**Roinn Cumarsáide, Gníomhaithe ar son na hAeráide & Comhshaoil**
Department of Communications, Climate Action & Environment

# National Mitigation Plan

## JULY 2017

# Table of Contents

# Contents

# Message from the Taoiseach

Ireland places great value on cooperation in the international community to meet the challenges facing humanity. How Ireland interacts with the world is a statement about us as a people and how we see our place in the world. Climate change is one of the biggest global challenges of this century. Its scale and complexity demands a coordinated approach at both national and international levels.

Ireland is committed to concerted multilateral action to tackle climate change through the Paris Agreement, which represents the international community's best hope for collectively ensuring the very survival of our planet. Our commitment to the Paris Agreement requires us to take action at home, while acknowledging the scale of challenge involved.

Ireland's first National Mitigation Plan sets out this Government's shared approach to reducing our own greenhouse gas emissions. It is a first step, but one which we are committed to building on in the years ahead. As a Government and a society, we must become fully engaged with climate change, alter our behaviours, and work collaboratively to bring about the required transformation. We will only succeed if each of us fully plays our part.

The Programme for a Partnership Government commits us to chart a course towards achieving a low carbon and climate resilient future by 2050, while also recognising that no one has a monopoly on good ideas. This challenge will require broad based consensus at political and public level to take incremental steps towards realising our 2050 objective.

The Government does not underestimate the scale of what this entails. It will require fundamental societal transformation and, more immediately, will require allocation of resources and sustained policy change, as well as the ongoing engagement with wider society. Equally, we must embrace the economic opportunities decarbonisation presents. We will be taking a number of further steps in the coming months, including the National Dialogue on Climate Action, the National Planning Framework and the *10 Year Capital Investment Plan*.

This transformation process will require broad support in the Oireachtas. The Government, for its part, is committed to the Oireachtas providing oversight of our work as set out in the Climate Action and Low Carbon Development Act, 2015.

We will also come forward later this year with our first National Adaptation Framework which will set out the Government's approach to preparing for the expected impacts of climate change on Ireland in the years ahead. I commend Minister Naughten and his colleagues for presenting a National Mitigation Plan which sets out honestly and clearly what lies ahead of us, but also begins the process of collectively developing a strong roadmap for action across all sectors to build the foundations for Ireland's low carbon transformation.

**Leo Varadkar, T.D.**
*Taoiseach*

# Foreword

Confronting climate change is the global imperative of our generation. It presents huge challenges as well as opportunities for Ireland and for the international community. We must meet these challenges and grasp these opportunities head on if we are to achieve the transformation that will be required to enable us to transition effectively to a low carbon and climate resilient future. Each one of us has a role to play in this transformation.

Ireland's first statutory National Mitigation Plan is a very important first step by this Government in enabling transition in what will be a long journey with many different and complex elements to consider along the way.

This is a whole-of-Government Plan, reflecting in particular the central roles of the key Ministers responsible for the sectors covered by the Plan – Electricity Generation, the Built Environment, Transport and Agriculture, as well as drawing on the perspectives and responsibilities of a range of other Government Departments.

Government has already implemented a wide range of policies and measures to reduce greenhouse gas emissions across the economy and we are actively developing proposals to further expand measures already in place and to implement additional measures. This Plan describes in detail these existing measures and those under consideration.

Ireland faces a significant task in reducing its greenhouse gas emissions, the current profile of which reflects both the particular structure of our economy as well as the outcome of curtailed public and private investment capacity over the course of recent years. The choices available to us to achieve the deep decarbonisation required are neither straightforward nor cost-free. But we also recognise that the measures we are developing now will position Ireland to harness a range of benefits into the future, for example in terms of the creation of sustainable green jobs, sustaining food production, deepening our energy security, improving the quality of our lives and making our working and built environments healthier.

In this way the measures that we implement through this National Mitigation Plan will lay the foundations for transitioning Ireland to a low carbon, climate resilient and environmentally sustainable economy by 2050. To support this ongoing work, the Plan also includes over 100 individual actions for various Ministers and public bodies to take forward as we move to implementation of what will be a living document. Progress will be reported on by Government annually in its Annual Transition Statement, and will be supplemented as necessary by further actions and measures each year.

Importantly, the Government recognises that this first Plan does not provide a complete roadmap to achieve the 2050 objective, but begins the process of development of medium to long term mitigation choices for the next and future decades. This will be an ongoing process, including the preparation of successive National Mitigation Plans at least every five years as provided for in the Climate Action and Low Carbon Development Act, 2015.

To support the inclusive nature of this work, the Government has also established a National Dialogue on Climate Action. The National Dialogue will provide an opportunity to create awareness, engagement and motivation to act (locally, regionally and nationally)

in relation to the challenges presented by climate change, and will create structures and information flows to facilitate people gathering to discuss, deliberate and achieve consensus on appropriate responses to these challenges as well as enable and empower appropriate action.

The transition we must achieve is essential for Ireland's future and for the future for the planet. This National Mitigation Plan sets out our vision to achieve this transition in which each and every one of us has a role to play as we work to build this future.

**Denis Naughten, T.D.**
*Minister for Communications, Climate Action and Environment*

**Michael Creed, T.D.**
*Minister for Agriculture, Food and the Marine*

**Eoghan Murphy, T.D.**
*Minister for Housing, Planning, Community and Local Government*

**Shane Ross, T.D.**
*Minister for Transport, Tourism and Sport*

# 1 Introduction

One of the greatest global challenges for this and future generations is how we address climate change. Evidence for warming of the climate system is unequivocal and it is extremely likely that human activity has been the dominant cause of the observed warming since the mid-20th century. Observations show that global average temperatures have increased by almost 1 °C since pre-industrial times. The atmosphere and ocean have warmed, the amount of snow and ice has diminished and sea levels have risen as the concentrations of greenhouse gases (GHG) have increased. The projections of future global and regional climate change indicate that continued emissions of greenhouse gases will cause further warming and changes to the climate system[1]. Changes in Ireland's climate are in line with these global trends.

Climate change is already having diverse and wide ranging impacts on Ireland's environment, society, economic and natural resources. Future impacts are predicted to include sea level rise; more intense storms and rainfall; increased likelihood and magnitude of river and coastal flooding; water shortages in summer; increased risk of new pests and diseases; adverse impacts on water quality; and changes in the distribution and time of lifecycle events of plant and animal species on land and in the oceans. Against this background, strategies must be devised to reduce and manage climate change risks through a combination of mitigation and adaptation responses.

The international community has a limited window for real action to ensure that current and future generations can live sustainably in a low carbon and climate resilient world.

The Paris Agreement recognises that the impacts of climate change will be felt by all, but also that these impacts will be uneven. As a Party to the Paris Agreement, Ireland recognises the principle of "common but differentiated responsibility and respective capabilities" within the Agreement which acknowledges a diverse range of capacities and responsibilities by Parties. Ireland also recognises both the right and responsibility of all Parties to pursue low carbon, climate resilient development and is supporting initiatives, within the framework of both the Paris Agreement and the UN Sustainable Development Goals, to support less developed countries in achieving these objectives.

In Ireland, Government is taking the lead in addressing the climate challenge and we must ensure that there is a sustained, considered and strategic approach to incremental and permanent decarbonisation involving all of Government and society. However, the climate challenge cuts across all sectors of society and we all need to consider how best we can contribute to the solutions. In this respect, Government cannot achieve the decarbonisation objective acting on its own and concerted engagement by individual citizens, communities and wider civil society will be necessary. As a first step in building this engagement, the Government is establishing a National Dialogue on Climate Action to provide an inclusive process of consensus-building across society on enabling the transition to a low carbon and climate-resilient future.

1 IPCC, 2013. Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

The extent of the challenge to reduce greenhouse gas emissions in line with our international commitments under the Paris Agreement as well as to meet our more immediate EU obligations is well understood by Government. The strength of the Government's commitment to meeting this challenge is reflected also in the *National Policy Position on Climate Action and Low Carbon Development (2014)* and the *Climate Action and Low Carbon Development Act, 2015*. The *National Policy Position* established a commitment to deep decarbonisation of the economy by 2050 and the 2015 legislation provides the enabling statutory framework for this to happen. The Government also recognises that, as part of the ongoing evolution of international climate change policy, the objectives set out in the *National Policy Position* will, in time, require review to ensure coherence with the Paris Agreement.

This first National Mitigation Plan represents an initial step to set us on a pathway to achieve the level of decarbonisation required. In this context, this Plan not only contains measures to address the challenge to 2020, but equally importantly also begins the process of development of medium to long term options to ensure that we are well positioned to take the necessary actions in the next and future decades. This first Plan does not represent a complete roadmap to achieve the 2050 objective, but rather is a work in progress reflecting the reality of where we are in our decarbonisation transition. It is intended that the Plan becomes a living document, accessible on the website of the Department of Communications, Climate Action and Environment (DCCAE), which is continually updated as ongoing analysis, dialogue and technological innovation generate more cost-effective sectoral mitigation options.

Under the 2015 Act, each National Mitigation Plan must specify the policy measures that Government consider are required to manage greenhouse gas emissions and the removal of emissions at a level that is appropriate for furthering the *national transition objective* set out in that Act. Given that this long-term objective must be achieved by 2050, it is not prudent or even possible to specify, in detail, policy measures to cover this entire period as we cannot be certain what scientific or technical developments and advancements might arise over the next 30 years or so.

This does not mean that inaction or a 'wait and see' approach is appropriate either, as early action that limits greenhouse gas emissions sooner will spread the burden of emissions reductions over a longer timeframe and, therefore, the overall cost of reductions will be less. While there is a need to ensure that action taken now does not lock Ireland into excessively expensive reduction pathways or solutions which depend on unsuitable technologies, there is nevertheless now a broad consensus internationally on what must happen to achieve the deep decarbonisation required within individual economies. Country-specific contexts and starting points vary greatly however and, in Ireland's case, the large share of national emissions from the agriculture sector presents particular challenges.

In this respect, Ireland's first National Mitigation Plan is a critical first step towards decarbonising our economy and this and successive Plans will, over time, build on the foundation work underway with further policy development in the years ahead and expansion of the suite of measures already in place. This work is necessarily ongoing and envisages the Government, subject to budgetary considerations, adopting appropriate mitigation options so as to achieve progressive emissions reductions in each of the four key sectors covered by this Plan. In this regard, and in line with the globally agreed 2030 UN Sustainable Development Goals,

climate action should be seen as complementary to other important policy objectives, such as promoting sustainable economic development pathways, improving energy security and addressing air pollution impacts on human health.

In preparing this Plan, the Government has designated specific Ministers as responsible for the sectoral mitigation measures in each of the four sectoral chapters of the Plan. Each Minister is responsible for implementing the sectoral mitigation measures within their own sectors and for taking forward the actions listed to further develop those measures. Each Minister is also directly accountable and must report to the Oireachtas, under the 2015 Act, on progress in their respective sectors. The Government and individual Ministers will also be able to draw upon the advice and recommendations of the independent Climate Change Advisory Council in fulfilling their requirements under the 2015 Act.

The development of this National Mitigation Plan began in 2015. As well as being supported by a range of technical inputs, the National Mitigation Plan has also been informed by the submissions received during a public consultation in March and April 2017. A report on this consultation and a listing of the submissions received is available on www.dccae.gov.ie.

One of the strongest messages to emerge from the consultation was the need for the National Mitigation Plan to clearly set out how Ireland will meet its 2050 transition objective. Although, as stated above, this document cannot specify the individual measures that will be required to achieve this objective, it will, in the chapters that follow, provide further clarity on the nature and scale of the reduction pathways required to get from the present levels of emissions to the levels contemplated by the *national transition objective*. Full articulation of the implications of these reduction pathways for all sectors of the economy is essential and will be further elaborated in this Plan as well as in future work. The National Dialogue on Climate Action will, in turn, seek to give further voice to the implications, for individuals and for wider society, of the deep emissions reductions required to decarbonise our economy.

The National Mitigation Plan is also underpinned by environmental analysis undertaken through the Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) processes. The SEA Environmental Report and Environmental Statement, and the Natura Impact Statement, which are published with the National Mitigation Plan, are key components of the analytical basis for the Plan. Annex 2 of this Plan sets out the mitigating measures presented in the SEA Environmental Report and Natura Impact Statement and the sectoral responses to these measures.

To ensure that progress in implementing the National Mitigation Plan is robust and transparent, the Government will publish a progress report each year as part of the Annual Transition Statement provided for in the 2015 Act. Official data on Ireland's emissions for each year, to be included in the Annual Transition Statement, will continue to be provided by the Environmental Protection Agency (EPA) who will also continue to prepare annually updated projections of greenhouse gas emissions.

The National Mitigation Plan is structured as follows:

- **Chapter 2: Climate Action Policy Framework** describes the overall framework for policy on climate action operating in Ireland within the context of international and EU climate policy objectives. This chapter describes the long-term decarbonisation objective that Ireland has set for itself, describes transition pathway scenarios towards meeting this objective, and assesses our current progress towards achieving our existing targets. The chapter then describes a number of cross-cutting actions and implementation and oversight arrangements for the National Mitigation Plan.
- **Chapter 3: Decarbonising Electricity Generation** describes the policy context within which action is being taken in the electricity sector to achieve a low carbon energy sector by 2050. Measures in the context of Ireland's existing renewable energy targets are complemented by the longer-term policy framework provided by the Energy White Paper *Ireland's Transition to a Low Carbon Energy Future.*
- **Chapter 4: Decarbonising the Built Environment** focuses on action being taken to improve energy efficiency and reduce greenhouse gas emissions associated with Ireland's building stock, sets out the work that is currently underway to prepare for deeper measures after 2020, and provides a 2050 vision for Ireland's built environment.
- **Chapter 5: Decarbonising Transport** describes the profile of Ireland's transport sector and its multiple objectives within Ireland's economy. The chapter sets out the various measures already helping to contain the level of emissions associated with the transport sector and identifies a range of potential additional measures that can help to intensify mitigation efforts within the sector. As part of the longer term vision for the sector, this National Mitigation Plan sets out an ambition that all new cars and vans sold in Ireland from 2030 will be zero emission capable.
- **Chapter 6: An Approach to Carbon Neutrality for Agriculture, Forest and Land Use Sectors** describes the range of actions being taken to advance the long-term vision for this sector of an approach to carbon neutrality which does not compromise capacity for sustainable food production.

# 2 Climate Action Policy Framework

## 2.1 The Global Response to the Climate Challenge

Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which together provide an international legal framework for addressing climate change. In December 2015, an ambitious new legally binding, global agreement on climate change was agreed in Paris. The *Paris Agreement* aims to restrict global temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. It aims to increase global ability to adapt to the adverse impacts of climate change and to foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten sustainable food production. It also seeks to achieve a balance between anthropogenic emissions by sources, and removals by sinks, of greenhouse gases in the second half of this century.

### The Paris Agreement

The Paris Agreement was adopted by 195 Parties to the UNFCCC, representing 95% of global emissions, at the twenty-first session of the Conference of the Parties to the UNFCCC in December 2015. The ratification of the Agreement by the European Union triggered its entry into force on 4 November 2016, the same date the Agreement was ratified by Ireland.

This legally-binding Agreement, represents a global milestone in international efforts to achieve a peaking of greenhouse gas emissions as soon as possible and to achieve net zero emissions by the second half of the century. These efforts are now represented by 188 Nationally Determined Contributions (NDCs) which will increase in ambition over time. Work under the UNFCCC is ongoing and will focus during 2017 and 2018 on the design of the structures to help implement the Paris Agreement.

The Paris Agreement will measure the effectiveness of NDCs in achieving the goals of the Agreement via a series of global stocktakes, to be held in five-yearly cycles beginning in 2023. The global stocktake process will be informed by a facilitative dialogue, to be held in 2018, which will assess the ambition of Parties as reflected in the current suite of NDC's. It is anticipated, in line with the principles of the Paris Agreement, that the ambition reflected in each Party's NDC will increase over time. Ireland's contribution to the Paris Agreement will be via the NDC tabled by the EU on behalf of its Member States, which commits the EU as a whole to reduce greenhouse gas emissions by at least 40% by 2030, compared with 1990 levels.

## 2.2 Action at European Union Level

In February 2011, the European Council reconfirmed the EU objective of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990, in the context of necessary reductions according to the *Intergovernmental Panel on Climate Change (IPCC)* by developed countries as a group[2]. While maintaining a focus on the long-term objective to 2050, the European Union has also decided that this objective should be achieved by fixing targets for intermediate stages before 2050.

### Targets for 2020 and 2030

The overall EU objective for 2020, adopted by the European Council in March 2007, is to reduce its greenhouse gas emissions by 20% by 2020 compared to 1990 levels. This is to be achieved through reductions in all sectors of the economy. Reductions through the EU's Emissions Trading Scheme (ETS) are complemented by the individual targets for each EU Member State, established through the 2009 Effort Sharing Decision[3].

In October 2014, the European Council reached political agreement on headline greenhouse gas emissions reduction targets in the context of the 2030 Climate and Energy Framework[4]. An overall EU reduction of at least 40% in greenhouse gas emissions by 2030 compared to 1990 levels is to be delivered collectively by the EU, with reductions in the ETS and non-ETS sectors amounting to 43% and 30% respectively by 2030 compared to 2005. These headline targets also form the basis for the EU's first NDC under the Paris Agreement. As part of the Climate and Energy Framework, the European Council also included a binding target of at least 27% of renewable energy in the EU and an energy efficiency increase of at least 27%. An increase in the energy efficiency target from 27% to 30% is currently under negotiation.

In July 2016, the European Commission published a set of proposals concerning the allocation of individual targets for EU Member States to give effect to the overall EU level target for the non-ETS sector to reduce emissions by 30% by 2030 compared to 2005 levels[5]. Negotiations on these draft Effort Sharing Regulation (ESR) proposals are ongoing. In parallel, negotiations are also ongoing on a proposal to revise the EU's Emissions Trading Directive (Directive 2003/87/EC) for the 2021-2030 period. In order to give effect to the European Council's energy-related targets, the European Commission published the 'Clean Energy for All Europeans' package on 30 November 2016. It consists of eight legislative proposals which focus on the period 2021 to 2030.

2 EUCO 2/1/11: http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/119175.pdf.

3 Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020.

4 EUCO 169/14: http://data.consilium.europa.eu/doc/document/ST-169-2014-INIT/en/pdf.

5 Proposal for a Regulation of the European Parliament and of the Council on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 for a resilient Energy Union and to meet commitments under the Paris Agreement and amending Regulation No 525/2013 of the European Parliament and the Council on a mechanism for monitoring and reporting greenhouse gas emissions and other information relevant to climate change. COM(2016) 482.

## 2.3 National Policy Framework and Long-Term Vision

### National Policy Position

In 2014, the Government adopted the *National Policy Position on Climate Action and Low Carbon Development*[6]. The *National Policy Position* establishes the fundamental national objective of achieving transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out the context for the objective, clarifies the level of greenhouse gas mitigation ambition envisaged and establishes the process to pursue and achieve the overall objective. Specifically, the *National Policy Position* envisages that policy development will be guided by a long-term vision based on:

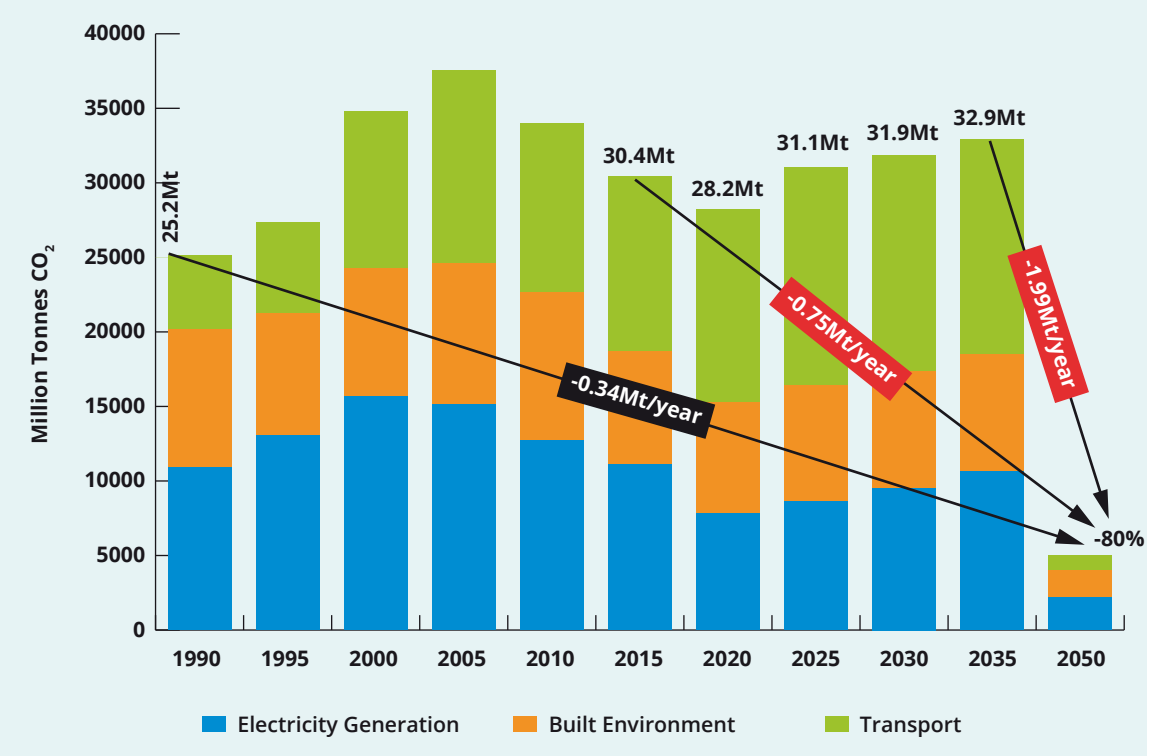
- an aggregate reduction in carbon dioxide ($CO_2$) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors; and
- in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

As envisaged by the *National Policy Position*, the evolution of climate policy in Ireland will be a dynamic, iterative process, with the ultimate objective of successive mitigation plans and adaptation frameworks incrementally achieving the required transition. The *National Policy Position* underlines the need to take a long-term view having regard to, *inter alia*, current and future obligations under EU or international agreements as well as the economic imperative for early and cost-effective action.

Figure 2.1 below sets out different scales of reduction effort required to achieve the vision in the *National Policy Position of* 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. These effort levels are based on historic and projected emissions for these three sectors, as compiled by the EPA. With a starting point based on historic emissions in 2015, average annual reductions of 0.75Mt $CO_2$ in total from the Electricity, Built Environment and Transport sectors would be required between now and 2050. However, when the projected position in 2035 under the EPA's 2017 'with additional measures' scenario is taken as the starting point, this would require a reduction in emissions of almost 2Mt $CO_2$ per year to 2050. This clearly underlines the importance of earlier action to reduce Ireland's emissions.

6 The National Policy Position is set out in Annex 4 of this Plan

**Figure 2.1 Historic and Projected $CO_2$ Emissions from the Electricity Generation, Built Environment and Transport Sectors.**




The Electricity, Built Environment and Transport sectors represented here are based on National Mitigation Plan sectors rather than total emissions in the EPA inventory. In particular, emissions from the Agriculture, Forestry and Land Use sectors are not represented as a separate objective for 2050 applies in this sector.

Source: EPA

## Climate Action and Low Carbon Development Act 2015

The *Climate Action and Low Carbon Development Act 2015* provides the statutory basis for the *national transition objective* – the goal of progressively pursuing a low carbon, climate resilient and environmentally sustainable economy by 2050. To enable achievement of the *national transition objective*, the 2015 Act provides the legislative framework for the development and submission to Government for approval of national mitigation plans and national adaptation frameworks. This includes the institutional and governance framework for the development of these plans on a regular basis, together with independent advisory and Oireachtas accountability arrangements.

## 2015 Energy White Paper

The White Paper on Energy Policy, *Ireland's Transition to a Low Carbon Energy Future 2015-2030*, published in 2015, sets out a framework to guide energy policy in the period to 2030. The White Paper recognises that a radical transformation of our energy system is required to meet our national, EU and international climate objectives and sets a course for an energy sector where the State will provide the supports that enable consumers to become active energy citizens. It posits a policy approach where our energy system will change from one

that is almost exclusively led by Government and utilities to one where individuals and communities are agents of change in the way Ireland generates, transmits, stores, conserves and uses energy. It sets out a vision, a framework and over 90 actions for Irish energy policy up to 2030 as we transition to a low carbon society and economy by 2050. The vision is to reduce greenhouse gas emissions from the energy sector by between 80% and 95% compared to 1990 levels by 2050, while ensuring that secure supplies of competitive and affordable energy remain available to our citizens and businesses.

The White Paper sets out how the energy transition will see accelerated and diversified renewable energy generation, and a renewed impetus on energy efficiency. This will be facilitated by strong regulation, effective markets, appropriate infrastructure, and deeper cooperation with our partners in Northern Ireland and the EU.

### Strategic Objectives

Many of the emissions reduction measures and actions set out in this National Mitigation Plan are aligned with and build upon commitments made in the White Paper. Implementation, through this and successive National Mitigation Plans, of the vision articulated by the National Policy Position, the Climate Action and Low Carbon Development Act and the Energy White Paper will be guided by the following strategic objectives:

- policy will contribute to reductions in Ireland's greenhouse gas emissions and enhancement of sinks in a manner that achieves the optimum benefits at least cost;
- a stable and predictable policy and regulatory framework will be underpinned by rigorous analysis and appraisal, supported by strong research and analytical capacity;
- the Government will pursue investment, innovation and enterprise opportunities towards building a competitive, low carbon, climate-resilient and environmentally sustainable economy; and
- the citizen and communities will be at the centre of the transition.

## 2.4 How Ireland is Contributing to the EU Effort

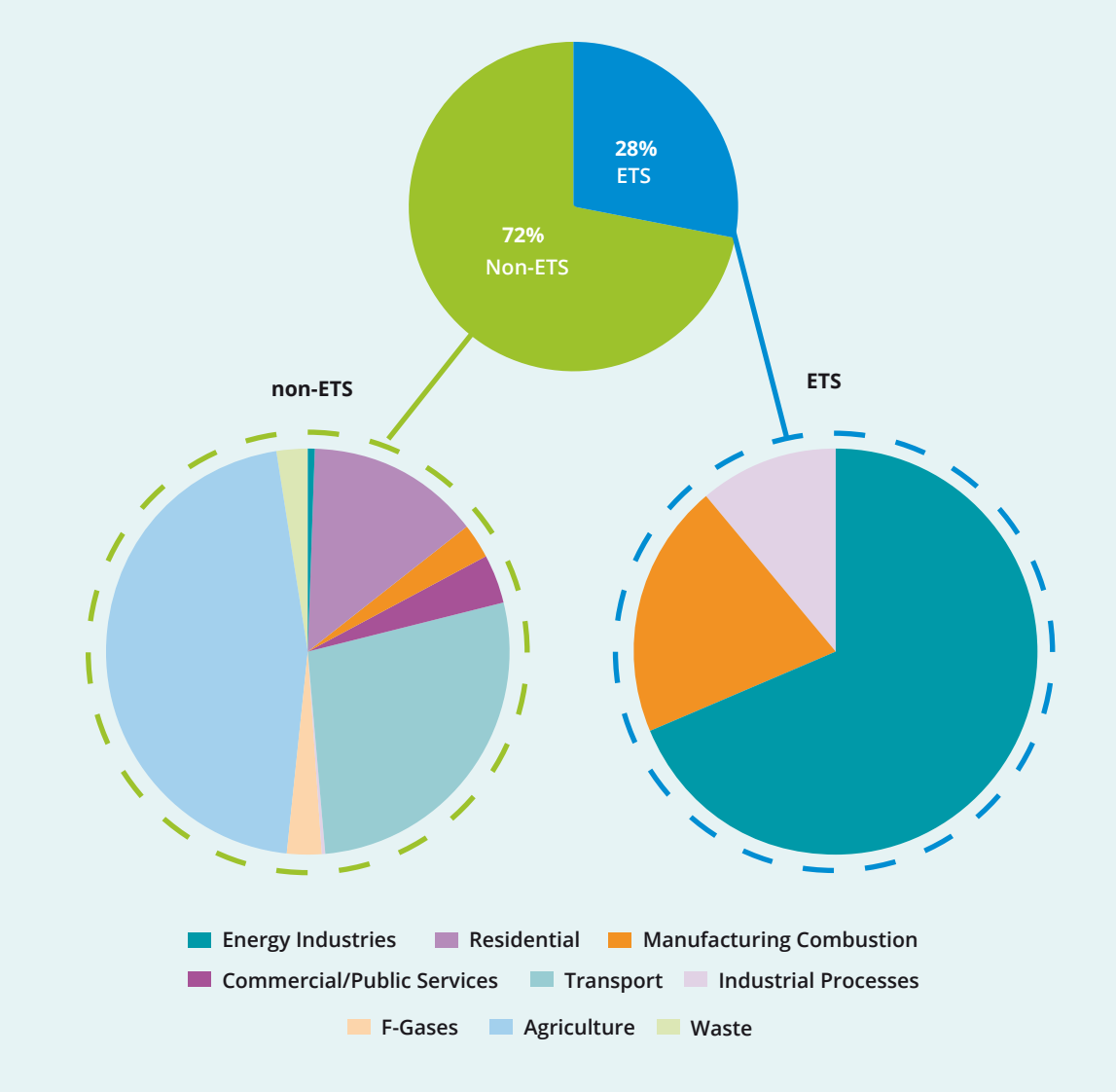
As set out above, the European Union's greenhouse gas emissions reduction objectives for 2020 will be delivered through a combination of the EU-wide Emissions Trading System and a series of individual targets for each Member State.

### EU Emissions Trading System

The 2003 Emissions Trading Directive established a cap and trade system for greenhouse gas emissions associated with large industry and electricity generation installations across the EU[7]. The EU ETS includes some 11,000 installations (102 installations are currently permitted in Ireland), with an installed capacity of more than 30MW. It covers approximately 45% of total EU emissions, but only 28% of total emissions in Ireland.

7 Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

**Figure 2.2 ETS/non-ETS Breakdown in Ireland, 2015 Figures**




Source: EPA

## Non-ETS – Effort Sharing

In parallel, the 2009 Effort Sharing Decision (Decision No. 406/2009/EU) set individual Member State targets for non-ETS emissions (primarily emissions associated with heating in buildings, transport, agriculture). In relation to the targets for 2020, Ireland has an emissions reduction target for each year between 2013 and 2020 under the 2009 EU Effort Sharing Decision. For the year 2020 itself, the target set for Ireland is that emissions should be 20% below their level in 2005. This will be Ireland's contribution to the overall EU objective, which is legally binding. Ireland's target of 20% is jointly the most demanding 2020 reduction target allocated to EU Member States under this Decision, which is shared only with Denmark and Luxembourg and can be compared to an EU average reduction of 10%.

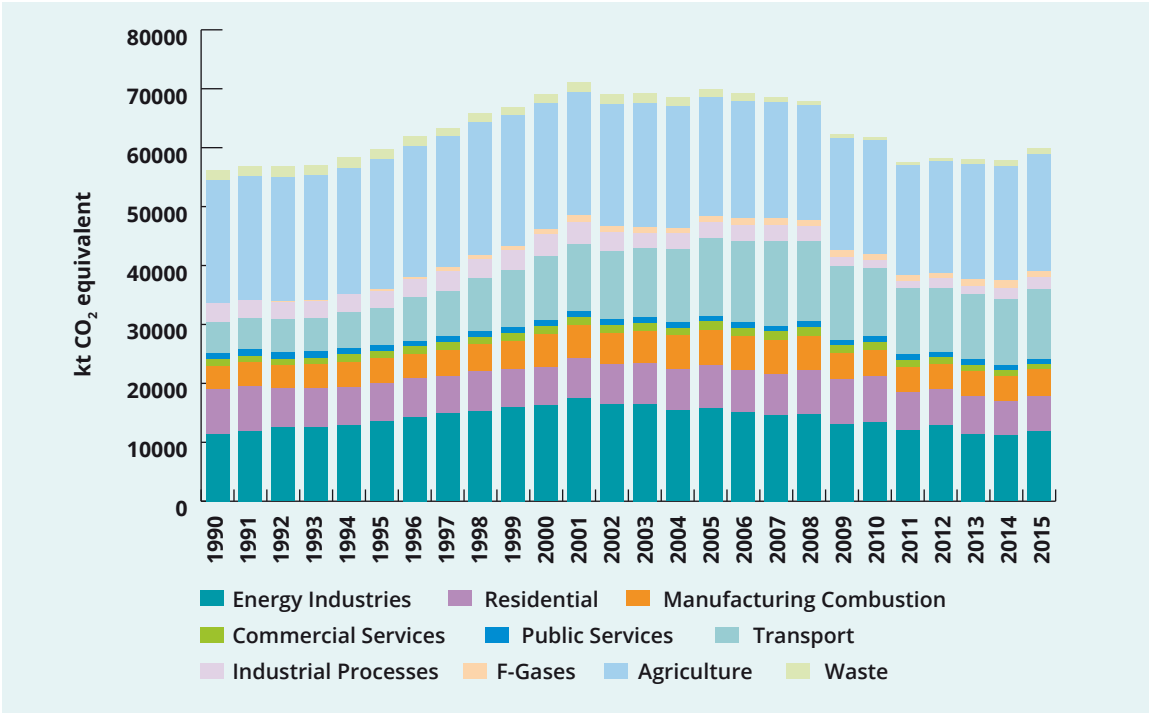
The 2013 target is based on the average of emissions for the years 2008-2010. The target for each of the years 2014 through to 2019 is on a trajectory between the targets for 2013 and 2020, and surpluses in one year can be used to cover deficits in any subsequent year.

## 2.5 Trends in Emissions and Projected Compliance with Targets

### Trends in Emissions 1990-2015

Figure 2.3 below shows the long-term trend in total emissions since 1990. According to the latest inventory published by the EPA in April 2017, emissions for 2015 are estimated at 59.88 Mt $CO_2$eq, a 3.7% increase on 2014 emissions. The longer term trend in emissions indicates a peak was reached in 2001 with reductions in eight of the last ten years. This trend has closely tracked activity in the economy and emissions are again now increasing across all sectors in line with economic and employment growth, particularly in the transport sector.

**Figure 2.3 Greenhouse Gas Emissions by Sector 1990-2015**



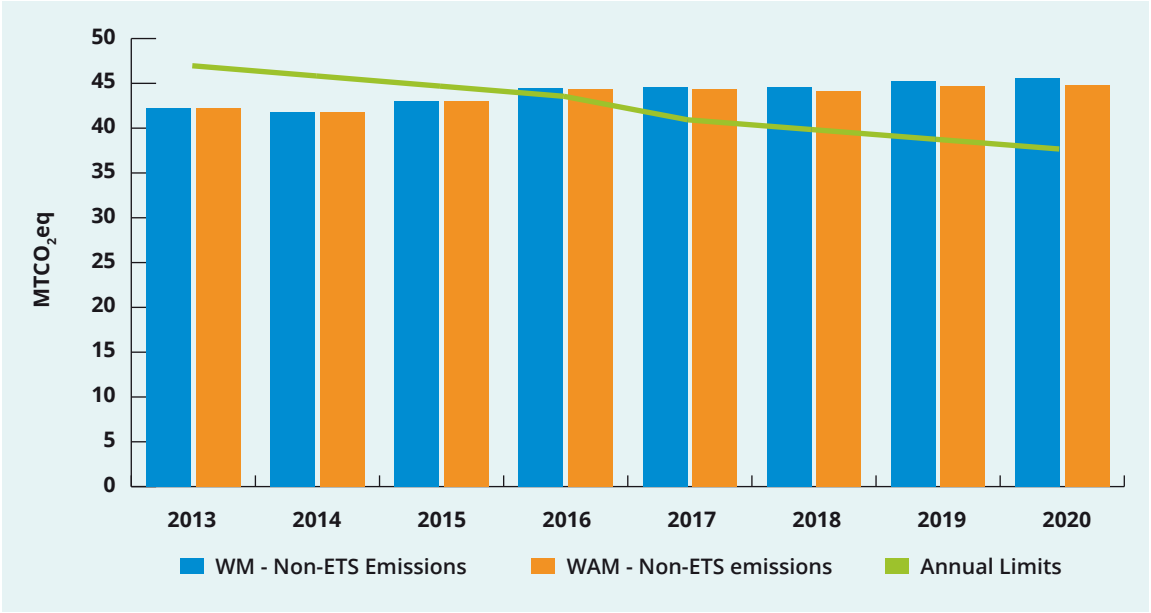

Source: EPA

### Greenhouse Gas Emissions Projections to 2020

The EPA also produces greenhouse gas emission projections on an annual basis for all sectors of the economy. According to the latest set of projections (April 2017), based on two different scenarios, Ireland's emissions in 2020 could be in the range of 4-6% below 2005 levels. The two scenarios are a business as usual (BAU) scenario based on measures already in place at the end of 2015 (EPA 'with measures' scenario) and a scenario predicated on additional policy measures being brought forward by 2020, particularly in relation to the Government's renewable energy and energy efficiency targets (EPA 'with additional measures' scenario)[8].

The inventory and projection figures indicate that Ireland will be in compliance with its 2015 annual limit under the Effort Sharing Decision, but that Ireland is likely to exceed its annual targets in 2016 or 2017, and over the remainder of the period to 2020. Figure 2.4 below sets out Ireland's annual limits under the Effort Sharing Decision under both EPA projection scenarios.

**Figure 2.4 Greenhouse Gas Emissions Projections Under EPA Scenarios and Comparison with Reduction Pathway Required Between 2013 and 2020 Under Effort Sharing Decision**




Source: EPA

8 The National Mitigation Plan includes data on the cumulative mitigation potential of both measures in place and measures under consideration as possible options for the short, medium and long term. Any new measures adopted on foot of this Plan will be accounted for by the EPA in future updates to emissions projections.

A useful way to examine the implications of this is to focus on Ireland's carbon budget (i.e. the maximum amount of carbon dioxide equivalent ($CO_2$eq) that Ireland may emit in a particular time period). Because the Effort Sharing Decision imposes annual targets, this effectively establishes a non-ETS greenhouse gas emissions budget over the period 2013-2020 of 338Mt $CO_2$eq. It is possible then to calculate the shortfall over the entire period 2013-2020. The EPA projections indicate total non-ETS greenhouse gas emissions are 351.6 Mt $CO_2$eq, indicating a 'gap to target' of 13.7 Mt $CO_2$eq under a business as usual scenario.

