate policy. The Intergovernmental Panel on Climate Change has provided such analyses for a range of emissions pathways: from keeping the global temperature increase below 2°C to 'business as usual' pathways, where the temperature increase is projected to greatly exceed 2°C.<sup>†</sup> This allows for comparative analysis of projected impacts, vulnerabilities, risks and costs associated with such climate futures. The impacts of climate change are expected to be experienced as a combination of gradual changes such as changes to ecosystems; slow-onset changes such as sea level rise; and changes in extremes such as an increase in the frequency and intensity of heavy rainfall events. The occurrence of low-probability, high-impact events, such as the changes in large-scale ocean circulation for example, the Atlantic Meridional Overturning Circulation, best known in Ireland through the effects of the Gulf Stream, should also be included in risk assessments. Vulnerabilities and levels of risk also vary by sector, location and through time, and are considered further in Section 5.

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<sup>†</sup> The Intergovernmental Panel on Climate Change has adopted a series of Representative Concentration Pathways (RCPs) for this purpose. RCP2.6 represents the low emissions pathway while RCP8.5 is the 'business as usual' high emissions pathway.

## Greenhouse gas emissions

The Fifth Assessment Report from the Intergovernmental Panel on Climate Change shows that the global temperature increase will primarily be determined by the cumulative emissions of carbon dioxide; that is, the sum of historical, current and future emissions. This arises from the complex relationships between the atmospheric carbon cycle and those of the terrestrial and ocean systems. Consequently, a significant proportion of carbon dioxide emissions will perturb the atmosphere for centuries to millennia, with impacts that will persist for tens of millennia. Emissions of additional carbon dioxide therefore represent a substantial multi-century commitment to future climate change.

The Intergovernmental Panel on Climate Change has identified carbon dioxide budgets that would lead to stabilisation of the global temperature at specific levels. This implies that emissions of carbon dioxide have to be reduced to net zero to stabilise the global temperature at any particular level.<sup>(7)</sup> For a temperature increase of 2°C the cumulative emissions budget is between 2,500 and 5,000 billion tonnes of carbon dioxide since 1870. For a temperature increase of 1.5°C this is between 1,800 and 4,000 billion tonnes of carbon dioxide. The range is a result of scientific uncertainties about the Earth's response to the additional energy being trapped; for example, the climate sensitivity.<sup>†</sup> In 2010 the cumulative emissions of carbon dioxide are estimated to have been between 1,500 and 1,700 billion tonnes, with annual emissions being of the order of 37 billion tonnes. At this rate of emissions the budgets for 1.5°C and 2°C may be exceeded in the next 5 to 25 years, respectively. It is therefore likely that active interventions to reduce atmospheric carbon dioxide concentrations will be needed to stabilise the global temperature below 2°C. The need for such technologies is extremely likely if the global temperature is to be stabilised at 1.5°C. Such interventions include carbon dioxide removals by forests or other land sinks and the use of negative emissions technologies; for example, bioenergy coupled with carbon capture and storage. The Intergovernmental Panel on Climate Change has identified that large scale reliance on such approaches may entail significant risks.

Emissions of non-carbon dioxide greenhouse gases must also be addressed. The Fifth Assessment Report states that to keep the global temperature increase well below 2°C, net greenhouse gas emissions must be brought to near or below zero by the end of the century. It also recognised that it is not currently feasible to reduce all greenhouse gases to zero. After carbon dioxide, methane and nitrous oxide are the two most important greenhouse gases. Globally methane is emitted as a result of a diverse range of human activities including from fossil fuels, agricultural food production and waste management. In Ireland, methane and nitrous oxide mainly arise from agricultural activities. Current technological solutions for addressing these emissions are limited. Methane is a much more potent greenhouse gas than carbon dioxide but only remains in the atmosphere for a relatively short period, that is 12 years. Nitrous oxide is also a potent greenhouse gas. It has a longer atmospheric lifetime of 120 years. A range of industrial gases and air pollutants also impact on the climate system over short and long lifetimes. These are considered further in Appendices 1 and 2.

Neutralising or balancing emissions and removals of carbon dioxide and non-carbon dioxide greenhouse gases represents a considerable challenge but it is necessary at national and global levels.

<sup>†</sup> Climate sensitivity can be described as the temperature response of the Earth's climate system to a doubling of atmospheric carbon dioxide levels; the Fifth Assessment Report of the Intergovernmental Panel on Climate Change provided a likely range of 1.5°C to 4.5°C.

### 3. Policy responses to climate change

The 1992 United Nations (UN) Framework Convention on Climate Change (FCCC) provides the platform for advancing international policy on climate change. Its objective, 'to avoid dangerous human interference with the global climate system', is to be achieved by stabilisation of atmospheric greenhouse gas levels. However, it does not specify what these levels are. Until the adoption of the Paris Agreement in December 2015, the UN Framework Convention on Climate Change was best known for its Kyoto Protocol (KP). The Kyoto Protocol was agreed in 1997, and established emissions targets for developed countries having the greatest historic responsibility for climate change. During the first commitment period of the Kyoto Protocol from 2007 to 2012, Ireland, the EU and other developed countries acted collectively to reduce their emissions of the main greenhouse gases. The second commitment period of the Kyoto Protocol runs from 2013 to 2020.

#### Paris Agreement

The Paris Agreement entered into force on 4<sup>th</sup> of November 2016, less than a year after it had been agreed by world governments in December 2015. It is considered to be a major step in advancing the international actions to avoiding dangerous and irreversible climate change. The key goals of the Paris Agreement can be summarised as:

- ▲ to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels,
- ▲ to enhance adaptive capacity, strengthen resilience and foster climate-resilient and low emission development and
- ▲ to make finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilience development.

While it does not specify atmospheric greenhouse gas stabilisation values, the 2°C and 1.5°C temperature goals can be scientifically linked to such limits and in particular global emissions budgets for carbon dioxide (see **Greenhouse gas emissions**). The Paris Agreement also specifies that countries are to collectively aim to 'peak global greenhouse gas emissions as soon as possible' and 'to undertake rapid reductions thereafter in accordance with the best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century'.<sup>(3)</sup> These commitments will be subject to regular assessment under Global Stocktakes. The first of these will take place in 2023 and they will occur at five year intervals after that.

#### EU actions on climate change

The EU adopted the goal of keeping the global temperature increase below 2°C in 1997. This has enabled the EU to lead on global climate policy development. It also guides actions within the EU as outlined in the EU 2050 Roadmap.<sup>(10)</sup> Figure 1 provides an illustrative breakdown of the changes required to achieve this across economic sectors and the scale of the challenge for all EU citizens. The overall aim is that EU greenhouse gas emissions will be reduced by between 80% and 95% relative to 1990 levels by 2050. The EU 2020 Climate and Energy Package<sup>(9)</sup> is guided by this analysis, as is the EU mitigation contribution to the Paris Agreement, which specifies a reduction of greenhouse gas emissions by at least 40% relative to 1990 levels by 2030.<sup>(10)</sup>



The EU Climate and Energy Package also established binding emissions reduction targets under the two pillars of climate action: 1) the EU-wide Emissions Trading Scheme (EU ETS) and 2) the Member State-led Effort Sharing Decision (ESD; also known as non-ETS). The Emissions Trading Scheme is the EU’s main tool for reducing emissions of greenhouse gases from large scale power generation and industry. It covers 45%<sup>[11]</sup> of EU-wide emissions of greenhouse gases. For Ireland the Emissions Trading Scheme covers 27% of greenhouse gas emissions.<sup>[12]</sup> This means that Ireland’s Effort Sharing Decision target (which includes emissions from the built environment, transport, agriculture and waste) accounts for significantly more of Ireland’s emissions, at 73%, than the EU average of 55%.<sup>[9]</sup> This is reflected in Ireland’s non-Emissions Trading Scheme emissions, which are much higher than the EU average.

Ireland’s Effort Sharing Decision emission reduction target is a 20% reduction in emissions of greenhouse gases by 2020, relative to emissions in 2005, with binding annual emissions limits for the period 2013 to 2020. The EU Energy Union<sup>[13]</sup> and its targets for renewable energy and energy efficiency are linked to climate policy. Ireland has specific 2020 targets for these areas, which are listed in Table 1. In June 2016, the EU Commission presented proposals for Effort Sharing Decision emissions reduction targets for the period 2020 to 2030<sup>[14]</sup> for Ireland and other Member States. Once finalised, these targets will be considered in future Council reports.