**Table 2.1 Gap to Non-ETS 2020 Target**

| Gap to Non-ETS 2020 Target | | |
|---|---|---|
| **2013-2020** | **Non-ETS Carbon Budget (Mt)** | **Gap (Mt)** |
| Required per EPA 2017 BAU Scenario | 351.6 | – |
| Effort Sharing Decision Limits | 337.9 | 13.7 |

The likely shortfall in terms of reaching Ireland's target of a 20% reduction by 2020, reflects both our reduced investment capacity over the period of the economic downturn, as well as the fact that the target itself was misinformed and not consistent with what was achievable on an EU wide cost-effective basis[9].

In the interim, the EPA projections suggest that Ireland may have a cumulative deficit of units from 2019. Some of this cumulative deficit can be addressed by means of the retirement of Annual Emissions Allocations and units from the Kyoto Protocol Flexibility Mechanisms carried forward from 2008-2012. The legislative framework governing the EU's 2020 emissions reductions targets includes a number of flexibility mechanisms to enable Member States to meet their annual emissions targets, including provisions to bank any excess allowances to future years and to trade allowances between Member States. Ireland expects to make use of both of these mechanisms in meeting its compliance requirements under the Effort Sharing Decision.

It is clear, however, that reliance on such flexibilities will not be a sustainable approach over the longer term. Further policies and measures beyond those that are already in place will be necessary to ensure that Ireland is on a sound pathway to the more onerous targets that we are likely to have under the proposed ESR for 2030 and to make progress towards permanent and incremental decarbonisation to achieve the *national transition objective*, specified in the *Climate Action and Low Carbon Development Act, 2015*, by 2050.

9 Chiodi A., Gargiulo M., Deane J.P., Lavigne D., Rout U.K. and Ó Gallachóir B.P. 2013 *Modelling the impacts of challenging 2020 non-ETS greenhouse gas emissions reduction targets on Ireland's energy system* Energy Policy Vol. 62, Pages 1438-1452.

While reducing emissions is challenging for all sectors, the challenge is greater in some sectors, particularly the agriculture and transport sectors. Emissions in the agriculture sector are projected to increase by 5% in the period 2015 to 2020[10]. For the transport sector, emissions are projected to increase by between 10% and 12% under the EPA scenarios over the same period, with the increase likely to be at the higher end.

### Challenge to 2030

Over the longer term to 2030, and based on the same expectations of policy implementation as for 2020, the EPA projects that total non-ETS emissions will be 1%-3% below 2005 levels i.e. that emissions will continue to increase after 2020. This should be considered a conservative outlook which understates the likely level of progress by 2030, as these projections imply no additional policies and measures will be implemented after 2020.

As stated earlier, a proposal on the non-ETS targets for individual Member States, the ESR, was published by the European Commission in July 2016. The ESR proposal suggests a 39% greenhouse gas reduction target for Ireland, based on GDP per capita, for the period 2021 to 2030. This target is adjusted downward for cost-effectiveness by 9 percentage points to give a headline target of 30%. While this target is not yet agreed, it is clear that it will present an enormous challenge for Ireland, particularly with the likely outcome in 2020 being a 4 to 6% reduction in non-ETS emissions compared to our 20% emissions reduction target, as outlined above.

The EPA's business as usual projections scenario (i.e. with no additional measures in place beyond those already in place at the end of 2015) suggests that Ireland will require a carbon budget of 472 Mt $CO_2$eq over the period 2021 to 2030. The table below summarises the impact of the proposed 2030 target on Ireland's maximum carbon budget over the period 2021-2030.

**Table 2.2 Impact of ESR Proposal on Carbon Budget for Ireland**

| 2021-2030 | Carbon Budget (Mt) | Gap (Mt) |
|---|---|---|
| Required per EPA's *BAU Scenario* | 472 | – |
| 39% Target | 359 | 113 |
| 30% Target (reflecting 9% Cost Effectiveness Adjustment) | 383 | 89 |

10 Removals from the land use, land-use change and forestry sector is not included in the EU's Effort Sharing Decision up to 2020.

This analysis suggests the bringing forward of additional measures with a cumulative greenhouse gas mitigation capacity of 89 Mt $CO_2$eq over the period 2021 to 2030, requiring very substantial investment by both the public and private sectors, as well as a broad range of non-financial policy tools, including regulations, standards, education initiatives and targeted information campaigns. Work is ongoing on the analysis and costing of various suites of measures that could meet the 2030 target as cost-effectively as possible.

## 2.6 Enabling the National Transition

A significant challenge lies ahead for Ireland in achieving the *national transition objective*. In addition to targeted measures to reduce emissions on a sector by sector basis, it is also necessary to identify actions of an enabling nature that can be taken on a cross-sectoral basis, address any obstacles to the effectiveness of measures and identify policies that may act in support of the achievement of emissions reductions. Given the long-term nature of the *national transition objective*, this will be an ongoing effort. This National Mitigation Plan, therefore, identifies a number of key actions which have the potential to make a significant impact, both in the short term and over the coming decades.

### Transition Pathway Scenarios

Key to addressing the long-term view required by the *National Policy Position* is the development of possible transition pathway scenarios to 2050 to inform sectoral strategic choices and policy development within sectors. Transition pathway scenarios will assist in understanding the strategic choices that Ireland will face in the years ahead, in identifying specific policies and measures that may be needed, and in establishing the required stable policy framework at sectoral level needed to achieve the 2050 objective in a cost-effective manner. These will also be essential in informing the achievement of Ireland's intermediate targets, established at EU level, for the 2020 and 2030 periods.

Such roadmaps are not predictions of what will definitely emerge in the future but are modelled scenarios, based on specific assumptions at a point in time, of possible future outcomes. They seek to represent the types of changes that might be necessary in relation to, for example, the structure of our energy system or our land use choices. As assumptions underpinning such scenarios are subject to change, roadmaps must also be subject to regular revision in the light of scientific or technical developments.

The 2013 report *Low Carbon Energy Roadmaps for Ireland,* explored possible routes towards decarbonisation of the energy system under different scenarios of $CO_2$ emissions reductions for 2050[11]. The report drew the following broad conclusions in relation to the energy system in Ireland:

- Significant investment in energy efficiency and renewable energy technologies would be required for Ireland to transition to a low carbon economy by 2050;
- Fossil fuels are incompatible with a low carbon economy and, while their use will be greatly diminished, natural gas may still be required in electricity generation;
- Bioenergy could become the dominant energy source by 2050, with significant implications for land use and energy security; and
- Significant changes in electricity infrastructure may be required to accommodate electrification of heat and transport.

A follow-up report commissioned by DCCAE, *Energy Modelling to inform the National Mitigation Plan*[12] takes account of the European Commission's ESR proposals for 2030, in particular, to describe the possible implications for non-ETS $CO_2$ emissions by 2030 in the context of the longer-term pathway to the 2050 objective in the *National Policy Position*.

Under the assumptions that Ireland would fully meet its proposed target of a 30% reduction on 2005 emissions levels, and that agriculture emissions would continue their expected trend under the EPA's business as usual scenario to 2030, the report models a 'National Mitigation Plan scenario' which demonstrates a requirement for significant reductions in non-ETS energy emissions from 23Mt $CO_2$ in 2020 to 17 Mt $CO_2$ in 2030.

For the transport sector, the National Mitigation Plan scenario implies a requirement for significant reductions in petrol and diesel consumption due to vehicle efficiency gains, electrification of the private transport fleet and an increased share of biofuels by 2030. The degree of electrification within the transport sector that would be required could increase electricity demand by over 3,000 GWh per annum by 2030.

Reduced emissions from buildings by 2030 are driven by a significant increase in energy efficiency, much greater use of renewables and electrification of heating. This scenario envisages an 85% reduction in the use of oil as well as complete phase out of coal and peat for heating by 2030.

This report also examines possible macro-economic implications of decarbonisation by 2050 under the National Mitigation Plan Scenario addressing future implied marginal abatement costs of carbon, sectoral impacts, and impacts on energy system costs. While the existing modelling framework does not allow for a comprehensive assessment of the economic impacts in different sectors, it can be concluded that the changes required in the energy system in Ireland will present both opportunities and challenges at both a sectoral and macro-economic level. The decarbonisation required will require significant additional investment but this will be offset by lower fuel bills and reduced reliance on fossil fuel imports. The signalling effect of progressively rising carbon prices will affect economic activity but, in the longer term,

11 *Low Carbon Energy Roadmap for Ireland*, ESRI, UCC and e4sma, December 2013. Available on www.dccae.gov.ie.

12 *Energy Modelling to inform the National Mitigation Plan, UCC and ESRI, May 2017*. Available on www.dccae.gov.ie.

this will be mitigated as fossil fuels represent a declining share of total energy consumed and the impact of rising fossil fuel prices on the economy will decline.

It is important to note that these transition pathway scenario reports to date focus on energy supply and energy end-use in Ireland, and not on other sources of greenhouse gas emissions. In particular, emissions from agriculture, forestry and other land use will require specific treatment in the context of the national policy position for 2050. As an initial step, further definition of the concept of carbon neutrality within this sector will be required. See also section 6.3 for further discussion on carbon neutrality.

The Government intends to commission regular updates to these scenarios as an aid to further informing policy development in the years ahead. It is proposed that the next update will be commissioned for publication in 2020.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **1** | Publish updated analysis on transition pathway scenarios to 2050. | DCCAE | DAFM, DTTAS, all relevant Government Departments | 2020 |

### Appraisal and Evaluation of Public Expenditure

Government choices in relation to expenditure are informed by rigorous analysis in relation to the proposed costs and benefits of such expenditure. This requirement applies to all Irish public bodies that are responsible for expenditure of public funds and these bodies are also required to ensure that the best possible value-for-money is obtained whenever public money is being spent or invested.

Public bodies rely on the *Public Spending Code,* published by the Department of Public Expenditure and Reform (DPER), for guidance on how to approach such analysis, by appraising a proposed programme before expenditure is committed as well as the ongoing management, control, review and evaluation of expenditure projects and programmes that are underway or completed. To assist public bodies, the *Public Spending Code* also includes detailed guidelines on cost benefit analysis (CBA).

Because the impacts of climate change are expected to be pervasive in Ireland's environment, society, economy and natural resources, it is essential that Government's expenditure choices are informed by an assessment of the full range of such impacts at the appraisal stage. This means being able to capture the broadest possible range of potential costs as well as the range of benefits that might also accrue. This should apply to all expenditure above defined thresholds and not just to expenditure with an explicit climate change mitigation or adaptation objective.

The current *Public Spending Code* includes a shadow price of carbon which provides for monetisation of the value of greenhouse gas emissions as part of expenditure appraisal. This shadow price is based on a combination of EU ETS allowance prices and EU Reference Scenario prices, depending on the time horizon chosen. This will be reviewed to ensure that an appropriate range of shadow prices of carbon are available to public bodies undertaking expenditure appraisal. The *Public Spending Code*'s test discount rate, used to convert

future costs, benefits and income streams into their present value to allow for meaningful measurement and comparison for appraisal purposes, will also be reviewed to ensure it is suitable for reflecting the long-term nature of climate change-related costs and benefits.

The review of the *Public Spending Code*, which has now commenced, will involve economic and evaluation resources within the relevant Departments determining if the existing appraisal framework provides the best available advice on measuring and reporting on the costs and benefits, including their distributional impacts, associated with climate change measures and engaging with DPER to consider specific sectoral guidance, as well as to ensure that the *Public Spending Code* evolves to meet appraisal requirements for public service programmes and projects.

It is expected that an updated *Public Spending Code* will also be able to better inform private sector investment decisions that require both a shadow price of carbon and an appropriate test discount rate. The Code will be kept under ongoing review into the future to ensure sound decision-making based on the best available analysis and assumptions in light of technical and scientific knowledge.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **2** | Undertake a review of guidance on public expenditure appraisal and evaluation to ensure their suitability to capturing key costs and benefits of climate measures. | DPER | DCCAE, D/ Finance, DAFM, DTTAS | 2018 |

### Carbon Pricing and Taxation

Ireland is one of a minority of countries globally to have implemented economy-wide carbon pricing measures[13]. Since 2005, electricity generation sites and large industrial installations have been included in the EU's Emissions Trading System (ETS). Outside of the ETS, a national carbon tax, currently set at €20 per tonne of $CO_2$ emitted, was introduced on a phased basis from 2009.

The Government is committed to carbon pricing as a core element of the suite of policy measures to address and reduce greenhouse gas emissions over time. Carbon pricing has the potential to drive reductions in consumption of fossil fuels and encourage energy efficiency improvements by households and businesses. At EU level, the Government is actively inputting into the proposals to reform the ETS with a view to it delivering an appropriate carbon price signal to advance decarbonisation of that sector.

Over the longer term, carbon pricing will have a key role to play in the transition to a low carbon economy and has been recognised by the Climate Change Advisory Council as an important tool for Ireland to achieve its decarbonisation objective in a cost-effective manner by 2050[14]. It will be important therefore that the rate at which carbon tax is set is kept under review to ensure that it

13 Source: *State and Trends of Carbon Pricing 2016*, World Bank.

14 Source: *First Report,* Climate Change Advisory Council,

is able to send a sufficiently strong signal to drive changes in household and business behaviour. In addition, clear long-term signalling by Government on the future evolution of carbon tax is vital. As a first step, the Department of Finance is commissioning further analysis to inform the policy direction of the tax with an examination of the mitigation and distributive impacts of the carbon tax as implemented and an assessment of its possible future price evolution.

More generally, the overall taxation system will have a key role to play in decarbonisation into the future. Further detail on taxation measures in place and under consideration are set out in the relevant sectoral chapters

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **3** | Examination of impact of carbon tax and future tax rate. | D/ Finance | DCCAE, DTTAS | 2018 |

### Fossil Fuel Subsidies

Fossil fuel subsidies have the potential to make consumption of fossil fuels more attractive relative to other, more sustainable alternatives. Internationally, the need to phase out fossil fuel subsidies has been recognised and particularly by the G20. Where subsidies exist, either directly or indirectly, they may be aimed at addressing other policy objectives rather than simply promoting the use of fossil fuels. The range of subsidies that are in place in Ireland need to be identified in order to inform a future strategy for addressing such subsidies where they have the potential to act as a barrier to decarbonisation. As a sign of Government commitment to this policy, Public Service Obligation (PSO) support for Bord na Móna's Edenderry peat-fired generation station expired in December 2015. PSO support for the ESB owned West Offaly and Lough Ree power stations will expire in December 2019. Thereafter, security of supply subsidies for electricity generated from peat will no longer be supported under the PSO.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **4** | Prepare a report identifying fossil fuel subsidies in place for consideration by Government. | DCCAE | D/Finance, DPER, EPA, all relevant Government Departments | 2019 |

### Energy Cost Competitiveness

Price competitiveness is needed both for business (which provides employment and creates wealth) and for households (which need affordable energy and protection against energy poverty). A reliable and competitively priced supply of energy is vital for business and its ability to compete successfully in international markets. The Energy White Paper places an emphasis on competitiveness alongside sustainability and security of supply objectives and committed to developing measures of Ireland's energy cost competitiveness. Arising from this,

the Sustainable Energy Authority of Ireland's (SEAI) statistical bulletin, *Electricity and Gas Prices in Ireland,* which is published twice yearly, now tracks the evolution of average gas and electricity prices for households and businesses.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **5** | Prepare periodic reports on the electricity and gas prices for households and businesses. | SEAI | DCCAE | Bi-annually |

The White Paper also recognises a number of drivers of end-user energy prices, including fuel prices, energy infrastructure investment costs, electricity generating fuel mix and non-energy costs that affect energy prices. While the Commission for Energy Regulation (CER) has a statutory responsibility to protect the interests of consumers and ensure that prices are fair and reasonable, it is also important, from a competitiveness perspective, that measures to reduce greenhouse gas emissions across all sectors seek to achieve optimum benefits at least cost, are evidence-based and subject to rigorous analysis and appraisal prior to being implemented.

### Economic Opportunities in the Low Carbon Economy

Research, development and innovation will play a key role in achieving Ireland's transition to a low carbon economy and society. The development and adoption of new and existing green technologies will be vital in areas ranging from energy efficiency, to electricity generation, transport and agriculture. Innovations in business models and services provision, along with research aimed at modelling future scenarios and monitoring progress, will also be important.

Because of the cross-cutting nature of the climate change challenge, Government support for climate-related research, development and innovation is provided by a variety of different Departments, Agencies and through specific programmes, and the Government remains committed to strong levels of funding in the coming years. Collaboration between national, EU and international research programmes, including through the EU's Horizon 2020 and Innovation Partnerships, also offer potential to support the identification of economic, social and environmental opportunities associated with the transition to a low carbon society. In addition, the Energy White Paper commits to a range of actions to encourage energy-related innovation and maximise the economic and business opportunities for Ireland.

It is also recognised that the private sector will have an important role in investing in decarbonisation in Ireland either on its own initiative or in parallel with Government funding. Business will play a pivotal role in this regard and Government for their part must ensure that policy evolves in such a way as to ensure that there is both an enabling environment and appropriate signalling for businesses and innovators to make the necessary investments for our low carbon, sustainable future. Green public procurement, for example, enables public bodies to play their part in driving increased energy efficiency standards and to consider life-cycle assessments of environmental impacts through the procurement process[15].

15 Green Public Procurement – Guidance for the Public Sector (EPA), 2014.

Initiatives such as Sustainable Nation Ireland, a public-private partnership established to promote Ireland as a hub for sustainable investment and innovation, demonstrate the potential for the private sector to support and develop ideas, innovations and investment strategies to successfully transition Ireland to a low carbon economy. As part of Government's IFS2020 Strategy, Sustainable Nation Ireland has been mandated to promote Ireland as an international hub in the area of green finance and will in 2018 undertake a series of initiatives, under the banner as Ireland's Year of Sustainable Business, to further promote sustainability as a key business imperative, highlight low carbon investment opportunities in Ireland and further underpin Ireland as an emerging green finance hub.

Alongside efforts to spur further technological innovation, research will also need to focus on non-technological innovations including barriers to institutional and individual behavioural change. To better understand the important role that behavioural economics and psychology plays in decision making and to encourage and facilitate more people choosing energy efficient and sustainable options, the SEAI is establishing a dedicated Behavioural Economics Unit in 2017, to provide input to policy development and coordinate with the use of this discipline across wider government policy formation. The unit will trial and test interventions, including how best to communicate effectively with target groups to achieve the desired outcomes and will assess impacts.

### Ensuring a Just Transition

Fully realising the economic opportunities in the low carbon economy is key to ensuring a just transition, in particular for the groups and communities most affected by the scale of the transformation required. Investment in the low carbon economy has the potential to create decent work and quality jobs to support local communities and workers in regions most strongly impacted by the ongoing transformation to a decarbonised society.

In support of existing Government policy, as set out in the Regional Action Plans for Jobs, and the significant roles played by the IDA, Enterprise Ireland and Local Enterprise Agencies in creating and sustaining employment and supporting enterprise development, a report will be prepared on the spatial or geographical economic and employment implications of the transition. The National Dialogue on Climate Action will also afford citizens and communities the opportunity to actively participate and engage in this important area of Government policy.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **6** | Prepare a report on the economic and employment implications of the transition. | DCCAE | DJEI, all relevant Government Departments and Agencies | 2017-2019 |
| **7** | Address the just transition as part of the National Dialogue on Climate Action. | DCCAE | DJEI, all relevant Government Departments and Agencies | 2017-2019 |

### National Dialogue on Climate Action

It is essential that we put in place a system of community engagement to build public support for the action plans that we need to put in place over the coming years and decades. The Programme for a Partnership Government commits to establishing a National Dialogue on Climate Action. This will subsume the National Energy Forum, which is a key action of the Energy White Paper. Given the long term nature of climate action, much still needs to be settled in terms of long-term policy direction and, in this context, a national dialogue is timely and will be a useful tool to engage people with the challenge of climate change; motivate changes in behaviour; and create structures at local, regional and national levels to support the generation of ideas and their translation into appropriate cost-effective actions.

The objectives of the National Dialogue on Climate Action are to:

- Create awareness, engagement and motivation to act (locally, regionally and nationally) in relation to the challenges presented by climate change;
- Create structures and information flows to facilitate people gathering to discuss, deliberate and maximise consensus on appropriate responses to these challenges, and to enable and empower appropriate action;
- Establish, on a long term basis, appropriate networks for people to meet periodically to consider evidence-based inputs on the economic, social, behavioural, environmental and public aspects of climate and energy policy; and
- Provide regular input, through the National Dialogue on Climate Action, into the prioritisation and implementation of climate and energy policy which can be reported and monitored at local/regional/national levels.

The National Dialogue on Climate Action will run initially for a period of two years with administrative support to be provided by the EPA. In the interim, and while the National Dialogue on Climate Action secretariat is being established, further details are available on www.dccae.gov.ie.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **8** | Implement National Dialogue on Climate Action on a two-year pilot basis. | DCCAE | EPA, all relevant Government Departments and Agencies | 2017-2019 |

### Role of Local Authorities

A successful transition to a low carbon economy requires engagement from all levels of Government and a bottom-up approach is also essential to promote awareness and engagement within individual communities across Ireland. There is also recognition within the Local Authority sector of the need for the sector to assume a leadership role within their local communities to encourage appropriate behavioural change. This recognition stems from the fact that the sector is often to the fore in effectively responding to major emergencies and increasing incidents of severe weather arising from the impact of climate change, such as flooding events.

Local Authorities also have a key role to play in addressing climate change mitigation action and are well placed to assess, exploit and support opportunities within their administrative areas, in cooperation with each other and with national bodies, and through the involvement and support of local communities. The Climate Action and Low Carbon Development Act, 2015 provides that a Local Authority may adopt mitigation measures in relation to that local authority's administrative area.

Local authorities are actively working in consultation with Replace with DCCAE and DHPCLG, together with the EPA, to develop proposals for a regional approach to climate action. This would envisage each region having an office dedicated to coordinating climate activities for the local authorities, as well as the relevant regional assemblies within those regions. Such structures would also provide an opportunity for the sector to play a key role in coordinating relevant activities related to the National Dialogue on Climate Action.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **9** | Develop proposals to establish regional climate action offices to coordinate Local Authority response to climate action. | Local Authorities | DCCAE, DHPCLG, EPA, all relevant Government Departments and Agencies | 2018 |

### National Planning Framework

The Government is currently preparing a new National Planning Framework to provide for future development and investment in Ireland over the next twenty years. *Ireland 2040 – Our Plan*, aims to coordinate key areas such as housing, jobs, health, transport environment, energy and communications into an overall coherent strategy. It will have statutory backing and will provide a framework from which other, more detailed plans, including city and county development plans and regional strategies, will take their lead. The development of this new national planning framework provides a timely and key opportunity to ensure that the climate implications of our spatial choices are fully considered and addressed to ensure that our national planning system supports, and is aligned with, our *national transition objective* to achieve a low carbon economy by 2050.

Spatial planning can make a significant contribution to addressing climate change mitigation and adaptation challenges, as well as helping to promote the transition required in our energy system, by helping to shape new and existing developments in ways that reduce greenhouse gas emissions, increase resilience to the impacts of climate change and enable renewable energy obligations to be met. A strong spatial plan will also help to prioritise the development of crucial infrastructure such as public transport that can deliver optimum national benefits in relation to the national transition objective for 2050. The integration of climate change adaptation and mitigation considerations into development plans will also help to sustain the momentum for addressing climate change that currently exists within the Local Government sector. Established planning processes provide potential to further incorporate climate considerations into the hierarchy of spatial plans and guidance material in order to provide a strategic long-term context necessary to address both mitigation and adaptation.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **10** | Ensure climate considerations are fully addressed in new National Planning Framework. | DHPCLG | DCCAE, all relevant Government Departments | 2017 |

### Climate Change Research

Ireland's climate science research capacity and supporting infrastructure are key resources for informing policy development for both mitigation and adaptation. They provide analysis of options to respond to the associated challenges and the opportunities that may arise from the required low carbon transition towards 2050. They also enable Ireland to contribute to ongoing international efforts and commitments in relation to climate science research, observation, analysis and decarbonisation. The funding of climate change-related research addresses a variety of different objectives including:

- development and refinement of analysis of carbon stocks and greenhouse gas emissions and removals in Ireland;
- research on the ongoing and expected future impacts of climate change in Ireland, responses of managed and natural systems to climate change and identification of adaptation options and solutions for Ireland;
- identification and testing of solutions for achievement of societal and economic low carbon transformation to 2050; and
- advancing of research to inform the achievement of clean air objectives, and exploring the relationship between climate change and air pollutants/short-life climate forcers, including identification of synergies and trade-offs between policy actions to address clean air and climate.

Climate change research is funded in Ireland by the Government primarily through the EPA. The EPA supports a national climate change research programme to address key challenges for Ireland, develop essential research infrastructures both in the context of EU and international research activities, and investment, and observation and assessment, programmes.

The EPA has a statutory role in coordinating environmental research in Ireland and is also responsible for promoting access to Horizon 2020 funding under the climate action, environment, resource efficiency and raw materials pillar, and for the EU's Joint Programming Initiatives which aim to enhance collaboration between national research programmes in Europe to address key societal challenges in a more efficient and effective manner.

In addition a number of other agencies, such as the SEAI, Teagasc, Department of Agriculture, Food and the Marine (DAFM), Met Éireann and the Irish Research Council also fund research which helps to inform climate change policy in Ireland. The EPA currently coordinates with these Agencies in planning its research.

It is important to ensure ongoing coherence between different national and EU funding streams of climate research both to exploit synergies and to avoid duplication. It is also essential to ensure that publicly-funded research is accessible and broadly disseminated, and that it is relevant to inform the future development of policy, in particular through alignment with the objectives of National Mitigation Plans and National Adaptation Frameworks.

The EPA, in light of its statutory role, has established a National Climate Research Coordination Group bringing together the various actors to advance these objectives. It is proposed that the National Research Coordination Group report annually on its activities and provide an assessment and synthesis of key findings from the research programme and wider related research activities every five years.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **11** | Annual report from National Climate Research Coordination Group. | EPA | DCCAE, SEAI, all relevant Government Departments and Agencies | 2018, Ongoing |

## 2.7 Implementation and Oversight

Implementation of the National Mitigation Plan will require strong governance and accountability, including oversight by the Oireachtas, independent advice from the Climate Change Advisory Council and coordination across Government supported by continuing investment and robust technical and analytical input.

### Annual Progress Report

The Climate Action and Low Carbon Development Act, 2015 requires relevant Ministers to present an Annual Transition Statement to both Houses of the Oireachtas setting out details of measures adopted and their effectiveness. The Annual Transition Statement is also to include details of the most recent EPA inventory and projections. The Government will present the 2017 Annual Transition Statement to the Oireachtas before the end of 2017 and will include an annual progress report on the implementation of the National Mitigation Plan as part of each Annual Transition Statement from 2018 onwards.

### National Mitigation Plan High Level Steering Group

A National Mitigation Plan High Level Steering Group will be established to drive implementation of the Plan. The Steering Group will meet at least once every quarter and will report to the relevant Cabinet Committee.

### Financing the National Mitigation Plan

Financing climate action to the required level presents an enormous challenge for Ireland. Early action is imperative to find the most cost-efficient and cost-effective solutions. However, finding the appropriate and most equitable manner to address this issue is not going to

be easy particularly given the economic circumstances of recent years and where finances are still continuing to stabilise and recover. As a large number of public bodies have a role in relation to Exchequer-funded climate change-related expenditure, it is essential that Government has a clear view on the total volume of such expenditure in each year and to allow for the evolution in this expenditure to be monitored over time.

Ultimately, decisions on whether or not to proceed with Exchequer-supported measures can only take place in the context of Government prioritisation as part of expenditure planning, including as part of the current spending review, the mid-term review of the Capital Plan *Building on Recovery: Infrastructure and Capital Investment 2016-2021*, the 10 year capital plan, and the budgetary and estimates processes. A whole-of-Government approach, through these processes, is essential in terms of identifying an optimal mix of public, private, societal and taxation mechanisms to enable an effective transition. The Government will also publish a new ten year Capital Plan by the end of 2017 to succeed the current plan and this will provide an opportunity for further prioritisation of expenditure required to implement the National Mitigation Plan.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **12** | Develop proposals for identifying, monitoring and reporting of climate related expenditure through the Exchequer. | DPER/ DCCAE | All relevant Government Departments and Agencies | 2018<br>Ongo-ing once method-ologies in place |

Reliance solely on Exchequer expenditure schemes is neither affordable nor adequate to the scale of the challenge to be addressed and the Government recognises that this National Mitigation Plan will require a targeted balance between Exchequer-supported expenditure and fiscal, taxation policies and regulation. In certain cases, taxation policy may have a stronger role to play in changing individual or business behaviour.

In addition, further work will be required across all sectors to investigate options for non-Exchequer financing of measures under this Plan and for funding the longer-term transition required. This will not, however, detract from existing commitments to fund climate change-related measures in the Capital Plan or its forthcoming mid-term review. The importance of providing clear signals on policy direction in this context within individual sectors is essential. Policy certainty, both in terms of what measures will be taken and the scale of the intervention required, as well as developing arrangements to exchange knowledge and best practice on the design of mitigation and adaptation measures, will have the direct effect of increasing the available investment opportunities for non-public sources of finance.

As an initial step to further developing a suite of options for non-Exchequer funding that may have applicability on a sectorial basis, DCCAE will prepare a report for Government, in advance of Budget 2019, assessing the suitability of the options presented in this National Mitigation Plan for non-Exchequer sources of funding as well as recommendations for a long-term funding strategy to enable domestic investment in both mitigation and adaptation measures as an essential element of Ireland's low carbon transition.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **13** | Prepare a scoping report for Government on options for non-Exchequer sources of financing for climate measures in advance of Budget 2019. | DCCAE | DPER, D/ Finance, NTMA, all relevant Government Departments and Agencies | 2018 |

### Analytical Support

Technical support for the development and management of key operational elements in the national climate and energy policy process is provided by the *Technical Research and Modelling Group (TRAM)*. TRAM has supported the development of this National Mitigation Plan, and is informing ongoing negotiations relating to Member State targets for distributing the EU 2030 30% target reduction in non-ETS greenhouse gas emissions.

It is important that the full range of policy tools can be brought to bear on the challenge. Consideration must be given to the role of regulations, standards, education initiatives and targeted information campaigns. While specific sectors will have their own well-developed research and analytical capacities, either internally in Departments, in bodies under their aegis, or in the wider policy support community, it is also recognised that the whole-of Government nature of this Plan requires an over-arching support capacity.

The Government will therefore continue to appropriately resource the technical support capacity necessary for the development of climate change policy generally and, in the context of the National Mitigation Plan, the analysis of cost-effective measures which can deliver the optimal mitigation potential, exploit economic opportunities and safeguard our economic recovery.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **14** | TRAM to support ongoing development and implementation of the National Mitigation Plan. | DCCAE | All relevant Government Departments and Agencies | Ongoing |

### Climate Change Advisory Council

The Climate Change Advisory Council was established under the Climate Action and Low Carbon Development Act, 2015 as an independent body whose key function is to provide advice and recommendations to the Government, the Minister for Communications, Climate Action and Environment and to relevant sectoral Ministers in relation to the development of national mitigation plans and national adaptation frameworks. The Advisory Council is also tasked with advising on matters relating to the achievement of Ireland's objective to transition to a low carbon, climate resilient and sustainable economy by 2050. The first report of the Advisory Council was published in November 2016[16].

The Advisory Council also provided advice to relevant Ministers in preparation of this National Mitigation Plan. The Advisory Council is also required, under the 2015 legislation, to report annually on progress made during the previous year in achieving greenhouse gas emissions reductions and to make recommendations, as it considers necessary or appropriate, in relation to the most cost-effective manner of achieving reductions in greenhouse gas emissions in order to enable the achievement of the *national transition objective*.

16 See http://www.climatecouncil.ie.

# 3 Decarbonising Electricity Generation

## 3.1 Introduction

### Vision for the Sector

The aim of this Chapter is to provide clarity on policies and measures that are part of a framework for actions across the electricity generation sector to achieve a low carbon electricity sector by 2050. The overriding objective of existing and proposed sectoral mitigation measures set out in this chapter is to continue to identify the most cost-effective carbon abatement return for citizens and society.

Between now and 2050 we will move from a centralised fossil fuel-based electricity system to a low carbon power system. Smart operation of the power system at both transmission and distribution level and energy efficiency will enable maximisation of the existing grid. Increased levels of renewable generation will be accompanied by the development of large scale technology solutions, such as pumped storage and battery storage, together with demand response to complement the challenges posed. The development of viable storage solutions both at grid and domestic levels will be critical to facilitating the electrification of the heating and transport sectors. Consumers will increasingly interface with the distribution system and manage their own energy use with the assistance of smart technologies. This goal will have been reached in an environment where early participation of citizens in planning processes will shape the energy transition and be instrumental in achieving societal acceptance of the transition to a low carbon electricity system.

In 2020, a reformed ETS will be in place that will deliver an appropriate carbon price signal to advance the decarbonisation of the ETS sector. The existing renewable electricity support schemes (i.e. REFIT) will remain in place and a new support scheme, currently under development, will also be operational. Assuming applications relating to the construction of renewable generation plants that are already permitted are built out before 2020, Ireland will meet its 40% renewable electricity obligation. By 2020 a decision will also have been made on the future of Moneypoint coal burning station.

In the decade beginning in 2021, the new Renewable Electricity Support Scheme (RESS) will incentivise investment in further renewable generation beyond the current target. Peat burning generation will gradually be replaced by sustainable biomass. Benefits for health, well-being, air quality and sustainable development will accrue as we transition away from coal and peat generation. Aside from the converted peat burning stations, the role of biomass will largely be confined to the heating sector. Our electricity system will be one where onshore wind remains a key part of Ireland's generation portfolio out to 2030. Assuming more cost competitive technologies do not emerge in this decade, this is likely to remain the position beyond 2030 and possibly out to 2050. In this decade, increasingly competitive costs will allow offshore wind to play a significant role in Ireland's electricity generation system. Planning and development of offshore wind and grid will take place in a regional context where alignment of high level rules and regulations will facilitate the development of offshore projects and achieve economies of scale. As solar costs become more competitive, solar (both roof top and ground mounted) and micro generation technologies will further contribute to the renewable generation portfolio. Gas will remain the generation back-up technology. By the end of the decade, further

interconnection with Great Britain and mainland Europe will have enhanced stability of the grid, facilitated further development of our indigenous renewable electricity resources and allow trading of renewables in an integrated electricity market. Towards 2030 and up to 2032, support for generation projects under the various Renewable Energy Feed-In-Tariff (REFIT) schemes will expire.

Beyond 2030, we will see the deployment of wave and tidal power at commercial scale. These technologies will require support in the early years to incentivise investment. They will make an important contribution to enhanced grid stability. Finally, carbon capture and storage (CCS) technology, driven by appropriate carbon price signals of a reformed ETS, will be in place to ensure that emissions from back-up gas generation are captured.

## Overview

Energy is indispensable to contemporary social and economic functioning, while energy policy seeks to balance the sometimes competing aspects of sustainability, competitiveness and security of supply. Given the scale, scope and extent of energy use, it inevitably has significant environmental aspects including greenhouse gas emissions arising from power generation, heating and transport. Harnessing our renewable energy resources will play a key role in the transition towards a sustainable, secure and competitive energy system. A key sector in this transition is electricity generation which since 2005, has been subject to the EU's ETS.

While representing just under a third of emissions from the energy sector[17], electricity has been an area of considerable decarbonising success and a target area for future progress. Under the Renewable Energy Directive 2009/28/EC, Ireland is legally bound to deliver 16% of its final energy requirements from renewable sources by 2020. Ireland has committed to meeting this overall renewable target by achieving 40% renewable electricity, 12% renewable heat and 10% renewable transport by 2020.

Our ability to achieve a low carbon energy system will be linked to our capability to decouple economic growth from emissions growth. It is to be noted, however, that while meeting the renewables share in electricity consumption reduces the ETS emissions of the power generation sector, it does not contribute to the non-ETS emissions reduction target. Ireland is also committed to an EU-wide non-binding national energy efficiency target of 20% to be achieved by 2020. Meeting the 40% target for renewable electricity is equivalent to approximately 6% to 7% of total energy consumed in Ireland. The greater the volume of energy consumed, the greater the quantity of renewables required to meet the target. It follows that the EU's non-binding energy efficiency target, of 20% by 2020, is of critical importance to meeting our renewable targets, as meeting the efficiency target will reduce our requirement for renewable energy to meet the overall 16% target.

Strong progress is being made towards increasing the share of indigenous renewable energy in our electricity generation portfolio. Analysis by the SEAI for the year 2015, indicates that 9.1% of Ireland's gross final energy consumption was met by renewable energy, with 25.3% of electricity demand produced from renewable energy sources.

17 Data source: 'Energy Related Emissions in Ireland' (SEAI 2016).

**Table 3.1 Renewable Energy Target – Overall Progress and Remaining Challenges**

| Sector | Expected Renewable Energy Share (RES) in 2020 | 2015 | Gap to Target |
|---|---|---|---|
| ***Electricity (RES-E)** | 40% | 25.3% (of which wind is 22.8%) | 14.7% |
| ***Heat (RES-H)** | 12% | 6.5% | 5.5% |
| **Transport (RES-T)** | 10% | 5.7% | 4.3% |
| **Overall** | 16% | 9.1% | 6.9% |

*Non-binding targets

The EU 2017 Renewable Energy Progress Report[18], projecting renewable energy deployment for individual Member States out to 2020, plots a trajectory of 15.5% for Ireland. To date, wind energy has been the largest driver of growth in renewable electricity. The total amount of renewable generation connected to the grid at December 2016 was 3,120MW, of which wind generation was approximately 2,796MW, hydro was 238MW and biomass was 86MW[19]. Eirgrid estimates that a total of between 3,900MW and 4,300MW of onshore renewable generation capacity will be required to allow Ireland to achieve 40% renewable electricity by 2020. This leaves a further requirement of between 780MW and 1,180MW to be installed by 2020 if the 2020 electricity target is to be reached, requiring an increased rate of installation.