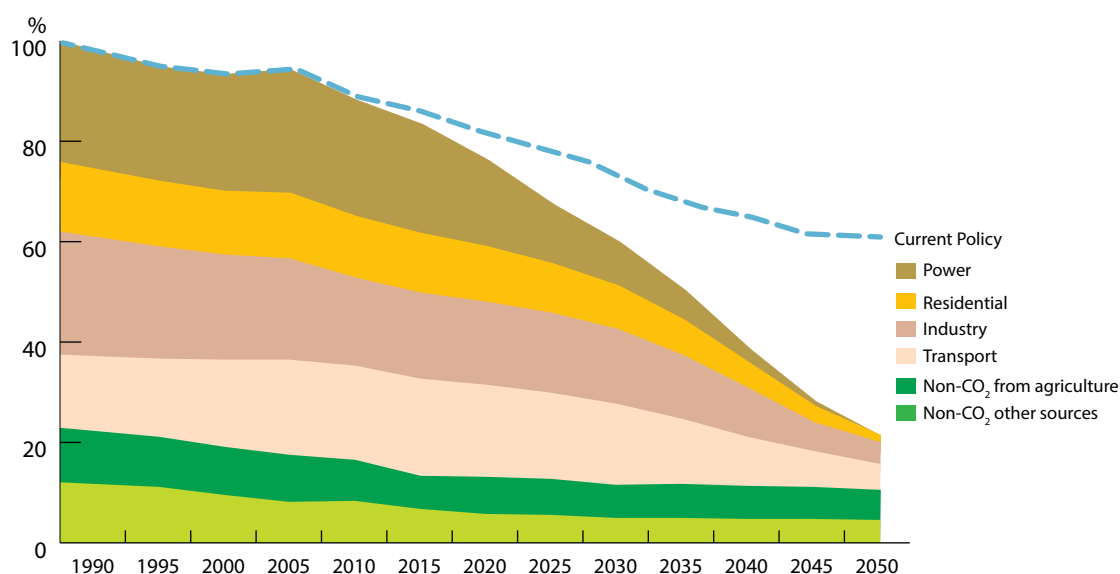


Figure 1: EU greenhouse gas emissions reductions necessary across all sectors to transition towards an 80% reduction compared to 1990 levels. **Data source** European Commission – EU 2050 Roadmap 201<sup>[10]</sup>

Table 1: EU climate change mitigation targets to 2020, 2030 and 2050.

	2020	2030	2050
<b>GHG emission reduction target</b>	20% cut in greenhouse gas emissions on 1990 levels	At least 40% cut in greenhouse gas emissions on 1990 levels <sup>a</sup>	80% to 95% cut in greenhouse gas emissions on 1990 <sup>a</sup>
<b>Renewable energy target</b>	20% of EU energy from renewables (16% for Ireland)	At least 27% of EU energy from renewables	
<b>Energy efficiency target</b>	20% improvement in energy efficiency	At least 27% <sup>b</sup> improvement in energy efficiency	

<sup>a</sup> through domestic reductions alone, no international credits.

<sup>b</sup> to be reviewed in 2020 with the possibility of increasing share of energy efficiency to 30%.<sup>[15]</sup>

## EU Adaptation Strategy

The EU Adaptation Strategy<sup>(16)</sup> aims to make Europe more climate resilient by taking a coherent approach across the adaptation activities of Member States. The strategy supports action on adaptation by providing guidance and funding, promoting knowledge generation and information-sharing between Member States through a European climate adaptation platform (Climate-ADAPT),<sup>(17)</sup> and aims to enhance resilience of vulnerable sectors by integrating adaptation into relevant EU policies.

## The National Policy Position

The National Policy Position<sup>(4)</sup> outlines the context and basis for national action on climate change. In doing so it recognises that climate change is a threat for humanity. It anticipates and supports mobilisation of a comprehensive international response under the UN Framework Convention on Climate Change to address climate change and a global transition to a low carbon future. It recognises the challenges and opportunities of the broad transition agenda for society and aims, as a fundamental national objective, to achieve transition to a low carbon, climate resilient and environmentally sustainable economy by 2050.

The National Policy Position established a long-term national mitigation objective of low carbon transition based on an aggregate reduction in carbon dioxide emissions of at least 80% compared to 1990 levels by 2050 across the electricity generation, built environment and transport sectors. In parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, is envisaged which does not compromise capacity for sustainable food production. This is to be pursued through the National Mitigation Plan.

The National Policy Position also establishes the objective to inform and mobilise an integrated approach to adaptation. This would involve all stakeholders on all institutional levels to ensure that adaptation measures are identified and implemented. This would include thorough incorporation of these into future investment plans, to manage and reduce sectoral and local vulnerability to the negative impacts of climate change.

### Linking policy actions

Climate policy establishes links across economic and policy sectors including energy, transport and agriculture. However, policy linkages are most clearly evident between climate action and other areas of atmospheric protection including air quality and the protection of the ozone layer. These are illustrated in Appendix 1. The Council will aim to highlight synergies between these actions. Here it notes that Ireland is a member of the UN Economic Commission for Europe (UNECE) Convention on Long Range Transport of Air Pollution,<sup>(18)</sup> a Party to the Montreal Protocol to the Vienna Convention which aims to protect the ozone layer<sup>(19)</sup> and a member of the Climate and Clean Air Coalition (CCAC)<sup>(20)</sup> which aims to facilitate joint actions on air pollution and climate. It also notes EU actions in these areas including under the Fifth Environmental Action Programme.<sup>(21)</sup>

## Measuring progress

A key achievement of the UN Framework Convention on Climate Change, with the help of the Intergovernmental Panel on Climate Change, has been to establish a detailed system for determining, reporting and accounting of emissions and removals of greenhouse gases. For developed countries such as Ireland these are reported in National Inventory Reports (NIRs)<sup>[22]</sup> which are produced annually by the Environmental Protection Agency. While there is no such system for climate change impacts and adaptation, these and wider actions on climate change are addressed in the more comprehensive National Communications<sup>[23]</sup> which are produced and submitted to the UN Framework Convention on Climate Change every four years. These also provide details on areas such as policies and measures, research and finance. A subset of the information contained in National Communications is provided in Biennial Reports<sup>[24]</sup> to the UN Framework Convention on Climate Change.

The EU Mechanism for Monitoring and Reporting (MMR)<sup>[25]</sup> provides the framework for sharing information and assessing progress under six working groups. This includes assessment of annual greenhouse gas emissions inventories and official projections of future emissions based on standardised approaches. The Environmental Protection Agency provides official projections of emissions of greenhouse gases to 2020 and 2030 based on the EU Mechanism for Monitoring and Reporting standards. Projections of removals of carbon dioxide by forestry are also developed. This is being extended to other land use categories such as grazing and crop land. The Mechanism for Monitoring and Reporting also addresses adaptation issues. The EU Adaptation Preparedness Scorecard<sup>[26]</sup> provides an assessment of the level of preparedness of each Member State qualitatively in relation to its adaptation policy-making process.

The Council recognises the importance, quality and value of these data and analyses as well as the considerable effort required to provide this information for the UN and EU. This information provides a robust basis for its work in preparing this First Report.

## 4. National mitigation objective and steps towards its achievement

Achievement of the national mitigation objective will require a major societal and economic transformation. This entails strategic long-term planning and effective implementation of a suite of interlinked policies and measures across sectors such as energy, transport, built environment, and agriculture and land use. The Council expects that these will be addressed in the first National Mitigation Plan, which should outline the roadmap to achieve the 2050 national mitigation objective, and in doing so identify policies and measures to meet internationally agreed targets to 2020 and 2030.

The Council considers that the National Policy Position establishes the framework for mitigation actions under the National Mitigation Plan. The key role of this plan is to establish a stable policy framework at sectoral levels that is required to achieve the 2050 national mitigation objective. This is essential to provide confidence for investors and decision makers at all scales, whose contributions will be central to the required transition. The National Mitigation Plan should also set out how it will identify and address barriers either through immediate actions or by creating the structures and processes required to do so. Key barriers are considered to include institutional, behavioural and technological barriers. The Council recognises that all sectors must contribute and that the plan will include both broad based and specific policy instruments. Policies should be effective in meeting the challenge, be efficient, operate at least cost to the economy and society, take advantage of the opportunities that this challenge presents, and ensure that the effort associated with transformative change is shared across society in a balanced manner. In order to create an environment that best facilitates the emergence of the most effective solutions, policy should be technology neutral where possible. It may be important to identify transition points or specific targets and timings for decarbonisation. For example, a timeline for achievement of zero-emission urban public transport systems, as part of an overall pathway to 2050, may be designed.