Looking to the European Union's emerging climate and energy targets for 2030, it is likely that all Member States will be required to expand their renewable electricity generation portfolios beyond their 2020 capacities. This will be subject to negotiation in the context of the Commission's Clean Energy Package proposals and Ireland's share of any EU binding renewable target to be agreed would have to be fair, affordable and deliverable.

The 2009 Renewable Energy Directive provides that Member States who don't reach their national target may purchase credits, known as statistical transfers in order to reach their target. As a market has not developed to date, the likely cost of such purchases is as yet unknown. SEAI has estimated that the cost may be in the range of between €65 million and €130 million for every percentage point Ireland falls short of the overall 16% target.

Looking beyond 2020, an EU target of 'at least 27%' is set for the share of renewable energy consumed in the EU in 2030. This target will be binding at EU level. It is to be met through individual Member States' contributions guided by the need to deliver collectively the EU target but without preventing Member States from setting their own national targets and supporting them, in line with the state aid guidelines, as well as taking into account their degree of integration in the internal energy market. The proposed revised Renewable Energy Directive

18 Data source COM(2017) 57 final Brussels 1.2.2017.

19 Data source: Eirgrid and ESB Networks.

does indicate that Member States cannot reduce the renewable share of energy use below their national target for 2020, i.e. Ireland would have a target of at least 16% in the period 2021-2030. Electricity interconnection and reinforcement of internal lines are identified in EU policy as necessary to reinforce the single energy market[20] and rising levels of intermittent renewables will require a more interconnected internal energy market and appropriate back up, which will need to be coordinated as necessary at regional level.

A critical milestone on the path to achievement of the *national transition objective* to 2050 will be the adoption of the new Renewable Energy Directive and agreement on Ireland's RES-E contribution towards the EU 2030 target. Assuming the Directive is adopted, further expansion of renewable electricity will be required to meet Ireland's contribution to the 2030 target. A proposal for a new EU Governance Regulation to apply post 2020 is also currently under negotiation at EU level. The proposal envisages arrangements whereby Member States would report on their policies and measures for national emissions, renewable energy and energy efficiency in successive National Energy and Climate Plans. The important interrelationship between renewable energy and energy efficiency targets has already been noted, and energy efficiency will be discussed in more detail in Chapter 4. Finally, it is not intended that the EU's 2030 renewable energy and energy efficiency targets be translated into nationally binding targets in EU legislation.

## 3.2 Emissions Profile

Data produced by the SEAI shows that energy sector related emissions[21] in Ireland accounted for 60% of greenhouse gas emissions in 2015[22]. These energy related emissions are attributed to transport accounting for 37%, heat 31% and electricity 31%. This breakdown is likely to remain unchanged out to 2020.

While the carbon impact of electricity generation has almost halved between 1990 and 2015, further reducing the carbon intensity of the electricity generation sector remains a challenge for the energy sector. Analysis by the SEAI further shows that since 1990, the share of high carbon content fuels in electricity generation, such as coal and oil, has been reducing with a corresponding rise in the relatively lower carbon natural gas and zero carbon renewables (imported electricity is considered zero carbon in terms of reporting national greenhouse gas emissions under international and EU reporting obligations). Over the period 1990 to 2014, the carbon intensity of Ireland's electricity dropped by 49%, from 896 g $CO_2$/kWh in 1990 to a new low of 456 g $CO_2$/kWh in 2014. However, over the long term, this trend can and does vary in individual years because of market forces, such as dislocation in fuel supply or generation capacity. For example, in 2015 the $CO_2$ intensity of electricity increased by 2.5% to 467.5 g $CO_2$/kWh primarily as a result of the 19.6% increase in coal used for generation. SEAI has also estimated that renewables in electricity generation avoided greenhouse gas emissions of 3,188 kt$CO_2$ in 2015[23]. This however does not contribute to our 2020 national emissions reduction

20 Data source COM (2017)53 final Brussels 1.2.2017.

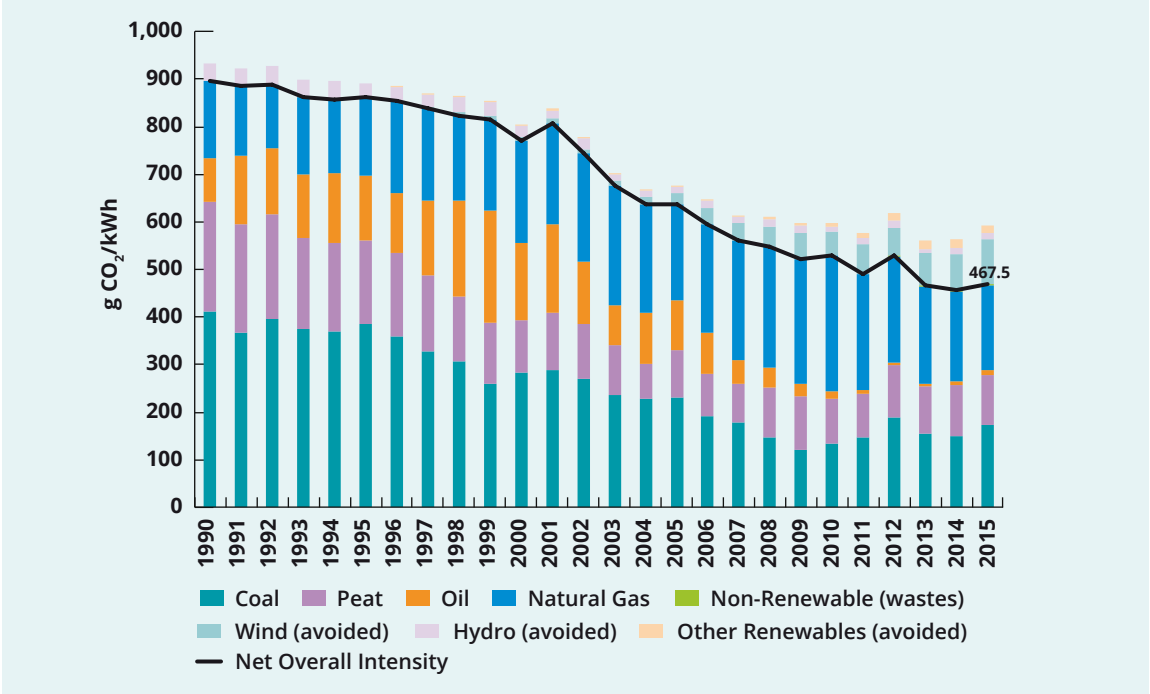
21 The energy sector encompasses electricity generation, oil refining, briquetting etc., and also industry, transport, residential, commercial/public and agriculture and fisheries sectors. Energy in Ireland 1990-2015 SEAI November 2016.

22 ENERGY-RELATED EMISSIONS IN IRELAND (2016 REPORT), SEAI, October 2016.

23 Renewable Energy in Ireland 2015, SEAI, August 2016.

target as previously mentioned as the target relates to non-ETS emissions only. The figure below shows the trend in $CO_2$ emissions per KWh of electricity supplied since 1990, with contributions by fuel[24].

**Figure 3.1 $CO_2$ Emissions per kWh of Electricity Supplied with Contributions by Fuel**




Source: SEAI

24 Energy in Ireland, 1990-2015, 2016 Report, SEAI, 2016.

The following table shows individual generation intensity, benchmarking the trend from 2010 against 2005 data:

**Table 3.2 $CO_2$ Intensity (g $CO_2$/kWh)**

| Source | 2005 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|
| **Coal** | **0.868** | **0.950** | **0.908** | **0.906** | **0.889** | **0.934** | **0.907** | **0.925** |
| **Peat** | **0.987** | **1.08** | **1.085** | **1.100** | **1.069** | **1.060** | **1.059** | **1.041** |
| **Oil** | **0.752** | **0.712** | **0.723** | **0.725** | **0.705** | **0.723** | **0.660** | **0.852** |
| Fuel oil | 0.744 | 0.793 | 0.813 | 0.799 | 0.776 | 0.789 | 0.763 | 0.769 |
| Gasoil/Diesel/DERV | 0.917 | 0.572 | 0.643 | 0.616 | 0.664 | 0.616 | 0.532 | 0.633 |
| **Natural Gas** | **0.419** | **0.400** | **0.387** | **0.384** | **0.381** | **0.373** | **0.367** | **0.367** |
| Public power Plants | 0.419 | 0.407 | 0.397 | 0.393 | 0.391 | 0.384 | 0.375 | 0.373 |
| CHP | 0.407 | 0.337 | 0.314 | 0.326 | 0.323 | 0.312 | 0.327 | 0.327 |
| **Overall (gross) Intensity** | **0.554** | **0.468** | **0.435** | **0.467** | **0.411** | **0.404** | **0.415** | **0.437** |

Source: SEAI

While Ireland has a pipeline of projects in place to achieve 40% renewable electricity by 2020, reaching this milestone is becoming increasingly challenging, with a need to ensure timely deployment by facilitating increased community acceptance, and more efficient and effective planning and regulation. Achieving 40% renewable electricity is estimated to result in cumulative greenhouse gas emission reductions of 22.06 $MtCO_2$ in 2020.

Regarding the period 2021 to 2030, Ireland has yet to determine the exact contribution renewable energy will make towards progressing the transition towards a low carbon society and economy. While the EU target of an 'at least' 27% share of renewable energy consumed in 2030 has already been noted, Ireland may, in the period to 2030, need to progress significantly beyond the 16% target for 2020, in order to avoid significant deviation from the necessary path to decarbonising by 2050.

Decarbonisation of the energy sector is likely to cause an increase in electricity demand due to fuel switching in the transport and buildings sectors. Renewables penetration of electricity generation in 2030 has also yet to be determined, making it difficult to project the timing and quantum of new renewable generation coming on stream, and the amount of greenhouse gas emissions that it will avoid over the period. Assuming that it will be at least maintained at 40%, this will result in cumulative greenhouse gas emission reductions of 65.60 $MtCO_2$ in 2030. A move beyond 40% renewable electricity may be required to maintain a reasonable trajectory to 2050, particularly as decarbonisation of large scale electric power generation provides options to decarbonise sectors such as heating and transport through electrification.

## 3.3 Opportunities and Challenges

### White Paper on Energy: *Ireland's Transition to a Low Carbon Energy Future 2015-2030*

As already referenced, the 2015 Energy White Paper sets out a vision to guide Irish energy policy and the actions that Government intends to take in the energy sector from now up to 2030, aimed at transforming Ireland's fossil-fuel based energy sector into a clean, low carbon system by 2050. It aligns with the global and EU response to meeting the climate challenge and sets out how the energy transition will see accelerated and diversified renewable energy generation, and a renewed impetus on energy efficiency.

As regards the electricity sector, the White Paper recognises that achievement of a low carbon future – while recognising policy objectives of sustainability, security of supply and competitiveness – will involve:

- generating our electricity from renewable sources of which we have a plentiful indigenous supply,
- moving from more carbon intensive fossil fuel generation to lower emissions fuels, and
- increasing the use of electricity and bioenergy to heat our homes and fuel our transport.

The transition will impact on the lives of our citizens and energy consumers alike and will require appropriate renewable energy infrastructure and technologies capable of providing the necessary services to meet the challenge. The active engagement of Ireland's citizens and communities will be critical to guiding society-wide efforts to transform our energy system. Individuals and communities will become agents of change in the way Ireland generates, transmits, stores, conserves and uses energy. Other enabling factors that are recognised in the policy paper are strong regulation, effective markets and deeper cooperation with our partners in Northern Ireland and the EU.

### Abundant, Diverse and Indigenous Renewable Energy Resources

Ireland has abundant, diverse and indigenous renewable energy resources, which will be critical to decarbonising our energy system, including electricity generation. Onshore wind has to date been the most cost-competitive renewable electricity technology in Ireland, accounting for 22.8% of overall electricity generation in 2015. In addition to our onshore wind resource, bioenergy, solar, offshore wind and other technologies can play a role in Ireland's renewable energy mix. It is intended to diversify, having regard to cost efficiency and effectiveness criteria, our renewable generation portfolio over the period between 2020 and 2030.

### Solar

The sharp decline at a global level in the cost of solar photovoltaic (PV) technology has resulted in significant interest in this renewable technology across Europe and in Ireland. Technology costs are projected to fall further. The use of this technology in Ireland is less efficient than, for example, areas of southern Europe where solar penetration is stronger. That said, the deployment of solar PV in Ireland has the potential to contribute to our renewable energy targets. Solar PV can be deployed in roof-mounted or ground-mounted installations, and in this way it can empower Irish citizens and communities to take control of the production and consumption of energy. Solar PV is one of a range of technologies under consideration by DCCAE under the new Renewable Electricity Support Scheme currently under development. Further details are set in in Table 3.4 under Measure RE6.

At present, financial support is available for solar thermal heating technology through the provision of grants offered by the SEAI. Large industry and Small and Medium Size Enterprises (SMEs) can avail of these grants, while households can also avail of grant support for investment in solar thermal under the Better Energy Homes Scheme.

### Bioenergy

The *Draft Bioenergy Plan*, published in 2014, identifies that while biomass will play a role in renewable electricity, it is likely to make a more significant contribution to the heating and transport sectors where fewer alternative technologies are available. The final *Bioenergy Plan*, which is currently being developed, will underpin the development of the bioenergy sector in the period out to 2020 and lay the foundations for its longer term growth. The Plan seeks to form a link between critical policy areas for Ireland, namely, renewable energy; agriculture; forestry; the environment; sustainability; and the growth potential of the green economy; while taking account of international development policy considerations. In this way, it is intended that the *Bioenergy Plan* will provide a mechanism to inform and coordinate policy and implementation across these policy areas, thus supporting the sustainable exploitation of Ireland's bioenergy resources. The Plan is expected to be finalised by the end of 2017.

In parallel, and to accelerate the development of our emerging domestic biomass industry, the Government recently noted the proposal to establish Bord na Móna BioEnergy, a new division of Bord na Móna. Bord na Móna BioEnergy will aim to be the largest supplier of sustainable biomass in Ireland.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **15** | Oversee the establishment of Bord na Móna Bioenergy. | DCCAE | DAFM, DPER | 2017 |
| **16** | Finalise the Bioenergy Plan. | DCCAE | DAFM, SEAI, DPER | 2017 |
| **17** | Progress actions arising from Bioenergy Plan. | DCCAE | DAFM, SEAI, DPER | 2018 |

### Offshore Energy

Ireland has a landmass of around 90,000 square kilometres, but it also has a sea area around ten times that size at 900,000 square kilometres. With one of the best offshore renewable energy (wind, wave and tidal) resources in the world, there is very significant potential in utilising these resources to generate carbon-free renewable electricity. The development of this offshore renewable energy resource will have an important role in Ireland's longer-term renewable energy mix, as technologies develop and become more cost competitive. At present, there are a number of companies actively involved in developing offshore wind energy projects. In February 2014, the Government published the *Offshore Renewable Energy Development Plan (OREDP)*. The overall conclusion of the SEA underpinning the *OREDP* is that it would be possible to achieve up to 4,500MW from offshore wind and 1,500MW from wave and tidal devices, without impacting significantly on the environment. The *OREDP* provides for Exchequer support for ocean research, development and demonstration.

The *OREDP* is being implemented by a cross Departmental, inter Agency Steering Group led by DCCAE, with three working groups focusing on environment, infrastructure and job creation. To ensure the plan remains fit for purpose, an Interim Review will be carried out in 2017.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **18** | Carry out an interim Review of the *OREDP.* | DCCAE | SEAI, DJEI, Marine Institute, EPA, industry | 2017 |

### Community Engagement, Participation and Acceptance, Spatial Planning and Regulation

A fully joined up and integrated approach, involving public sector bodies at national, regional and local level, will be necessary to address existing legitimate community concerns, and any barriers that might hinder the achievement of low carbon targets for electricity generation. In particular, the expansion of renewable electricity and other forms of renewable energy raises issues of community engagement, participation and acceptance. While investment in infrastructure is an essential precondition for the expansion of renewable energy, community concerns have been raised in relation to the provision of this energy infrastructure. Effective community engagement is essential for building public confidence and will help Ireland achieve our transition to renewable electricity. To ensure successful community acceptance of renewable infrastructure, flexible approaches to community engagement are required. In December 2016, DCCAE published a new *Code of Practice for Wind Energy Development in Ireland on Guidelines for Community Engagement*. The Code cites ten key areas for delivery on the part of wind energy developers. In the short-term, focused sustainable energy education and publicity will support behavioural change, increase our energy efficiency and underpin renewable electricity policies.

In the context of developing the proposed new renewable electricity support scheme, DCCAE is working with relevant agencies and industry to design optimum models to increase community participation in renewable electricity projects. Community ownership models can include wholly-owned community projects and shared-ownership community projects, with varying degrees of community/developer ownership, and both types of model will be supported through the new RESS.

This analysis will also identify and assess optimum measures to realise community benefit from renewable electricity projects within the local area. Community participation will be a key design principle of the new scheme. International experience and local stakeholder workshops and interviews have identified a number of primary policy initiatives (which will shape the scheme) and secondary support measures, which will enable these policy objectives. International examples of primary policies which increase community participation in renewable projects, include mandating the opportunity for local communities to invest in and own a percentage equity in all renewable electricity projects; mandatory payment of community benefit payment; providing priority access to the grid for community-owned projects; preferential treatment for community-led projects in terms of support mechanisms e.g. soft loans for development phase, grant aiding for feasibility studies; community projects being able to directly supply local consumers etc. As part of the design process for the new RESS, the optimum primary

and secondary support policies and measures for Ireland will be published for feedback, as part of the RESS public consultation.

This analysis also includes assessing the potential for supporting micro-generation of renewable electricity.

The development of an inclusive process of public participation, where local communities engage in the planning process, will be critical in shaping the energy transition. A number of regulatory initiatives are addressed in the following sections.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **19** | As part of the development of the new RESS, approaches to community participation in renewable energy projects to be finalised. | DCCAE | SEAI, renewable energy developers | 2017 |

### Financing and Delivering Renewable Electricity Projects

Growing our renewable generation portfolio is critically dependent on the timely delivery of projects by industry. Industry is in turn dependent on the willingness of financial institutions to provide funding. Lack of early and meaningful engagement by industry with local communities has often resulted in lengthy planning processes, and legal challenges by third parties to planning authorisations, increasing the risks faced by industry and financial institutions. This in turn has slowed down the rate of build of new onshore generation. Finalisation of the targeted review, being led by DHPCLG, of the Wind Energy Guidelines in relation to noise, shadow flicker and proximity will provide advice to planning authorities and should also be of assistance to developers and the wider public. An SEA will be undertaken by DHPCLG on the preferred draft approach to the revised Guidelines. Subject to the SEA process, it is envisaged the new statutory Guidelines will be finalised and issued to planning authorities in 2018.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **20** | Finalise Wind Energy Guidelines. | DHPCLG | DCCAE, planning authorities, citizens, renewable energy developers | 2018 |

### Enhancing the Grid

Increasing the share of renewables coming on to our electricity network requires both expansion and upgrading of the grid. While considerable enhancement of Ireland's electricity grid has already taken place, further investment will be required. EirGrid's new *Grid Development Strategy* and its *DS3 Programme* will be central to this effort. The DS3 Programme seeks to increase the penetration level of variable renewable electricity on the all-island system in order to ensure that it can accommodate up to 75% penetration of renewable energy by 2020. Ireland is currently leading the world with respect to the amount of non-synchronous variable renewable electricity integration onto a single alternating current power system. Led by Eirgrid and involving Distribution System Operators, Regulatory Authorities and conventional and renewable generators on the island of Ireland, implementation of this multi-annual programme will facilitate management of a more secure power system with increasing volumes of variable electricity. The changes required to realise this 75% penetration level involve both technical innovation and changes in the way electricity plants are managed. As regards the latter, the *DS3 Programme* supports the development of incentives for better plant performance. This 75% penetration level for instantaneous variable renewable electricity integration is critical if we are to achieve the annual target of 40% renewable electricity by 2020. Moving beyond the 75% penetration level is a further key challenge for the period beyond 2020.

In addition, as greater volumes of renewable electricity are connected to the grid, new measures and systems will be required at distribution system level to provide for the integration of distributed generation, energy storage and demand response.

### Interconnection

Electricity interconnection and reinforcement of internal lines are identified in EU policy as necessary to reinforce the single energy market[25]. In this context, the integration of Ireland's electricity system into that of Northern Ireland, Great Britain and mainland Europe through enhanced interconnection can facilitate increased variable renewable generation on the Irish system, as well as increasing security of supply.

The EU has agreed a non-binding 10% interconnection target to be met by 2020, with a 15% non-binding target for 2030. Ireland has one electricity interconnector to Wales, and Northern Ireland has one interconnector to Scotland. The electricity systems of Ireland and Northern Ireland are joined by one electricity interconnector of scale. A second interconnector (the North-South 400kV Interconnector project) has planning consent in Ireland, but is currently in the planning process in Northern Ireland. In addition, there are further interconnection initiatives with Great Britain and mainland Europe underway. These are still at the early stages and, if progressed will lay the foundations for further interconnection post-2020.

25 Data source COM (2017) 53 final Brussels 1.2.2017.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **21** | Commission and complete economic and technical research on the merits of further interconnection for Ireland. | DCCAE | TSOs on the island, Regulators on the island, private developers | 2017 |
| **22** | Develop a regulatory policy for electricity interconnectors for Ireland. | CER | DCCAE, TSOs on the island, private developers | By 2020 |

### Brexit and the Single Electricity Market (SEM)

Brexit is, due to the close links between Ireland and the UK, the most significant economic and social challenge of the past 50 years impacting Ireland's economy and society.

One of the key links between Ireland and the UK is energy. Ireland imports most of the energy it uses and the UK is a key conduit for much of this energy. In addition, there are close energy links between Ireland and Northern Ireland, most notably the SEM across the island of Ireland. The energy relationship Ireland has with the UK is unique when compared to other European countries and other sectors. Although other European countries have significant energy relationships with the UK, no country has the level of reliance of Ireland. Furthermore, the energy sector is unique – while many sectors of the Irish economy have high levels of trade with the UK, the energy sector has one of the highest levels of interdependence with the UK.

Energy is therefore necessarily identified as a high priority in terms of the arrangements to be agreed in the context of the UK's Brexit decision and, in this context, the following priorities have been identified:

- Maintaining the SEM across the island of Ireland;
- Maintaining trade in secure supplies of energy between the UK and Member States;
- Accommodating ability to meet EU obligations; and
- Supporting energy infrastructure.

It is to be noted that, until exit negotiations are concluded, the United Kingdom remains a full member of the EU and all the rights and obligations of EU membership remain in force.

### Competitiveness

The European Energy Union is about more than energy and climate alone. It is about accelerating the modernisation of Europe's entire economy, making it low carbon and efficient in energy resources, in a socially fair manner[26].

26 COM(2017) 53 final Brussels 1.2.2017.

It is important to recognise that increasing the share of renewables on our grid will impact on the cost of electricity and must therefore be undertaken in the most cost-effective way possible to maintain Ireland's economic competitiveness. The costs of grid enhancement, interconnection, and electricity support schemes make their way onto our electricity bills.

Electricity support schemes are funded through the PSO levy on all electricity consumers. Accurately projecting future PSO costs can be challenging due to a range of factors such as fluctuating electricity prices, varying capacity prices, the future share of renewables, and the termination of PSO contracts. Subject to approval, a new renewable electricity support scheme (Measure RE6) funded through the PSO will result in increased costs of electricity for all consumers. In designing the new scheme, the cost implications for households and businesses is therefore a matter of high priority.

### Integrated Single Electricity Market (I-SEM)

The creation of a fully integrated electricity market across the EU is one of the medium term goals of the *Third Energy Package*. The vision will be realised by way of the implementation of common EU guidelines, procedures and codes across the EU to allow electricity and gas to be traded freely across the Union.

The SEM Committee for the island of Ireland is proceeding with an inclusive process to arrive at an EU compliant solution for the SEM known as I-SEM. The aim is to ensure that Ireland can obtain the benefits of EU electricity integration in a compliant manner and maintain as far as possible the positive aspects of the SEM. While there are policy decisions associated with integrating the existing renewables arrangements, such as support schemes, into the new market structures, it is expected that over time the I-SEM will increase the efficiency of the electricity market.

### Coal and Peat

In 2012, high gas prices and low coal and ETS prices resulted in more coal and peat being used for electricity generation in Ireland. In 2015, consumption of coal for electricity generation increased by 19.6% to 1,127 ktoe. However, the share of coal used in electricity generation reduced from 40% in 1990 to 25% in 2015. Coal use was at its lowest in 2009 at 775 ktoe but increased by 50%, to 1,160 ktoe, in 2012. Peat consumption in electricity generation increased by 0.8%, to 554 ktoe, in 2015 and accounted for 12.3% of the fuel inputs to electricity generation[27]. As previously stated, the overarching objective of the Energy White Paper is to transition to a low carbon energy system which provides secure supplies of competitive and affordable energy to citizens and businesses. This will ultimately involve moving away from higher emission fuel types to lower emissions fuels such as gas, or zero carbon renewable energy technologies. As well as implementing national climate mitigation policy measures, reducing the carbon intensity of electricity generation in Ireland will require the ETS to deliver an adequate carbon price signal. This is something which it has failed to do to recently.

27 Energy in Ireland 1990-2015, SEAI, November 2016.

Moneypoint, Ireland's only coal burning electricity generation plant, is owned and operated by the ESB. It contributes to Ireland's security of supply by diversifying the fuel mix, provides generation storage capacity on site and provides competitively priced electricity. However, while Moneypoint is an important element of our power generation mix, before it comes to the end of its operating life in its current configuration in 2025, the most suitable low carbon generation technology will have to be identified as committed to in the *Programme for a Partnership Government*. Key decisions on the future of Moneypoint will be taken before 2020.

PSO support for Bord na Móna's Edenderry peat-fired power station expired in December 2015. The Edenderry power station is now in receipt of support for biomass co-firing via REFIT 3 for up to 30% of the size of the plant. In addition, Bord na Móna has stated that it intends to cease harvesting peat for electricity generation by 2030. The company has committed to replace large-scale peat production with alternative energy sources. This will contribute significantly to the decarbonisation of electricity and is in keeping with the Energy White Paper.

The PSOs for the ESB's West Offaly and Lough Ree peat power stations expire in 2019, aligning with Government policy to transition to a low carbon energy system. This will provide a key incentive for the owners of these plants to convert to alternative generation technologies. These two peat plants may, like Edenderry, also move to co-firing with biomass. In such a situation the peat plants would be eligible to apply for support under REFIT 3.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **23** | Carry out a study to identify the most suitable replacement low carbon technology for the Moneypoint generation plant. | DCCAE | ESB | 2018/ 2019 |
| **24** | In line with Bord na Móna's sustainability strategy, oversee review of future of peat generation plants. | DCCAE | ESB, Bord na Móna | 2019 |

### Electricity use in Buildings and Transport

There is an increasing trend of fuel switching in the building and transport sectors, as electrical technologies become more cost-efficient. Replacements for fossil fuel heating technologies, such as heat pumps, are readily available and declining in cost. In transport, electric vehicles will replace many passenger car models. Consumers will drive the transition by choosing to use less energy, adopt lower carbon options for heating and transport and participate in energy markets by shifting their energy use to off peak times or investing in smart home technologies. The shift to electricity in buildings and transport will cause uncertainty in the amount of electricity needed to meet the country's needs, as electricity use rises through new end-uses and reduces through improved energy efficiency. It also has the consequence of reducing emissions in the non-traded sectors, as the additional emissions will fall with electricity in the EU ETS.

### Energy Storage

Intermittent renewable technologies require back up technologies in order to ensure that grid stability is maintained. A range of energy storage technologies such as pumped storage, batteries and using voids in salt caverns to store compressed air are under consideration and development. Currently, many of these technologies are not fully mature and costs may not be commercially viable.

The speed of development of viable energy storage solutions to facilitate the integration of renewable energy on to the grid and the use of renewables in transport will be critical to accelerating the low carbon transition.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **25** | Ongoing research into technology to assist the increase of variable renewable electricity generation. | Eirgrid | DCCAE, CER, Third Level institutions | Ongoing |

### Carbon Capture and Storage

The 2015 Energy White Paper envisages that, for the medium term, gas will remain a critical component of our electricity generation mix as we transition to a low carbon energy system. In this context, there may be a role for CCS. This technology involves capturing $CO_2$ from power stations (such as combined cycle gas turbines) and transporting it to geological storage sites. To date, CCS has had very limited deployment at a global level. Subject to commercial and technical considerations, CCS could facilitate decarbonisation of our electricity sector while allowing an appropriate level of gas fired generation to balance intermittent renewable generation. Commercial viability of CCS will be driven by appropriate carbon price signals emerging post reform of the ETS. DCCAE intends to explore the feasibility of utilising reservoirs of $CO_2$ storage.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **26** | DCCAE to explore the feasibility of utilising suitable reservoirs for $CO_2$ storage. | DCCAE | Electricity Generators, heavy industry, Geological Survey of Ireland | Within next five years |

## 3.4 Mitigating Measures in Place

Ireland has a range of policy measures in place aimed at decarbonising the electricity system.

### Measures RE1, RE2, RE3 and RE4 – Support Schemes for Renewable Electricity

Internationally, support schemes are widely used to incentivise the growth of renewable electricity technologies, recognising the necessity to finance the cost differential between fossil and renewable energy resources. An Alternative Energy Requirement (AER)(RE4) scheme and three REFIT schemes, namely REFIT 1 (RE1), REFIT 2 (RE2) and REFIT 3 (RE3), have been in place in Ireland for a number of years. The cost of the support schemes is recovered directly via the annually set PSO levy, payable by all electricity consumers.

The AER scheme was launched by the then Department of Transport, Energy and Communications in 1996 and was the first step towards a market support for wind energy as part of the Department's programme to promote the generation of electricity from renewable resources. The programme involved the tendering for contracts of certain fixed amounts of capacity, by potential renewable energy generators. The AER will remain in place until 2021, resulting in estimated cumulative greenhouse gas emissions reductions of 6.51 $MtCO_2eq$ over the period 2016 to 2030.

The REFIT schemes effectively provide a floor price for renewable electricity, guaranteeing a minimum return to investors in the various technologies. Different rates are set for different technologies and successful applicants must complete the development of their projects within a specified time period. REFIT 1, REFIT 2 and REFIT 3 will remain in place until 2027, 2032 and 2030 respectively, and are estimated to result in combined cumulative greenhouse gas emissions reductions of 59.09 $MtCO_2eq$ over the period 2016 to 2030.

The support schemes aim to encourage, in particular, onshore wind, hydro and biomass technologies. It is envisaged that the relevant generation units will remain in operation post the ending of the support payments, and continue to contribute to the transition to a low carbon electricity system.

### Measure RE5 – Support for Ocean Research, Development and Demonstration

The *OREDP* provides for Exchequer support for ocean energy test sites and prototype development. With regard to the latter, the SEAI manages the Prototype Development Fund on behalf of DCCAE. The main focus of the fund is on stimulating industry-led projects for the development and deployment of ocean energy devices and systems. As wave and tidal technologies are not expected to reach commercial scale until the late 2020s, it is critical that Exchequer funding remain in place until at least the second half of that decade. The quantum of this requirement will be dependent on research and development in Ireland. Ireland is also actively contributing to the development of a programme of EU and international collaboration in offshore renewable energy, specifically in respect of the difficult early stage of ocean energy development. This collaboration offers the opportunity to access EU and other non-Exchequer funding. Noting the technology maturation timeline, no estimates of cumulative greenhouse gas emissions reductions over the period 2016 to 2030 are provided.

## 3.5 Mitigating Measures under Consideration

In designing new measures, security of supply, social acceptability, cost-effectiveness and technical feasibility are key considerations.

### Measure RE6 – Renewable Electricity Support Scheme

The quantum of new renewable generation required to come on stream by 2030 has yet to be determined and will be materially influenced by decisions at EU level regarding the ETS and renewables trajectories. It has already been noted that the decarbonisation of large scale electricity generation provides options to decarbonise sectors such as heating and transport through electrification. A new PSO-funded RESS is currently being designed. Key design considerations of the new scheme will include it's cost effectiveness, the overall quantum of renewable generation supported, renewable technologies supported, the increased levels of community and citizen participation and the delivery of broader energy policy ambitions. Clarity on the scheme, which will be subject to Government and EU State Aid approval, is expected in 2017.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **27** | Finalise RESS and obtain Government and EU State Aid approval for the scheme. | DCCAE | Renewable electricity generators, local communities, Government, EU Commission | 2018 |

### Measures RE7 and RE8 – Further Electricity Interconnection and Future of Moneypoint

The decision-making processes in regard to further electricity interconnection (RE7) and optimal future low carbon technical solutions for Moneypoint (RE8) and the peat-fired generation stations are less advanced and are likely to impact on greenhouse gas emissions reductions in the post-2020 period. Robust economic and other analysis of options will inform and underpin decision-making. In the absence of such decisions it is not possible to estimate cumulative greenhouse gas emissions reductions over the period out to 2030.

## 3.6 Overview of Costs and Emissions Reduction Potential

The tables below set out a brief overview of measures in place and under consideration by DCCAE. Several studies have attempted to address the question of the impact of support schemes on the electricity system costs in Ireland. The main analysis undertaken to date on the costs of renewable electricity is a 2015 study (unpublished) involving the SEAI, Eirgrid, the CER and Government Departments. The study examined costs and savings within the electricity system arising from additional renewable electricity deployment to 2020.

Any update of existing analysis presents a number of challenges to making a credible assessment of the net economic impacts of renewable electricity support measures. The only methodology which is fit for purpose for addressing this question would involve running multiple scenarios in PLEXOS (proprietary electricity modelling software). Such a study would take more than a year to complete. Since none of the previously conducted studies applied the same underlying fossil fuel price assumptions as those which have been used elsewhere in the National Mitigation Plan analysis, it is not possible to use existing analysis to understand the impact of the AER and REFIT. The task would also require an assessment of the differentiated costs of each individual support scheme. Disaggregating the impacts of different technologies under the various schemes is a complex task, requiring a baseline and multiple policy scenarios to be established running from 1999 onwards. A robust study into the impacts of renewable electricity supports on costs would also require the expert input of multiple stakeholders including CER and Eirgrid.

In summary, taking account of the above and the absence of a comprehensive study to date, projecting PSO costs into the future is extremely challenging. Any attempt to provide an estimate of costs without factoring in the elements above ignores the complexity of the issues involved and would not fully capture the net economic impacts of these supports. The completion of such an update has not been possible in the context of the National Mitigation Plan timeline. To inform future energy policy, it is appropriate that an update of existing analysis is available to policy makers. Such analysis will also serve to inform the implementation of mitigation measures under this Plan and the development of measures under successive Plans. DCCAE is committed to harnessing appropriate resources to ensure that such an update or similar exercise is undertaken, thereby allowing the question of the impact of support schemes on the electricity system costs in Ireland to be addressed. In consultation with relevant agencies, the scope of this study will be complete by the end of 2017, with the study finalised by 2019.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **28** | To inform future energy policy, undertake a study of the costs and savings arising from renewable electricity deployment. | DCCAE | CER, Eirgrid, SEAI | 2018 /2019 |

### Table 3.3 Decarbonising Electricity Generation – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place

| Classification of Measure | | | | Exchequer Expenditure (€) | | | |
|---|---|---|---|---|---|---|---|
| Reference | Title | Type | Objective of measure | Direct Spend | Tax Foregone | Total | |
| RE1<br>In Place | Renewable Energy Feed-in-Tariff Scheme (REFIT 1) | Support Scheme | To support investment in the development of renewable electricity generation and contribute to 2020 renewable electricity generation targets. | Nil | Nil | Nil | |
| RE2<br>In Place | Renewable Energy Feed-in-Tariff Scheme (REFIT 2) | Support Scheme | To support investment in the development of renewable electricity generation and contribute to 2020 renewable electricity generation targets. | Nil | Nil | Nil | |
| RE3<br>In Place | Renewable Energy Feed-in-Tariff Scheme 3(REFIT3) | Support Scheme | To support investment in the development of renewable electricity generation and contribute to 2020 renewable electricity generation targets. | Nil | Nil | Nil | |
| RE4<br>In Place | Alternative Energy Requirement (AER) Scheme | Support Scheme | To support investment in the development of renewable electricity generation and contribute to 2020 renewable electricity generation targets. | Nil | Nil | Nil | |
| RE5<br>In Place | Ocen Energy Prototype Development Fund | Research and Demonstration | To support investment in the development of offshore wave and tidal energy devices up to commercial stage, leading to deployment at offshore generation sites and ultimately contributing to renewable electricity generation from late 2020's. | Estimated 18.0m up to and including, 2020. | Nil | 18.0m | |

* Several studies have attempted to address the question of the impact of support schemes on the electricity system costs in Ireland. An update on existing analysis using the harmonised macroeconomic assumptions applied to the assessment of other sectors would be required to take account of oil and gas prices, and to align with the assumptions underpinning the analysis in other sectors. The completion of such an update has not been possible in the context of the National Mitigation Plan timeline.