In order to assist in this process an initial analysis of Ireland's pathway to 2050 is provided here as well as an initial consideration of areas for development. Ireland's greenhouse gas emission profile provides the context for this analysis.

### Ireland's greenhouse gas emissions profile

Annual greenhouse gas emissions inventories are the measure of the mitigation challenge that Ireland faces and will chart the anticipated transition to 2050. The Environmental Protection Agency provides official greenhouse gas emissions data which are reported annually to the EU and UN. The sectoral breakdowns of Ireland's emissions in 1990 and 2014 are shown in Figure 2. Emissions from energy and agricultural activities are dominant over this period. Emissions of carbon dioxide primarily from energy generation, the built environment and transport made up 64% (37.4 million tonnes) of total greenhouse gas emissions in 2014. The agriculture sector accounts for 33% of greenhouse gas emissions and is the main source of non-carbon dioxide emissions; that is, methane and nitrous oxide emissions. The most notable change between 1990 and 2014 was that emissions from the transport sector increased from 9.1% (5.1 million tonnes) to 19.5% (11.4 million tonnes) of total emissions over this period.

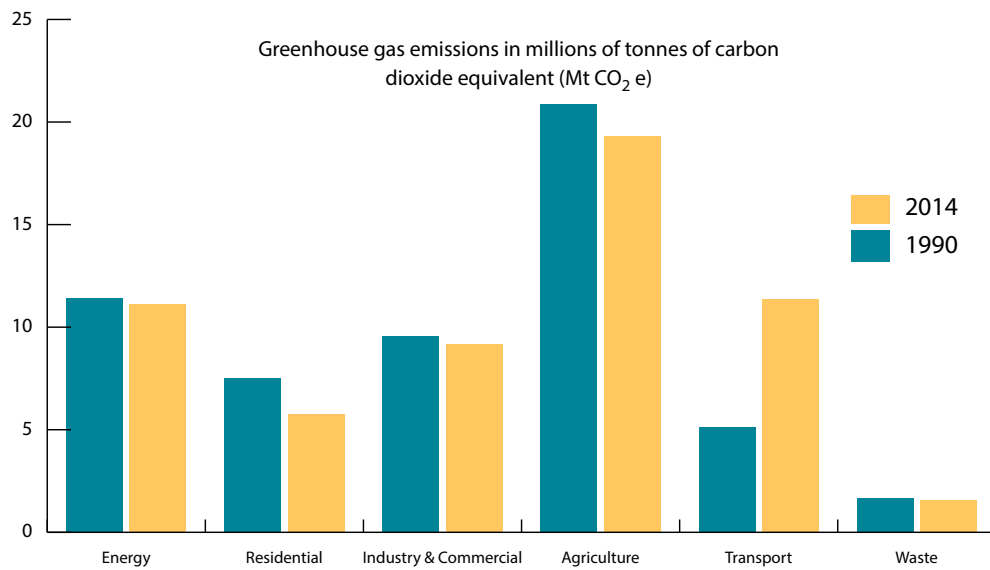


Figure 2: Greenhouse gas emissions by sector in 1990 and 2014. **Data source** Environmental Protection Agency – Ireland’s National Inventory Report 2015. <sup>[22]</sup>

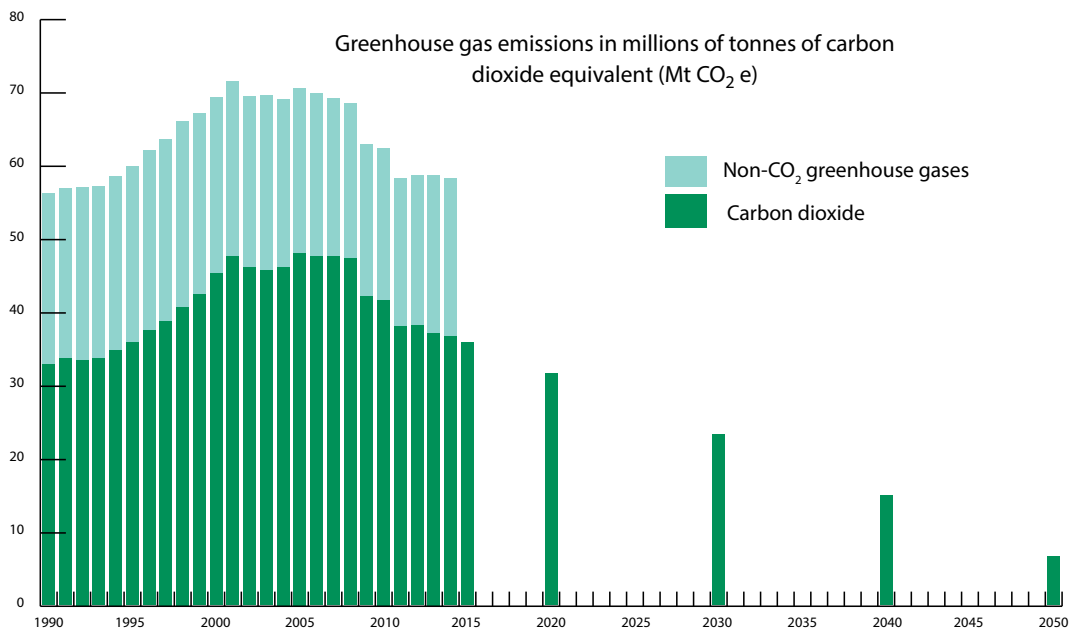


Figure 3: Carbon dioxide and non-carbon dioxide greenhouse gas emissions over the period 1990 to 2014 <sup>[22]</sup> and projections of carbon dioxide emissions for each decade to 2050 in line with a linear pathway for achievement of the national mitigation objective. Similar projections to 2050 for neutralising non-carbon dioxide greenhouse gas emissions through reductions of these emissions and enhanced carbon dioxide removals are not shown due to their complexity and uncertainty around how this will be achieved. **Data source** Environmental Protection Agency – Ireland’s National Inventory Report 2015. <sup>[22]</sup>

The variation in emissions of carbon dioxide and total greenhouse gases over the period from 1990 to 2014 is shown in Figure 3. Emissions increased in the period from 1990 to 2001 and then plateaued to 2008, before displaying a downward trend. Within the EU emissions ‘Bubble’, Ireland was allowed to increase its greenhouse gases emissions by 13% relative to 1990 levels in the period to 2012. In 2014 emissions of carbon dioxide were 36.6 million tonnes; that is, 3.7 million tonnes higher than 1990 emissions of 32.9 million tonnes.

The National Policy Position sets out the national mitigation objective of reducing emissions of carbon dioxide by at least 80% by 2050, relative to 1990 levels.<sup>†</sup> This is illustrated in Figure 3. It will require that emissions of carbon dioxide are less than 6.6 million tonnes in 2050. A linear analysis indicates that achievement of this level of emissions reduction in the period from 2015 to 2050 will require average annual carbon dioxide emissions reductions of between 2.0% and 2.5% relative to 2014 emissions levels; that is, annual emissions reductions of 0.8 million tonnes of carbon dioxide. Over the period from 2005 to 2014 the average annual emissions reduction was of the order of 2.3%. This level of emissions reduction was strongly influenced by the economic recession. Future emissions reductions of this scale are required through effective national climate policy.

The second element of the national mitigation objective is an approach to carbon neutrality for the agriculture and land use sectors by 2050. Neutralising or balancing emissions of non-carbon dioxide greenhouse gases represents an enormous challenge. Because of the complexity of this challenge and uncertainty about how this will be achieved, it is not shown graphically in Figure 3. An overview of the nature of this task and issues that may need to be accounted for in doing this is provided in Appendix 2. There is a requirement for extensive research to better understand the links between natural and managed systems and processes. New advanced and robust observation and analysis systems are also central to quantification of this challenge and in supporting its achievement. Its achievement requires significant reductions in non-carbon dioxide greenhouse gas emissions from the agriculture sector combined with enhanced uptake of carbon dioxide in soils and biomass.

In addition to the above steps there may be a requirement for deployment of negative emissions technologies, for example, bioenergy carbon capture and storage, to provide additional removals to offset these and other residual greenhouse gas emissions. This is an active area of research which at a global level may eventually be necessary to effecting an overall reduction in the atmospheric concentration of carbon dioxide.