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA) | NPV 2017-2030 (€) (based on economic CBA) | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | Nil | See note below* | See note below* | Unknown | 5,670 | 19,710 |
| | Nil | See note below* | See note below* | Unknown | 7,890 | 27,390 |
| | Nil | See note below* | See note below* | Unknown | 2,310 | 8,000 |
| | Nil | See note below* | See note below* | Unknown | 1,760 | 6,070 |
| | Nil | Detailed economic analysis has not been undertaken. The absence of proven technology means that this measure will not contribute to GHG emissions reductions in the ETS sector up to 2020. | Detailed economic analysis has not been undertaken. Uncertainties regarding the timeline for development of offshore wave and tidal technologies to commercial scale make it difficult to estimate the contribution of this measure to GHG reductions from the late 2020's. | Unknown | Nil | Unknown. Technology is not expected to reach commercial scale until the late 2020s. |

**Table 3.4 Decarbonising Electricity Generation – Overview of Costs and Emissions Reduction Potential – Mitigating Measures under Consideration**

| Classification of Measure | | | | Exchequer Expenditure (€) | | | |
|---|---|---|---|---|---|---|---|
| Reference | Title | Type | Objective of measure | Direct Spend | Tax Foregone | Total | |
| RE6<br>Under Development | Renewable Electricity Support Scheme (RESS) | Support Scheme | To support investment in the development of renewable electricity generation and contribute to 2020 renewable electricity generation targets. | Nil | Nil | Nil | |
| RE7 | Increased electricity interconnection | Economic Instrument – direct investment | To increase security of electricity supply and facilitate increased levels of variable renewable electricity on the system. | Unknown | Unknown | Unknown | |
| RE8 | Future of Moneypoint | Economic Instrument – direct investment | To arrive at decisions on optimal future low carbon technical solutions for Moneypoint generation plant. | Unknown | Unknown | Unknown | |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA) | NPV 2017-2030 (€) (based on economic CBA) | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | Nil | Unknown as the scheme is not yet finalised. | Unknown as the scheme is not yet finalised. | Unknown as the scheme is not yet finalised. | Unknown as the scheme is not yet finalised. | Unknown as the scheme is not yet finalised. |
| | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown |
| | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown |

# 4 Decarbonising the Built Environment

## 4.1 Introduction

### Vision for the Sector

Looking to 2050, the expectation is an energy landscape quite different from today. Homes, buildings and appliances will be more efficient. The vision is to use less energy and for most of the energy to come from low or zero-carbon fuels. This will be achieved in the built environment through improved building regulations so that new buildings will be low or "nearly zero emission" standard and through energy efficiency upgrades, known as retrofits, to the existing building stock. As a result, buildings would be expected to consume much less energy than they do now. Besides reducing the amount of energy consumed through energy efficiency measures, the mix of fuels providing that energy will have transitioned to much lower carbon content. This will come about through the phasing out over time of higher carbon intense fuels such as coal, oil and peat with almost no coal or peat and little oil remaining in the residential heating mix by 2050. Electrification will play a much more significant role in heating. This electricity will be primarily fuelled by cleaner fuels.

Ultimately, carbon mitigation in the Built Environment will require a combination of energy efficiency and decarbonisation of heat i.e. that the fuel sources for heating move from fossil (typically oil or gas) to a low carbon option such as renewable or electric heat. Therefore, the first course of action is to renovate a building so that it loses as little heat as possible, before fuel switching. If the fabric of the building has already improved, these less energy intensive heating solutions will still produce the desired level of comfort. In summary, the key aspects relating to the built environment are as follows:

1. **Energy management:** understand existing energy use – how and when energy is being used;
2. **Energy efficiency:** undertake energy efficiency improvements to reduce usage and make your demand for energy more flexible; and
3. **Fuel switching:** meet this reduced energy use with less energy intensive/ low carbon heating solutions.

Options for renewable heating include biomass and biogas from waste streams and from energy crops, solar thermal and geothermal energy. The planned Renewable Heat Incentive (RHI) scheme will provide a key policy support measure for this development.

Through electrification of heat, there is a key link between the sectoral mitigation measures for the Built Environment and those for Electricity Generation as the electrification of heat is one of the main options for decarbonisation of heat, albeit this is dependent on the rate and level of decarbonisation of the electricity generation system. Options include heat pumps which are typically most suitable to new buildings and buildings with low fabric heat loss.

Other options, including smart electric thermal storage, are the subject of much research where Ireland is playing a leadership role through, for example, the EU Horizon 2020 RealValue Project. A research consortium led by GlenDimplex Ireland received €12m EU funding under Horizon 2020. The project will involve installing energy systems into 1,250 homes, 800 of which will be in Ireland. The study will include 100 homes in Northern Ireland with the remaining pilot homes situated in Germany and Latvia. Other Irish partners include Eirgrid, ESB Networks and SSE.

The deployment of broadband Infrastructure will further facilitate the potential of smart meters and the realisation of technological opportunities presented to achieve "smart buildings" and in that context energy efficiency could both benefit from and further drive the uptake of broadband services and drive the creation of digital content.

### Overview

Improving energy efficiency is central to our transition to a low carbon economy. This is because using less energy, and using it in a more flexible way, is the most cost-effective and accessible way to tackle climate change. This is why conserving energy is the first step to take in the process of decarbonising our built environment. It is also a step everyone can take in some shape or form. In addition, the more energy use is reduced through efficiency measures, the lower the effort required to achieve renewable energy targets.

The Energy White Paper recognises that in terms of energy efficiency, attaining the objective of a low carbon future will involve radically changing our behaviour as citizens, industry and Government and becoming significantly more energy efficient.

Energy efficiency upgrades to the fabric of our buildings by for example, carrying out works such as insulation and airtightness reduces the amount of energy needed for heating and cooling and reduces the $CO_2$ emissions connected with our energy use in those homes and workplaces. However, this is just the first step. To actually decarbonise our built environment, we need to go further and switch from using fossil fuel as the source for the energy we use in our buildings.

There are two main options for switching away from fossil fuels: renewable fuels such as biomass or electrification of heat using technologies such as heat pumps. However, it is critical that the fabric of a building is upgraded first so that the desired levels of comfort and function are maintained in our homes and workplaces when a less energy intensive renewable energy system is then used. The principle of 'fabric first' is now embedded in existing government support for energy efficiency upgrades and will continue to define the ongoing development of measures to combine energy efficiency improvements with the fuel switching necessary to make real progress on decarbonising our built environment.

### The Multiple Benefits of Energy Efficiency

The benefits of energy efficiency are not only for our energy system and our emissions profile. There are also direct benefits from improved energy efficiency for citizens across our society in a wide range of areas that at first glance may seem unconnected with energy. There is already a strong body of international evidence highlighting these wider benefits. Examples of these wider benefits include:

- making homes warmer and drier improves health and social inclusion outcomes;
- reducing energy use reduces energy bills for householders and businesses and supports competitiveness and rural development; and
- energy efficiency in the public sector reduces the public sector energy bill, freeing up funding for public services while driving quality and innovation in those services, thus contributing to public sector reform; and making homes energy efficient to enable the move away from fossil fuels is critical for improving the quality of the air we breathe. This is particularly important for those communities that are reliant on solid fuels for heating.

Alignment of relevant Government policy and strategies with energy efficiency objectives will be key to maximising these wider benefits. The current development of the Clean Air Strategy is a case in point where an opportunity exists to align cross-cutting objectives.

All of this is why, starting in 2016, DCCAE has been establishing an integrated set of new measures designed, not only to support greater energy efficiency through deeper upgrade measures and fuel switching, but crucially to validate the international evidence for the multiple benefits of energy efficiency and fuel switching in the Irish context. We are taking action to find out what it is that really works for Irish energy users and what motivates them to decide to act to make their contribution to the decarbonisation of our built environment through energy efficiency initiatives. These new measures build on the ongoing Government commitment to, and investment in, energy efficiency initiatives, which includes the provision of grants for energy improvements to 350,000 homes in Ireland. The introduction of these new measures has been possible through the allocation of an additional €20m in Exchequer funding in 2017.

### Progress to Date

Currently, Ireland relies on high-emitting, imported fossil fuels to meet over 88% of our energy needs at an annual cost of around €4.6 billion[28]. By 2050 we need to reduce this reliance on fossil fuels very considerably. As stated previously, the Energy White Paper sets out a vision of a low carbon energy system which envisages greenhouse gas emissions reductions in the range of 80% to 95% compared to 1990 levels by 2050.

To achieve this, our energy system has to fundamentally change, both in terms of where our energy comes from and how we use it – this is why energy efficiency is important. If we use less energy it makes it easier to replace our fossil fuels with renewable energy. If we use our energy more flexibly it makes it easier to integrate different types of renewable energy into our energy system.

28 The SEAI Energy in Ireland 1990 to 2014 (2015) Report can be accessed at www.seai.ie/Publications/Statistics_Publications/Energy_in_Ireland/Energy-in-Ireland-1990-2014.pdf.

A key priority of EU energy policy since 2008 has been how to realise the potential of energy efficiency for a cost-effective transition to a sustainable, decarbonised, European energy system. It was in response to the emerging international policy consensus on the importance of energy efficiency that the Government decided in 2009 to set a target for Ireland to improve its energy efficiency by 20% by 2020, meaning that energy savings of 31,925 GWh must be made[29].

Measures to achieve this target are set out in Ireland's *National Energy Efficiency Action Plans* (NEEAPs)[30]. A new NEEAP[31] has been prepared in parallel with the development of this Plan. It provides more information on energy efficiency initiatives specified in this chapter as well as other initiatives that will also make a contribution to Ireland's climate action objectives. Based on SEAI's latest assessment, implementation of NEEAP measures has resulted in energy savings of 18,654 GWh of the target 31,925 GWh. In other words almost 12% of the national target of 20% was achieved by the end of 2016. SEAI assessments in April 2017 indicate Ireland is on course to achieve 25,904 GWh by 2020 based on the measures currently in place and funded.

In 2009, it was also decided that the public sector should provide leadership on energy efficiency for the whole of our economy and society. This is why the public sector was given a more challenging target of a 33% energy efficiency improvement. SEAI monitor the progress to this target of over 300 public sector bodies and 3,700 schools. The SEAI *Annual Report 2016 on Public Sector Energy Efficiency Performance*[32] shows that, based on end 2015 figures, energy efficiency in the public sector has improved by 21%. The next report is scheduled for publication in October 2017.

### Energy Efficiency and Climate Targets

While Ireland's 20% energy efficiency target is not legally binding, it is critical to our progress towards our statutory EU 2020 targets to reduce $CO_2$ emissions by 20% and meet 16% of our energy demand from renewable sources. Because our renewables target is a proportion of our overall energy demand, the less energy we use, the more energy efficient we are and the easier it is to meet that renewable energy target. This is why, where additional Exchequer funding is available, its allocation towards energy efficiency measures should allow us to maintain, and increase, our efforts to address the NEEAP forecast of, on a BAU basis, a shortfall on our energy efficiency target in 2020 of around 3 percentage points. The additional 20m in Exchequer funds allocated for energy efficiency in 2017 will maximise our progress to the 2020 target and build capacity to absorb more investment in following years, should that become available.

29 It should be noted that 4,000 GWh of savings are forecast to come from Transport.

30 http://www.dccae.gov.ie/en-ie/energy/topics/Energy-Efficiency/national-energy-efficiency-action-plan-(neeap)/Pages/National-Energy-Efficiency-Action-Plan-(NEEAP).aspx

31 http://www.dccae.gov.ie/en-ie/energy/topics/Energy-Efficiency/national-energy-efficiency-action-plan-(neeap)/Pages/National-Energy-Efficiency-Action-Plan-(NEEAP).aspx

32 http://www.seai.ie/Publications/Your_Business_Publications/Public_Sector/Annual-Report-2016-on-Public-Sector-Energy-Efficiency-Performance.pdf

Looking beyond 2020 to the level of energy efficiency to be achieved by 2030, the European Commission proposed an EU wide energy efficiency target of 30%. This is currently under negotiation and the public had the opportunity to give their views on the Commission's proposal through a public consultation which closed in May 2017[33]. The energy savings Ireland will commit to make between 2021 and 2030 will be established through the ongoing development of options as part of the National Mitigation Plan development process, and also through the development of the National Energy and Climate Plan to be prepared by each EU Member State for the post-2020 period. Research by the SEAI indicates that there is technical potential for energy savings in the Built Environment of 16,000 GWh in the 2021 to 2030 period. The question is, with significant in-roads having been made into lower cost measures, how much of this technical potential will it be economic to realise and would they represent the least cost pathway for Ireland's low carbon transition as a whole.

### Energy Efficiency Post 2020

The focus since 2009 has been on 'shallow measures' such as attic insulation and lighting replacement. This has seen a significant volume of energy saving activity and it has built public awareness of energy efficiency, particularly in the residential sector. However, to continue to realise the potential of energy efficiency beyond 2020, we must achieve a step change, both in the level of activity and the 'depth' of the measures undertaken. This is essential if we are to be able to grasp the opportunity to decarbonise heating.

That is why the development process of this Plan is so important for the decisions we need to make on how we renovate, design, construct and use our buildings. And this is why the outcomes and learnings from the new pilot measures introduced in 2016 and 2017 will be so important as a source of evidence for policy making on the package of measures necessary for the post 2020 period. Ultimately we know that whatever we do post 2020, it must be more cross cutting and can no longer be confined to pure energy policy interventions. While this means the implementation of energy efficiency measures that also deliver on a range of policy areas from public health, to competitiveness to education, it also means that fiscal and sectoral regulatory measures will be required to drive the level of activity required.

## 4.2 Emissions Profile

### Projected Emissions from the Built Environment

According to greenhouse gas emission projections produced by the EPA (see Table 4.1 below), the Built Environment will account for 17.7% of total national non-ETS emissions in 2020, under modelled Scenario 1 and emit just over 8Mt $CO_2$eq in 2020 out of a total of 45.6 Mt $CO_2$eq. In modelled Scenario 2, emissions from the Built Environment fall to 7.7 Mt $CO_2$eq out of a total of 44.8 Mt $CO_2$eq. In both scenarios, emissions levels would be contained, but the level of reduction needed to place the Built Environment on a low carbon trajectory would not be achieved in the 2020-2030 period.

33 http://www.dccae.gov.ie/energy/en-ie/Pages/Consultation/Consultation-on-Clean-Energy-Package.aspx

**Table 4.1 Projected emissions from the Built Environment to 2020**

| Sector | Mt $CO_2$eq 2020 | Mt $CO_2$eq 2030 |
|---|---|---|
| **Scenario 1** | | |
| Commercial/Institutional | 1.9 | 2.2 |
| Residential | 6.1 | 6.4 |
| **Total Built Environment** | **8.1** | **8.6** |
| **Total non-ETS** | **45.6** | **47.1** |
| **Built Environment as % of non-ETS emissions** | **17.7%** | **18.3%** |
| **Scenario 2** | | |
| Commercial/Institutional | 1.6 | 1.8 |
| Residential | 6.1 | 6.1 |
| **Total Built Environment** | **7.7** | **7.9** |
| **Total non-ETS** | **44.8** | **46.0** |
| **Built Environment as % of non-ETS emissions** | **17.1%** | **17.2%** |

## 4.3 Opportunities and Challenges

The focus on energy efficiency in Ireland, as set out in the Energy White Paper, reflects the strong international consensus that now exists regarding the critical importance of energy efficiency for effective action on climate change. The International Energy Agency (IEA) recommends that governments treat energy efficiency as the 'first fuel' in their energy mix on the basis that the most cost-effective energy is the energy we do not use. IEA analysis demonstrates that energy efficiency has the potential to support economic growth, enhance social development, advance environmental sustainability, ensure energy system security and help build wealth[34].

While Ireland has made real progress on energy efficiency, it has come from lower cost, more accessible measures such as attic insulation and energy conservation campaigns. Tackling these easier, cheaper measures first is a sensible approach and it has done a great deal to raise awareness of what energy efficiency is about and the benefits it can bring. However, we are now moving into a new phase where we need to achieve larger

34 IEA (2014): 'Energy efficiency: a key tool for boosting economic and social development' can be accessed at www.iea.org/newsroomandevents/pressreleases/2014/september/energy-efficiency-a-key-tool-for-boosting-economic-and-social-development.html.

amounts of more durable energy savings from larger scale projects, in particular deep renovation of buildings and more sustainable new build. The greatest opportunity to reduce lifecycle energy and carbon is at the early design stages of new investments. Up to 95% of the lifespan cost is already committed at the end of the design process. Case study projects have demonstrated that savings available can range up to 50% improvement from a baseline design.

Energy efficiency is achieved as a result of reduced or more flexible demand from different sectors of the economy and society, rather than centrally planned works or incentivising a small number of market players to act. This means that the success of policy on energy efficiency, and the operational measures put in place to give effect to it, is dependent on a great many individual people making their own decision to make their homes or places of work more energy efficient. So, while it is very important that the measures in place are technically robust, how they are communicated to those people whose decision to act policy makers depend on, is just as important. Based on the experience gained and data gathered in the last eight years or so, a great deal has been learned about how to encourage the uptake of energy efficiency, i.e. the opportunity for energy efficiency, and what discourages people from acting, i.e. the challenges.

The Capital Plan *Building on Recovery: Infrastructure and Capital Investment 2016-2021* provides for investment to improve energy efficiency in the built environment which will result in reduced greenhouse gas emissions, including supports for domestic energy improvements, smart metering, the upgrade of public building stock to more energy efficient levels, improved energy efficiency of school buildings as well as support for the RHI. The mid-term review of the Capital Plan to be conducted in 2017 will provide an opportunity to consider the potential for further contribution of Capital Plan investment to the achievement of National Mitigation Plan and energy efficiency objectives. Based on 2017 allocations, maintaining 2017 level of funding would see €330m allocated to energy efficiency measures in the period 2017 to 2020.

Greater accessibility to alternative and lower carbon intensive energy sources should present opportunities to encourage householders and businesses to make more sustainable energy choices. The Minister for Communications, Climate Action and Environment is commissioning a study on the wider costs and benefits of gas network extensions, to include possible climate and decarbonisation aspects, as well as the regional and rural development benefits such as in supporting rural centres. It is expected that a preliminary report will be delivered before the end of 2017.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **29** | Commission study on the wider economic costs and benefits – including in the areas of climate, decarbonisation and rural development – of potential extensions of the Irish Natural Gas network, and related funding options. | DCCAE | To be determined in the tender planning process. | 2017/ 2018 |

### The Residential Sector

In the residential sector, reducing energy bills has been a key 'selling point' for energy efficiency and has certainly been a strong motivating factor for the over 350,000 private householders that have undertaken grant-aided energy efficiency upgrades in Ireland to date. However, it is increasingly apparent that improved comfort and ease of energy management are also factors that people value and they consistently figure in how people rate their satisfaction with the energy efficiency upgrades they have received. Ease of access to grant funding through the SEAI's Better Energy Programme has also proven to be a success factor. Building on this experience, and on stakeholder feedback received there is a case for increasing the advisory support available to householders in choosing the measures they should undertake, the building works involved, and how they then manage the energy in their newly energy efficient homes. This knowledge is feeding into ongoing development of the Better Energy Programme and Building Energy Rating (BER) process. It is also why DCCAE, through SEAI, has begun a Deep Retrofit Pilot scheme in 2017, and the SEAI is establishing a Behavioural Economics Unit in 2017 to better understand how householders and business people make decisions on investing in energy efficiency.

There is also clear evidence that living in a cold damp house is linked to poor health, in particular chronic respiratory conditions. The risk of this increases significantly for those living in, or at risk of, energy poverty. There is an invaluable opportunity to address energy poverty through energy efficiency. Reducing energy bills for those least able to pay helps address general deprivation while increasing comfort and can result in better health outcomes and improved social inclusion. That is why, in 2016, DCCAE embarked on a joint policy initiative with the Department of Health to establish the Warmth and Wellbeing Pilot Scheme. Delivered by the SEAI and Health Service Executive (HSE), it is bringing comprehensive energy upgrades to the homes of older people and children with certain clinical conditions. A research project will run in parallel over the three years of the pilot to establish the impacts of these measures on the health of recipients and if there is a reduction in their need for health services. Further actions on energy poverty are being undertaken through the implementation of the *National Strategy to Combat Energy Poverty*, including addressing poor energy efficiency standards in rental accommodation.

Looking beyond 2020, a key challenge in the residential sector will be financing and finding sources of finance other than the Exchequer grant aid. Ultimately, this will mean activating private financing at a sufficiently attractive interest rate. For energy efficiency upgrades costing over *c.* €3,000, which would typically be funded by a Better Energy Grant and householder savings, and less than an amount which would make a mortgage top-up attractive, the current interest rate of *c.* 10% is simply not low enough to encourage significant take up.

However, even an attractive interest rate won't be the deciding factor. People need to be convinced of the case for energy efficiency and supported to act. The recognition that not all decisions are made on a purely economic basis underpins the approach taken by SEAI and DCCAE. More effective communication approaches should result in more households choosing to undertake energy efficiency and building fabric upgrades when the communication approach is informed with insights from behavioural sciences and from

stakeholder engagement and research[35]. SEAI are using a range of approaches to better understand potential customer perspectives including surveys, focus groups, design thinking exercises, trials and data analysis. A range of insights are being identified and will inform future policy approaches.

Building on a broad range of research, SEAI are looking at a range of options to enhance the levels of awareness of, supports for and engagement in home retrofit to improve energy efficiency. This is explored in further detail in SEAI's recent report *Behavioural Insights on Energy Efficiency in the Residential Sector* and these insights will feed into pilot initiatives to test what is effective in an Irish context.

Wider home fabric upgrades need to be seen, and presented, in terms of the full range of resultant benefits including improved living environment, enhanced comfort, building value enhancement as well as reduced ongoing energy bills and improved environmental outcomes. This is why an important initiative with the additional funding made available for energy efficiency in 2017, is the establishment by the SEAI of a Behavioural Economics Unit to complement their ongoing financing of pilot schemes. These measures will also complement the Deep Retrofit Pilot scheme. Tackling the challenges of financing and advisory support will be key to placing the residential sector on an appropriate emissions reduction trajectory to 2050.

### The Commercial Sector

Achieving emissions reductions through energy efficiency in the commercial sector is potentially one of the most cost-effective areas of action. Government does not provide large amounts of Exchequer funding capital works in this sector in the same way as in the residential sector, rather the focus is on enabling actions and technical support. The Large Energy Users Network continues to be a very successful way for SEAI to engage with a significant part of commercial energy use and will continue to be a core measure.

SEAI will build on the experience gained here to tap into the potential of the SME sector. There is real energy saving potential here, particularly in relatively accessible areas such as lighting, heating and cooling. However, it is a sector that is by nature very diverse and for which energy costs tend not to be a critical issue. Communicating the case for energy efficiency effectively and making the right technical supports available will be necessary to meet the challenge here. This will be a key focus of the SME element of SEAI's industrial engagement programme.

The progressive implementation of the EU requirement under the Energy Efficiency Directive for businesses to carry out energy audits will provide an increasing regulatory drive for the commercial sector to improve energy efficiency. However, this regulatory requirement will not by itself produce energy savings. Rather they will come when businesses act on the results of their audits. Commitment to achieve certification of energy management and energy savings is the best way for businesses to ensure they are on the path to realising their energy efficiency potential and the cost savings it can produce. SEAI offers support to business to undertake

35 Research conducted by SEAI and D/CCAE in 2015-6 provided useful insights into factors that influence householders in deciding whether or not to invest in energy efficiency. Besides affordability these included, lack of clarity on the benefits of the investment, not seeing energy efficiency improvements as a worthwhile investment; doubt about the outcome; unpersuaded about the benefits, a high perception of risk; concerns about the complexity or hassle associated with the work.

certification of the efficient design and management of energy assets using the ISO 50001 and IS399 standards through the Excellence in Energy Efficient Design (EXEED) programme.

There is also an increasing appreciation in the business community of corporate social responsibility and climate action. Energy efficiency is becoming increasingly recognised as the first and most accessible step business can take to 'go green'.

### The Public Sector

The public sector shares many characteristics with the commercial sector in terms of the size and use of its built environment. There is a very important opportunity for the public sector to provide leadership to the wider economy on energy efficiency and, in doing so, contribute to public sector reform. To realise the energy efficiency potential of this sector a *Public Sector Energy Efficiency Strategy*[36] was recently approved by Government and its implementation is now underway and included in a number of actions under this Plan. The objectives of the Strategy are:

- The public sector, maximising its own skills and experience, takes a national **leadership role** in deploying cost efficient energy efficiency projects and initiatives;
- The delivery of this Strategy is **a shared, whole-of-Government, effort** where all Government Departments, and the bodies under their aegis, play their part in embedding structured energy management as part of their business delivery;
- In the context of public sector reform, the public sector takes an action focused and results driven approach to sustainable and cost efficient **energy management**, thereby delivering better value for money and better services for citizens; and
- The public sector contributes to the development of a more **sustainable energy system**, a reduction in $CO_2$ emissions and a cleaner and healthier environment now and for future generations.

While a lot has been achieved in the public sector since 2010,[37] achieving its target of improving energy efficiency by 33% by 2020 will require an increased level of effort and larger scale building renovation projects. To build on the existing supports for the public sector such as the SEAI's Public Sector and the Office of Public Works (OPW) Optimising Power@Work programmes, the Strategy introduces a number of other measures including:

- A new governance structure to ensure senior leadership on energy efficiency in the public sector;
- A central project pipeline and enhanced project development assistance;
- €3m for an initial pilot of deep renovation projects to central government buildings by the OPW in partnership with SEAI; and
- Clarity on the retention of savings achieved by public sector bodies from energy efficiency as part of their management of their administrative budgets.

36 http://www.dccae.gov.ie/energy/SiteCollectionDocuments/Energy-Efficiency/Public%20Sector%20Energy%20Efficiency%20Strategy.pdf

37 For detailed data on progress to date see the SEAI's Annual Report 2016 on Public Sector Energy Performance: https://www.seai.ie/Publications/Your_Business_Publications/Public_Sector/Annual-Report-2016-on-Public-Sector-Energy-Efficiency-Performance.pdf.

### Cross Sectoral and Community

Using energy efficiency to address issues as diverse as deprivation or commercial energy costs is a clear example of how energy efficiency is not an energy only issue. It can and does support the achievement of objectives from health, to social inclusion, competitiveness and greenhouse gas emissions reduction. Therefore, there is huge opportunity in combining the efforts of different groups and bringing them together to act and, in doing so, to support each other. This is where the Better Energy Communities scheme, which supports joint projects by business, public sector and community partners, is making a real contribution, not just to energy efficiency, but to increasing public understanding of the low carbon transition.

Conserving their energy is the first step citizens can take to make their contribution to climate action and realise benefits for their families and businesses. But we also need to build the capacity of communities to participate in such initiatives. This is why the SEAI also established the Sustainable Energy Communities scheme, which works with groups from all around Ireland to build their technical and project management skills. The starting point is energy efficiency, but the next step can be renewable energy generation within communities, which forms another link between the sectoral mitigation measures for the Built Environment sector and those for Electricity Generation sector.

Developing understanding of energy efficiency across the economy, providing energy efficiency upgrades to homes, public bodies and businesses, and providing technical and project management support to community groups, are all elements of the Energy Efficiency Obligation Scheme, which is a critical part of how we are making energy savings to 2020. The targets for the energy companies obligated by the scheme to deliver energy efficiency measures to homes (including those experiencing, or at risk of, energy poverty) and businesses were recently increased for the period to 2020. It is envisaged that this scheme will continue to play a key role in our energy efficiency strategy to 2030.

## 4.4 Mitigating Measures in Place

Ireland's NEEAP provides a comprehensive overview of mitigating measures to improve energy efficiency and reduce emissions across all sectors including the built environment. Ireland's fourth NEEAP was submitted to the EU Commission in early May 2017. The new Long Term Renovation Strategy (for the Built Environment) is in preparation as required by EU legislation and is expected to be completed in Q3 2017.

There are three key opportunities where it is possible to influence the use of energy in the built environment:

- **Design:** when new buildings and facilities are being planned and designed and when existing buildings, and the energy using processes carried out within them, are being re-designed;
- **Acquisition:** when equipment and facilities are being bought, upgraded or leased; and
- **Use:** when people use energy as part of their daily lives in the places they live and work.

The Mitigating Measures currently in place, and those being introduced in 2017, focus in various ways on each of these areas. While some of these measures have been in place for some years e.g. the Better Energy Programme has been operating since 2009, other measures began in 2016 or 2017 made possible by the allocation of an additional €20m in Exchequer funding in 2017. These include:

- Warmth and Wellbeing energy efficiency and health pilot to validate the evidence in an Irish context that providing energy efficiency improvements to the homes of people suffering with chronic respiratory conditions leads to better health outcomes;
- EXEED programme to embed energy efficiency design and structured energy management in the commercial and public sectors;
- Deep Retrofit Scheme, which will see homes taken off fossil fuels and upgraded to an A rated BER;
- Renovation schemes in government buildings and schools, through partnerships between SEAI and OPW and Department of Education and Skills (DES) respectively;
- The requirement on the public sector to meet the Nearly Zero Energy Building (NZEB) standard by 2018 – two years ahead of the private sector;
- New supports for SME's, which is internationally recognised as a sector with huge energy saving potential but also very difficult to engage; and
- The establishment of a Behavioural Economics Unit in SEAI to leverage behavioural insights as a way of increasing uptake of existing supports and designing new, citizen focused, measures.

Some of the measures outlined below are in the form of pilots. This is because we are at an important stage in developing our energy efficiency strategy. We have learned a lot from the measures in place. This has allowed us to identify the opportunities and challenges. Now we need to understand the best way to develop our measures to meet the needs of energy users and help them make the decision to act on energy efficiency. The outcomes of these pilot schemes such as the Warmth and Wellbeing, Deep Renovation, EXEED and OPW/SEAI public sector renovation projects will inform the design of measures to be implemented in the post-2020 period.

## Fiscal Supports

### Better Energy Programme

The Better Energy grant programme is administered by the SEAI on behalf of DCCAE and consists of the Better Energy Homes (BEH) scheme, Better Energy Warmer Homes (BEWH) scheme and Better Energy Communities (BEC) scheme.

### Alternative Financing (an element of the Better Energy Programme)

SEAI offers small scale grants and supports to trial innovative financing options such as salary sacrifice for residential energy efficiency upgrades.

### Measure BE1 – Better Energy Homes

The BEH scheme provides grant aid to private homeowners who wish to improve the energy performance of their home. Fixed grants are provided towards the cost of a range of measures including attic insulation, wall insulation, heating systems upgrades, solar thermal panels and accompanying BER.

### Measure BE2 – Better Energy Warmer Homes

The BEWH scheme funds energy efficiency improvements in the homes of the elderly and vulnerable, making the homes more comfortable, healthier and more cost-effective to run.

### Measure BE3 – Rental Sector – Housing Assistance Package

In 2017, a pilot scheme to encourage landlords participating in the Housing Assistance Package to avail of the Better Energy Programme will get underway to incentivise energy standard improvements in the rental sector.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **30** | Housing Assistance Package – Local Authorities signed up to participate and scheme operational. | DCCAE | SEAI | 2017 |

### Measure BE4 – Better Energy Communities

The BEC scheme aims to encourage community based partnerships to improve the thermal and electrical efficiency of the building stock and energy poor homes and facilities, encouraging the implementation of deeper and more technically and economically challenging measures. These partnerships can be between the public and private sectors, domestic and non-domestic sectors, commercial and not-for-profit organisations and energy suppliers. The community and business supports leverage considerable additional private investment.

### Measure BE5 – Warmth and Wellbeing Pilot Scheme

This three-year pilot is providing energy efficiency improvements to the homes of older people and children suffering from chronic respiratory conditions. This is a joint policy initiative between DCCAE and the Department of Health and delivered by the SEAI and the HSE.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **31** | Warmth and Wellbeing Scheme – 1,500 homes will be upgraded for occupants who qualify for the scheme. | SEAI | DCCAE | 2018 |
| **32** | Warmth and Wellbeing Scheme evaluated with a view to a possible national rollout. | DCCAE | SEAI | 2020 |

### Measure BE6 – Deep Retrofit Pilot

This pilot scheme was launched by SEAI in 2017 to establish how best to support deeper levels of renovation in the residential sector, with a view to gaining practical experience of how to develop a residential energy efficiency offering post-2020.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **33** | Implement the Deep Retrofit pilot. | SEAI | DCCAE | 2017-2019 |

### Measure BE7 – Social Housing upgrades

Energy efficiency upgrades are undertaken by local authorities to social housing stock funded by DHPCLG.

### Measure BE8 – Green Procurement and Accelerated Capital Allowances

Accelerated capital allowances (ACA) for energy efficient equipment is supporting the reduction of energy use in the workplace and the awareness of energy efficiency standards in appliances and products.

## Other Financial Supports

### Measure BE9 – The Energy Efficiency Fund

In 2014, the Government invested €35m in a commercial fund along with a number of private investors. The fund has raised over €70m in investment and has a project pipeline of commercial and public projects.

## Regulatory Measures

### Measure BE10 – Building Regulations

Part L – Conservation of Fuel and Energy in Buildings, one of twelve parts comprising the Second Schedule of the Building Regulations, is in place to limit the energy use and carbon dioxide emissions from a building as far as is practicable and requires an energy performance and carbon dioxide emissions performance that is 60% better than the 2005 Part L requirements. This is recognised as an advanced energy performance requirement for buildings.

The Energy Performance of Buildings Directive requires that all new buildings (public and private) are NZEB[38] by 2020. It also requires that new buildings owned and occupied by public authorities are NZEB after 2018.

38 The Directive defines a NZEB as a building that has a very high energy performance and that the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby. This definition was incorporated in the Building Regulations earlier this year by way of Statutory Instrument (S.I. No. 4 of 2017 Building Regulations (Amendment) Regulations).

Part L of the Building Regulations for Dwellings sets the NZEB performance for buildings completed after the 31st December 2020, which represents a 70% improvement in energy performance when compared with the 2005 Part L requirements.

Part L of the Building Regulations for Buildings other than Dwellings is currently under review in order to establish the NZEB performance requirement and this will be published by mid-2017. This review will set a performance level representing an improvement in the order of 60% over current standards. As part of this review, it is also intended to extend the requirement to achieve a cost optimal energy performance at a whole of building level when a major renovation is being carried out in respect of a building[39].

The requirement to achieve a cost optimal energy performance during major renovations will be extended to include dwellings during the next review of Part L of the Building Regulations for Dwellings which is scheduled to take place during 2018. However in the interim and in order to assist the construction industry in preparation for NZEB, a numerical indicator for the energy performance requirement of NZEB dwellings was inserted into the revised Technical Guidance Document L (2011) in respect of Dwellings in early 2017.

### Measure BE11 – Building Energy Rating (BER) Certificates

The requirements around the BER have proved very effective in raising awareness of energy efficiency. More consumer-friendly BER documentation will be introduced in 2017 to better guide householders in understanding the results of their BER and acting on them, by including information on measures and likely costs. The new BER documentation will also feature the emissions levels associated with the dwelling more prominently to help raise awareness of these emissions and how they could be managed.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **34** | New BER Advisory report to be introduced. | SEAI | DCCAE | 2017 |

### Measure BE12 – Energy Audits for Large Energy Users

As part of the implementation of the EU Energy Efficiency Directive, in 2015 a requirement was placed on large energy users in the commercial and public sectors to undertake energy audits. This mandatory requirement, which applies to enterprises over certain employee and financial thresholds, is supported by advisory measures.

### Measure BE13 – Energy Efficiency Obligation Scheme

Since 2014, as part of the implementation of the EU Energy Efficiency Directive, energy suppliers above a certain threshold are obligated to deliver annual energy savings to consumers across the residential and commercial sectors. The targets for obligated parties have been increased for the period 2017 to 2020 and the threshold for obligation lowered. Penalties are in place for non-compliance.

39 A "major renovation" means the renovation of a building where more than 25 % of the surface of the building envelope undergoes renovation.

### Technical Support

#### Measure BE14 – Large Industry Energy Network

This is a voluntary network of the largest commercial energy users, facilitated by the SEAI, through which companies share knowledge and best practice on energy management and energy cost reduction. The network will continue to focus on structured energy management and exploring new opportunities to improve energy efficiency including through its working groups. One of the working groups focuses on energy efficient design which culminated in the development of the EXEED certified programme. This will be further developed during 2017.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **35** | Roll out EXEED Programme. | SEAI | | 2017 |

#### Measure BE15 – SME Support

The SEAI provides advice and training for SMEs on energy management, particularly in areas such as lighting, heating and cooling.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **36** | SME Support – Publish new Energy Audit Handbook. | SEAI | DCCAE | 2017 |
| **37** | SME Support – Publish new interactive SME Guide. | SEAI | DCCAE | 2017 |
| **38** | SME Support – Develop and pilot new targeted grant support actions (Variable Speed Drives (VSD's) in the farming sector and lighting in SMEs). | SEAI | DCCAE | 2017 |

#### Measure BE16 – Qualibuild

This is an initiative run by the Qualibuild Consortium to develop the energy efficiency skills of the construction sector. Around 60 instructors and 200 construction workers have received training to date.

#### Measure BE17 – Technical Bureau

Energy efficiency activity adds real value to student experience, but present particular challenges to the educational sector. The SEAI and DES are building on their existing cooperation to establish this support to schools to understand and manage their energy use in coordination with the DES's capital programme.

### Measure BE18 – Behavioural Economics Unit

To better understand how to overcome the barriers consumers face to taking action on energy efficiency, the SEAI is establishing a dedicated Behavioural Economics Unit in 2017. The Unit will trial and test interventions including how best to communicate effectively with target groups to achieve the desired outcomes and develop interventions to improve the uptake of SEAI's energy efficiency programmes for individual homeowners, businesses and communities and will measure outcomes. In addition, the new unit will provide input to policy development and coordinate with the use of this discipline across wider government policy formation.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **39** | Establish new Behavioural Economic Unit in SEAI. | SEAI | DCCAE | 2017 |

### Measure BE19 – Support Network for Delivery of Public Sector Energy Efficiency Targets

The SEAI supports public sector bodies (PSBs) to achieve their 33% energy efficiency target. From 2017 these supports will be enhanced in support of the new Public Sector Energy Efficiency Strategy to include assistance in establishing a pipeline of large-scale projects.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **40** | Implementation of Public Sector Energy Efficiency Strategy (PSEES). | DCCAE | All Government Departments | Ongoing |
| **41** | PSEES – All PSBs will have nominated Energy Performance Officers (EPOs) and the Steering Group will be in place. | DCCAE | All Government Departments | 2017 |
| **42** | PSEES – Initial pipeline projects identified. | DCCAE | | 2017 |
| **43** | PSEES – First progress report to Government. | DCCAE | | 2017 |
| **44** | PSEES – Implement the *2017 Central Government Building Energy Retrofit Fund Pilot* and report to DCCAE on outcomes. | OPW/ SEAI | | 2017 |
| **45** | PSEES – Deliver the *2017 National Energy Efficiency Upgrade Pilot programme for schools.* | SEAI/ DES | | 2017 |

## 4.5 Mitigating Measures under Consideration

### Measure BE20 – Renewable Heat Incentive

A Renewable Heat Incentive (RHI) is in development as part of the action to meet our 2020 renewable heat target. A public consultation was undertaken from January to March 2017.