The Council affirms that there is urgency for collective global action to prevent the large-scale and irreversible impacts of climate change from becoming a reality. Ireland should be ambitious in taking mitigation actions. The Council considers that the level of mitigation ambition established in the National Policy Position is commensurate with the minimum that is required in contributing to EU and global efforts to address the causes of climate change. The Council's ambition is that Ireland should aim to have no further negative influence on the Earth's climate system by the middle of this century and subsequently should work in cooperation with its EU and global partners to reverse previous contributions to climate change.

## Policy progress to date

The Council considers that progress on emissions reductions in Ireland arising directly from climate policy is at best mixed. There are areas of considerable concern. Implementation of important elements of climate policy such as the EU Emissions Trading Scheme are determined at EU level and are not solely the responsibility of the government of Ireland. However, the government has a role in advancing EU policy, while other policy areas are its sole responsibility. A number of policy areas are considered here, including establishment of an effective price for carbon emissions, which is an essential component of EU and national climate policy.

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<sup>†</sup> The National Policy Position specifies the main sector responsible for production of fossil carbon dioxide. For completeness the Council analysis provided here includes all fossil carbon dioxide emissions reported in the National Inventory Report <sup>[22]</sup>.

## Establishing a price for carbon

An effective carbon price is important if Ireland is to achieve its decarbonisation objective in a cost-effective manner by 2050. This encourages energy efficiency and substitution away from fossil fuel energy use. It also incentivises research and development by signalling to business that it is profitable to develop and deploy technologies that reduce or eliminate emissions of carbon dioxide. Currently Ireland has two prices for carbon emissions arising from the EU Emissions Trading Scheme and a national carbon tax, respectively. Maintaining these at an effective level is essential for decarbonisation.

## The EU Emissions Trading Scheme

The EU Emissions Trading Scheme determines the price of emissions for electricity generation and heavy industry. This scheme has, so far, failed to deliver an adequate price signal. The Council has written to government on this issue (see Appendix 3) to highlight that it is in the best interests of both Ireland and the EU to have an effective minimum carbon price in the EU Emissions Trading Scheme.

Decarbonisation of large-scale electric power generation provides options to decarbonise sectors such as heating and transport through electrification. Certainty that the EU Emissions Trading Scheme will provide an effective carbon price signal is therefore a key component of transformative change.

## National carbon tax

An effective national carbon price is also essential. Ireland's carbon tax covers emissions arising from the combustion of fossil fuels, such as coal and oil, for uses outside of electricity generation and heavy industry sectors. To incentivise the required transition toward the 2050 national mitigation objective, this price must be sufficiently high and evolve to reflect the cost of decarbonisation. Further research may be required to identify the most appropriate price schedule to achieve this. The Council looks forward to seeing how the National Mitigation Plan will address the effectiveness of the current national carbon price and its future development.

## Addressing fossil fuel subsidies

Fossil fuel subsidies are a barrier to decarbonisation. They reduce the price of carbon emissions, making unsustainable consumption practices more attractive relative to sustainable alternatives. The leaders of the Group of Twenty nations have pledged to act on their removal. In Ireland, one example of a fossil fuel subsidy is the public price support for peat-fired electricity generation. This is financed by the Public Service Obligation (PSO) levy on all consumers' electricity bills. The planned phase-out of this subsidy is an important step in decarbonising electricity generation. Currently the price support for peat is expected to be phased out in late 2019 or early 2020. From a climate action perspective this phase-out should be accelerated while support is also provided for communities that may be adversely affected.

There are other national supports which either directly or indirectly subsidise the continued use of fossil fuels. It is the view of the Council that the National Mitigation Plan should initiate a process to identify these in order to inform a strategy for their removal in an appropriate manner.

### A suite of measures is required

Reliance on price signals alone is not sufficient: a wide range of other policy measures are needed to promote behavioural change. Effective policy must understand how non-price interventions can change behaviour and incentivise greater change. For example, policies that provide targeted information may be required to overcome certain individual barriers that relate to personal characteristics around a lack of knowledge and understanding or to highlight roles and responsibilities for adopting low carbon behaviours. Certain social barriers may be overcome by measures that seek to build new low carbon social norms or encourage more sustainable habitual practices. In many cases, there is no alternative to private car transport and this is an example of a material barrier which may be overcome by improved planning and public transport infrastructure. In general, reliance on a carbon price alone may also fail to take many related costs and benefits into account. The positive impacts of climate actions on health, wellbeing, air quality and the environment need to be incorporated into policy and decision-making.

Furthermore, it is important that the costs and benefits of policy interventions are fairly distributed. Effectively tackling climate change requires major changes in our pattern of consumption. For example, households need to switch from carbon-intensive fuels, such as coal and peat, to low carbon or renewable alternatives. Adjusting to this change will initially impose an additional cost, the burden of which will differ across households. These additional costs may impose a greater burden on low-income households, who spend a larger share of their income on energy. Undue impact on the less well-off should be addressed through the welfare and taxation systems. Other aspects of climate policy can also be used to facilitate equitable outcomes. For example, energy efficiency upgrades can be targeted at low-income households. These issues should be addressed in the National Mitigation Plan.

Given these factors, a broad range of supplementary policies will be required. Interventions such as regulations, standards, education initiatives, voluntary agreements, awareness campaigns and the targeted use of financial incentives may help overcome behavioural barriers or market failures. Investment in low-carbon innovation may help to build a greener economy and society through research and development.

### Policy progress and meeting 2020 targets

The official greenhouse gas inventory data show that emissions have declined significantly since 2004 and that Ireland met its Kyoto Protocol emissions targets to 2012. As of 2014, the year of the most recent official emissions data, emissions were below the annual level required to meet the 2020 targets. However, official projections of greenhouse gas emissions indicate that the economic recovery will reverse this downward trend in the near future, or may already have done so, and that Ireland will not meet its 2020 emissions targets. This would mean that Ireland would not be on a long-term pathway to decarbonisation. These projections are of even greater concern as the Council is aware that official projections are necessarily based on the assumption of full delivery of emissions reductions by specific measures. This is not necessarily the situation in reality. For example, the deployment of electric vehicles has not reached the expected level of uptake.<sup>†</sup> Not meeting 2020 targets and not being on a pathway to decarbonisation by 2050 is considered to have a number of implications for Ireland, including cost implications. There is an urgent requirement to first enhance implementation of existing policies and measures and then

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<sup>†</sup>Sales of electric vehicles comprised 0.23% of new car sales in 2014 the target is 20% of car sales by 2020.



to identify additional policies and measures to ensure that Ireland's is on a pathway to meet its 2020 targets. In this context a number of sectoral issues and options are highlighted.

### Renewable energy

Policies to enable deployment of renewable energy technologies are essential. To date deployment of wind generation has progressed at considerable pace, with 2,400 megawatts (MW) installed by 2015. However, there is still a requirement for a further 1,600 megawatts to be installed before 2020 to meet renewable energy targets.<sup>[27]</sup> This requires an increased pace of installation. Policies enabling enhanced community engagement and more efficient planning and regulation may aid timely deployment, and these should be advanced.<sup>[28]</sup>

Renewable energy displaced 3.2 million tonnes of carbon dioxide in 2015 according to the Sustainable Energy Authority of Ireland.<sup>[29]</sup> Wind energy made the largest contribution to this, with 2.4 million tonnes carbon dioxide being avoided.<sup>[29]</sup> However, this uptake of renewable energy has largely displaced relatively low emission gas-fired generation rather than high emissions peat and coal generation; otherwise the emissions reductions would have been greater. In fact, the carbon intensity of electricity increased by 2.5% to 467.5 grams carbon dioxide per kilowatt hour (g CO<sub>2</sub>/kWh)<sup>[29]</sup> in 2015, primarily as a result of increased coal use in electricity generation. This reflects the failure of the EU Emissions Trading Scheme to provide an adequate price signal and steps are required to address this.

### Home heating and retrofits

The built environment accounts for 26% of Ireland's greenhouse gas emissions. Ireland has a considerable stock of poorly insulated energy inefficient housing, resulting in considerable heating costs for owners. The introduction of the Building Energy Rating (BER) for homes, administered by the Sustainable Energy Authority of Ireland, has, along with higher standards for new builds, improved building standards. Retrofit programmes have raised awareness of home heating standards and have in places been very successful in retrofitting existing housing stock. Recent pilot programmes exploring deeper retrofit of residential buildings have shown promise, but further work is necessary to identify the most cost-effective approaches to significantly upgrade Ireland's building stock.

The Sustainable Energy Authority Ireland has estimated that to achieve 2020 energy efficiency targets around 75,000 homes will need to be upgraded every year between now and 2020, three times the rate achieved in 2014. This number would be reduced if deeper retrofits were carried out. Poorly insulated homes are linked to health problems for residents.<sup>[30]</sup> Factoring health and quality of life benefits into decision making on retrofitting of homes will make such investments more attractive for house owners, state agencies and local authorities and should be the norm in such processes.

### Transport and targeted use of tax systems

In 2014, transport contributed around 20% of Ireland's total emissions. Progress in tackling transport emissions has been limited. Policy must provide an appropriate price signal and utilise evidence on wider factors that influence individual, household, business and societal transport choices. Poorly managed growth in transport generates wider societal costs, in particular congestion costs, related pressure on infrastructure and health costs from a range of air

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† Good ventilation systems are essential in highly insulated housing to ensure good indoor air quality and avoid build-up of radon.

pollutants, such as particulate matter (PM). These are of increasing concern, as outlined by the World Health Organisation,<sup>(31)</sup> European Environment Agency<sup>(32)</sup> and Environmental Protection Agency.<sup>(33)</sup> The Council considers that wider societal costs, and particularly health costs, should be included in policy analyses and decision-making on future transport policy.

Recent experience indicates that a significant change in the motor vehicle stock can be achieved by changing the structure of taxes associated with car ownership, such as annual road tax and vehicle registration tax. There may be scope to further optimise the current emissions-based VRT and motor tax systems to achieve further emissions reduction. Sufficient evidence is available to design such a scheme in a revenue neutral way. This exemplifies how the tax system can be used to trigger responses that reduce carbon emissions. It may be applied more widely to influence positive choices by individuals, households, and businesses.

### **Agriculture, forestry and land use**

In 2014, agricultural activity comprised 33% of greenhouse gas emissions in Ireland. These were largely composed of non-carbon dioxide emissions of methane and nitrous oxide, arising from enteric fermentation, manure management and fertiliser and urea application to soils. Official projections of agricultural emissions indicate that they are expected to increase from 2015 because of changes in animal numbers, crop areas and projected nitrogen application to soils.<sup>(34)</sup> Agricultural activities, such as livestock management (grazing land activities) and tillage (cropland activities), are fundamentally linked to the land and the land use practices which enable food production. These practices themselves can lead to emissions or removals of greenhouse gases. These land uses will need to be assessed in conjunction with forest and wetland management to provide a more complete picture of the impact of agriculture and land use on Ireland's emissions profile.

An approach to carbon neutrality for the agriculture, forestry and land use sectors by 2050, as stated in *Linking policy actions* and Appendix 2, is the second component of the 2050 national mitigation objective. This will require a considerable reduction in non-carbon dioxide greenhouse gas emissions in the agriculture and land use sectors along with sustainable afforestation<sup>(35)</sup> and improved management of other land areas to enhance carbon uptake.

There is an urgent requirement for research to identify further options to reduce non-carbon dioxide greenhouse gas emissions and to more fully determine the nature of the total land sink, its overall contribution to national actions on climate change, and its potential for enhancement. A timeline for expected delivery of solutions from such investment should be provided in the National Mitigation Plan. The variety and value of multiple ecosystem services provided by the land sector must also be taken into account in this assessment. The Council looks forward to seeing how these will be addressed in the National Mitigation Plan.

Ongoing deployment of technological breakthroughs that reduce the emissions intensity of agricultural production must be encouraged. For example, recent research has identified fertilisers which have lower emissions of nitrous oxide, which is a potent greenhouse gas. A shift from calcium ammonium nitrate (CAN) fertiliser to such a fertiliser could reduce annual emissions by 1.5 million tonnes, and reduce costs for farmers.<sup>(36)</sup> Uptake of this option is required in a manner that is captured by the national inventory development process.

### Accounting for forestry and land use

Carbon dioxide removals and emissions arising from afforestation and managed forest are accounted for under the Kyoto Protocol. Ireland's afforestation programme has increased forest cover from 6.8% (around 465,000 hectares) in 1990 to 10.6% (around 754,000 hectares) <sup>(22)</sup> in 2014. Ireland has also elected to account for emissions and removals in grazing land and cropland under the second commitment period of the Kyoto Protocol. This is a positive development; however, development of robust systems to account for these sinks remains a challenge. Further research and development is needed in this area to assist policy development. These areas are not included in the EU 2020 Climate and Energy Package, but are likely to be included in the 2030 targets. In the future all land uses, including wetlands, are likely to be accounted for as part of actions to address climate change.

Forestry policy in Ireland aims to increase forest cover to 18%, around 1.25 million hectares, by 2046. <sup>(37)</sup> In order to meet this goal, planting will be required to increase to 8,000 hectares per year. Such afforestation needs to be carried out in a sustainable manner as defined in the guidelines provided in the 2012 Afforestation Scheme. <sup>(35)</sup>

## 5. Towards national resilience to climate change

The National Policy Position identifies achievement of resilience by 2050 as a key part of the national transition objective. This is to be achieved through a continuing, iterative and evolving process under the National Adaptation Framework. The National Adaptation Framework should provide a strategic context for advancing policy actions at sectoral and local levels via an informed and integrated approach. This should include stakeholders, institutional actors and practitioners, to ensure that effective adaptation measures are identified and implemented, monitored and assessed. It will also require incorporation into ongoing governance and management systems and via investments to manage and reduce national, sectoral and local vulnerability to the negative impacts of climate change.

Adaptation is a central component of EU policy and the Paris Agreement. The Paris Agreement established a global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change. This is with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of keeping the global temperature increase well below 2°C. The EU adaptation strategy provides a regional context and supports adaptation actions by Member States.

Unlike mitigation of climate change, there is no generally accepted adaptation metric.<sup>[38]</sup> In this context a range of indicators at local and sectoral levels are being developed to determine progress in adaptation actions. In addition, processes to identify and reduce risks associated with climate change through adaptation have been established under the United Nations Framework Convention on Climate Change and the EU. These utilise concepts such as exposure, vulnerability, risk and resilience, which are also expected to be a part of the National Adaptation Framework implementation process in determining progress on achievement of the national resilience objective as set out in the National Policy Position.

### Global context for development of national resilience

The rate and level of climate change impacts that Ireland will experience will be determined by the effectiveness of global actions to stabilise the Earth's climate system. The Paris Agreement established an adaptation goal that will inform global actions as well as actions in the EU and Ireland. However, the effectiveness of how the Paris Agreement will be implemented has still to be determined. This may not be fully clear for some time; the first Global Stocktake of the Paris Agreement will take place in 2023. This introduces additional uncertainty into investments and plans which have long lifetimes, such as major infrastructure. The National Policy Position is focused on achievement of resilience by 2050. In the period to 2040 impacts and risks are projected to be largely similar regardless of which global emissions pathway is followed. The levels of impacts for the rest of this century and beyond, and the level of adaptation needed to ensure resilience, will become clearer over this period as implementation of the Paris Agreement is progressed.

Ireland will continue to experience the ongoing effects of climate change, with a high degree of climate variability and associated uncertainties in relation to extremes. However, given the strong likelihood for Ireland of continued climate variability and extreme events, it is imperative that adaptive actions linked to planning begin now where they have not been initiated already. This should be based upon informed understanding of current vulnerabilities and projected changes. This is in the expectation that the measures will enable the effective management of the likely risks in the period to 2040, or over the lifetime of projects.

## National capacity, risk and adaptation

The Council recognises that Ireland has built national capacity in the areas of research and analysis, and is continuing to do so. This is being broadened through engagement with stakeholders on climate impacts analysis and adaptation assessments towards development of effective adaptation responses. However, knowledge and information gaps exist that need to be addressed. There is growing awareness of climate-related risks and the need to develop appropriate responses, particularly in public sector organisations and local authorities. Much of this, though, is considered to be at an early stage of development.

The development of the National Adaptation Framework and the increasing need to address socio-economic exposure to climate and weather variability and extremes are primary drivers of capacity building in Ireland. Risk assessments are being developed to prioritise actions, and indicators are being developed to monitor progress on adaptation as part of the National Adaptation Framework development process. These indicators will be essential for evaluating and monitoring the effectiveness of adaptation actions.

## Initial observations and considerations

The Council recognises that the National Adaptation Framework development process is ongoing and will be completed in 2017. Ireland faces a range of challenges, from ensuring the adaptation and resilience of critical infrastructure, communities and sectors to providing effective responses, including warning systems and emergency responses.