### Measure BE21 – Smart Metering

A CBA on the roll out of a national programme is due at the end of 2017.

### Measure BE22 – Minimal Thermal Standards in Rental Properties

The National Strategy to Combat Energy Poverty has highlighted the correlation between energy poverty and the low levels of energy efficiency in rental accommodation. It also identified the objective, post-2020, of introducing regulatory measures to preclude the rental of the lowest BER rated properties in the interests of improving living standards and reducing energy costs for those at risk of energy poverty. A consultation on this issue will be undertaken by DCCAE in 2017.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **46** | Minimal Thermal Standards in rental properties – Public Consultation underway. | DCCAE | Landlords | 2017 |
| **47** | Minimal Thermal Standards in rental properties – Consider consultation submissions and where warranted, introduce measures to help facilitate landlords achieve compliance with envisaged new regulations. | DCCAE | SEAI | 2018 |

### Measure BE23 – Voluntary Housing Association Upgrades

The potential of a pilot scheme to assist in addressing energy poverty by providing grant aid for energy efficiency upgrades through a cluster approach has been identified.

## 4.6 Overview of Costs and Emissions Reduction Potential

The tables below set out a brief overview of measures in place and under consideration that have been modelled as part of the ongoing cross-Departmental work on evaluating the emissions reduction potential and costs of a range of climate change mitigation measures. The analytical outputs are based on a marginal abatement cost curve approach which assesses the impact of an abatement measure against a set baseline. Common assumptions have been applied for the three energy sectors in relation to key parameters such as the discount rate, fuel costs and shadow prices. The further expansion of existing programmes and schemes in the period post-2020, will require further analysis, which will include the results of the various pilot schemes now underway or beginning in 2017. The work of the Behavioural Economics Unit to be established by SEAI in 2017 will also be a key input to such analysis.

**Table 4.2 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place**

| Classification of measure | | | | Exchequer Expenditure (€)[##] | | | |
|---|---|---|---|---|---|---|---|
| **Title** | **Reference** | **Type** | **Objective of measure** | **Direct Spend** | **Tax Foregone** | **Total** | |
| BE1<br>In place | Better Energy Homes (BEH) | Economic Instrument – Fiscal Measure | The BEH scheme operated by SEAI is aimed at improving the energy efficiency of homes to reduce occupant's energy consumption, costs and emissions. It provides grant aid to private homeowners to improve the energy performance of their home. Grants can be provided towards the cost of measures including attic and/or wall insulation, heating system upgrades, solar thermal panels and accompanying BER. | 79.54m | N/A | 79.54m | |
| BE2<br>In place | Better Energy Warmer Homes (BEWH) | Economic Instrument – Fiscal Incentive | The BEWH scheme improves the energy efficiency of the housing stock of those in energy poverty through the provision of funds for energy efficiency improvements to help reduce their energy consumption, costs and emissions. This makes the homes more comfortable, healthier and more cost-effective to run. | 86.48m | N/A | 86.48m | |
| BE3<br>Will be in place from 2017 | Housing Assistance Package | Economic Instrument – Fiscal Incentive | This is a pilot scheme as part of the Better Energy Programme to encourage landlords participating in the Housing Assistance Package to avail of the Better Energy Programme to incentivise energy standard improvements in the rental sector. | N/A – Spend and impacts reflected in other BEP measures. | N/A | N/A | |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA)*** | NPV 2017-2030 (€) (based on economic CBA)*** | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | N/A | Direct* = -88m<br>Direct Plus* Indirect = -76m | Direct = 23m<br>Direct Plus Indirect = 66m | Direct** = -31 (Economic)<br>Direct Plus Indirect = -89 (Economic) | 149 | 744 |
| | N/A | Direct* = -67m<br>Direct Plus* Indirect = -61m | Direct = -32m<br>Direct Plus Indirect = -10m | Direct** = 135 (Economic)<br>Direct Plus Indirect = 41 (Economic) | 47 | 235 |
| | N/A | Spend and impacts reflected in other BEP measures – especially BE2. | Spend and impacts reflected in other BEP measures. | Spend and impacts reflected in other BEP measures. | Spend and Impacts are reflected in other BEP measures. | Spend and impacts reflected in other BEP measures. |

**Table 4.2 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place**

| Classification of measure | | | | Exchequer Expenditure (€)[##] | | | |
|---|---|---|---|---|---|---|---|
| **Title** | **Reference** | **Type** | **Objective of measure** | **Direct Spend** | **Tax Foregone** | **Total** | |
| BE4<br>In place | Better Energy Communities (BEC) | Economic Instrument – Fiscal Incentive | The aim of this scheme is to improve the energy efficiency of clusters of buildings in community based settings and encourage implementation of deeper upgrade measures. The BEC scheme aims to encourage community based partnerships to improve the energy efficiency of clusters of buildings to reduce occupants' energy consumption, costs and emissions. These partnerships can be between the public and private sectors, domestic and non-domestic sectors, commercial and not-for-profit organisations and energy suppliers. | 85.76m | N/A | 85.76m | |
| BE5<br>In place | Warmth and Wellbeing Pilot Scheme | Economic Instrument – Fiscal Incentive and Research/ Demonstration | A three-year pilot providing energy efficiency improvements to the homes of older people and children suffering from chronic respiratory conditions relating to the thermal efficiency of their homes. This is a joint policy initiative between DCCAE and the Department of Health and delivered by the SEAI and the HSE. Research on the outcomes including reduction in need for healthcare will inform the understanding of the wider benefits of improving homes to improve energy efficiency. | 32.4m | N/A | 32.4m | |
| BE6<br>New from 2017 | Deep Retrofit Pilot | Research – Demonstration (Pilot) | The aim of this pilot is to test approaches to achieving deep retrofit in the residential sector, to gain practical experience of how to develop a residential energy efficiency offering post 2020 to deliver the scale of impacts needed to achieve decarbonisation goals. | 21.2m | N/A | 21.2m | |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA)*** | NPV 2017-2030 (€) (based on economic CBA)*** | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | N/A | Direct * = -101m<br>Direct Plus Indirect = -85m | Direct = 56m<br>Direct Plus Indirect = 113m | Direct ** = -61 (Economic)<br>Direct Plus Indirect = -122 (Economic) | 184 | 922 |
| | N/A | Direct * = -25m<br>Direct Plus Indirect = -23m | Direct = -12m<br>Direct Plus Indirect = -3m | Direct ** = 132 (Economic)<br>Direct Plus Indirect = 38 (Economic) | 18 | 89 |
| | N/A | Direct * = -28m<br>Direct Plus Indirect = -26m | Direct = -18m<br>Direct Plus Indirect = -8m | Direct ** = 256 (Economic)<br>Direct Plus Indirect = 115 (Economic) | 14 | 70 |

**Table 4.2 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place**

| Classification of measure | | | | Exchequer Expenditure (€)[##] | | | |
|---|---|---|---|---|---|---|---|
| **Title** | **Reference** | **Type** | **Objective of measure** | **Direct Spend** | **Tax Foregone** | **Total** | |
| BE7<br>In place | Social Housing Upgrades (DHPCLG) | Capital Programme | Local authorities are currently undertaking an ambitious programme of insulation retrofitting, with the support of DHPCLG. The programme is being implemented in a number of phases: Phase 1 commenced in 2013 and is focused on providing attic/roof insulation and the less intrusive cavity wall insulation while Phase 2, which has commenced on a pilot basis, will focus on the external fabric upgrade of those social housing units with solid/hollow block wall construction. | The funding provision for this Programme in 2017 is €22 million. Based on a no-policy change scenario it is expected that an annual funding provision of similar order will be made available over the period in question. | N/A | TBD | |
| BE8<br>In place | Green Procurement & Accelerated Capital Allowance (ACA) ("Triple E" List) | Economic Instrument – Fiscal Incentive | To promote the use of qualifying energy efficient products, equipment and technologies, an ACA scheme is in place for the purchase of energy efficient equipment in the workplace. Companies are offered a tax incentive to purchase highly energy efficient equipment thus helping to improve the energy efficiency of Irish companies and to contribute to emissions reductions. | TBD | TBC | TBC | |
| BE9<br>In place | Energy Efficiency Fund | Economic Instrument – Fiscal Incentive | This is a commercial fund of €70m in which Government have invested €35m. The objective is to support a pipeline of commercial and public projects. It has the capacity to leverage potential investment of €300m in energy efficiency. | N/A | N/A | N/A | |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA)*** | NPV 2017-2030 (€) (based on economic CBA)*** | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | TBD | TBD | TBD | TBD | TBD | TBD |
| | N/A | TBD | TBD | TBD | TBD | TBD |
| | N/A | This is a support measure – its impacts should mostly be reflected in other quantified measures. | This is a support measure – its impacts should mostly be reflected in other quantified measures. | This is a support measure – its impacts should mostly be reflected in other quantified measures. | This is a support measure – its impacts should mostly be reflected in other quantified measures. | This is a support measure – its impacts should mostly be reflected in other quantified measures. |

**Table 4.2 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place**

| Classification of measure | | | | Exchequer Expenditure (€)[##] | | | |
|---|---|---|---|---|---|---|---|
| **Title** | **Reference** | **Type** | **Objective of measure** | **Direct Spend** | **Tax Foregone** | **Total** | |
| BE10–1<br>At public consultation – to complete Oct. 2017 | Building Regulations – Nearly Zero Energy Buildings (NZEB) | Regulation | The aim of this measure is to introduce new Building Regulations for Buildings other than Dwellings to achieve an reduction in energy demand and carbon dioxide emissions in the order of 60% compared to 2005 levels. | NA. Building Regulations cost covered within existing administrative structures. | N/A | N/A | |
| BE10–2<br>To be implemented in 2018 | Building Regulations – Nearly Zero Energy Dwellings (NZEB) | Regulation | The aim of this measure is to introduce new Building Regulations for Dwellings to achieve a reduction in energy demand and carbon dioxide emissions in the order of 70% compared to 2005 levels. | Currently under evaluation for social housing. | N/A | N/A | |
| BE10–3<br>At Public consultation-due to publish Oct. 2017 | Building Regulations – Major Renovations | Regulation | The aim of this measure is to introduce new Building Regulations for Buildings other than Dwellings to achieve an cost optimal performance when more than 25% of the surface area of the buildings undergoes major renovation. | TBD | N/A | TBD | |
| BE10–4<br>To publish 2018 | Building Regulations – Major Renovations-Dwellings | Regulation | To introduce new Building Regulations for Dwellings to achieve an cost optimal performance when more than 25% of the surface area of the buildings undergoes major renovation. | N/A – Building Regulations cost covered within existing administrative structures. | N/A | N/A | |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA)*** | NPV 2017-2030 (€) (based on economic CBA)*** | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | N/A | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | This measure will provide a reduction in the order of 50% to 60% in carbon emissions from all new buildings other than dwellings completed after the 31st December 2020. This equates to 44.1$kgCO_2/m^2$/yr for a typical office.<br>Cumulative reduction TBD. |
| | N/A | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | This measure will provide a reduction in the order of 70% in carbon emissions from dwellings completed after the 31st Dec 2020. This equates to 91.35 $ktCO_2e$. |
| | N/A | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Currently under review.<br>TBD |
| | N/A | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Regulatory Impact Assessment and cost optimal reports provides impact at a building level.**** | Currently under review.<br>TBD |

**Table 4.2 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place**

| Classification of measure | | | | Exchequer Expenditure (€)[##] | | | |
|---|---|---|---|---|---|---|---|
| Title | Reference | Type | Objective of measure | Direct Spend | Tax Foregone | Total | |
| BE11 In Place – and to be enhanced in 2017 | Building Energy Rating (BER) Certificates | Regulatory Instrument | A BER is an indication of the energy performance of a dwelling on a scale of A (most efficient) to G (least efficient) arrived at following an energy audit. By providing purchasers/ renters with such information it promotes more awareness and understanding of energy efficiency. All dwellings offered for sale or rent must display their BER rating. The scheme is operated by SEAI on a cost-neutral basis. From 2017 BER Certificates and reports will be enhanced to provide more detailed information to owners/ buyers/occupants on how much more comfortable and cost-effective the home could be if specific energy efficiency measures were undertaken. The new BER documentation will also feature the emissions levels associated with the dwelling more prominently to help raise awareness of these emissions and how they could be managed. | N/A | N/A | N/A | |
| BE12 In place | Energy Audits for Large Energy Users | Regulatory Instrument | Mandates larger energy users in the commercial and public sectors to have energy audits undertaken. This mandatory requirement is supported by advisory measures. | N/A – costs are borne by the bodies them-selves. | N/A | N/A | |
| BE13 In place, to be expanded in 2017 | Energy Efficiency Obligation Scheme | Regulatory Instrument | Under this scheme all energy suppliers with sales above a certain threshold are required to deliver annual energy savings across the residential and commercial sectors. The targets for obligated parties are being increased for the period 2017 to 2020 and the sales threshold for participation in the obligation scheme lowered. | No direct excheq-uer cost. Potential cost for consum-ers if obligated party passes on cost to consum-ers. | N/A | N/A | |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA)*** | NPV 2017-2030 (€) (based on economic CBA)*** | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | N/A "operated by SEAI on a cost neutral basis". | This is a support measure – its impacts are reflected in other quantified measures. | This is a support measure – its impacts are reflected in other quantified measures. | This is a support measure – its impacts are reflected in other quantified measures. | This is a support measure – its impacts are reflected in other quantified measures. | This is a support measure – its impacts are reflected in other quantified measures. |
| | N/A | A support measure – impacts will be reflected in other quantified commercial and public sector measures i.e. BE19 and BE14. | A support measure – impacts will be reflected in other quantified commercial and public sector measures. | A support measure – impacts will be reflected in other quantified commercial and public sector measures. | A support measure – impacts will be reflected in other quantified commercial and public sector measures. | A support measure – impacts will be reflected in other quantified commercial and public sector measures. |
| | N/A | Direct * = -39m<br>Direct Plus Indirect = -29m | Direct = 117m<br>Direct Plus Indirect = 151m | Direct ** = -180 (Economic)<br>Direct Plus Indirect = -233 (Economic) | 130 | 648 |

**Table 4.2 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place**

| Classification of measure | | | | Exchequer Expenditure (€)[##] | | | |
|---|---|---|---|---|---|---|---|
| **Title** | **Reference** | **Type** | **Objective of measure** | **Direct Spend** | **Tax Foregone** | **Total** | |
| BE14 In place | Large Industry Energy Network | Technical Support | The aim of this measure is to improve energy efficiency of larger commercial energy users. The Large Industry Energy Network (LIEN) is a voluntary grouping of the largest commercial energy users, where companies share knowledge and best practice and are supported by SEAI with guidance on energy management, energy efficiency as well as technical support and advice for those choosing to pursue or maintain an energy management to the ISO 50001 standard. Further support may be provided through SEAI's ExEED programme. | 11.2m | N/A | 11.2m | |
| BE15 In place – and to be enhanced in 2017 | SME Support | Education and Training | This measures aims to Improve energy efficiency for small enterprises. The SEAI provides advice and training for SME's on energy management, particularly in areas such as lighting, heating and cooling as well as providing support to SME's to invest in implementing energy saving measures with short payback periods. | 4.8m | N/A | 4.8m | |
| BE16 In place | Qualibuild | Education and Training | To promote up to date skills and knowledge in the construction sector to deliver a high standard of build and best practice in energy efficiency. This initiative is run by the Qualibuild Consortium. | N/A | N/A | N/A | |
| BE17 Will be in place from 2017 | Schools Technical Bureau | Education and Training with funding support | Provision of tailored advice and support by SEAI to enable schools and DES to identify and take advantage of opportunities to reduce energy use and improve energy performance when making facilities upgrades to schools including through maintenance, summer works and capital programmes. | 10.8m | N/A | 10.8m | |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA)*** | NPV 2017-2030 (€) (based on economic CBA)*** | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | N/A | Direct * = -7m<br>Direct Plus Indirect = -4m | Direct = 54m<br>Direct Plus Indirect = 65m | Direct ** = -150 (Economic)<br>Direct Plus Indirect = -179 (Economic) | 72 | 360 |
| | N/A | Direct * = -2m<br>Direct Plus Indirect = -1m | Direct = 24m<br>Direct Plus Indirect = 28m | Direct ** = -231 (Economic)<br>Direct Plus Indirect = -260 (Economic) | 21 | 106 |
| | N/A | N/A | N/A | N/A | N/A – the impacts will result in improved energy efficiency largely captured elsewhere. | N/A – the impacts will result in improved energy efficiency largely captured elsewhere. |
| | N/A | Direct * = -7m<br>Direct Plus Indirect = -6m | Direct = 3m<br>Direct Plus Indirect = 4m | Direct ** = -144 (Economic)<br>Direct Plus Indirect = -199 (Economic) | 4 | 22 |

### Table 4.2 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place

| Classification of measure | | | | Exchequer Expenditure (€)## | | | |
|---|---|---|---|---|---|---|---|
| **Title** | **Reference** | **Type** | **Objective of measure** | **Direct Spend** | **Tax Foregone** | **Total** | |
| BE18 In place from 2017 | Behavioural Economics Unit | Research, Education and Training | To better understand the important role that behavioural economics and psychology plays in decision making and to encourage and facilitate more people choosing energy efficient and sustainable options, the SEAI is establishing a dedicated Behavioural Economics Unit in 2017, to provide input to policy development and coordinate with the use of this discipline across wider government policy formation. The unit will trial and test interventions including how best to communicate effectively with target groups to achieve the desired outcomes and will assess impacts. | TBD | N/A | TBD | |
| BE19 In Place and being enhanced in 2017 | Support Network for Delivery of Public Sector Energy Efficiency Targets | Education and Training with support from grants | The SEAI supports public sector bodies to achieve their 33% energy efficiency target through technical assistance. From 2017, these supports will be enhanced in support of the new Public Sector Energy Efficiency Strategy in establishing a pipeline of larger scale projects. | 10.8m (by SEAI)# | N/A | 10.8m (by SEAI) | |

* Based on present level of funding

** Marginal cost per tonne figures are per non-ETS tonne and calculated for the 2017-2030 period

*** Negative NPV is reflected where the costs outweigh the benefits considered over the time-frame of the analysis.

**** http://www.housing.gov.ie/housing/building-standards/energy-performance-buildings/report-development-cost-optimal-calculations

# Projections for this measure are based on closing gap to target. While the SEAI support element is funded (€10.8m over the period 2017 to 2020), the modelled programme and expenditure for this measure (€39.1m per annum) is not funded. This represents the scale of investment required from across the public sector to close some of the gap to target.

## Unless otherwise specified, the Exchequer expenditure relates to the period 2017-2020

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA)*** | NPV 2017-2030 (€) (based on economic CBA)*** | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | N/A | Direct* = 3m<br>Direct Plus Indirect = 4m | Direct = 21m<br>Direct Plus Indirect = 23m | Direct ** = -266 (Economic)<br>Direct Plus Indirect = -295 (Economic) | 16 | 79 |
| | N/A | Direct * = -108m<br>Direct Plus Indirect = -99m | Direct = 113m<br>Direct Plus Indirect = 140m | Direct ** = -227 (Economic)<br>Direct Plus Indirect = -282 (Economic) | 100 | 498 |

**Table 4.3 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures under Consideration**

| Classification of Measure | | | | Exchequer Expenditure (€) | | |
|---|---|---|---|---|---|---|
| Reference | Title | Type | Objective of measure | Direct Spend | Tax Foregone | Total |
| BE20 Under consideration | Renewable Heat Incentive | Financial Support Mechanism | A Renewable Heat Incentive (RHI) is in development as part of the action to meet Ireland's 2020 renewable heat target. This scheme aims to encourage industrial and commercial energy users to switch from fossil fuels to renewable energy. Feedback from a public consultation from 26 January to 3 March will be taken account of in designing the scheme. | TBD | N/A | TBD |
| BE21 Under consideration | Smart Metering | Education & Awareness | To facilitate improved energy efficiency by empowering consumers with more detailed, accurate and timely information regarding their energy consumption and costs – empowering them to reduce consumption, spend and emissions. To be rolled out nationally from 2021 subject to the results of a Cost Benefit Analysis (CBA) which is due at the end of 2017. | N/A – Cost to be met by energy suppliers which may be passed on to consumers. | N/A | N/A |
| BE22 Under consideration | Minimal Thermal Standards in Rental Properties | Regulation | To improve the energy efficiency of rental properties – reducing energy consumption and emissions and improving comfort levels. The National Strategy to Combat Energy Poverty has highlighted a link between energy poverty and the low levels of energy efficiency in rental accommodation. It also identified the objective, post 2020, of introducing regulatory measures to preclude the rental of the lowest Better Energy Rated (BER) properties in the interests of improving living standards and reducing energy costs for those at risk of energy poverty. A consultation on this issue will be undertaken by DCCAE in 2017. | N/A. Upgrades to be financed by property owners – with possible support under Government energy efficiency schemes. | N/A | N/A |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA) | NPV 2017-2030 (€) (based on economic CBA) | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | N/A | TBD | TBD | TBD | TBD | TBD |
| | N/A | TBD | TBD | TBD | TBD | TBD |
| | N/A | N/A | N/A | Any costs arising for the exchequer would occur and be accounted for under other support measures. | TBD | TBD |

**Table 4.3 Decarbonising the Built Environment – Overview of Costs and Emissions Reduction Potential – Mitigating Measures under Consideration**

| Classification of Measure | | | | Exchequer Expenditure (€) | | | |
|---|---|---|---|---|---|---|---|
| Reference | Title | Type | Objective of measure | Direct Spend | Tax Foregone | Total | |
| BE23 Under consideration | Voluntary Housing Association Upgrades | Economic Instrument – Fiscal Incentive | To develop and implement a dedicated programme for voluntary housing associations which could better target energy poor homes at a competitive rate. The potential of a pilot scheme to assist in addressing energy poverty by providing grant aid for energy efficiency upgrades through a cluster approach has been identified. This cluster approach would reduce the overall cost of the works. | 15.9m | N/A | 15.9m | |

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA) | NPV 2017-2030 (€) (based on economic CBA) | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | N/A | Direct = -19m<br>Direct + Indirect = -17m | Direct = 0<br>Direct + Indirect = 7m | Direct = 4 (Economic)<br>Direct + Indirect = -62 (Economic) | 20 | 118 |

# 5 Decarbonising Transport

## 5.1 Introduction

### Vision for the Sector

Moving to a low carbon society represents a significant challenge for Ireland's expanding transport sector where the use of fossil fuels is firmly embedded in driving culture. To address the challenge of transitioning from conventionally fuelled vehicles to alternative fuels and technologies an ambitious national target was established whereby all new cars sold in Ireland will be zero carbon emission or zero emission-capable by 2030 as well as many of our public transport buses and rail lines. The ultimate aim is to decarbonise the national passenger car fleet by 2050 and increase the use of alternative fuels in the freight sector.

This Chapter addresses the role of transport in developing a National Mitigation Plan. It considers the characteristics and emissions profile of the transport sector in Ireland, looks at how that profile has changed over recent years, and projects how it might develop into the future. The Chapter identifies and discusses various measures already helping to reduce the level of greenhouse gas emissions associated with the transport sector in this country. It also identifies a range of potential additional measures with the aim of further intensifying efforts to mitigate emissions from the sector. The key considerations and the broad indicative nature of the costs and benefits associated with such measures are also described, as these will be a critical focus of the future policy deliberations, choices and decision-making in this area.

### Background

The Government is committed to reducing emissions and building a climate resilient low carbon transport sector by 2050. A number of successful measures have already been introduced to reduce transport sector emissions. Such measures – detailed later in this Chapter – include: sustained investment in the public transport network; the introduction of a Biofuels Obligation Scheme; regulations limiting tail pipe emissions in cars; incentives to encourage the purchase of electric vehicles; and redesigning the Vehicle Registration Tax (VRT) and motor tax regimes to promote low carbon emitting vehicles.

A mix of further measures, developments and initiatives will be needed to continue to respond to the climate challenge into the future. New technology deployment and behavioural change initiatives need to be advanced across the transport sector, stimulating changes to the way we travel and the types and amounts of fuels that we use. Further measures being progressed are the implementation of the National Planning Framework (currently being developed by Government) which aims to ensure better integration of land use and transport planning policy in order to reduce commuter travel demand and support more efficient patterns of development and travel; increasing public transport capacity and securing a shift, where feasible alternatives exist, away from private car use; encouraging the take-up of alternative fuels to petrol and diesel; and the increase of the obligation under the Biofuels Obligation Scheme to further reduce the concentration of high-emitting fuels. In addition, the potential role of taxation, the impact of 'fuel tourism' and driving behaviours are all also being examined.

Decisions relating to implementing further mitigation measures require careful consideration of the likely impacts on the environment, the economy and the Exchequer as well as their relative contributions to meeting national emission targets. Consideration must also be given to the implication of combining measures and potential interactions compared to stand-alone alternatives. Increasingly, routes to decarbonisation of the transport sector are becoming better understood and more evident. With effective planning, such change should not act as an impediment to progress and economic growth. In fact, it should be expected that moving towards achieving Ireland's climate targets can also be associated with deriving additional benefits to our standard of living and health.

All citizens rely on some aspect of the transport system and it is clear that travel patterns are firmly established. These patterns are reinforced by a number of factors including cost, time, accessibility, flexibility, comfort and safety. Undoubtedly, changes will be required to the transport system to enable the sector to contribute to our national policy vision of a low carbon economy. This transformation will take time but the pathway is becoming clearer.

The *National Policy Framework on Alternative Fuels Infrastructure for Transport in Ireland: 2017-2030* sets an ambitious target that from 2030 all new cars and vans sold in Ireland will be zero emission (or zero emission-capable) and that other technologies, perhaps still unknown, will be fuelling larger vehicles, so that by 2050, the nation's car fleet, along with much of our public transport buses and rail lines, will be low/near zero emissions. In the meantime, Ireland is seeking greater diversification of fuels in the freight sector to include a mix of natural gas, biogas, electricity (light vans) and renewable diesel or other biofuels. Hydrogen may also play a role although the timing of hydrogen deployment is as yet uncertain.

Emissions from international maritime transport are being tackled as part of a global approach led by the International Maritime Organization (IMO) and emissions from airlines within the European Economic Area (EEA) are part of the ETS, with other international emissions the focus of a recent International Civil Aviation Organisation (ICAO) agreement. The focus of approaches set out in this chapter is on efforts to reduce emissions from the remaining elements of the transport sector, under the non-ETS sector.

Alongside national policy objectives, the transport sector is also bound by certain commitments at EU level. The Renewable Energy Directive specifies a legally binding 10% renewable energy in transport target to be achieved by all Member States by 2020. The Biofuels Obligation Scheme is the primary mechanism being deployed to achieve this target by 2020. Progress is being made in increasing the share of renewable energy in our transport energy. By 2015 this share was 3.3%, or 5.7% when the weightings for double certificates are applied in accordance with the Directive.

The expectation for transport at EU level is most recently expressed in the European Commission's July 2016 *European Strategy for Low-Emission Mobility.* This reiterates the ambition that 'by mid-century, greenhouse gas emissions from transport will need to be at least 60% lower than in 1990 and be firmly on the path towards zero. Emissions from air pollutants from transport that harm our health need to be drastically reduced without delay.' The main elements of the Strategy include:

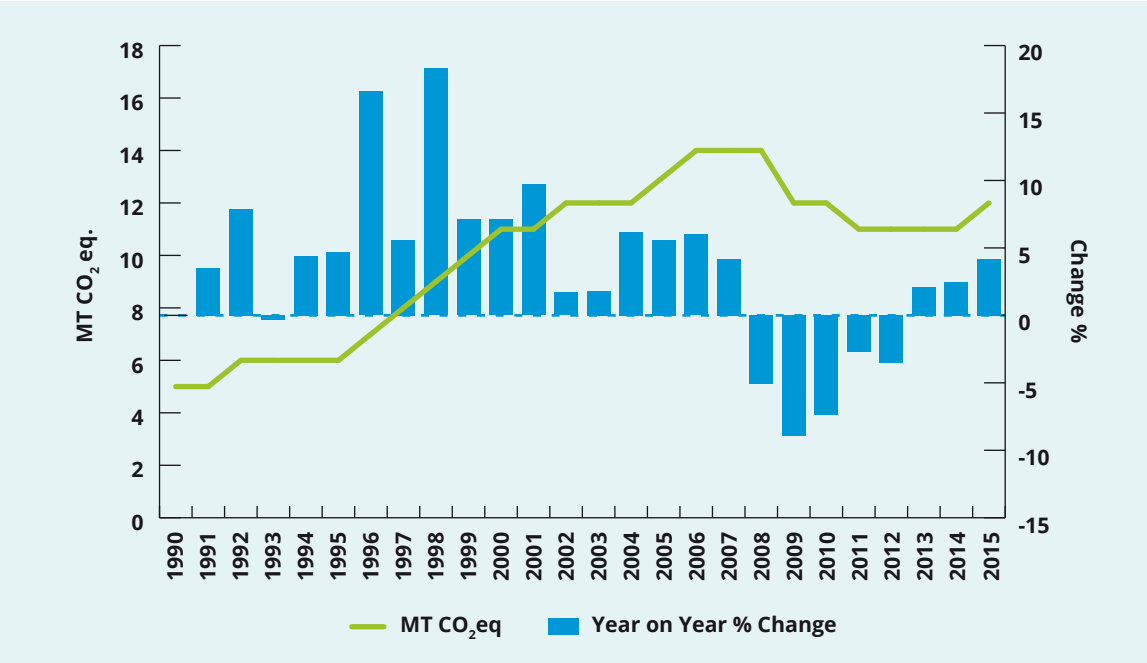
- Increasing the efficiency of the transport system by making the most of digital technologies, smart pricing and further encouraging the shift to lower emission transport modes;
- Speeding up the deployment of low-emission alternative energy for transport, such as advanced biofuels, renewable electricity and renewable synthetic fuels and removing obstacles to the electrification of transport; and
- Moving towards zero-emission vehicles. While further improvements to the internal combustion engine will be needed, Europe needs to accelerate the transition towards ultra-low- and zero-emission vehicles.

These objectives are reflected in national transport climate policy development and in the measures in this plan.

## 5.2 Emissions Profile

Ireland's emissions profile has changed considerably since 1990, with the contribution from transport increasing by 130% between 1990 and 2015. The transport sector has been the fastest growing source of greenhouse gas emissions over the period, representing 27.5% of Ireland's non-ETS emissions in 2015. The transport share of overall national greenhouse gas emissions has increased from 9% in 1990 to almost 20% in 2005 and remains now at that 20% level. During this period, there was a significant increase in both economic output and car ownership levels, from around 800,000 cars in 1990 to close to two million in 2015 (+149%). There is a strong correlation between Irish GNP and transport greenhouse gas emissions, particularly those emissions relating to the freight sector. The challenge is to decouple these pathways and reduce emissions without compromising economic growth. The success of policies relating to vehicle energy efficiency measures in the car and van fleets and the gradual increase in rates of biofuel substitution are examples of initiatives that can support progress in this regard.

**Figure 5.1 Transport Sector Greenhouse Gas Emissions 1990 to 2015 (EPA)**




Source: EPA

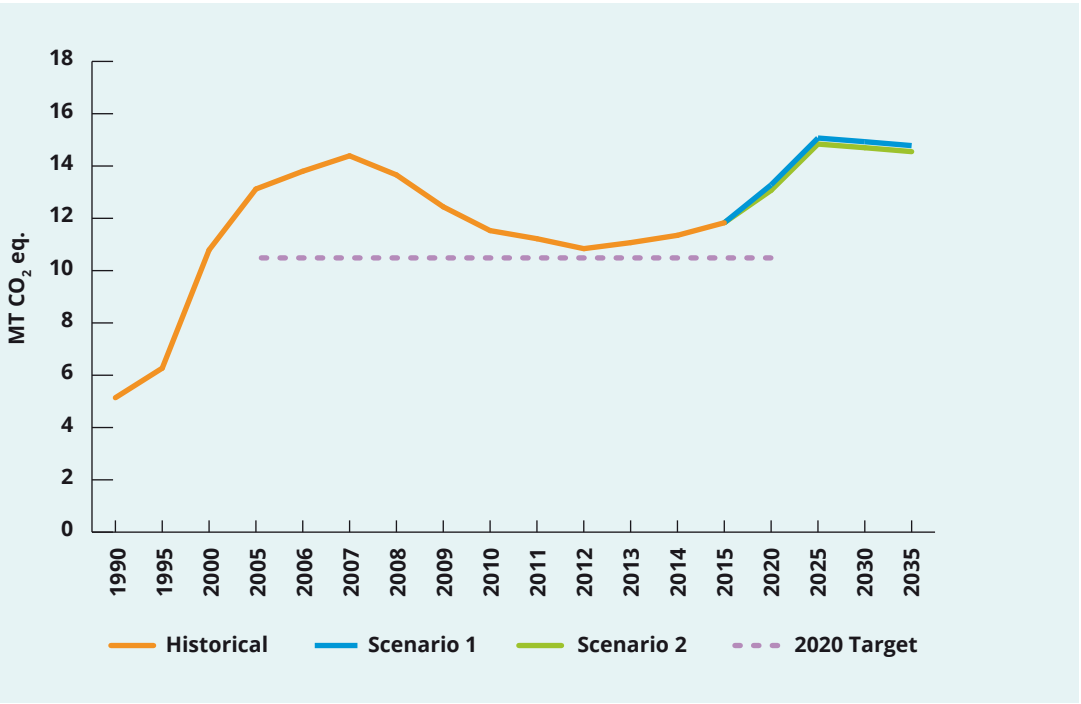
In 2013, despite transport emissions having decreased by 23.1% below peak levels of 2007, an increase of 2.1% was reported for the first time in five years. This was followed by another year on year increase of 2.5% in 2014 and 4.2% in 2015.

The decrease in the years 2008 to 2012 reflected both the impact of the economic downturn, combined with carbon taxation and improvements to energy efficiency in the car fleet underpinned by changes to VRT and motor tax introduced in mid-2008. In addition, the Biofuels Obligation Scheme started operation in mid-2010, with biofuels displacing up to 6% of the petrol and diesel used thus contributing further to reduced greenhouse gas emissions.

Demand for transport is experiencing renewed growth. Vehicle use is showing an upward trend with total annual vehicle kilometres for private cars increasing by 9.4% between 2011 and 2015. The private car remains the dominant mode choice in Ireland with 74% of all journeys being taken by car. Ireland's dependence on the car is more pronounced outside Dublin (76% of all journeys outside Dublin) than in Dublin (54% of all journeys). This profile is largely in line with other similar European countries.

According to the latest greenhouse gas emission projections from the EPA, transport emissions are set to increase by 10-12% beyond current levels over the period to 2020, depending on the level of policy intervention (Scenario 1 and Scenario 2). Relative to 2005, transport emissions are projected to increase slightly or, at best, remain at the same level by 2020. The latter assumes greater progress in relation to achieving energy efficiency and renewable transport targets. Over the longer term, the EPA project that without intervention transport sector emissions will increase by 11.3% over the period 2020 to 2035[40].

**Figure 5.2 Projections of Greenhouse Gas Emissions from the Transport Sector**




Source: EPA

*It is assumed that the renewable energy penetration in both Scenario 1 and 2 is maintained at 2020 levels in percentage terms supported by the Biofuels Obligation Scheme 2010.*

These projections, based on the assumption that no further policies and measures are implemented post-2020, show that transport is not currently on a low carbon pathway. Measures to shift Ireland onto the desired pathway are likely to have significant cost implications for the State, but can also bring a broad range of benefits in terms of how transport works in Ireland.

40 Source: EPA's document 'Ireland's Greenhouse Gas Emission Projections: 2016-2035'.

## 5.3 Opportunities and Challenges

Ireland now has annual climate mitigation targets out to 2020 with a further sustainable target trajectory being put in place to 2030. To align with national and international objectives out to 2050, it is now clear that the scale of greenhouse gas mitigation required and the adjustments needed in the transport sector will pose significant fiscal and policy challenges. Our climate commitments are set against a welcome return to economic growth which will, however, coupled with our demographic trends, add significant transport demand pressures. The transport sector must meet this additional demand, while addressing the related congestion, climate mitigation and air quality concerns posed.

Despite widely accepted mitigation costs in the transport sector and projected strong transport demand increases, the transport sector will be required to contribute emissions reductions to the national effort and set Ireland on a trajectory to a low carbon transport future. These necessary actions can also deliver benefits, such as improved energy security and economic opportunities from renewable and indigenous fuels. Indeed many important co-benefits arise in areas of health, lifestyle, air quality, travel costs and the local environment, from measures designed to address greenhouse gas emissions reduction in the transport sector.

### Settlement Patterns, Transport and Land Use Planning

Transport demand is essentially a derived demand and is largely dependent on the level of activity within an economy. Population growth, labour force participation rates, settlement patterns and changes in the affordability of transport have an impact on demand. Settlement patterns, in particular, play a fundamental role in influencing how people travel, both the distances undertaken and the modal choice. In a European context, Ireland has a particular challenge as we are an island nation with a dispersed population and limited numbers of high density urban settlements suitable for the provision of effective public transport systems. Eurostat data indicates Ireland has the highest percentage population living in rural areas of all EU Member States[41].

Effectively meeting travel demand in a manner that avoids congestion and limits transport emissions requires effective spatial policies to be implemented at local and national levels. The spatial relationship between where a person lives, works, goes to school, shops and socialises forms the basis for demand. The provision of sustainable transport options is only realistic when development patterns locate populations close to employment centres and complementary services such as education, retail and leisure. Walking and cycling, in particular, become more viable as transport options when the distance between such services is reduced. It is clear that land use policy is a key determinant of transport investment decisions so it is vital that land use planning and transport planning are fully aligned. The development of a new National Planning Framework will play a critical role in securing this alignment. Furthermore, the National Transport Authority (NTA), through its various statutory planning, regulatory and investment functions, is also working in a manner that can deliver a better integration of land use and transport planning, consistent with Government spatial planning objectives.

41 Eurostat release 51/2012 (http://ec.europa.eu/eurostat/documents/2995521/5150318/1-30032012-BP-EN.PDF).

### Multiple Objectives

The transport sector is required to fulfil a number of interdependent and sometimes conflicting policy objectives. Supporting economic growth, both domestically and within our export sectors, has always been a key basis of support of transport investment. Our transport system is expected to respond to the needs of a growing economy, yet remain cost competitive within an international context, particularly for the freight industry. Access to transport is also an important policy consideration in securing social inclusion and equality.

In this context, developing further cost-efficient measures for the sector will be challenging. The marginal abatement cost per tonne of $CO_2$eq in the transport sector is widely recognised as being very high and well in excess of the range of carbon prices considered likely in the ETS by 2020 and beyond. As part of a study undertaken by UCC/ESRI/E4sma[42] in 2013 it was estimated that, under one particular scenario to reduce carbon emissions nationally by 80%, the marginal abatement cost of carbon (priced in € per tonne of carbon dioxide) could increase to as much as €335/tonne by 2050. This level of carbon abatement cost is not unusual in transport and is in marked contrast to a current carbon tax of €20/tonne and EU-ETS price of less than €10/tonne.

### Energy Security and High Dependence on Oil

With a very high dependence on oil (98%), greater diversification of fuels in the Irish transport sector is also highly desirable from an energy security perspective. The use of fossil fuels, particularly petrol and diesel, is firmly embedded in the car driving culture of Ireland. These fuels are also the predominant choice for freight and public transport services. Of the total vehicle fleet, 45.6% of vehicles use petrol while 53.6% operate on diesel. Notwithstanding the levels of efficiency achieved in conventionally fuelled vehicles in recent years, this profile reflects the scale of change that will be required if alternative fuels are to play the role envisaged in our national and EU vision for 2050.

### Technology and Behavioural Change

Advancements in technology are at the forefront of changes occurring in the transport sector. Technology will undoubtedly offer one of the most cost-effective and feasible pathways to achieving our mitigation objectives between now and 2020, 2030 and ultimately 2050. Ireland, as a technology taker, will need to be suitably positioned to adapt to an expanding market of alternative fuels and new technologies.

Behavioural change amongst motorists will be critical in reducing emissions in the transport sector. Many of the mitigation measures are dependent on modal shift or a change in the fuel and/or technology currently employed to meet travel demands. Addressing concerns relating to the refueling infrastructure network, range anxiety and economic considerations – including upfront capital, resale values and maintenance costs – will encourage greater public acceptance of new technologies. Improving public awareness through information campaigns and advisory supports will help to achieve the necessary behavioural change required to mitigate transport emissions.

42 UCC/ESRI/E4sma 'Technical support on developing low carbon sector roadmaps for Ireland' (2013).

### Electric Vehicles and Alternative Fuels

Based on current information, a full electrification of the car fleet could represent a feasible option for Ireland, where supporting grid infrastructure is developed. While there are no certainties in predicting future technologies, there are strong indications from car manufacturers and energy market analysts that mass market adoption will happen for electric vehicles. Advances in battery technology, increasing competition in the market and lower vehicle costs would suggest that electrification will be the predominant low carbon choice for transport, particularly for the private car, taxis and commercial vans. We can expect freight to be fuelled by a range of fuel types or combinations of such types as biogas, biofuels, electricity, hydrogen, CNG and LNG. The level of contribution from biofuels is expected to have limits over the long term due to various resource constraints, demand/supply and land use issues.

### Fuel Tourism

The growth in transport emissions since 1990 has also been, in part, due to the changed pattern in 'fuel tourism', the purchase of fuel in Ireland for use outside the jurisdiction. From a position in 1990 where purchasers regularly travelled North to buy transport fuel, the SEAI estimates that fuel tourism from north of the border currently makes up an estimated 10% of transport energy demand. Due to the internationally agreed methodology for calculating emissions, such fuel purchases are calculated as emissions of the State. They are present on the national emissions inventory, despite the fact that the fuel is consumed outside this jurisdiction. In examining the feasibility of price equalisation in order to reduce if not to eliminate fuel tourism, it is clear that the role of exchange rate movements and the potential impact of Brexit add complexity to the design of any potential measures to address this issue. An approach involving a price equalisation model secured through taxation would increase fuel cost to consumers nationally and, potentially, involve job losses in some Border areas. It is estimated, however, that between 2017-2030 elimination of fuel tourism could lead to a reduction in Ireland's greenhouse gas emissions levels of up to 13,000 $ktCO_2eq$. Any measures that move fuel prices closer to those north of the border could have a marked impact on fuel tourism and this should remain a key consideration.

### Role of EU Regulations

EU legislation sets mandatory emission reduction targets for new cars. This legislation is the cornerstone of the EU's strategy to improve the fuel economy of cars sold on the European market. Similar targets have been set for new vans. The law required that new cars registered in the EU did not emit more than an average of 130 grams of $CO_2$ per kilometre (g $CO_2$/km) by 2015. By 2021, phased in from 2020, the fleet average to be achieved by all new cars is 95g $CO_2$/km. The 2015 and 2021 targets represent reductions of 21% and 42% respectively compared with the 2007 new passenger car fleet average of 164g $CO_2$/km. The successful implementation of these regulations will be fundamental to decarbonisation in the short to medium term, particularly up to 2030.

### Wider Benefits

Pursuing a low carbon vision for transport will not only contribute to achieving Ireland's climate change commitments but can also benefit society in terms of lifestyle and the provision of more liveable communities, particularly in urban areas. Aligned with the targets under the EU Climate and Energy Package are headline targets for smart, sustainable and inclusive growth[43]. A greener, low carbon future has the potential to provide benefits for Ireland, particularly if the transport sector is responsive and transitions early in the period to 2050. Implementing smarter travel policy will also accrue significant benefits to people from the perspective of health, travel cost, local environment and air quality. Significant behavioural change will be required to accrue such benefits and a cross-sectoral approach will be necessary to maximise this significant potential.

## 5.4 Mitigating Measures in Place

Ireland has a comprehensive range of policy measures in place aimed at delivering a low carbon transport system; these are reviewed in this section of the Chapter.

### Fiscal Supports

#### Measure T1 – Public Transport Investment

The quality, capacity, cost and accessibility of public transport are critically important in the context of delivering a sustainable transport sector. Transport climate emission reduction efforts must be reinforced by continued investment in public transport capacity increases and quality improvements to secure high levels of modal shift.

The allocation of capital funding for public transport under the Government's Capital Plan *Building on Recovery Infrastructure and Capital Investment 2016-2021* is €3.6 billion. In 2017, this includes funding for capacity enhancements to the public transport system including completion of the Luas Cross City project which will provide an additional ten million passenger journeys annually, renewal and replacement of the PSO bus fleet and other improvements to the bus and rail networks to improve efficiency and capacity.

Other public transport investment projects being progressed over the lifetime of the Capital Plan include electrification of the Northern DART line to extend the DART to Balbriggan, the City Centre Re-signalling Programme and the construction of a new Central Traffic Control Centre. The Capital Plan also provides funding to commence construction in 2021 of the new Metro North link between the city centre, Dublin Airport and Swords so as to be operational by 2026/2027. A Green Public Transport Fund was also established in 2017 to provide funding for pilot low emission vehicle programmes in the public transport fleet.

43 Europe 2020 – Europe's Growth Strategy (European Commission, 2010).

Exchequer current funding of over 275 million is being provided to the NTA in 2017 for PSO and Rural Transport Programme (RTP) public transport services. This will allow for improved services on our publicly funded bus and rail networks including increased service frequencies on the high capacity DART network, additional services across the bus network and additional capacity on Kildare Line commuter rail services through utilisation of the recently reopened Phoenix Park Tunnel.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **48** | Completion of the Luas Cross City integrated light rail network. | Transport Infrastructure Ireland/NTA | DTTAS | Q4 2017 |
| **49** | Support Government funding commitments to rail and bus improvements, including completion of the City Centre Re-signalling Programme and investment in the bus fleet and bus priority measures. | DTTAS/ Iarnród Éireann/ Bus Éireann/ Dublin Bus | | Ongoing |
| **50** | Electrification of the Northern DART Line to extend the DART to Balbriggan. | Iarnród Éireann | DTTAS | 2022 |

### Measure T2 – Smarter Travel Initiative Investment

The Department of Transport Tourism and Sport (DTTAS) is focused on the promotion of sustainable means of transport – walking, cycling and public transport – through the provision of funding for infrastructure as well as funding for behavioural change programmes to encourage the use of more sustainable transport modes. Smarter Travel Initiative is allocated €100m funding under the Capital Plan *Building on Recovery: Infrastructure and Capital Investment 2016-2021*.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **51** | Investment in infrastructure and behavioural change interventions to encourage and support a shift to sustainable modes of transport. | DTTAS | NTA | Ongoing |

### Measure T3 – Low Emission Vehicle (LEV) Incentivisation

Since 2011, the SEAI has been providing grants of up to €5,000 to incentivise consumers to purchase a battery electric vehicle (BEV) or a plug-in hybrid electric vehicle (PHEV). By the 31st December 2016, 1,705 electric vehicles were SEAI grant aided. In addition to the grant scheme, such vehicles qualify for VRT relief of between €2,500 and €5,000 depending on the type of low emission technology being used. This provides a maximum combined subsidy (grant plus VRT relief) of €10,000 in the case of a BEV and €7,500 for a PHEV. In Budget 2017,

it was announced that VRT relief on BEVs will continue until end 2021 with relief until end 2018 for PHEVs. Increasing range performances, decreasing purchase prices and the availability of an extensive nationwide charging network are providing a supportive environment for a widespread transition to electro-mobility.

In addition, a tax incentive for companies paying corporation tax is in place in the form of ACA for energy efficient equipment. Since 2008, this attractive scheme has allowed companies to write off 100% of the purchase value of qualifying energy efficient equipment against their profit in the year of purchase. The scheme supports the purchase of BEVs, PHEVs, hybrid vehicles and the associated charging equipment. Furthermore, we will expand the ACA in 2017 to include the refuelling infrastructure and equipment for natural gas, both CNG and LNG.

Gas Networks Ireland has received funding from the European Commission, under the Connecting Europe Facility (CEF) Transport Fund, to carry out a study of the impact of installing 14 Compressed Natural Gas (CNG) refuelling stations and a large scale renewable gas injection point on the gas network in Ireland. The project is known as the "Causeway Study" and represents a significant deployment of CNG refuelling infrastructure in Ireland. The provision of a biogas injection facility will enable indigenous renewable gas to become part of Ireland's future transport fuel mix. Construction and deployment of the stations and the injection point will continue until 2019 and the project will be completed in 2020. Furthermore, Gas Networks Ireland has a Natural Gas Vehicle Fund to support the deployment of dedicated CNG vehicles. The fund, which is worth €700,000, has been set up to fund the difference in cost between a conventional vehicle and a CNG vehicle.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **52** | Maintain a grant scheme for electric vehicles. Support levels to be reviewed annually. | DCCAE | SEAI | 2020 |
| **53** | Deployment of 14 CNG refuelling stations and a renewable gas injection facility. | Gas Networks Ireland | | 2020 |
| **54** | Broaden the ACA tax incentive for companies to encourage investment in refuelling infrastructure and equipment for natural gas, both CNG and LNG. | DTTAS | DCCAE,SEAI, DTTAS, D/ Finance | 2018 |

### Measure T4 – Taxation Policy

The policy objective of reducing $CO_2$ emissions is reflected in the current charging system for private vehicle motor tax and passenger car VRT. This taxation applies to any passenger cars entering the fleet since 2008. Since January 2013, a revised banding structure was introduced for both motor tax and VRT, splitting the lowest $CO_2$ Band A (1-120g/km) into four and Band B (121-140g/km) into two. A zero emissions band for electric vehicles was also introduced for motor tax purposes only. In 2016, 78% of new purchases were in the A Bands and 18% in Bands B. Cars with $CO_2$ emissions more than 140 g/km now comprise just 4% of new car purchases. This measure is considered very effective in influencing purchasing decisions by motorists in favour of more fuel efficient vehicles. Future band revisions will need to account for both the efficiency and broader environmental impacts associated with specific vehicle types (see T19).

Additionally, a carbon tax, whereby a tax is levied on the carbon content of fuels, was introduced in Budget 2010. The current rate is €20 per tonne of $CO_2$ emitted by the fuel concerned and applies to both petrol and diesel resulting in a price increase of €0.056 and €0.065 per litre respectively.

The adoption of natural gas as a transport fuel is being encouraged with the excise rate applied set at the minimum rate allowable under the Energy Tax Directive for a period of eight years. This certainty around the reduced rate is expected to incentivise the uptake of natural gas as a transport fuel which is a much cleaner fuel than diesel as well as provide a pathway for the use of biogas in transport.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **55** | Maintain under continuous review the use of the VRT/Motor Tax system in incentivising the uptake of lower emission technologies. | D/ Finance, DHPCLG | DTTAS | Ongoing |
| **56** | Continue to encourage the adoption of natural gas as a cleaner transport fuel by maintaining the excise rate applied at the minimum rate allowable under the Energy Tax Directive. | D/ Finance | | 2023 |

## Policy/Regulations

### Measure T5 – Public Transport Energy Efficiency

A number of energy efficiency actions have been put in place in recent years in the area of public transport, covering both bus and rail. New public transport vehicles are procured to the highest EURO class standard available; while service providers/operators improve energy efficiency through adopting various technological solutions and instigating driver behaviour change programmes. There are co-benefits of improving energy efficiency including increased fuel economy, consequential emission reductions and enhanced air quality. Examples include train configuration changes by Irish Rail and eco-driving initiatives by Dublin Bus and Bus Éireann.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **57** | Continue to optimise current energy efficiency actions in place in the area of public transport. | Iarnród Éireann/ Bus Éireann/ Dublin Bus/ Transport Infrastructure Ireland | DTTAS | Ongoing |

### Measure T6 – Biofuels Obligation Scheme

To assist in meeting EU renewable energy obligations, the Government introduced a Biofuels Obligation Scheme to ensure that a proportion of the transport fuel used in the State consists of environmentally sustainable biofuels. Broadly, the approach is that the fuels are blended together and made available to consumers at the pump. The existing scheme places an obligation on suppliers of road transport fuels to ensure that a proportion of the fuels they place on the market here are produced from renewable sources. The Biofuels Obligation rate has increased over time from a share of 4.166% in 2010 to 8.695% (by volume) from 2017. The biofuel substitution delivered non-ETS greenhouse gas emissions abatement levels of c. 0.4Mt$CO_2$eq in 2015 alone.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **58** | Sustain the current Biofuels Obligation Scheme to ensure that biofuels continue to be an increasing part of the road transport fuel mix. | DCCAE | NORA, Obligated Parties | Ongoing |

### Measure T7 – National Policy Framework on Alternative Fuels Infrastructure for Transport

To help reduce oil dependency in transport and associated harmful effects, the EU Commission has developed a sustainable alternative fuels infrastructure strategy. Ireland's *National Policy Framework,* published in May 2017, addresses such infrastructure requirements as EV charging points and natural gas refueling stations. Minimum requirements (in setting up alternative fuels infrastructure across the EU) are expected to reassure car manufacturers and investors who will make the long term investment decisions needed to promote the use of vehicles powered by alternative fuels.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **59** | Implement the *National Policy Framework on Alternative Fuels Infrastructure for Transport: 2017-2030.* | DTTAS | | 2017-2030 |

### Measure T8 – Review of Public Transport

The *Programme for a Partnership Government* commits to a review of public transport policy to ensure services are sustainable into the future and are meeting the needs of a modern economy. This measure reflects the Government commitment to adopting a dynamic approach to managing the needs and evolution of the transport system over time.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **60** | Publish a new *Public Transport Policy Statement.* | DTTAS | | 2018 |

### Measure T9 – Review of Active Travel Policy

In April 2009, the Government published the first *National Cycle Policy Framework*. It outlined 19 high level objectives containing 109 actions, aimed at ensuring the development of a strong cycling culture in Ireland. The Framework set a target that 10% of all journeys will be made by bicycle by 2020. A Review of the *National Cycle Policy Framework* is currently underway and will be published later this year.The *Smarter Travel Policy* is also undergoing a review during 2017 and the investment made in Active Travel Towns and Smarter Travel Areas will be evaluated during 2017 in order to inform future funding of Smarter Travel measures. In addition, a Greenways Strategy is being prepared and will guide investment in Greenways in the coming years.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **61** | Publish a review of the *National Cycle Policy Framework.* | DTTAS | | 2017 |
| **62** | Review the *Smarter Travel Policy.* | DTTAS | | 2017 |
| **63** | Publish the *Greenway Strategy.* | DTTAS | | 2017 |

### Measure T10 – National Intelligent Transport Systems (ITS) Strategy

Among the key advantages of intelligent transport systems (ITS) is their ability to enhance the efficiency of transport infrastructure, traffic management and mobility. This can reduce congestion and fuel use in the transport network. DTTAS is currently drafting a comprehensive national strategy on ITS.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **64** | Draft a comprehensive National Strategy on ITS. | DTTAS | | 2018 |

### Measure T11 – National Planning Framework

The National Planning Framework (NPF), currently under development by DHPCLG, will provide a framework for national planning, pulling together relevant Government policies and investment on national and regional development. Amongst a number of strategic goals, the Framework aims to ensure better integration of land use and transport planning policy in order to reduce commuter travel demand and support more efficient patterns of development and travel. Investment in social, educational, health and employment spheres will all impact on the development of an integrated, efficient and sustainable transport system. Recognising these interactions and setting a longer-term path will help to deliver more sustainable transport over time.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **65** | NPF to secure better integration of land use and transport planning to reduce travel demand and encourage more sustainable modes of travel (walking, cycling, and public transport) as well as more efficient and cleaner transport. | DHPCLG, NTA | DTTAS | 2017 |

### Measure T12 – Aviation Efficiency

The Irish and UK National Supervisory Authorities (NSAs) created the UK-Ireland Functional Airspace Block (FAB) in 2008 to help reduce fragmentation of air navigation service provision across Europe and improve efficiencies. In the first four years of the FAB operation, it delivered over €70m of savings to customers, including 232,000 tonnes of $CO_2$ from 73,000 tonnes of fuel.

*No actions required, savings continue to be delivered*

### Measure T13 – EU $CO_2$ Cars/Vans Regulation

The EU, through Regulation 443/2009, aims to improve average new car efficiency by enforcing emission performance standards. Emission levels will drop over the coming years from 130g $CO_2$/km by 2015 to a target of 95g $CO_2$/km for 2021. Emissions from conventional combustion engines will need to fall further after 2021. The European Commission is working on post-2021 carbon dioxide standards for cars and vans and launched a public consultation on options together with a *Strategy for Low-Emission Mobility* in 2016.

Similar to regulation 443/2009 mentioned above, EU Regulations require that by 2021 average emissions for the new light commercial vehicle fleet fall to a target of 147g $CO_2$/km. Targeting support within the tax system for early take up of low-emission vehicles as they become available would reinforce the carbon reduction objective of the Regulation.

*No actions required, regulations provide for progressive emission reductions at vehicle fleet level*

### Measure T14 – Public Sector Energy Efficiency Strategy

The *Public Sector Energy Efficiency Strategy* was published in January 2017 and notes the importance of public sector fleets for testing new technologies and facilitating or accelerating their market uptake. Use of new technologies and alternative fuels will not only improve the environmental performance of the sector but will also increase fuel efficiency of the fleet. Beyond fleet measures, there is also scope for the promotion of energy efficient measures through modal shift with a focus on travel choices made by public servants.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **66** | Continued development and implementation of sectoral energy saving projects. | DTTAS | SEAI, Office of Government Procurement | Ongoing |

## Research

### Measure T15 – Research and Development

Research and technological developments within climate change mitigation are advancing at a fast pace. The Climate Change Unit of DTTAS is supported by a number of bodies to analytically review on an ongoing basis the emerging evidence including: the Department's Economic and Financial Evaluation Unit, the academic sector, as well as State Agencies such as SEAI. Departmental and agency analytical/evaluation capacity are kept under review and proposals to scale up such capacity are being considered to meet the substantial technical demands of monitoring and managing sector performance, evolution and planning.
To ensure a strong understanding of the challenges and opportunities associated with decarbonising transport over the long term, DTTAS supports and collaborates on a number of international and national research projects.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **67** | Continue support for the International Transport Forum's (ITF) *Decarbonising Transport Worldwide* research and modelling project. | DTTAS | ITF | 2020 |
| **68** | Undertake and fund climate change and air quality research and analysis within the Irish transport sector. | DTTAS | | Ongoing |

## 5.5 Mitigating Measures under Consideration

In the context of the ambitious milestone for 2050, DTTAS has undertaken a review of existing measures to establish if they offer scope for further emission reductions through expansion or extension. A range of new measures were also considered to potentially deliver further tangible, cost efficient low carbon results for transport. The aim is to identify those potential measures that could deliver the greatest return in emissions reduction, at the least cost to the State and the economy. Implementation of further mitigation measures will be dependent on appropriate funding. In consultation with key stakeholders, this Plan will be subject to ongoing review to ensure that the most effective measures are prioritised.

Some measures proposed are leadership measures and while their individual associated potential emissions savings would be less than 50kt and accordingly did not warrant economic analysis, these measures could play a significant leadership and demonstration role in the transition to a low carbon transport sector. It is also important to note that several of the core policy levers that affect the transport sphere – including, for example, taxation policy or fuel policy – are not within the control of DTTAS, but rather are led by other areas of Government. As achieving further significant emissions mitigation in the transport sector will depend on policy decisions about these levers being appropriately informed and influenced by climate and transport considerations, this will require continued close co-operation by DTTAS with other key Departments (principally DCCAE, D/Finance and DPER) so as to enable their policies to support transport sector and climate objectives.

### Fiscal Supports

#### Measure T16 – Further Public Transport Investment

The Capital Plan *Building on Recovery: Infrastructure and Capital Investment 2016-2021* was framed within the context of Government fiscal policy and will allow a significant investment (€3.6bn) in maintaining public transport infrastructure. A mid-term review of the Capital Plan will be carried out this year and the Minister for Transport, Tourism and Sport made the case for public transport investment to be both increased and accelerated as part of that review in order to address growing transport needs.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **69** | Investment in improved and additional public transport capacity. | DTTAS | NTA | Ongoing |
| **70** | Utilisation of the Green Public Transport Fund to support the uptake of low carbon, energy efficient technologies within the public transport sector. | DTTAS | NTA | 2017 |

### Measure T17 – Supports and Incentives to Modal Shift

Potential expansion of existing support schemes such as the Cycle To Work Scheme and Travel Pass (Taxsaver) Scheme will be considered as part of a sectoral approach to reducing emissions. However, any expansion of these schemes would incur costs in terms of revenue to the State forgone.

A significant barrier to modal shift relates to behaviour change and encouraging people away from private cars to more sustainable travel solutions such as cycling, walking and public transport. It is proposed that a Behavioural Economics Working Group will be established to review research, best practice and the most effective proven communication methods to motivate substantial modal shift.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **71** | Examine the expansion of existing support schemes. | D/ Finance | DTTAS | 2018 |
| **72** | Establish a Behavioural Economics Working Group to consider behavioural change. | DTTAS | | 2017 |

### Measure T18 – Further Low Emission Vehicle (LEV) Incentivisation

Technology advancement, affordability and consumer choice will be the greatest levers in triggering large-scale change. Under a commitment within the *Programme for a Partnership Government* a Taskforce was established to consider the range of measures and options available to Government to accelerate the take-up of low carbon technologies, especially EVs. The work of this LEV Taskforce is divided into three areas: market growth stimuli and public leadership, charging infrastructure and legislation and planning. Recommendations from the Taskforce will be presented to the Government to inform future investment considerations in order to progress towards the stated ambitions in the *National Policy Framework on Alternative Fuels Infrastructure for Transport in Ireland: 2017-2030;* namely, that by 2020 there will be 20,000 EVs on the road and that all new cars and vans sold in Ireland from 2030 will be zero emission (or zero emission capable).

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **73** | Recommend incentives and optimal regulatory framework for early adoption of LEV technology. | DTTAS/ DCCAE | DHPCLG, LEV Task Force members | 2017 |

### Measures T19 and T20 – Taxation Policy Development

The role and interrelationship of various elements of the tax system are key factors in decision making about vehicle purchasing and use. The potential of certain tax policies to underpin a clear pathway and positive policy environment for an early transition to alternative, cleaner fuels will form a key element of the overall approach. In 2017 the LEV Taskforce will consider the tax implications of the accelerated deployment of low emission vehicles. Consideration will need to be given to how important revenue streams can be safeguarded as this transition is implemented. The tax system can be a useful mitigation tool but it is important to ensure that it is used to complement other measures rather than bluntly distorting the competitiveness of the overall economy through cost increases without providing alternatives. Further detailed consideration of measures along with the relevant Departments will be required before any change can be made.

Measure T19: The motor tax and VRT system could be further amended in line with improvements to energy efficiency and emissions reductions in cars and vans to additionally incentivise or maintain the advantages of purchasing of the lowest emitting vehicles. Such measures require careful design to ensure they are aligned with other policy objectives such as air quality.

Measure T20: To encourage the take-up of alternatively fuelled vehicles, the current tax treatment of vehicles and fuels could also be considered.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **74** | Conduct a review of vehicle and fuel taxation measures within the context of evolving technology development and need to chart a sustainable pathway to the decarbonisation of transport by 2050. | D/ Finance | DTTAS | Ongoing |

## Policy/Regulations

### Measure T21 – Biofuels Obligation Scheme Development

It is intended that the biofuel obligation will be incrementally increased on a sustainable basis between 2018 and 2020 to assist meeting the renewable transport target of 10% in 2020. The incremental increases will take cognisance of technical developments and broader environmental considerations. It is proposed to hold a public consultation in 2017 on further increases to the obligation rate to 2020.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **75** | Conduct a public consultation on progressively increasing the biofuel obligation rate by 2020. | DCCAE | NORA, Obligated Parties | 2017 |

### Education/Information Initiatives

#### Measure T22 – Eco-driving

Eco-driving is a term used to describe the energy efficient use of vehicles using driving techniques that can lead to average fuel savings of 5-10%. A campaign aimed primarily at commercial fleets (HGVs and Buses) has potential to reduce emissions. Measures under consideration include the use of a grant to HGV/bus operators where their drivers are trained and in-cab technology is installed to assess and improve driver behaviour.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **76** | Consider the introduction of a grant scheme to encourage eco-driving for HGVs and buses. | DTTAS | SEAI | 2017 |

### Longer Term Mitigation Measures

As complementary policies evolve over time, the potential greenhouse gas mitigation effect of certain measures can be better determined and secured. Furthermore, increases in the cost of carbon over time can place measures in the spotlight that had been ruled out in the short-term due to the cost or inefficiency burden they were considered to have imposed. Some such potential longer-term measures are considered in this section; however, they currently have no specific attributable actions as their implementation will be dependent on the evolution of more short and medium term mitigation measures as our low carbon transition progresses.

#### Measure T23 – National Policy on Parking

A comprehensive national policy on parking is a key long term objective. It should include motorised vehicles and bicycles and Local Authorities should be provided with guidelines to support its implementation as they are responsible for parking provision, planning and related matters.

Development of a National Policy on Parking is a key longer-term objective of DTTAS. Parking requirements and behaviour will be strongly influenced over the coming years by a range of factors including the further advancement of an integrated public transport system, the emerging role of a sharing economy approach to vehicle ownership and use and implementation of a new National Planning Framework. These and other evolving considerations will need to be given due regard in building such a policy.

A reduction in public parking supply in urban centres allows more space to be available to facilitate services and infrastructure for pedestrians, cyclists and public transportation. Changes to parking supply in urban centres would have to be considered in tandem with policies on 'out-of-town' parking. A national parking policy would have to complement demand management measures and developments in ITS.

### Measure T24: Reduction of Top Speed Limits on Motorways

Energy use increases at higher speeds. While there is a lack of official and robust data on this issue, various sources suggest that moving from 100km/h to 120km/h increases fuel consumption by up to 20%. One option could be to reduce maximum speed limits on motorways from 120km/h to 110km/h for cars/LGVs and from 90km/h to 80km/h for HGVs, which would however need to be considered in the context of the design speed for existing infrastructure and the potential implications of traffic transfer on to secondary networks. For benefits to be fully realised, this would require a step change in speed enforcement across the country requiring the involvement of the Department of Justice and Equality (DJE), the Gardaí and the Road Safety Authority.

## Concluding Comments on Mitigating Transport Emissions

The significant reduction in Ireland's transport emissions which was achieved between 2007 and 2012 – despite the relative constancy of road passenger kilometres travelled over that time – is important in pointing to some of the approaches to be deployed for the future with a view to resuming an emissions reduction trajectory in the transport sector. The reduction over that period had three main causes:

- a fall-off in road freight activity, particularly construction freight, related strongly to the economic downturn;
- the introduction of a proportion of biofuels into the transport fuel mix under the Biofuels Obligation Scheme; and, very significantly
- a step change in the energy efficiency of the car fleet under the dual track approach of EU-mandated efficiency improvements and changes in car purchasing behaviour secured by changes to the VRT and Motor Tax regimes.

Further profound changes are required if the transport system is to contribute meaningfully to achieving the Government's national policy vision of Ireland becoming a low carbon economy. To meet the considerable additional transport demand which is expected to arise in the coming years, while also addressing congestion, climate mitigation and air quality concerns, it will be necessary to undertake a significant expansion in public transport capacity, concentrating particularly on suitable urban areas. A comprehensive transition to alternative vehicle technologies will also be necessary, and this will require an enabling and supportive policy environment. The national low carbon vision is mirrored in the *National Policy Framework on Alternative Fuels Infrastructure for Ireland* through the ambition of decarbonising the national passenger car fleet by 2050 and seeking to have greater deployment of alternative fuels within the freight sector.

For the future, the key transport measures which are delivering on greenhouse gas mitigation with important congestion and air quality co-benefits, will be maintained and further developed or augmented as appropriate. Work on further developing the evidence base in support of the appropriate additional measures to be prioritised in the short to medium term is being intensified. For the longer term, further examining the range of potential additional measures signalled here will inform policy discussion and choices on these options.

Overall, a wide range of important, complementary policies being developed and implemented across the transport sector will continue to yield important climate dividends. The pathway to a largely decarbonised transport sector is extremely challenging but the various steps along the way are becoming increasingly clearer.

## 5.6 Overview of Costs and Emissions Reduction Potential

The tables below set out a brief overview of measures in place and under consideration that have been modelled as part of the ongoing cross-Departmental work on evaluating the emissions reduction potential and costs of a range of climate change mitigation measures. The analytical outputs are based on a marginal abatement cost curve approach which assesses the impact of an abatement measure against a set baseline. Common assumptions have been applied for the three energy sectors in relation to key parameters such as the discount rate, fuel costs and shadow prices. It is clear that in certain cases such as motor tax or EV incentives, there are multiple scenarios possible in the design of the measures. The estimates listed below are therefore indicative only of one such scenario. In most cases, it has not been possible to include indirect impacts such as air quality and health benefits but further research in the area of indirect impacts is planned by DTTAS. To date, the measures have each been modelled as stand-alone scenarios; it is envisaged that further work on modelling the interaction between measures will also be undertaken.

### Table 5.1 Decarbonising Transport – Overview of Costs and Emissions Reduction Potential – Mitigating Measures in Place

| Classification of Measure | | | | Exchequer Expenditure (€) | | |
|---|---|---|---|---|---|---|
| Reference | Title | Type | Objective of measure | Direct Spend | Tax Foregone | Total |
| T1<br>In place | Public Transport Investment | Fiscal Support | Modal shift to public transport or non-motorised transport. Improved behaviour. Improved transport infrastructure. | c.750m p.a.* | Nil | c.750m p.a. |
| T2<br>In place | Smarter Travel Initiative Investment | Fiscal Support | Modal shift to public transport or non-motorised transport. Improved behaviour. | c.15m p.a.** | Nil | c.15m p.a. |
| T3<br>In place | Low Emission Vehicle (LEV) Incentivisation | Fiscal Support | Low carbon fuels. | 33.5m*** | 17.5m**** | 51m |
| T4<br>In place | Taxation Policy-Vehicle Registration Tax and Annual Motor Tax rebalancing | Fiscal Support | Efficiency improvements of vehicles). Demand management/reduction. | Nil | *c.* 200m p.a. | *c.* 200m p.a. |
| T5<br>In place | Public Transport Energy Efficiency | Policy/ Regulation | Modal shift to public transport or non-motorised transport. Improved behaviour. Improved transport infrastructure. | Included in T1 | N/A | Included in T1 |
| T6<br>In place | Biofuels Obligation Scheme | Policy/ Regulation | Low carbon fuels. | N/A | N/A | N/A |
| T12<br>In place | Aviation Efficiency | Policy/ Regulation | Demand management/ reduction. | N/A | N/A | N/A |
| T13 In place | EU $CO_2$ Cars/Vans Regulation | Policy/ Regulation | Efficiency improvements of vehicles. | N/A | N/A | N/A |

* Average 2005-2015

** Average 2009-2015

*** 6,700 €5,000 grants between 2017 and 2023

**** VRT relief €5000 for 3,400 BEVs between 2017 and 2021 and for 220 PHEVs between 2017 and 2018

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA) | NPV 2017-2030 (€) (based on economic CBA) | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | Nil | Economic assessment of public transport investment undertaken on a case by case basis. | Economic assessment of public transport investment undertaken on a case by case basis. | Not available | Not available | Not available |
| | Nil | A final evaluation of the Smarter Travel Areas programme due to be completed in 2017. | A final evaluation of the Smarter Travel Areas programme due to be completed in 2017. | Not available | Not available | Not available |
| | Nil | TBD | TBD | TBD | Not available | Not available |
| | Nil | TBD | TBD | TBD | 677 | 2,397 |
| | N/A | N/A | N/A | N/A | 159 | 579 |
| | Not available | TBD | TBD | TBD | 2,161 | 9,800 |
| | N/A | N/A | N/A | N/A | 264 | 934 |
| | N/A | N/A | N/A | N/A | 3,013 | 12,093 |

### Table 5.2 Decarbonising Transport – Overview of Costs and Emissions Reduction Potential – Mitigating Measures under Consideration

| Classification of Measure | | | | Exchequer Expenditure (€)# | | |
|---|---|---|---|---|---|---|
| Reference | Title | Type | Objective of measure | Direct Spend | Tax Foregone | Total |
| T18 Under consideration | Further Low Emission Vehicle (LEV) Incentivisation | Policy | To support the uptake of low emission vehicles in the national fleet. | 778m | 202m | 980m |
| T19 Under consideration | Taxation Policy Development – Motor Tax (Cars) | Economic Instrument – Fiscal Incentive | To incentivise the purchase of more efficient or low emission vehicles. | Nil | 728m | 728m |
| T19 Under consideration | Taxation Policy Development – Motor Tax (LGVs) | Economic Instrument – Fiscal Incentive | To incentivise the purchase of more efficient or low emission vehicles. | Nil | 713m | 713m |
| T21 Under consideration | Biofuels Obligation Scheme Development | Regulatory | To increase the penetration of renewable energy in the transport energy mix in order to meet the 10% RES-T target. This measure involves increasing the biofuels obligation rate to 10.3%. | Nil | Nil | Nil |
| T22 Under consideration | Eco-driving | Education and Training | To achieve more efficient driving behaviour for HGV and bus/coach operators which would lead to a reduction in fuel consumed. | 11.8m | 76.2m | 88m |
| T24 Under consideration | Reduction of Top Speed Limits on Motorways | Regulatory | To result in more efficient driving behaviour that leads to a reduction in fuel consumed by reducing top speed limits on motorways for 120km/h to 110km/h for cars/LGVs and from 90km/h to 80km/h for HGVs. | 1.0m | 349m | 350m |

# Exchequer Expenditure figures relate to the 2017-2030 period

* Negative NPV is reflected where the costs outweigh the benefits considered over the time-frame of the analysis

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA)* | NPV 2017-2030 (€) (based on economic CBA)* | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | Nil | -279m | -1.1bn | 1,241 | 41 | 876 |
| | Nil | 24m | 246m | -88 | 265 | 2,804 |
| | Nil | 23.8m | 292m | -74 | 291 | 3,925 |
| | 86m | -83m | -446m | 204 | 322 | 2,184 |
| | Nil | -7.1m | -9.1m | 22 | 36 | 405 |
| | Nil | -370m | -1.1bn | 573 | 561 | 1,881 |

# 6 An Approach to Carbon Neutrality for Agriculture, Forest and Land Use Sectors

## 6.1 Introduction

### Vision for the Sector

As is set out in the *National Policy Position*, the long term vision for the agriculture, forest and land use sectors is based on an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production. This effectively means that agricultural emissions are balanced by increasing carbon-sequestration, reducing emissions from the land sector, increasing fossil fuel displacement and energy intensive materials displacement. This vision which is further discussed later in the chapter, aligns with the European Council Conclusions in October 2014[44] and also the *Programme for a Partnership Government* which sets out the objective to be achieved in this sector as to balance the control of agricultural emissions with the economic and social objective of promoting the sustainable development of a rural economy.

The Irish agriculture sector is committed to ensuring that growth continues on the basis of sustainability so that Ireland can play its part in meeting the increasing global food demand while having regard to Ireland's climate obligations. The sector is also committed, through proactive use of research, technology and institutional arrangements, to demonstrate how better sustainable agricultural and land management and resource efficiency can reduce emissions while improving the resilience of food production systems and contributing to climate action. The sector must be in a position to anticipate and adapt to the negative impacts of climate change, as well as looking to maximise the benefits for the food production system.

The scale of the challenge facing the sector in this regard is recognised both at national and EU level, with increasing emphasis on linking additional demand for food production in the sector with improving environmental credentials. The multiple objectives of the the agriculture and land use sector with their lower mitigation potential were clearly recognised in the October 2014 European Council Conclusions. In Ireland, the sector not only produces sustainable food products, biomass and wood products it also sequesters carbon while providing other essential eco system services including those related to water and biodiversity. The development of the Irish agriculture sector is supported by the European Union's Common Agriculture Policy (CAP) through a combination of direct payments to farmers, financial assistance towards investments in rural development and environmental protection and market support measures. The current programming period covers from 2014 to 2020; with the European Commission hosting an open consultation process on 'modernising and simplifying the CAP' during the period February-May 2017. The results of this consultation will be delivered in July 2017 at a stakeholder conference and will influence the Commission communication expected in late November 2017 on the potential future shape of CAP post 2020. The increased emphasis on a higher level of environmental credentials in the CAP is a trend which is likely to

44 http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145397.pdf

continue as the CAP undergoes review. It is recognised that this will require a greater focus on environmental commitments in both Pillar 1 (e.g. greening and cross compliance,) and Pillar 2 (the Rural Development Programme (RDP)), which is discussed further later in the Chapter.