The Council wishes to highlight a number of cross-cutting issues identified by the Council's Adaptation Committee which may assist in the National Adaptation Framework development process. These include:

- ▲ The need for clarity on governance and ownership of implementation actions arising from the National Adaptation Framework process
- ▲ The need to identify and manage the interconnectivities that exist across sectors, scales and levels of governance, including potential cascading of effects in the management of these
- ▲ Positive engagement with citizens and stakeholders is essential in addressing the adaptation challenge through provision of information and identifying and tackling behavioural barriers
- ▲ Recognising the importance of existing systems and supports, including in forecasting, warning and response systems, and to build on and enhance these
- ▲ Adaptation to climate change is a continuous learning process. There is a pressing need to learn from both successes and failures. 'Learning well' may be key to 'adapting well'.

In this context, the Council has identified thematic and structural issues which can support an integrated approach to cross-cutting actions. These include:

- ▲ Ensuring that human health, security and wellbeing are central to the objectives of the National Adaptation Framework
- ▲ Recognising the need for resilience in both managed and particularly natural ecosystems and the potential of the ecosystem services they provide; for example, green infrastructure and natural capital solutions

- ▲ Enabling existing governance and management structures to embrace adaptation planning and implementation; for example, local authority and river basin district management bodies
- ▲ Increasing the resilience of shared critical infrastructures and mapping risks in energy, transport, communications and water management, including freshwater and coastal marine water bodies
- ▲ The central roles of spatial planning, and updated building standards and regulations, in ensuring that future development and infrastructure take account of existing risks and projections of future risks arising from climate change
- ▲ Increasing capacity building, especially in support of front line actors in local authorities and other bodies leading on actions on the ground
- ▲ Providing a stronger central direction on the specific range of scenarios to be considered by sectors in their planning and the provision of a methodology for prioritisation of measures

The Council also wishes to highlight both the importance of Ireland's coastal zones and their vulnerability to climate change impacts and sea level rise. Ownership of the coastal zone and the assets in this area is complex while many of the climate vulnerabilities are shared across established ownership boundaries – these issues need to be addressed as part of the National Adaptation Framework process.

There is an urgent requirement to raise informed awareness in all communities that climate change, with its impacts, is taking place and requires action, with the role of local authorities being critical. Behavioural measures will have to play a key role in the development of actions to meet the national resilience objective.

Overall, the Council highlights that adequate financial and human resources are required in order to deliver, implement, monitor, evaluate and amend actions as necessary.

### **Authoritative Information – Climate Ireland**

It is essential that adaptation planning under the National Adaptation Framework is supported by authoritative and relevant information and analysis in a coherent and structured manner. Currently the Climate Ireland platform<sup>(39)</sup> is providing critical information to support planning by sectors and local authorities. The Council considers that this should evolve from research to an operational phase as a national information portal, as was envisaged in the 2012 National Adaptation Framework, with appropriate governance and management structures to support the National Adaptation Framework development and implementation process.

## National Adaptation Framework 2017

The 2017 National Adaptation Framework will play a vital role in helping Ireland achieve its national transition objective. In this context the Council considers that the National Adaptation Framework will need to provide short, medium and longer term perspectives as necessary which take account of risks and uncertainties for planning and investment cycles and decision making. This includes taking account of:

- ▲ Current and historic vulnerability to weather and climate variability and extremes as a basis for determining risks and exposure to changes in these that may occur in the future
- ▲ Slow-onset changes such as sea level rise, ecosystems changes and impacts of global changes
- ▲ In certain cases the occurrence of low-probability, high-impact events including the reduction of Atlantic Meridional Overturning Circulation or the loss of the Greenland Ice shelf

The National Adaptation Framework should enable a more integrated approach to adaptation planning in Ireland, ensuring the national action plan is coordinated and takes account of shared responsibilities and risks across stakeholders. A common framework for the prioritisation of investments in adaptive measures across all sectors should be established. This framework should provide detail on the kinds of policies and measures for consideration at national and sub-national levels, as well as detail on how these will be advanced and coordinated.

In this context, the framework should promote measures that are low regret, provide multiple benefits and address current vulnerability while taking account of projections of future climate conditions and associated impacts and risks. The council has provided initial views for the consultation process on the development of the National Adaptation Framework in Appendix 4. The Council will address adaptation issues in greater detail in its first Periodic Report.

## **6. Observations and recommendations**

This section sets out the Council's observations and recommendations. These are primarily focused on assisting the production of the first National Mitigation Plan. Adaptation issues will be addressed in greater detail in the first Periodic Review Report, to be produced in 2017.

### **National Mitigation Plan**

The Council considers that the first National Mitigation Plan should provide the roadmap to achieve the 2050 national mitigation objective and, in doing so, identify policies and measures to meet intermediate targets, to 2020 and 2030, agreed at EU level. The key role of the National Mitigation Plan is therefore to establish the required stable policy framework at sectoral levels that is needed to achieve the 2050 national mitigation objective and targets to 2020 and 2030 in a cost-effective manner while ensuring environmental integrity and supporting economic and social development.

The National Mitigation Plan should provide confidence for stakeholders, investors, decision makers and practitioners whose contributions will be central to the required transition. The National Mitigation Plan should also set out how it will identify and address barriers to change, including institutional, behavioural and technological barriers to change.

The Council is concerned that official emissions projections indicate that Ireland will not meet its 2020 targets. They suggest that Ireland is not on a pathway to achieving the 2050 national mitigation objective. The National Mitigation Plan should identify options for enhanced implementation of existing policies and measures, coupled with new and additional policies and measures.

### **EU Emission Trading Scheme**

An effective carbon price is of fundamental importance for effective decarbonisation. The Council is concerned that the EU Emissions Trading Scheme has, to date, failed to deliver an adequate price signal, evident from recent increases in the carbon intensity of electricity despite successful renewable energy deployment. The Council has recommended that the EU Emissions Trading Scheme needs reform, including the establishment of an adequate price floor (see Appendix 3).

An effective EU Emissions Trading Scheme facilitates the decarbonisation of electricity. This allows the potential for heat and transport to be decarbonised through electrification. An effective EU Emissions Trading Scheme is therefore an essential component for transformative change.

### **National carbon tax**

Establishing a national carbon tax was a major step forward towards decarbonisation. This price must be sufficiently high and reflect the cost of achieving the 2050 national mitigation objective. Further research is required to identify the most appropriate price schedule to achieve this. The Council looks forward to how the National Mitigation Plan will address the effectiveness of the current national carbon price and proposals for its development to 2050.

### **A suite of measures is required**

Price signals alone are not enough to achieve decarbonisation. Effective policy must understand how non-price interventions can change behaviour and incentivise greater change. Related impacts on health, wellbeing, air quality and the environment need to be incorporated into policy decision-making.



While effective policy requires all sections of society to change, policy should be designed to ensure that impacts are distributed fairly. Undue impact on the less well-off should be addressed through the welfare and taxation systems. Other aspects of climate policy can also be used to facilitate equitable outcomes, such as targeting energy efficiency upgrades at low-income households.

Given these factors, a broad range of supplementary policies such as regulations, standards, education initiatives, voluntary agreements and awareness campaigns will be required as well as targeted investment in research, development and innovation.

### **Addressing fossil fuel subsidies**

There are many supports which either directly or indirectly subsidise the continued use of fossil fuels. The National Mitigation Plan should initiate a process to identify these in order to inform a national strategy for their removal in an appropriate manner. In particular, the Council recommends that price supports for peat generation be phased out as soon as possible, while also providing support for communities that may be adversely affected.

## **Sectoral actions**

### **Renewable energy**

Policy to enable deployment of renewable energy technologies is essential. Measures to enable increased community engagement and ownership, and more efficient planning and regulation, may aid more timely deployment of renewable technologies.<sup>[40]</sup>

### **Home heating and retrofits**

Heating is a key area from which non-Emission Trading Scheme emissions arise. Ireland has a considerable stock of poorly insulated housing. Around 75,000 homes will need to be upgraded for improved energy efficiency every year between now and 2020. While the benefits of upgrade will exceed the costs for most households, there are many non-cost barriers to households undertaking improvements. Policy makers need to understand these barriers and put in place measures that help overcome them, while factoring in health impacts. Existing standards for new builds need to be maintained even with pressures to increase housing supply.

### **Transport**

Policy must provide an appropriate price signal and factor in other variables which influence transport choices. Unmanaged growth in transport also generates wider societal and environmental costs, in particular congestion costs, related pressure on infrastructure and health costs from a range of air pollutants<sup>[31][32][33]</sup>. The Council recommends that health and wider societal costs, such as congestion costs, should be factored into decision making on transport.

Progress in tackling transport emissions has been very limited. While an appropriate price signal is needed, many other supporting measures will also be essential to address the factors that influence transport choices.

Lessons learned from the restructuring of motor and vehicle registration tax systems in the past point to how changes in the tax system can be further optimised to produce significant changes in behaviour, while also being revenue neutral.

## **Agriculture, forestry and land use**

The agriculture sector will need to outline a pathway to achieve its contribution to the 2050 national mitigation objective. Significant reductions in non-carbon dioxide greenhouse gas emissions will be required. This, coupled with enhanced uptake of carbon dioxide in biomass and soils, will facilitate this sector in moving on to a transformative pathway and to achieve its contribution to the 2050 national mitigation objective. This will include actions to reduce emissions from this sector and to enhance removal through forestry and land use management. These will need to be implemented in a measurable, reportable and verifiable manner. The Council recognises that more research and development is needed for this to happen. A timeline for expected delivery of solutions from such investment should be provided in the National Mitigation Plan.

Research has shown that a switch to lower emission fertilisers would be effective in reducing greenhouse gas emissions. Such immediately available measures need to be put in place and captured by the National Inventories Reporting process.

Forestry policy in Ireland aims to increase forest cover to 18%, around 1.25 million hectares, by 2046.<sup>[37]</sup> Planting will be required to increase to 8,000 hectares per year to achieve this. There is an urgent need to identify measures to enable high levels of sustainable afforestation to be achieved. Sustainable afforestation can make an important contribution to climate action and can have wider ecological, economic and societal benefits.

## **Adaptation**

### **Governance**

The Council recognises that ownership of certain issues will be shared between responsible authorities. The National Adaptation Framework should provide clarity on these issues, including the ownership, management and assessment of adaptation actions as well as clarity on governance of adaptation at a national level.

### **Authoritative Information – Climate Ireland**

It is essential that adaptation planning under the National Adaptation Framework is supported by authoritative and relevant information over the range of climate scenarios that are relevant for Ireland, and that analysis of these scenarios is provided in a coherent and structured manner so that actors at sectoral and local levels can be clear on the range of information that they should consider in adaptation planning. Currently the Climate Ireland platform is providing such information to support planning by sectors and local authorities.

The Council considers that this should evolve from research to an operational phase as a national information portal, with appropriate governance and management structures. This is required to support the development of the National Adaptation Framework and its implementation. Communications, capacity building and support are needed to build national resilience.

## **Prioritisation of measures**

The Council considers that a key function of the National Adaptation Framework is to set out the adaptation priorities for Ireland. In doing this it should provide a common framework for investment decision making. Taking an approach that minimises short-term costs may not always be appropriate and the longer-term economic, social and environmental benefits of adaptation actions must be reflected in any decision making framework.

## **Research and innovation**

In this report the Council has identified a number of areas where further investment in research and innovation is needed. These recommendations on research, observation systems and innovation are pertinent to informing both mitigation and adaptation actions, as well as for supporting opportunities in providing climate solutions and services. A well-structured and effective climate change research and innovation programme is an essential component of the national response to climate change.

### **Policy support**

Research and infrastructural investment to assist and inform mitigation and adaptation policy development is essential at national and sectoral levels. Current research, analysis and observation capacity should be maintained and developed to support decision making on mitigation and adaptation actions. This includes localisation of Earth and Human systems models including modelling of climate, oceans, energy, transport, agriculture and land use. If the Council and the Department are to do their work effectively we also need models that capture the long-term interaction between the economy and the environment. These tools need to be supported by advanced observation systems and activity data. In combination these provide essential information for policy development over the short, medium and longer terms and for the work of the Council.

The Council is concerned that the necessary modelling tools are not available for government departments or the Council to do their work effectively. Suitable models that capture the long term interaction between economy and environment are needed to assess the true nature of the challenges facing us and to develop effective policies.

### **Supporting innovation**

Targeted development of climate solutions and services is required in order to avail of the opportunities that will arise from the necessary national and global transition. Solutions are needed to assist in mitigation of, and adaptation to, climate change and can create new enterprises and services opportunities for global markets.

The Council strongly recommends that there should be continued support for research and supporting infrastructures and the further development of these via a well-structured and effective climate change research and innovation programme to support policy and to provide climate solutions and services.

## **7. Conclusions**

A working carbon price is a key instrument for delivering transformative change to 2050. However, it is only one element of a much broader suite of policies and measures, including regulations, standards, education initiatives, voluntary agreements and awareness campaigns and investment in research, observation systems and innovation, that will be required to achieve the necessary transformation of the Irish economy and society. Further development of research will be essential to achieve carbon neutrality in agriculture and land use.

A more comprehensive assessment of selected issues, including those that have only been briefly mentioned in this report, will be considered in the first Periodic Review Report that will be provided by the Council next summer. The first Periodic Review Report will also pay particular attention to assessing the National Mitigation Plan, which is expected next year.

The Council looks forward to working with government and other stakeholders in enabling Ireland to achieve the low emissions, climate resilient future that is essential for climate security and prosperity.

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## Appendix 1: Influences of greenhouse gases and other pollutants

The Intergovernmental Panel on Climate Change determines the relative influences of greenhouse gases and other pollutants on the climate system by estimating their influence on the global energy balance since pre-industrial times, i.e. 1750. This is calculated as radiative forcing in watts per metre squared ( $\text{Wm}^{-2}$ ). The estimates of this provided in the Fifth Assessment Report are shown in Figure A1.1.

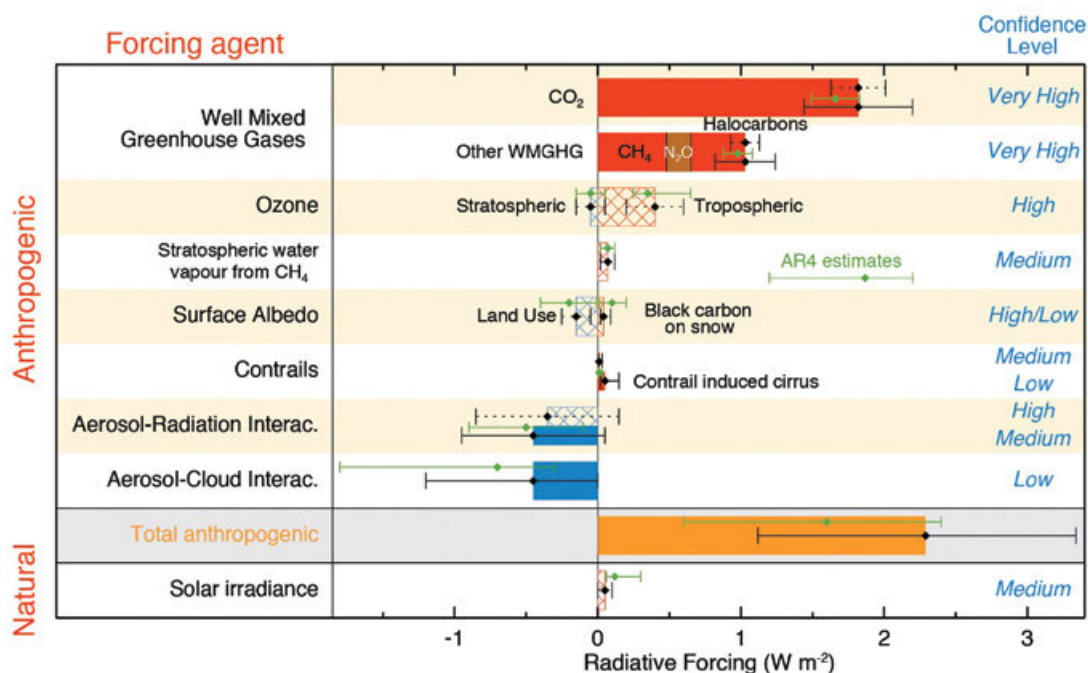


Figure A1.1: Radiative forcing of climate between 1750 and 2011. <sup>(6)</sup>

It is notable that radiative forcing by carbon dioxide ( $\text{CO}_2$ ) dominates this chart and that methane ( $\text{CH}_4$ ) and nitrous oxide ( $\text{N}_2\text{O}$ ) are the second and third most important greenhouse gases. The impact of a basket of industrial gases which include ozone depleting substances (ODS) and their replacement gases is also significant. While ozone depleting substances have been regulated under the Montreal Protocol and the Vienna Convention, their replacement gases, mainly hydrofluorocarbons (HFCs), are addressed under the UN Framework Convention on Climate Change. Moves to address these gases together under the Vienna Convention may be more appropriate from a policy perspective; however, the Council will aim to keep an overview of these emissions as part of its work. Also of note is the importance and variability of impacts of air pollution on climate. Increases in ground level ozone – a short-lived gas with an atmospheric lifetime of days to weeks – are significant. The impacts of other air pollutants are to cool the Earth by reflecting the energy from the sun directly as hazes or indirectly through influencing cloud characteristics. These impacts are short term but importantly have acted to mask some of the warming influences of greenhouse gases. It is noted that black carbon or soot is an exception to this, which acts to absorb solar energy and reduces the amount of energy reflected by snow and ice, leading to warming.