### Overview of the Sector

The land area of Ireland is 6.9 million hectares, of which 4.5 million hectares, or about 65%, is used for agriculture[45]. Some 81% of agricultural land is devoted to grass (silage, hay and pasture), 11% to rough grazing (0.47 million hectares) and 8% to crops, fruit and horticulture production (0.38 million hectares)[46]. Beef and milk production currently account for 68% of agricultural output at producer prices[47]. Ireland's livestock numbers in June 2015[48] included 6.9 million cattle, 5.1 million sheep and 1.5 million pigs which represents peak annual numbers as the December census is generally lower due to a predominantly grassland based production.

Ireland's maritime climate favours a grass-based system of agricultural production. It is estimated that our permanent grassland maintains a carbon pool of approximately 608 million tonnes carbon at 0-30cm in contrast to approximately 37 million tonnes carbon in our arable land area[49]. Our capacity to grow grass has underpinned the development of our dairy and beef sectors, and allows for the production of a product that is independently recognised as being both environmentally and resource efficient. Furthermore as our system of production is largely based on grazed and conserved grass, it significantly reduces dependence on imported cereals as animal feed.

These globally unique production attributes, coupled with our high levels of self-sufficiency, have contributed towards Ireland becoming a net exporter of dairy and beef products. Demand for Irish agricultural produce is largely driven by the quality appeal of the food produced here, with its low environmental footprint, its grass based system of production, and strict food safety traceability and welfare criteria.

Current analysis suggests that the emissions intensity per kcal of food output in 2013 is reduced approximately 14% relative to 2005 and early estimates project that the BAU 2030 emission intensity will be a quarter below the emission intensity in 2005. Further, early estimates of agriculture with additional measures is approximately 35% below 2005, although absolute emissions remain reasonably stable.

45 DAFM (2017) Fact Sheet on Irish Agriculture.

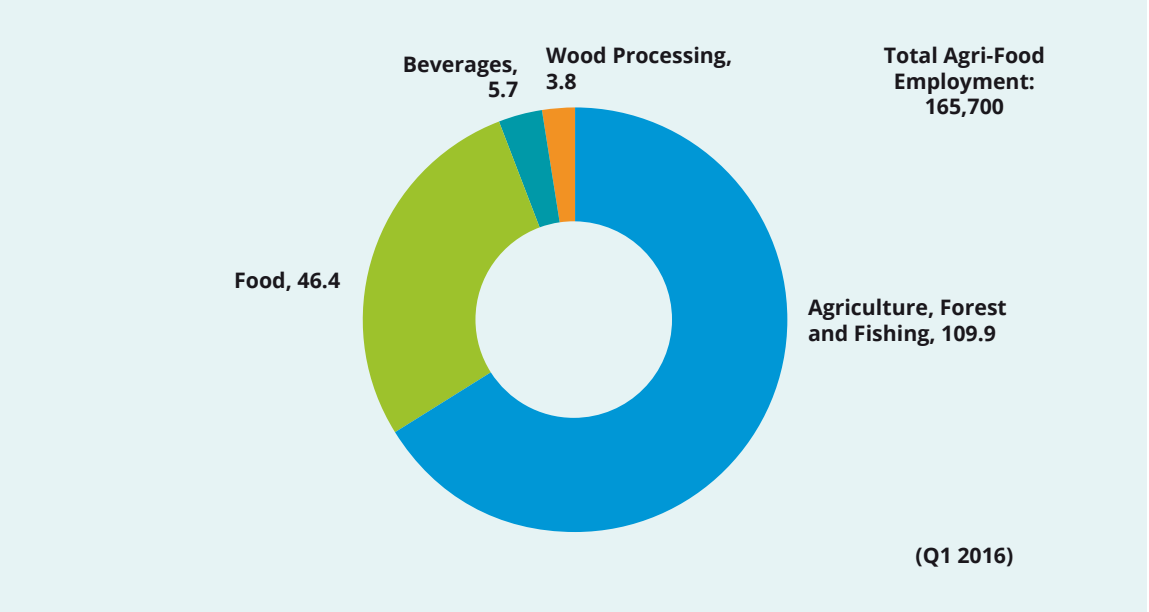
46 DAFM (2017) Fact Sheet on Irish Agriculture.

47 DAFM (2017) Fact Sheet on Irish Agriculture.

48 CSO (2015) June Crops and Livestock Survey.

49 Khalil, M.I., Kiely, G., O'Brien, P. and Müller, C. (2013). Organic carbon stocks in agricultural soils in Ireland using combined empirical and GIS approaches. Geoderma 193-194; 222-235.

**Figure 6.1 Breakdown of Total Agri-Food Employment (",000")**




Source: Central Statistics Office Quarterly National Household Survey (Q1 2016)

The agri-food sector is Ireland's largest indigenous manufacturing industry, with total agri-food employment, including on-farm employment in primary agriculture, forestry and fishing, as well as the food processing industry, accounting for over 165,700 jobs. The most recent data available[50] shows the agri-food sector accounting for 7.6% of Gross Value Added[51] (2014), 23% of all manufacturing turnover (2014), 8.4% of employment (2015) and 10.7% of merchandise exports (2015). This national economic significance is enhanced by the use of indigenous raw material, low profit repatriation, export orientation and a high level of economic expenditure, particularly in the rural economy. Balancing the environmental objective of reducing greenhouse gas emissions with the economic and social objective of promoting the sustainable development of a rural economy is critical. The industry-led *FoodWise 2025 Report*, launched in 2015, provides a strategic plan for the sustainable future growth and development of the sector. Sustainability is at the core of the strategy with an Environmental Sustainability Committee (ESC) in place to monitor and drive the implementation of the sustainability actions while ensuring sustainable food production is not compromised.

Ireland's national forest estate covers 750,000 hectares (end of 2015), or close to 11% of the land area of the country. Since 1990, over 312,000 hectares have been afforested as a result of state supports. Despite this rate of planting, the level of forest cover is low by European standards where the average among the EU-28 stands at 38%. Coniferous forest is the dominant type, representing 74% of all forests. Broadleaf forests represent 26% of forest cover and current policies support increasing this figure. The forest industry, comprising the growing, harvesting and processing of forest products, makes a significant and increasing contribution to the Irish economy. It is estimated that the economic value of the forest

50 DAFM (2017) Fact Sheet on Irish Agriculture.

51 This is a general economic indicator and means that the sector. contributed 7.6% of GDP in 2014.

sector in 2014 was €2.3 billion[52], when both indirect and induced effects are taken into account. The sector is responsible for approximately 12,000 jobs in the economy, with the majority in rural areas. Wood processing in Ireland is export-led. In 2014, exports of forest products were valued at €320 million. Ireland's forests also provide important biodiversity and amenity areas, with over 18 million visits made per year.

In addition to Ireland's agriculture and forest sector, the land area also extends to a significant peatland area both under agricultural and industrial management, hosting sites of biodiversity importance such as raised and blanket bogs and cutover peatland. The interactions between these sectors and human activity create the landscape we see today. The *National Peatlands Strategy*[53] sets out how to sustainably manage and protect/conserve our national peatland resource. This strategy estimated that Irish peatlands store some 1,566 million tonnes of carbon, representing approximately 64% of the total soil organic carbon stock present in Ireland.

## 6.2 Emissions Profile

The IPCC AR5[54] shows that agriculture, forestry and other land use (AFOLU) is responsible for 24% (10-12 $GtCO_2eq$ per annum of man-made greenhouse gas emissions in 2010) of the world's emissions roughly split 50:50 between agriculture and deforestation emissions.

In Ireland, agriculture accounts for about 33% of national emissions[55]. This figure reflects the importance of agriculture to the Irish economy, the significance of an efficient grass based livestock industry and Ireland's lack of heavy industry.

On the other hand, the forest sector, through afforestation and the use of forest-based biomass (FBB) and wood products, offers considerable scope for climate change mitigation, equivalent to 20-22% of agricultural emissions on an annual basis[56].

Additionally, other land uses also have a significant role to play in the management of emissions and removals with, for example, initiatives under the Green, Low Carbon, Agri-Environmental Scheme (GLAS) designed towards maintaining and enhancement of carbon stocks on agriculture land.

52 http://www.coford.ie/media/coford/content/researchprogramme/thematicareapolicyandpublicgoods/FORECON%20Final%20report%20lowres.pdf

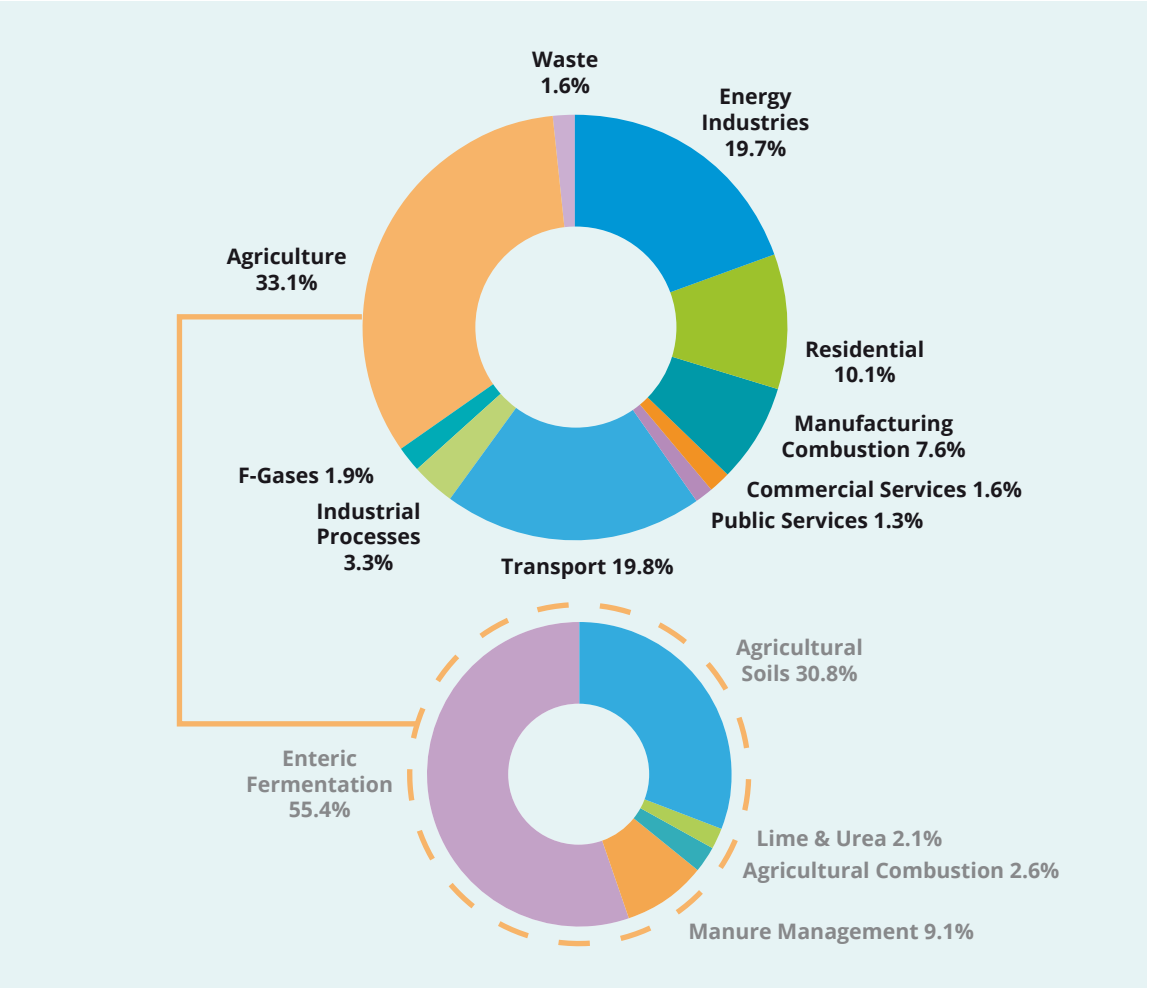
53 https://www.npws.ie/peatlands-and-turf-cutting/peatlands-council/national-peatlands-strategy

54 Intergovernmental Panel on Climate Change Fifth Assessment Report, available at: https://ipcc.ch/report/ar5/.

55 EPA (2017) Ireland's GHG Emissions in 2015.

56 Based on 2013 figures for Agriculture and Forest emissions and removals as reported in "Ireland's National Inventory Report 2015" (Duffy et al., 2015) and mitigation through the use of forest-biomass in place of fossil fuels (see "Woodflow and forest-based biomass energy use on the island of Ireland (2013)" (Knaggs and O'Driscoll, 2014).

**Figure 6.2 Greenhouse Gas Emissions in Ireland 2015**



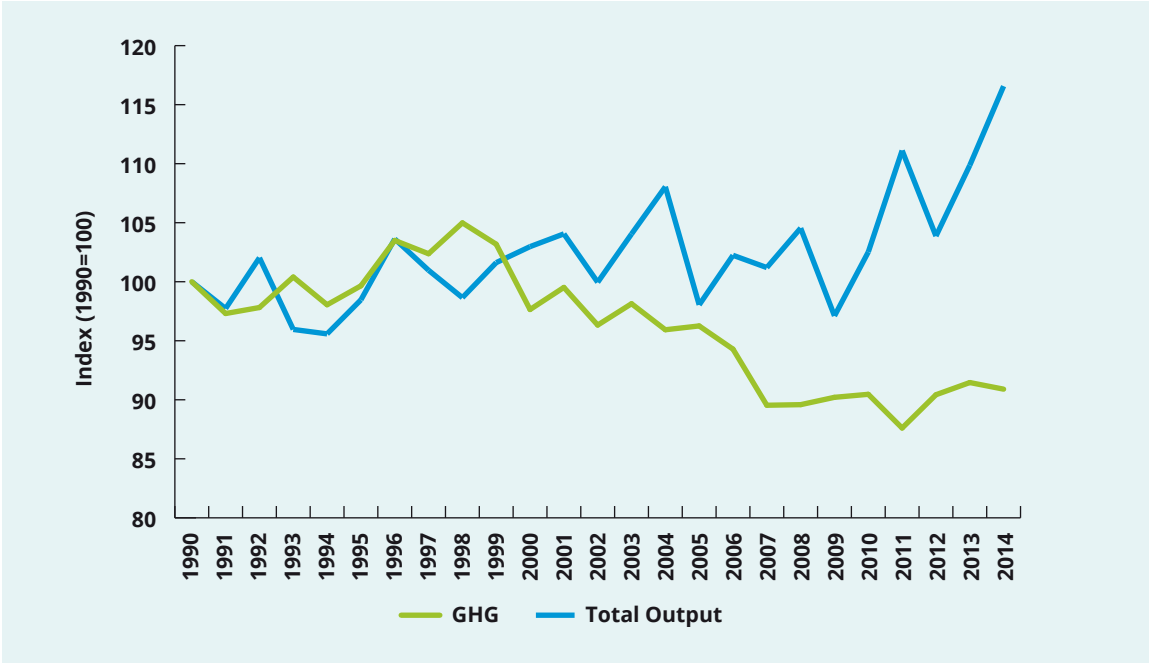

Source: EPA

Methane ($CH_4$) and nitrous oxide ($N_2O$) make up the majority of Irish agriculture greenhouse gas emissions, mainly due to the dominance of cattle and sheep livestock production. Methane is the most significant greenhouse gas emitted from agricultural activity in Ireland, accounting for 64.5% of total agricultural emissions. Enteric fermentation, which is a natural process in the digestive system of ruminant animals that results in the emission of methane, accounts for 90% of agricultural methane emissions. The remaining agricultural methane is associated with the storage and management of animal manures which may present opportunities, albeit limited, for methane recovery through the future deployment of anaerobic digestion technologies. Nitrous oxide emissions arise mainly from applications of nitrogen-based fertiliser and animal slurries to agricultural soils. Nitrous oxide contributes up to 35% of Ireland's agricultural greenhouse gas emissions.

Although on a slight upward trend in recent years, emissions from agriculture reached a peak in 1998 and have decreased to below their 1990 level since 2002. This reflects a long term decline in livestock populations and in fertiliser use due to policies and measures implemented under the CAP. The recent greenhouse gas emissions data for 2015, published by the EPA, indicate

that agriculture emissions are 5.5% below 1990 figures. This overall reduction in emissions from agriculture has also been influenced by measures such as the Rural Environmental Protection Scheme, Agriculture Environmental Options Scheme, GLAS, Organic Scheme, supports for manure management in line with the EU Nitrates Directive, and through development of renewable energy resources. It is also of note that improvements in sustainable intensification, such as improved fertiliser use and grassland management, have occurred alongside the afforestation of 300,000 ha of agricultural land since 1990, which has helped to maintain agricultural output.

**Figure 6.3 Trends in Greenhouse Gas Emissions arising from Agriculture and Total Agricultural Output (1990-2014)**




Source: DAFM

The most recent projections, which take into account *FoodWise 2025*, forecast agricultural emissions to be in the region of 20.6-20.8Mt $CO_2$eq in 2020 and 20.2-20.3Mt $CO_2$eq in 2030. This is just below the 2005 level (20.35Mt) and will put considerable pressure on the sector, despite the significant improvements to emissions intensity that have been achieved.

Additionally, it is acknowledged that well-managed grasslands on mineral soils tend to take up and store carbon in the soil. However, changes from grassland to arable land, in particular, can lead to significant carbon dioxide emissions as a result of the disturbance of the soil and the loss of vegetation above ground. Low-impact management practices can mitigate such effects without significantly reducing productivity. Also, intensive grassland and cropland activities on peat rich soils can result in significant emissions, but in recent years there is evidence to suggest that agricultural activity is re-orientating away from these soils towards the more productive and free draining soils and thereby reducing emissions. Ireland is one of a small number of EU countries to have elected to report on grassland and cropland management

activities for the 2nd commitment period of the Kyoto Protocol (KP) (2013-2020) so we are endeavoring to improve our understanding of the drivers of emissions from these activities with a view to developing policies and measures to reducing the source of these emissions. This will allow Ireland to take advantage of any sequestration benefits that may be allowed in the future from these activities. For example, there is up to 300kha of organic-rich agricultural soils where reduced management intensity such as less drainage and disturbance can result in a higher retention of soil carbon by reducing losses of $CO_2$ and in some cases aid sequestration of carbon. Some measures in the current agri environment climate scheme (GLAS) funded under the RDP will have some benefit here and also have benefits with promoting biodiversity.

Under Ireland's *National Biodiversity Plan* and the *National Peatlands Strategy*, a number of DAFM and EPA-funded projects are investigating the use of remote sensing (principally radar and optical techniques) data to detect changes in vegetation that will indicate either changes in land-use or land management. Further investigation will also be necessary to analyse synergies between these policies and mobilising carbon credits under the LULUCF (land use, land-use change and forestry) flexibility, referred to below, in particular related to emissions and removals from grassland and cropland activities.

***What is LULUCF?***

Land use, land-use change and forestry (LULUCF) is defined by the United Nations Climate Change Secretariat as a 'greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities[57]'.

The significance of the LULUCF sector is recognised in the July 2016 proposed EU ESR under the 2030 Climate and Energy Framework (CEF). Under the proposals Member States can access a flexibility from the LULUCF sector. There is however, a cap on the amount of credits that can be used to ensure the overall CEF 2030 target is not diluted.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **77** | Continue the work of the cross departmental and agency working group established in 2016 to further improve the monitoring reporting and verification of agricultural abatement options in the inventory to enhance transparency of agricultural and land use actions. | DAFM | Teagasc, Bord Bia and EPA | Ongoing |

57 http://unfccc.int/essential_background/glossary/items/3666.php

## 6.3 Opportunities and Challenges

### The Carbon Neutrality Concept

As noted at the outset, the long-term ambition for the sector is to move towards an approach to carbon neutrality which does not compromise capacity for sustainable food production. Further elaborating the concept of carbon neutrality and how it will be achieved over time is the first step. The work carried out by Teagasc (set out in the box below) towards adopting 'carbon-neutrality' as a 'horizon point' for agriculture by 2050[58] forms the basis for such an approach.

***Carbon Neutrality as a 'Horizon Point' for Irish Agriculture***

*Carbon Neutrality as a 'Horizon Point'* identifies the significant challenge for agriculture whilst also recognising the sectoral opportunities, both within the farm gate and outside the farm gate, to the wider rural economy and bioeconomy such as through fossil fuel and materials displacement in the energy and built environments.

In 2013, Teagasc prepared a report in the context of the formidable but constructive challenge posed to the agricultural industry in the final climate policy analysis report from the NESC Secretariat: *Ireland and the Climate Change Challenge – Connecting 'How Much' with 'How To'*. The latter report proposes to work towards carbon-neutral agriculture as a 'horizon point' for 2050, in which agricultural emissions are balanced by carbon-sequestration.

In their report, Teagasc analyse five pathways which look at agriculture and land use combined: increased sequestration, advanced mitigation, fossil fuel displacement, constrained activity and residual emissions. While it must be acknowledged that full neutrality was very challenging under these five pathways, it should not distract from efforts to approach carbon-neutrality as a horizon point. While we cannot be sure what future technologies will deliver, this is true of every sector. That said, new technologies are constantly emerging and we will be ready to encourage adoption of those that support climate ambition, an example of such a technology is trailing shoe which is supported under the RDP.

As part of the movement towards carbon neutrality, we are encouraging the sustainable use of farm manures, agri residues and FBB that can displace fossil fuels and energy intensive materials. Sustainable intensification should also provide space for, or contribute to, biodiversity, water quality, air quality and soil/carbon protection and of course creates space for alternative land uses such as forest. Increased afforestation and biomass use would occur under a sustainable land use policy as illustrated by the Teagasc analysis.

A key consideration in the move towards carbon neutrality will be cost-effective technology, therefore, it must be noted that each of the pathways is associated with significant constraints and caveats, with all pathways requiring incentivisation and/or policy intervention and coherence. In addition, continued research and development is needed to support the development and roll-out of new technologies to reduce greenhouse gas emissions, which highlights the importance of national research and coherence with the EC Horizon 2020 programme and LIFE funding.

58 See: https://www.teagasc.ie/media/website/publications/2013/3002/CarbonNeutrality.pdf

Another consideration in working towards carbon neutrality is the metrics to be used. Emissions metrics facilitate multi-component climate policies by allowing emissions of different greenhouse gases and other climate forcing agents to be expressed in a common unit (so called '$CO_2$ equivalence emissions'). The decision at international level to use GWP (Global Warming Potential) as the metric for comparison of the greenhouse gases included in the basket of gases under KP was made early in the process. At the time, a number of papers had expressed concern over the usefulness of the metric in the context of the stated goal of the UNFCCC. However, the scientific literature on alternative metrics was insufficient to propose their adoption. Since then, additional analysis has emerged on various metrics. The IPCC AR5 WG1 report[59] presents findings from the analysis of these, including specific values for the most well developed Global Temperature Potential, GTP.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **78** | Undertake research to further elaborate the concept of carbon neutrality from an Irish agriculture and land use perspective, to include a number of scenarios. | EPA/ DAFM | Teagasc | Ongoing |
| **79** | Assess relevant climate change proposals submitted in relation to European Innovation Partnerships (EIP) under the RDP. | DAFM | | Ongoing |

### Reducing Greenhouse Gas Emissions in Agriculture

In the period to 2020, the Department and its agencies set out to support the adoption of technically feasible mitigation options for Ireland's agricultural sector, through various schemes under the RDP and other advisory services facilitated by Teagasc. Additionally, the Irish Farmers' Association (IFA) are collaborating with the EPA to support the smart farming initiative which further emphasis the message of resource efficiency through improved animal, grassland and nutrient management which is key to reducing emissions.

As set out in the earlier section of this chapter, the emissions intensity per kcal of food output has been reducing with early estimates projecting that not only will this trend continue but there is likely to be significant further improvements out to 2030. It is important to note that in terms of emissions per unit of product, dairy and beef production in Ireland are recognised as being highly efficient, a fact independently acknowledged by the EU Commission's Joint Research Centre. As we can see in figure 6.3 such strategies have led to a disaggregation of production output and emissions. This achievement has been delivered as a result of continued research, advances in animal genetics, health and nutrition, and through optimising the use of fertilisers. Given the anticipated reorientation from beef to dairy and growth in dairy output in response to removal of the milk quota and growing dairy demand; it is also important to recognise that stablising emissions represents a significant ambition by the Government in addressing

59 https://www.ipcc.ch/report/ar5/wg1/

agriculture-related emissions through significant improvements in emissions intensity.

Alongside the efficiency measures referred to above we are also focusing on the potential for carbon sequestration and the potential carbon store that is in our grasslands. As mentioned above Ireland has elected grassland and cropland management activities for the 2nd commitment period of the Kyoto Protocol, so there will be a particular interest in identifying hotspots for carbon loss with a view to reducing these emissions. In identifying these carbon hotspots it will be a challenge to ensure that the quality of high nature value landscape is maintained. In a sector that is both an emitter of greenhouse gases and has the potential to absorb emissions, it is important that we consider both perspectives and take advantage of these opportunities as we aim to advance on the road to fulfilling the vision of approaching carbon neutrality.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **80** | Progress the cross departmental working group to analyse the feasibility of including Wetland Draining and Rewetting in the national inventory. | DCCAE | DAFM, DAHRRGA, NPWS, EPA, Teagasc | Ongoing |

Farming involves complex natural cycles, and mitigation in agriculture cannot be addressed, by one-off technological fixes. The most recent UK Agricultural greenhouse gas Marginal Abatement Cost Curve (MACC) has estimated its potential mitigation at approximately 3.5% below 2005[60].

Given the objectives of the Paris Agreement to keep temperature rise to less than two degrees and pursuing efforts to less than 1.5 degrees, the agriculture sector faces the particular challenges of reducing greenhouse gas emissions while responding to an increased need for food driven by a growing global population and rising affluence. Additionally it is also noted that many of the pledges submitted in advance of the Paris Agreement include agriculture and land management actions, further emphasising the important role agriculture and land use can make in achieving these goals. The OECD (2012) estimates that by 2050, the world population will reach nine billion (compared to seven billion currently), 70% of whom will live in urban areas. This will significantly increase the demand for food, by up to 70% globally between 2005 and 2050, and place further pressures on the environment. Therefore, for the first time, it is globally recognised the importance of developing synergies between climate and sustainable food and nutrition policies. This also changes the perspective of agriculture and land use mitigation from the historic looking baseline to a more forward looking perspective and how we can use our resources more efficiently to sustainably feed a growing world population. In this context, it is critical for Ireland to engage in the International process to participate in how the transparency of country pledges are developed. As a result, the potential opportunities for sustainably produced Irish food and drink products are considerable.

60 https://www.theccc.org.uk/wp-content/uploads/2016/02/MACCUpdate2015_FinalReport-16Dec2015.pdf

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **81** | Continue engagement at EU and international levels to ensure ambition and transparency of agricultural and land use pledges is enhanced in line with the objectives of the Paris Agreement. | DAFM | FAO, EPA, EU | Ongoing |

Agriculture is of huge importance to rural Ireland as recognised in the Programme for Government. The RDP measures are designed to ensure there are a number of overarching benefits for the rural environment, including mitigate climate change, preserve habitats and species, maintain water quality and ensure a more balanced development of rural areas. The opportunity for rural development is in line with the recently launched Action Plan for Rural Development which seeks to unlock the potential of rural Ireland.

The Teagasc MACC for Irish Agriculture (April 2012)[61] quantified the opportunities for abatement of agricultural greenhouse gases, as well as the associated costs and benefits. While there is limited potential for additional cost-effective mitigation using existing technologies and practices, the MACC analysis was key in informing the suite of priority measures selected for implementation, as set out in Section 6.4 below.

61 https://www.teagasc.ie/media/website/publications/2012/1186/1186_Marginal_Abatement_Cost_Curve_for_Irish_Agriculture.pdf

***What We Are Doing:***

In summary, as the sector continues on the pathway towards carbon neutrality, it will be guided by the principle of sustainable intensification as defined in *Food Wise 2025*[62].

The following overarching principles are being pursued to help us achieve this ambition:

- Recognising the multiple objectives of agriculture and land use in a vibrant rural economy
- Promoting sustainable intensification of food production to reduce the carbon intensity of food production and to contribute to both food security and greenhouse gas mitigation objectives such as through
  - Efficient multi trait animal breeding strategies
  - Efficient use and recycling of nutrients which optimise nitrogen use efficiency and reduce losses of reactive nitrogen to the environment
  - Exploring feeding strategies that maximise the efficiency of grass based production systems
  - Support of improvements to animal health and welfare
  - Support of ICT In agriculture to aid delivery of sustainable intensification
- Encouraging sustainable land management, afforestation and other forest sector mitigation activities, including forest product uses, that contribute to climate change mitigation and sustainably manage soil and forest carbon stocks; and
- Seek to move as far along the road to carbon neutrality as is possible in cost-effective terms, while not compromising the capacity for sustainable food production, in accordance with the Paris Agreement and the goal in Article 4 of achieving a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century.

62 Improving productivity while using natural resources in a manner which protects them into the future.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **82** | Undertake research to evaluate abatement actions across the areas of Climate, Air (including GHG), Water and Biodiversity to develop an integrated abatement strategy and cost curve. | DAFM/ Teagasc | As appropriate | 2020 |
| **83** | Undertake an in-house review to consider additional synergies between the Nitrates Action Plan and climate change policy, with a view to feeding into future updates of the Nitrates Action Plan. | DAFM | DHPCLG | ongoing |

### Mitigation Potential of Forests and Forest Products

At the global scale, forests represent the largest terrestrial carbon store, containing an estimated 1,246 billion tonnes of carbon, or 61% of the total terrestrial store. Avoiding and reducing emissions from deforestation is the first priority at the global level. Removal of forest cover releases $CO_2$ and other greenhouse gases into the atmosphere. Likewise, the functioning and management of forests are critical for climate change mitigation. When sustainably managed, combined with the use of harvested wood products (which stores carbon and displaces emissions arising from the use of high embodied energy products) in construction, other long-lived uses, and as a substitute for fossil fuels, they contribute to both the removal of $CO_2$ and a reduction of greenhouse gas emissions to the atmosphere.

Ireland has a target[63] to expand forest cover from the current 11% of the land area of the country to 18% by 2050, with the majority of this expansion to be undertaken by farmers. The current Forestry Programme envisages afforestation of 7,140 hectares in 2017, increasing incrementally to 8,290 hectares in 2020. To ensure the sustainability of this expansion, Ireland follows the principles of sustainable forest management and operates a robust regulatory system that covers the establishment, management, harvesting and regeneration of forests. Forests planted under the afforestation programme must include biodiversity enhancement areas and mixed tree species. In addition specific schemes support the establishment and management of native woodlands. The Forest Service applies Environmental Impact Assessment and AA Screening, and where necessary, AA regarding any possibility of a significant effect on a NATURA site arising from regulated forestry activities. A licensing system is in operation for harvesting activities and replanting is required after clearfelling operations. This guards against deforestation so that forests continue to sequester carbon and provide wood products into the future. Over the timeframe 1990 to 2030, it is estimated that the cost to the state of the afforestation programme will be €3.2 billion. In addition to carbon sequestration, these forests will provide wood for long-lived timber products, and sustainable biomass, the value of which is primarily achieved after a rotation of typically 40

63 Forests, products and people (DAFM 2014), http://www.agriculture.gov.ie/media/migration/forestry/forestpolicyreviewforestsproductsandpeople/00487%20Forestry%20Review%20-%20web%2022.7.14.pdf.

years. Forests are also recognised as supplying a range of additional ecosystem services related to recreation, biodiversity and, air and water quality that help to support the economy and improve quality of life, but the value of which is rarely quantified in monetary terms. Over the period 2021 to 2030, afforestation since 1990 (i.e. all new forests planted since 1990 and up to 2020) will remove an estimated net 4.5 million tonnes of $CO_2$ from the atmosphere per annum[64] based on the current method of accounting in EU Decision 529/2013.

Under the 2016 ESR proposal[65], which is currently under negotiation, Ireland has potential to contribute 2.7 Mt $CO_2$eq per annum through LULUCF (land use, land-use change and forestry) activities in order to meet its emission reduction requirements over the period 2021-2030. This is based on a combined contribution of net afforestation (afforestation less any deforestation emissions) over a 30-year historical period and cropland and grassland management.

### Circular Bioeconomy

The circular economy and particularly the bioeconomy (the biological element of the circular economy) can provide opportunities for FBB and residues and agriculture residues such as from crops, animal and dairy by-products to be used to produce biomaterials and biochemicals through biorefining or to produce heat and/or power through combustion or anaerobic digestion. Biorefining provides a strategic opportunity for large-scale sustainable use of biomass in the bioeconomy resulting in cost-competitive co-production of food and feed ingredients and also biobased products and bioenergy with optimal socioeconomic and environmental impacts (e.g. efficient use of resources and reduced greenhouse gas emissions). The Government, led by the Department of the Taoiseach, is currently developing a National Policy Statement on the Bioeconomy.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **84** | Publish a high-level Policy Statement on the Bioeconomy in Ireland. | D/Taoiseach through Bioeconomy Interdepartmental Group | DAFM, DCCAE, DTTAS, DJEI, DAHRRG | 2020 |
| **85** | Explore potential for higher value uses of forest and agri residues. | DAFM through promoting and supporting of participation of Irish Industry and Academia in Horizon 2020 Biobased Industries Joint Undertaking. | Science Foundation Ireland through the co-funding of the BEACON Research Centre | 2023 |

64 DAFM (2015) LULUCF Action Plan.

65 EU Commission (2016) Proposed Effort Sharing Regulation COM/2016/0482 final.

### Renewable Energy

Analysis by the SEAI indicates that approximately 1,000 ktoe of bioenergy will be required per annum to meet the country's 2020 renewable energy targets. Of this, heating will require 475 ktoe, transport 370 ktoe, with the remaining 155 ktoe required for electricity. Achieving the anticipated renewable energy usage in the three energy sectors will be very challenging. However, as a result of the afforestation scheme, wood production is forecast to increase significantly in the period up to and beyond 2020, with most of this increase coming from the private sector[66]. In particular, FBB available for energy, including residues from harvesting and wood-processing, is forecast to double by 2035, to 4.2 $Mm^3$. The equivalent of 15 PJ (c.360 ktoe) and 29 PJ (c.690 ktoe) of FBB is forecast to be available by 2020 and 2035 respectively. The development of resources nationally to contribute to meeting demand will depend on the price of biomass, so that producers can see an incentive to get into production, and also on the removal of barriers to mobilisation, which are being addressed through the *Draft Bioenergy Plan*. FBB provides a sustainable fuel source with high levels of greenhouse gas emissions savings relative to the use of fossil fuels.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **86** | Continue efforts to mobilise forest biomass. | Forest Service & Forest Sector Development/ COFORD, DAFM | Land owners, Teagasc, Industry | Ongoing |
| **87** | Support the expansion of the use of FBB including through the Wood Fuel Quality Assurance Scheme. | Forest Sector Development/ COFORD, DAFM | IrBEA, state and private forest owners | Ongoing |
| **88** | Seek to bridge the short term supply gap in indigenous biomass. | Forest Sector Development/ COFORD, DAFM | Land owners, Third level sector, Bioenergy industry | Ongoing |

The main contribution of the agriculture sector is in the supply of bioenergy feedstock, whether from biomass in the form of wood products such as forest thinnings and wood fuel, animal by products (ABP) or other agri-food by-products such as straw, slurries and processing waste, e.g. whey from cheese-making. The SEAI also updated their biomass supply curves for the period to 2035 where a number of agricultural materials are considered – https://www.seai.ie/Renewables/Bioenergy/Sources/Bioenegy-Supply-Curves-2015-2035/Bioenergy-Supply-Curves-2015-20351.html. The wood supply/demand balance for the period 2020-2025 is currently being updated by COFORD/DAFM.

Depending on market conditions there is potential to augment these supplies through increased recovery of harvesting residues on suitable sites, higher intensities of thinning, and through the planting of fast growing tree species.

66 Phillips et al., 2016 All Ireland Roundwood Production Forecast 2016-2035 (COFORD, Dublin) http://www.coford.ie

The sustainability of biomass will continue to be a critical consideration in the development of bioenergy policy under EU Directive 2015/1513, (and the now recast proposals under the 'EU Winter Package') which addresses the potential impact of Indirect Land Use Change and seeks to shift the focus away from first generation biofuels (from oils and sugar) and encourage investment in advanced biofuels, such as those produced from municipal waste and agricultural residues, that do not compete directly with food and feed crops. The circular economy, or bioeconomy, provides opportunities for FBB and agriculture residues, such as animal by-products (ABP), to be used to produce heat and/or power through combustion or anaerobic digestion. In addition there is potential to reduce carbon emissions along the full life-cycle of the food/processing chain through food waste reduction.

We have already noted the importance of agriculture to rural Ireland, however, we should also note the importance of rural Ireland in delivering greenhouse gas savings to other sectors of our economy. We rely on our agricultural landscape to host many renewable technologies. While many of our farmers are adopting energy efficient measures on their farms reducing their reliance on fossil based energy, such measures are incentivised in the agriculture measures under our Rural Development Plan such as roof top solar panels and energy efficiency at farm level. We need to support and enhance farm diversification where farmers can adopt a range of measures with a view to building a more resilient rural economy which maximises the opportunities for biomaterials to continue cascading through the economy and so displacing fossil based materials.

### Research

Research is critical in identifying state of art technologies to improve both the carbon efficiency and climate resilience of Irish agriculture and also to develop a circular bioeconomy. Ireland has significant expertise that can help the agri-food sector become a world leader in low carbon production systems. Research also has an important role in optimising the mitigation potential within the forest sector.

Irish agricultural greenhouse gas research is focused on developing an improved understanding of the key processes involved in the production of methane and $N_2O$ emissions such as identifying promising mitigation options (such as dietary strategies, manure management, fertiliser technologies as well as researching future technologies; quantifying the carbon sequestration potential of agricultural soils) and improving the national greenhouse gas inventories regarding forestry and agriculture.