## Appendix 2: Outline of the 2050 neutrality challenge

Current greenhouse gas emissions from the agriculture sector make up about 33% of total emissions.<sup>†</sup> These are primarily emissions of methane, around 63%, and nitrous oxide, around 35%. In 2014, Ireland had an estimated total sink of carbon dioxide by forestry of 3.48 million tonnes of carbon dioxide equivalent.<sup>‡</sup> Estimates of other land sinks exist but these are not yet at the same level of scientific quality as those for forestry. Some land uses are also a source for carbon dioxide; these included drainage of wetlands, and harvesting of peat for energy generation.

Neutrality by 2050 implies that agricultural emissions could be offset by removals such as are currently provided by afforestation. However, this requires that emissions are reduced, as far as is possible, while removals are greatly enhanced. Enhanced carbon dioxide removals can also be achieved through management of non-forest biomass and soils. Understanding and quantification of these removals is both necessary and challenging. Ideally this should be achieved from farm to national levels.

A first step in achievement of neutrality is balancing of carbon dioxide emissions and removals. This may already be the case in certain situations but will need to be proven, i.e. robust quantification of negative emissions/removals of carbon dioxide is needed. This will be a key measure of to what extent remaining emissions of methane and nitrous oxide may be offset.

The issue of greenhouse gas neutrality or balance is likely to be examined in depth by the scientific community in the coming years and addressed in the IPCC Sixth Assessment Report. These discussions are likely to include consideration of issues such as metrics, lifetimes of greenhouse gases and their contribution to climate change. How neutrality or balance is to be achieved and what measurement reporting and verification systems will be used remains open. However, solutions identified by Ireland will be of global interest.

The atmospheric lifetime of methane is 12 years and therefore its impact on climate is related to the rate of emission from ongoing activities. Carbon dioxide emissions accumulate in the atmosphere, implying a long-term commitment to climate change. An increase in methane emissions would require an equivalent removal of carbon dioxide from the atmosphere in order to achieve an effectively net-zero impact on climate.

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<sup>†</sup> This is based on Global Warming Potential (GWP) values over 100 year time horizon provided in IPCC 4th Assessment Report.

<sup>‡</sup> EPA, 2016 submission to UNFCCC, Table 4.A Forest Land.

## Appendix 3: Communication on EU Emissions Trading Scheme

Climate Change Advisory Council  
McCumiskey House  
Richview  
Clonskeagh Road  
Dublin 14, D14 YR62

Mr. Denis Naughten, TD  
Minister for Communications, Climate Action and Environment  
29 – 31 Adelaide Road  
Dublin 2, D02 X285

14th June 2016

Dear Minister,

I would like to take the opportunity to introduce the Climate Change Advisory Council. This is an independent, statutory body established under the Climate Action and Low Carbon Development Act 2015, charged with advising Ministers of State and the Government on national policy relating to climate change.

The Council is mandated to offer policy recommendations, primarily through two publications; the Annual Report and the Periodic Review Report. We aim to provide a first Council report later this year, which will offer preliminary recommendations on the development of climate change policy. The Council is concerned that the current pace of decarbonisation is not compatible with our 2050 low-carbon transition objective and Ireland may not meet emissions targets agreed under the 2020 Climate and Energy package.<sup>†</sup> Our forthcoming reports will therefore provide initial advice on appropriate policies to meet these objectives.

An essential part of this process will be to decarbonise electricity generation: this would facilitate the electrification of heat and transport, which must also be decarbonised to meet national objectives and EU targets. However, we are concerned that, to date, the EU Emissions Trading Scheme (ETS) has not provided appropriate incentives to decarbonise electricity generation across the EU.

This item will be discussed at EU level over the summer. In this context, the Council would like to make a recommendation to you that Ireland should support certain reforms to make the scheme more effective. Operation of the EU ETS to date has not encouraged adequate decarbonisation of electricity generation and heavy industry because prices for EU ETS emissions allowances (EUAs) have been too low. There is evidence to suggest that remedial measures recently announced by the EU Commission may be insufficient to address this problem and that further action is required.

As the accompanying background document shows, a suitable minimum EUA price could initiate a path of sustainable decarbonisation with greater certainty. This minimum price should rise over time to drive reform across the EU. The Council recommends that Ireland support any future proposals to introduce a minimum EUA price.

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<sup>†</sup> [http://ec.europa.eu/clima/policies/strategies/2020/index\\_en.htm](http://ec.europa.eu/clima/policies/strategies/2020/index_en.htm)

Support from EU Member States, including Ireland, is important for any minimum price proposal to receive adequate consideration at EU level. Council research suggests that national competitiveness is not an obstacle to a minimum EUA price. Indeed, given Ireland's relatively low dependence on coal-fired electricity generation, such a measure could improve Ireland's competitiveness relative to some other major EU economies.

A well-functioning EU ETS is the most effective way to ensure decarbonisation across all EU Member States and is of the utmost importance in achieving Ireland's climate change ambitions. We look forward to further constructive collaboration with your department as we work together to achieve our national transition objective to 2050, as well as meeting shorter-term EU 2020 targets.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'John FitzGerald', is positioned below the closing text.

Prof John FitzGerald  
**Chair**  
Climate Change Advisory Council

## Appendix 4: National Adaptation Framework letter

Climate Change Advisory Council  
McCumiskey House  
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Mr Denis Naughten TD  
Minister for Communications, Climate Change and Environment  
29 – 31 Adelaide Road  
Dublin 2, D02 X285

5<sup>th</sup> August 2016

### **RE: Consultation on the development of the National Adaptation Framework**

Dear Minister,

I am writing to you in response to a communication from Mr Alan Kelly TD, dated 19 April 2016, in connection with the development of Ireland's first statutory National Adaptation Framework (NAF). I wish to start by stating that the Climate Change Advisory Council is committed to providing independent advice to help Ireland achieve its national transition objective on adaptation as outlined in the National Policy Position.

I would like to take the opportunity to inform you, that the Council has established an Adaptation Committee to assist it in its work on adaptation issues. Our forthcoming reports will provide more detailed advice on appropriate policies and mechanisms on adaptation issues. In order to respond to the original request three initial observations are outlined here in relation to the development of the NAF.

1. The Council recognises that ownership of certain issues will be shared between responsible authorities. In this context greater clarity on integration and alignment of sectoral adaptation plans within the NAF will be central to implementation of required actions and achievement of national policy. An implementation plan will be required to overcome the risk of divergent or fragmented approaches to adaptation planning across government departments and local authorities, and to provide systems to monitor and assess progress on actions. Therefore the NAF should provide clarity on these issues including the ownership, management and assessment of adaptation actions.
2. The Council is aware that knowledge gaps exist in relation to the economic, environmental and social costs of climate change as well as the costs of adaptation. This is a key challenge in the development of the NAF and particularly for resourcing the transition to resilience. These are complex issues which need to be addressed. Analysis is required to better understand the economic implications of climate change, such as the costs of current and projected extremes and the investments that are necessary to reduce associated vulnerabilities and risks. The NAF should provide clarity on resource issues, including human and financial resources, and commit to further research in this area aimed at enhancing decision making on adaptation investments.

3. Finally, the Council considers that a key function of the NAF is to set out the adaptation priorities for Ireland. In doing this it should provide a common framework for investment decision making. Taking a 'least cost' approach may not always be appropriate and the longer-term economic, social and environmental benefits of adaptation actions must be reflected in any decision making framework.

We look forward to next stages of NAF process and its finalisation and to further constructive collaboration with your Department in moving to a climate resilient Ireland by 2050.

Yours sincerely,



Prof. John FitzGerald

**Chair**

Climate Change Advisory Council





Climate Change Advisory Council

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