In addition, (DAFM and Teagasc are active in EU and international research groups on greenhouse gas such as the EU Joint Programming Initiative on Agriculture, Food Security and Climate Change (JPI-FACCE) and the Global Research Alliance (GRA) on mitigating Agricultural greenhouse gases. DAFM hosts and chairs a national steering group which provides a forum to help guide Ireland's involvement in both initiatives.

DAFM research funding (which underpins both national and international research) is informed by two Strategic Research Agendas which identify sector research priorities and include relevant climate change mitigation related research areas. These are the Sustainable, Healthy Agri-food Research Plan (SHARP), developed by a cross-funder Working Group hosted by the DAFM and published in June 2015, and Forest Research Ireland (FORI) developed by a Working Group of the Competitive Forest Research for Development Council and published by DAFM

in October 2014. Informed by the two research agendas DAFM funds competitive calls for 'public good' research through its three research programmes; the Food Institutional Research Measure (FIRM), the Research Stimulus Fund (RSF) – for primary agriculture production, and the Programme of Competitive Forest Research for Development (COFORD).

Some €17.1 million in funding has been committed under DAFM's three programmes in the sustainable land management, bioeconomy and greenhouse gas related areas arising from DAFM's Research Calls, launched in the 2010-2015 period.

The Department also promotes and supports the activities of Irish researchers in the Horizon 2020 Societal Challenge 2 programme on 'Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy' and in the 'Biobased Industries Joint Technology Initiative' (BBI).

### Land Management

As mentioned previously, there are a number of DAFM and EPA-funded projects investigating the use of remote sensing data to detect changes in vegetation under Ireland's *National Biodiversity Plan* and the *National Peatlands Strategy*.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **89** | Continue to support climate and land based research at national and international levels. | DAFM | | Ongoing |
| **90** | Continue to engage with international projects for investigating sequestration and land-use change such as the GRA and the French Initiative "4 per 1000". | DAFM, Teagasc, EPA | | Ongoing |

### Behavioural Change

Many of the measures to mitigate agricultural emissions are dependent on behavioural change, from farmers in particular. This is a complex area incorporating many interdependent motivational factors. However, research shows access to information, contact with Government agents, and participation in farmers networks or watershed groups are important to achieve the necessary behavioural change to mitigate greenhouse gas emissions. The incorporation of knowledge transfer (KT) groups and other information services in the agriculture measures in this plan acknowledges the importance of behavioural change in achieving greenhouse gas reduction targets.

The amount of abatement will be highly dependent on rates of uptake of the various measures. This means that the role of KT will be more important than ever. Research alone will not lead to emissions reductions without strong linkage to KT. There are twin roles of research and KT: whereas research into new greenhouse gas mitigation options aims to further reduce the carbon-intensity of farms that are already carbon-efficient, KT efforts focus on narrowing the spread in carbon-intensities between the most efficient producers and the main body of producers.

Therefore, emissions reductions can only be realised if it is supported by a comprehensive KT programme. A number of initiatives have been introduced to aid in the uptake of new abatement measures such as AF4 and AF7 BETTER Farms, AF5 Pasture Profit Index and AF9 Carbon Navigator. Each of these measures as stand alone would do little to reduce greenhouse gas emissions. However, taken as part of a linked strategy between research, KT and policy, they are key tools for achieving climate targets.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **91** | Carry out further research to understand the behavioural barriers which influence farmers participation in environmental schemes. | DAFM, Teagasc | | 2020 |

*FoodWise 2025* and Origin Green[67] create the framework and enabling environment to underpin future ambition for the agriculture and land sector to ensure that, Ireland builds on its competitive advantage for environmentally sustainable, safe and quality assured food production, while focusing on improved agricultural resilience, productivity and resource efficiency and simultaneously encouraging good land management practices with a vision for a near carbon-neutral agricultural AFOLU sector. Ensuring sustainable food production is a basic tenet of the UNFCCC as expressed in Article 2 of the Paris Agreement.

*FoodWise 2025* states that 'environmental sustainability and economic sustainability are equal and complementary – one will not be achieved at the expense of the other' ensuring that environmental considerations are at the heart of agri-food policy. The strategy includes a number of recommendations and actions to support the sustainable growth of the sector up to 2025. While Origin Green is committed to further changes and developments across all levels of the supply chain to facilitate the continuous improvement of the programme. Over 137,000 farm assessments have been conducted to date, Bord Bia continues to work with stakeholders to communicate and highlight the benefits of sustainable farming practices. The carbon navigator offers a pragmatic decision making tool to highlight benefits of implementing sustainable practices on farm. Linkages between national programmes and Origin Green objectives are key e.g. farmers participating in the Beef Data and Genomics Programme and knowledge transfer schemes are required to complete a carbon navigator assessment.

67 The Origin Green sustainability development programme, which operates on a national scale, unites government, the private sector and food producers for a common vision to improve the environmental performance of individual farms and food producers.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **92** | Continue to improve farm sustainability through GLAS and the Origin Green Programme. | DAFM, Bord Bia | Teagasc | Ongoing |
| **93** | ESC to continue to monitor and drive the implementation of the sustainability actions. | ESC | DAFM | Ongoing |

## 6.4 Mitigating Measures in Place

Ireland has a comprehensive range of policy measures currently in place aimed at approaching carbon neutrality in the agriculture, forest and land use sectors.

The CAP has made an increasingly significant contribution to the environmental sustainability of the European agri-food sector in recent years through its two pillars:

- Pillar One provides a level of income support to farmers while introducing practices that are beneficial for the environment and climate on most of the utilised agricultural area.
- Pillar Two – The RDP – is the framework for sustainable management of the natural environment in which agricultural activity takes place.

As stated above, the Teagasc MACC analysis was key in informing the suite of priority measures selected for implementation through the RDP.

Both programmes are subject to rigorous review processes including an Ex-Ante and Ex-Post Evaluation in the case of the RDP. The Ex-Post evaluation of the RDP 2007-2013 is currently being reviewed by the Commission, and will be published in due course. The Forestry Programme is subject to ongoing review and is currently undergoing a mid-term review.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **94** | Focus Policy Assessment of the 2014-2020 RDP to be carried out. | DAFM | | Ongoing (due in 2017, 2019 and 2024) |
| **95** | Improve the transparency of CAP and RDP measures in the National Inventory that contribute to climate action with a view to better understanding the contribution of agriculture and land use abatement to Ireland's ESR targets. | DAFM | DPER, D/ Finance, DCCAE | Ongoing |

In the main, the focus of the other agriculture measures outside of the RDP is on increasing

environmental knowledge and environmental best practice to improve the depth and quality of environment protection and enhancement at individual farm level. Based on developments in research and innovation, which arises through the significant research programme, DAFM will seek to keep opportunities for further policy and measure evolution under regular review so as to maximise ways to explore and experiment options to drive our approach to carbon neutrality.

As part of the CAP stakeholder consultation there is an opportunity to take into account societal demands in the policy discussions on the future of the CAP and adapt it to better integrate the new political priorities in an inclusive and comprehensive manner. In parallel, the impact assessment, provides the evidence base for identifying challenges and objectives and drawing up policy options to achieve them. Impacts of these policy options are then assessed, considering economic, social and environmental dimensions.

In light of the climate challenge and other environmental concerns, DAFM seek to explore and encourage opportunities in the reform process for the CAP to further enhance its support for sustainable intensification, sustainable land management and diversification opportunities to improve the income resilience of farming families and rural areas.

It should be noted that the effectiveness of mitigation measures needs to be evaluated for individual agricultural systems based on climate, social setting and historical patterns of land use and management. There is no universally effective suite of measures. An outline of the key agriculture and forestry measures currently in place is set out below.

## Agriculture

### Measure AF1A – Cross Compliance and Green Direct Payment

Cross compliance requirements, as per EU regulations include statutory management requirements (SMR) regarding environment, food safety, animal health and welfare and plant health. In particular the Nitrates SMR, which Ireland has a whole territory approach, has significant synergies with reducing $N_2O$ emissions and improving nitrogen use efficiency. Additionally many of the good agricultural and environmental condition standards protect soil quality and landscape features such as hedgerows.

Compulsory Green Direct Payment rewards farmers for respecting three obligatory agricultural practices: maintenance of permanent grassland, ecological focus areas (EFA) and crop diversification; all of which have climate action benefits by protecting soil carbon pools under permanent grassland and encouraging landscape resilience through crop diversification and establishment of EFAs.

### Measure AF2A – Beef Data and Genomics Programme (BDGP)

The objective of the programme is to collect data including DNA samples on maternal traits of suckler cows from commercial farms to feed into a breeding index. The index will inform farmers in selecting robust and resource efficient suckler cow replacements thus lowering the intensity of greenhouse gas emissions by improving the quality and efficiency of the national beef herd. The carbon navigator is a key component which allows farmers to monitor progress in improvements and compare themselves against peers on similar land types.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **96** | Carry out further research to analyse the benefits of beef genomics. | DAFM | | 2019 |

### Measure AF2B – Knowledge Transfer Programme

The programme facilitates the transfer of information from research and advisory services to farmer discussion group networks that cover a wide range of topics, including sustainability and husbandry practice that contributes to climate mitigation (e.g. animal health, breeding, nutrient management).

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **97** | Continue to improve knowledge transfer and exchange to farmers by developing a network across State agencies and relevant advisory bodies. | Teagasc | DAFM | Ongoing |
| **98** | Further develop the range and depth of sustainability information collected for beef, dairy and other agriculture sectors. | Bord Bia | DAFM | Ongoing |

### Measure AF2C – Green, Low Carbon, Agri-Environment Scheme (GLAS)

GLAS is an agri-environmental scheme that incentivises agricultural production methods to address issues of climate change, water quality and biodiversity loss. The scheme supports low carbon agriculture through a range of cross-cutting measures, and promotes the delivery of targeted environmental advice and best practice at farm level.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **99** | Online Nutrient Management software tool rolled out. | Teagasc | DAFM | In Place |

### Measure AF2E – Targeted Agricultural Modernisation Schemes (TAMS II)

The scheme supports capital investment in a number of target areas which will promote, among other things, sustainability (e.g. low emissions slurry spreading equipment, farm nutrient storage, and renewable energy and energy efficiency).

### Measure AF2F – Organic Farming Scheme

The scheme promotes organic agriculture as an alternative farming system, contributing to improving soil quality, and mitigation and adaptation to climate change.

### Measure AF3 – Smart Farming Programme

This programme, developed by the EPA and the IFA, supports the measurement, monitoring and improvement of the environmental performance of farms. Further details can be found at the following link: http://smartfarming.ie

### Measures AF4 and AF7 – Business, Environment and Technology through Training Extension and Research (BETTER) Farms Programme

This programme includes a number of working farms as a means of demonstration, channelling research knowledge and outputs to practising farmers via discussion group networks and farming media. In particular the programme focuses on the areas of animal breeding, grassland management (including soil fertility) and herd health; all of which promote resource efficiency. Further details can be found on the Teagasc website: https://www.teagasc.ie/media/website/publications/2016/BETTER-Farm-Programme-Book.pdf

### Measure AF5 – Pasture Profit Index

The Pasture Profit Index is a guide to assist farmers planning to re-seed in order to maximise yield. By increasing the quantity of grass available for in situ grazing by livestock and reducing the need for external concentrate inputs it provides climate mitigation co-benefits. This is consistent with the grass based husbandry system that Ireland promotes.

### Measure AF6 – Animal By-Products

The objective is to encourage the use of ABP (e.g. tallow as a substitute for imported heavy fuel oil, and poultry litter as a biomass energy source).

### Measure AF8 – Origin Green

The Origin Green sustainability development programme, which operates on a national scale, unites government, the private sector and food producers in a common vision to improve the environmental performance of individual farms and food producers. Further details are available at the following link: http://www.origingreen.ie

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **100** | Continue to develop and enhance Origin Green. | Bord Bia | DAFM, Teagasc | Ongoing |

### Measure AF9 – The Carbon Navigator

The Carbon Navigator delivers feedback and advice on practices that effectively reduce the carbon-footprint of farm produce, and improve the economic performance of the farm. Further details can be found on the Teagasc website:

https://www.teagasc.ie/media/website/about/our-organisation/Bord-Bia-Dairy-Carbon-Navigator-LR5.pdf

https://www.teagasc.ie/media/website/about/our-organisation/Bord-Bia-Beef-Carbon-Navigator-LR4.pdf

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **101** | Continue to enhance and rollout at farm level, the Carbon Navigator Initiative. | Teagasc | DAFM, Bord Bia | Ongoing |
| **102** | Expand the Carbon Navigator initiative to other enterprises. | Bord Bia | DAFM, Teagasc | Ongoing |

### Forestry

#### Measure AF10A – Afforestation Scheme

This scheme aims to encourage landowners to convert land from agricultural production into forestry. Grants covering 100% of establishment costs are provided, along with 15 annual premium payments. Such planting undergoes a rigorous approvals process which ensures forests are established in appropriate areas. Management plans are required for all grant aided forest.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **103** | Current Afforestation Programme review to consider participation rates, climate change, environmental impact, rural communities and land use policy. | DAFM | | Mid 2018 |

#### Measure AF10B – Forest Road Scheme

Forest roads provide access to forests for management activities such as thinning and clear-fell, which can increase total cumulative carbon sequestration in the long term and produce long-lived wood products. This scheme provides grants to cover 100% of costs incurred in building such roads to ensure that the requisite access and infrastructure are put in place.

#### Measure AF10C – Woodland Improvement Scheme

This scheme provides financial support to forest owners towards the cost of woodland improvement works associated with tending and thinning of broadleaf forests planted since 1980, as well as enhancing the environmental qualities of existing predominantly broadleaf forests. This scheme can increase forest quality, productivity and carbon sequestration potential.

#### Measure AF10D – Reconstitution of Woodlands Scheme

The objective of this scheme is to restore the forest back to its original form following significant damage by natural causes but excluding damage caused by fire and wind blow. Natural causes eligible for funding include damage associated with frost, diseases, deer, grey squirrel and vole. The scheme also aims to maintain or restore forest ecosystems and biodiversity.

### Measure AF10E – Native Woodland Conservation Scheme

The objective of this scheme is to support the appropriate restoration of existing native woodlands and, where appropriate, the conversion of existing non-native forest to native woodland, in order to promote the restoration of Ireland's native woodland resource and associated biodiversity.

### Measure AF10F – NeighbourWood Scheme

The NeighbourWood Scheme funds the development of attractive close-to-home woodland amenities (or 'neighbourwoods') for public use and enjoyment. The scheme is available to local councils, private landowners and others, working in partnership with local communities. The measure delivers direct environmental and societal value through carbon sequestration and public amenity.

### Measure AF10G – Innovative Forest Technology Scheme

This scheme supports smaller scale technologies which are applicable to private forest holders, producer groups, forest contractors and haulage operators. These include innovations that can protect the environment such as variable tyre pressure systems that reduce damage to roads when hauling timber.

### Measure AF10H – Forest Genetic Reproductive Material Scheme

The scheme supports the conservation and development of Ireland's forest genetic resource, key to maintaining productive and healthy forests.

### Measure AF10I – Forest Management Plans

These plans provide details on the future management of forests, detailing information such as stock assessment, nutrient assessment, average height and yield class, planting year, and the projected years for first thinning(s) and clear-fell for each plot.

## 6.5 Mitigation Measures under Consideration

### Agriculture

The MACC referred to in section 6.3 has been updated and is almost finalised. The updated MACC quantifies the abatement potential of the agriculture, forest sector and land use sector for the period 2021-2030 and identifies further measures for consideration.

One such measure is a switch in fertiliser type, with research showing that switching to a protected urea product can be effective in reducing both greenhouse gas emissions and ammonia emissions. The research supporting the benefits of this protected urea product is also showing that updated emission factors can have a positive impact on the sector's emission profile. This suggests that further innovation in fertiliser nitrogen types and use will be essential to reducing $N_2O$ emissions.

Future mitigation measures are also dependent on the success of 2014-2020 measures including locally-led pilot schemes and the availability of CAP and exchequer funding. The requirements of the common monitoring and evaluation framework (CMEF) of the CAP and the mandatory ex-post review of the RDP will inform policy decisions on mitigation measures and CAP negotiations for the next Programme period.

An additional consideration to note is that RDPs must balance climate change mitigation with measures to fulfil other economic and social priorities identified for rural areas.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **104** | Evaluate the updated MACC with a view to identifying further measures for consideration. | DAFM | Teagasc | 2018 |

Given the role of agriculture and land use in the provision of materials to displace fossil fuel as described in section above on renewable energy, DAFM will consider the materials and technologies most appropriate at farm level that contribute to this and further enhance the diversification of farm incomes.

As an energy user, the agriculture and forestry sector will also continue to adopt improvements in energy efficiency and decarbonisation of energy use especially in energy intensive enterprises such as pigs, poultry, horticulture and dairy.

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **105** | Analyse the barriers to the diversification of farm incomes related to supply of materials and residues for renewable energy and adoption of AD. | DAFM | | 2020 |
| **106** | Scope out the most cost-effective and appropriate technologies to improve energy efficiency at farm level and assist with decarbonisation of energy use. | DAFM | | 2019 |

### Forestry

#### Measure AF10J – Forest Cover Expansion Post-2020

This policy is set out in '*Forests, products and people*', the DAFM Forest Policy Review (2014). The Review sets a goal for the expansion of forest cover to 18% by mid-century. The analytic framework for the policy takes into account the need to continue the climate change mitigation benefits of forests and forest products out to the mid-century period, as well as sustaining wood production and other ecosystem services. Future work will analyse the climate change mitigation implications based on what has been achieved under the current programme.

## 6.6 Overview of Costs and Emissions Reduction Potential

The table below sets out a brief overview of emissions reduction potential and costs for the agriculture and forest sector mitigation measures at RDP and Forest Programme level. It is important to note that the measures under these programmes are interlinked and have multiple co-benefits and therefore, should be reviewed as a package rather than standalone. For example, the low emissions farming practices supported by the RDP are set to go beyond the sustainable farming practice enshrined in the Irish legislative framework which includes the nitrates action programme and the cross compliance standards that contribute to the protection of the carbon pool stored in Irish farmland.

### Table 6.1 Agriculture, Forest and Land Use – Overview of Costs and Emissions Reduction Potential

| Classification of Measure | | | | Exchequer Expenditure (€) | | | |
|---|---|---|---|---|---|---|---|
| Reference | Title | Type | Objective of measure | Direct Spend | Tax Foregone | Total | |
| AF 2<br>In place | Rural Development Programme | Economic Instrument – Direct Investment | Overarching benefits for rural environment, including climate change mitigation, preservation of habitats and species, and maintaining good water quality. | 1,865.15m* | 0 | 1,865.15m | |
| AF 10<br>In place | Forestry Programme | Economic Instrument – Direct Investment | Increase level of forest cover; Increase supply of FBB to bridge expected supply gap by 2020 and beyond; Increase timber mobilisation by supporting private forest holders in actively managing their forests; Enhance the environmental and social benefits of new and existing forests. | 132.5m# | 0 | 132.5m | |

* Total RDP funding for climate change included in mitigation plan measures (money out of exchequer) and relate to the period 2014 to 2020. This figure is gross of the EAFRD funds specified under Exchequer Receipts.

** Funds flow in to exchequer – EAFRD funds.

*** This figure is calculated using the coefficients assigned by the Commission for climate change objectives of RDP measures and includes the multiple objectives of measures including water, biodiversity and social aspects in addition to climate mitigation. Presently, data is not available to disaggregate between measures of the RDP. The figure is under review due to evolving methodologies and refinement of MRV in the inventory.

# These costs relate to the period 2017-2020.

## As biological systems, the carbon sequestration capacity of forests is limited while young but increases rapidly. These figures only relate to afforestation over the identified timeframe and do not represent the full value of the forestry programme.

| | Exchequer Receipts (€) | NPV 2017-2020 (€) (based on economic CBA) | NPV 2017-2030 (€) (based on economic CBA) | Marginal cost per tonne of carbon abated (€) (as per MACC) | Cumulative GHG emissions reduction 2017-2020 ($ktCO_2e$) | Cumulative GHG emissions reduction 2017-2030 ($ktCO_2e$) |
|---|---|---|---|---|---|---|
| | 1,066.95m** | TBD | TBD | Approx 550*** | 1,454 | 10,054 |
| | 0 | TBD | TBD | Approx 20 | 120## | 2,440## |

# Annex 1 – National Mitigation Plan Actions

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **1** | Publish updated analysis on transition pathway scenarios to 2050. | DCCAE | DAFM, DTTAS, all relevant Government Departments | 2020 |
| **2** | Undertake a review of guidance on public expenditure appraisal and evaluation to ensure their suitability to capturing key costs and benefits of climate measures. | DPER | DCCAE, D/Finance, DAFM, DTTAS | 2018 |
| **3** | Examination of impact of carbon tax and future tax rate. | D/Finance | DCCAE, DTTAS | 2018 |
| **4** | Prepare a report identifying fossil fuel subsidies in place for consideration by Government. | DCCAE | D/Finance, DPER, EPA, all relevant Government Departments | 2019 |
| **5** | Prepare periodic reports on the electricity and gas prices for households and businesses. | SEAI | DCCAE | Bi-annually |
| **6** | Prepare a report on the economic and employment implications of the transition. | DCCAE | DJEI, all relevant Government Departments and Agencies | 2017-2019 |
| **7** | Address the just transition as part of the National Dialogue on Climate Action. | DCCAE | DJEI, all relevant Government Departments and Agencies | 2017-2019 |
| **8** | Implement National Dialogue on Climate Action on a two-year pilot basis. | DCCAE | EPA, all relevant Government Departments and Agencies | 2017-2019 |
| **9** | Develop proposals to establish regional climate action offices to coordinate Local Authority response to climate action. | Local Authorities | DCCAE, DHPCLG, EPA, all relevant Government Departments and Agencies | 2018 |
| **10** | Ensure climate considerations are fully addressed in new National Planning Framework. | DHPCLG | DCCAE, all relevant Government Departments | 2017 |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **11** | Annual report from National Climate Research Coordination Group. | EPA | DCCAE, SEAI, all relevant Government Departments and Agencies | 2018, Ongoing. |
| **12** | Develop proposals for identifying, monitoring and reporting of climate related expenditure through the Exchequer. | DPER, DCCAE | All relevant Government Departments and Agencies | 2018<br>Ongoing once method-ologies in place |
| **13** | Prepare a report for Government on options for non-Exchequer sources of financing for climate measures in advance of Budget 2019. | DCCAE | DPER, D/Finance, NTMA, all relevant Government Departments and Agencies | 2018 |
| **14** | TRAM to support ongoing development and implementation of the National Mitigation Plan. | DCCAE | All relevant Government Departments and Agencies | Ongoing |
| **15** | Oversee the establishment of Bord na Móna Bioenergy. | DCCAE | DAFM, DPER | 2017 |
| **16** | Finalise the Bioenergy Plan. | DCCAE | DAFM, SEAI, DPER | 2017 |
| **17** | Progress actions arising from Bioenergy Plan. | DCCAE | DAFM, SEAI, DPER | 2018 |
| **18** | Carry out an interim Review of the *OREDP.* | DCCAE | SEAI, DJEI, Marine Institute, EPA, industry | 2017 |
| **19** | As part of the development of the new RESS, approaches to community participation in renewable energy projects to be finalised. | DCCAE | SEAI, renewable energy developers | 2017 |
| **20** | Finalise Wind Energy Guidelines. | DHPCLG | DCCAE, planning authorities, citizens, renewable energy developers | 2018 |
| **21** | Commission and complete economic and technical research on the merits of further interconnection for Ireland. | DCCAE | TSOs on the island, Regulators on the island, private developers | 2017 |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **22** | Develop a regulatory policy for electricity interconnectors for Ireland. | CER | DCCAE, TSOs on the island, private developers | By 2020 |
| **23** | Carry out a study to identify the most suitable replacement low carbon technology for Moneypoint generation plant. | DCCAE | ESB | 2018/2019 |
| **24** | In line with Bord na Móna's sustainability strategy, oversee review of future of peat generation plants. | DCCAE | ESB, Bord na Mona | 2019 |
| **25** | Ongoing research into technology to assist the increase of variable renewable electricity generation. | Eirgrid | DCCAE, CER, Third Level institutions | Ongoing |
| **26** | DCCAE to explore the feasibility of utilising suitable reservoirs for $CO_2$ storage. | DCCAE | Electricity generators, heavy industry, Geological Survey of Ireland | Within next five years |
| **27** | Finalise RESS and obtain Government and EU State Aid approval for the scheme. | DCCAE | Renewable electricity generators, local communities, Government, EU Commission | 2018 |
| **28** | To inform future energy policy, undertake a study of the costs and savings arising from renewable electricity deployment. | DCCAE | CER, Eirgrid, SEAI | 2018/ 2019 |
| **29** | Commission study on the wider economic costs and benefits – including in the areas of climate, decarbonisation and rural development – of potential extensions of the Irish Natural Gas network, and related funding options. | DCCAE | To be determined in the tender planning process | 2017/ 2018 |
| **30** | Housing Assistance Package – Local Authorities signed up to participate and scheme operational. | DCCAE | SEAI | 2017 |
| **31** | Warmth & Wellbeing Scheme – 1,500 homes will be upgraded for occupants who qualify for the scheme. | SEAI | DCCAE | 2018 |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **32** | Warmth & Wellbeing Scheme evaluated with a view to a possible national rollout. | DCCAE | SEAI | 2020 |
| **33** | Implement the Deep Retrofit pilot. | SEAI | DCCAE | 2017-2019 |
| **34** | New BER Advisory report to be introduced. | SEAI | DCCAE | 2017 |
| **35** | Roll out EXEED Programme. | SEAI | | 2017 |
| **36** | SME Support: Publish new Energy Audit Handbook. | SEAI | DCCAE | 2017 |
| **37** | SME Support: Publish new interactive SME Guide. | SEAI | DCCAE | 2017 |
| **38** | SME Support: Develop and pilot new targeted grant support actions (Variable Speed Drives (VSDs) in the farming sector and lighting in SMEs). | SEAI | DCCAE | 2017 |
| **39** | Establish new Behavioural Economics Unit in SEAI. | SEAI | DCCAE | 2017 |
| **40** | Implementation of Public Sector Energy Efficiency Strategy (PSEES). | DCCAE | All Government Departments | Ongoing |
| **41** | PSEES – All PSBs will have nominated Energy Performance Officers (EPOs) and the Steering Group will be in place. | DCCAE | All Government Departments | 2017 |
| **42** | PSEES – Initial pipeline projects identified. | DCCAE | | 2017 |
| **43** | PSEES – First progress report to Government. | DCCAE | | 2017 |
| **44** | PSEES – Implement the *2017 Central Government Building Energy Retrofit Fund Pilot* and report to DCCAE on outcomes. | OPW/SEAI | | 2017 |
| **45** | PSEES – Deliver the *2017 National Energy Efficiency Upgrade Pilot programme for schools.* | SEAI/DES | | 2017 |
| **46** | Minimal Thermal Standards in rental properties Public Consultation underway. | DCCAE | Landlords | 2017 |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **47** | Minimal Thermal Standards in rental properties – consider consultation submissions and where warranted, introduce measures to help facilitate landlords achieve compliance with envisaged new regulations. | DCCAE | SEAI | 2018 |
| **48** | Completion of the Luas Cross City integrated light rail network. | Transport Infrastruc-ture Ireland/NTA | DTTAS | Q4 2017 |
| **49** | Support Government funding commitments to rail and bus improvements, including completion of the City Centre Re-signalling Programme and investment in the bus fleet and bus priority measures. | DTTAS/ Iarnród Éireann/ Bus Éireann/ Dublin Bus | | Ongoing |
| **50** | Electrification of the Northern DART Line to extend the DART to Balbriggan. | Iarnród Éireann | DTTAS | 2022 |
| **51** | Investment in infrastructure and behavioural change interventions to encourage and support a shift to sustainable modes of transport. | DTTAS | NTA | Ongoing |
| **52** | Maintain a grant scheme for electric vehicles. Support levels to be reviewed annually. | DCCAE | SEAI | 2020 |
| **53** | Deployment of 14 CNG refuelling stations and a renewable gas injection facility. | Gas Networks Ireland | | 2020 |
| **54** | Broaden the ACA tax incentive for companies to encourage investment in refuelling infrastructure and equipment for natural gas, both CNG and LNG. | DTTAS | DCCAE,SEAI, DTTAS, D/Finance | 2018 |
| **55** | Maintain under continuous review the use of the VRT/Motor Tax system in incentivising the uptake of lower emission technologies. | D/Finance, DHPCLG | DTTAS | Ongoing |
| **56** | Continue to encourage the adoption of natural gas as a cleaner transport fuel by maintaining the excise rate applied at the minimum rate allowable under the Energy Tax Directive. | D/Finance | | 2023 |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **57** | Continue to optimise current energy efficiency actions in place in the area of public transport. | Iarnród Éireann, Bus Éireann, Dublin Bus, Transport Infrastructure Ireland | DTTAS | Ongoing |
| **58** | Sustain the current Biofuels Obligation Scheme to ensure that biofuels continue to be an increasing part of the road transport fuel mix. | DCCAE | NORA,Obligated Parties | Ongoing |
| **59** | Implement the *National Policy Framework on Alternative Fuels Infrastructure for Transport: 2017-2030.* | DTTAS | | 2017-2030 |
| **60** | Publish a new *Public Transport Policy Statement.* | DTTAS | | 2018 |
| **61** | Publish a review of the *National Cycle Policy Framework.* | DTTAS | | 2017 |
| **62** | Review the *Smarter Travel Policy.* | DTTAS | | 2017 |
| **63** | Publish the *Greenway Strategy.* | DTTAS | | 2017 |
| **64** | Draft a comprehensive National Strategy on ITS. | DTTAS | | 2018 |
| **65** | NPF to secure better integration of land use and transport planning to reduce travel demand and encourage more sustainable modes of travel (walking, cycling, and public transport) as well as more efficient and cleaner transport. | DHPCLG, NTA | DTTAS | 2017 |
| **66** | Continued development and implementation of sectoral energy saving projects. | DTTAS | SEAI, Office of Government Procurement | Ongoing |
| **67** | Continue support for the International Transport Forum's (ITF) *Decarbonising Transport Worldwide* research and modelling project. | DTTAS | ITF | 2020 |
| **68** | Undertake and fund climate change and air quality research and analysis within the Irish transport sector. | DTTAS | | Ongoing |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **69** | Investment in improved and additional public transport capacity. | DTTAS | NTA | Ongoing |
| **70** | Utilisation of the Green Public Transport Fund to support the uptake of low carbon, energy efficient technologies within the public transport sector. | DTTAS | NTA | 2017 |
| **71** | Examine the expansion of existing support schemes. | D/Finance | DTTAS | 2018 |
| **72** | Establish a Behavioural Economics Working Group to consider behavioural change. | DTTAS | | 2017 |
| **73** | Recommend incentives and optimal regulatory framework for early adoption of LEV technology. | DTTAS, DCCAE | DHPCLG, LEV Task Force members | 2017 |
| **74** | Conduct a review of vehicle and fuel taxation measures within the context of evolving technology development and need to chart a sustainable pathway to the decarbonisation of transport by 2050. | D/Finance | DTTAS | Ongoing |
| **75** | Conduct a public consultation on progressively increasing the biofuel obligation rate by 2020. | DCCAE | NORA, Obligated parties | 2017 |
| **76** | Consider the introduction of a grant scheme to encourage eco-driving for HGVs and buses. | DTTAS | SEAI | 2017 |
| **77** | Continue the work of the cross departmental and agency working group established in 2016 to further improve the monitoring reporting and verification of agricultural abatement options in the inventory to enhance transparency of agricultural and land use actions. | DAFM | Teagasc, Bord Bia and EPA | Ongoing |
| **78** | Undertake research to further elaborate the concept of carbon neutrality from an Irish agriculture and land use perspective, to include a number of scenarios. | EPA, DAFM | Teagasc | Ongoing |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **79** | Assess relevant climate change proposals submitted in relation to European Innovation Partnerships (EIP) under the RDP. | DAFM | | Ongoing |
| **80** | Progress the cross departmental working group to analyse the feasibility of including Wetland Draining and Rewetting in the national inventory. | DCCAE | DAFM, DAHRRGA, NPWS, EPA, Teagasc | Ongoing |
| **81** | Continue engagement at EU and international levels to ensure ambition and transparency of agricultural and land use pledges is enhanced in line with the objectives of the Paris Agreement. | DAFM | FAO, EPA, EU | Ongoing |
| **82** | Undertake research to evaluate abatement actions across the areas of Climate, Air (including GHG), Water and Biodiversity to develop an integrated abatement strategy and cost curve. | DAFM/ Teagasc | As appropriate | 2020 |
| **83** | Undertake an in-house review to consider additional synergies between the Nitrates Action Plan and climate change policy, with a view to feeding into future updates of the Nitrates Action Plan. | DAFM | DHPCLG | ongoing |
| **84** | Publish a high-level Policy Statement on the Bioeconomy in Ireland. | D/Tao-iseach through Bi-oeconomy Interde-partmental Group | DAFM<br>DCCAE<br>DTTAS<br>DJEI<br>DAHRRG | 2020 |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **85** | Explore potential for higher value uses of forest and agri residues. | DAFM through promoting and supporting participation of Irish Industry and Academia in Horizon 2020 Biobased Industries Joint Undertaking | Science Foundation Ireland through co-funding of the BEACON Research Centre | 2023 |
| **86** | Continue efforts to mobilise forest biomass. | Forest Service & Forest Sector Development/ COFORD, DAFM | Land owners, Teagasc, Industry | Ongoing |
| **87** | Support the expansion of the use of FBB including through the Wood Fuel Quality Assurance Scheme. | Forest Sector Development/ COFORD, DAFM | IrBEA, state and private forest owners | Ongoing |
| **88** | Seek to bridge the short term supply gap in indigenous biomass. | Forest Sector Development/ COFORD, DAFM | Land owners, Third level sector, Bioenergy industry | Ongoing |
| **89** | Continue to support climate and land based research at national and international levels. | DAFM | | Ongoing |
| **90** | Continue to engage with with international projects for investigating sequestration and land-use change such as the GRA and the French Initiative “4 per 1000”. | DAFM, Teagasc, EPA | | Ongoing |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **91** | Carry out further research to understand the behavioural barriers which influence farmers participation in environmental schemes. | DAFM, Teagasc | | 2020 |
| **92** | Continue to improve farm sustainability through GLAS and the Origin Green Programme. | DAFM, Bord Bia | Teagasc | Ongoing |
| **93** | ESC to continue to monitor and drive the implementation of the sustainability actions. | ESC | DAFM | Ongoing |
| **94** | Focus Policy Assessment of the 2014-2020 RDP to be carried out. | DAFM | | Ongoing (due in 2017, 2019 and 2024) |
| **95** | Improve the transparency of CAP and RDP measures in the National Inventory that contribute to climate action with a view to better understanding the contribution of agriculture and land use abatement to Irelands ESR targets. | DAFM | DPER, D/Finance, DCCAE | Ongoing |
| **96** | Carry out further research to analyse the benefits of beef genomics. | DAFM | | 2019 |
| **97** | Continue to improve knowledge transfer and exchange to farmers by developing a network across State agencies and relevant advisory bodies. | Teagasc | DAFM | Ongoing |
| **98** | Further develop the range and depth of sustainability information collected for beef, dairy and other agriculture sectors. | Bord Bia | DAFM | Ongoing |
| **99** | Online Nutrient Management software tool rolled out. | Teagasc | DAFM | In Place |
| **100** | Continue to develop and enhance Origin Green. | Bord Bia | DAFM, Teagasc | Ongoing |
| **101** | Continue to enhance and rollout at Farm level, the Carbon Navigator Initiative. | Teagasc | DAFM, Bord Bia | Ongoing |
| **102** | Expand the Carbon Navigator Initiative to other enterprises. | Bord Bia | DAFM, Teagasc | Ongoing |

| Action | Proposal | Lead | Stakeholders | Timeline |
|---|---|---|---|---|
| **103** | Current Afforestation Programme review to consider participation rates, climate change, environmental impact, rural communities and land use policy. | DAFM | | Mid 2018 |
| **104** | Evaluate the updated MACC with a view to identifying further measures for consideration. | DAFM | Teagasc | 2018 |
| **105** | Analyse the barriers to the diversification of farm incomes related to supply of materials and residues for renewable energy and adoption of AD. | DAFM | | 2020 |
| **106** | Scope out the most cost-effective and appropriate technologies to improve energy efficiency at farm level and assist with decarbonisation of energy use. | DAFM | | 2019 |

# Annex 2 – Mitigating Measures Presented in the SEA Environmental Report and Natura Impact Statement

| Mitigation Measures Relating to Assessment of Alternatives | | |
|---|---|---|
| **Reference** | **Mitigation** | **Sector response/proposed action** |
| Strategic Alternative – Inclusion of the Waste Sector | In advance of the next five year National Mitigation Plan (NMP), carry out a detailed analysis of the annual trend and key contributory factors for the waste sector GHG Emissions. If this sector does not show a downward trend then this sector should be considered for inclusion in future iterations of the NMP. | DCCAE – Trends will continue to be considered and inform climate policy development as new data emerges from the EPA on an annual basis<br>Agriculture: It is suggested that this is also connected with any policies or incentives to encourage the development of the biogas/ biomethane industry as biodegradable waste is a key input.<br>Therefore there is a connection with the inclusion of animal manures or other agricultural materials as co-digestants |
| Strategic Alternative – Carbon Capture and Storage | Within the next five years and in advance of the subsequent NMP, a feasibility study should be undertaken to determine the potential application of CCS in Ireland in the future. The review should consider international best practice and experience as well as a life cycle analysis of environmental impacts. In addition, the study should be set in the context of Ireland's changing electricity generation mix and the move to decarbonisation of the powergen sector as well as the future of coal (Measure RE8 in the draft NMP). | Electricity Generation: The 2015 Energy White Paper envisages that, for the medium term, gas will remain a critical component of our electricity generation mix as we transition to a low carbon energy system. In this context, there may be a role for CCS. This technology involves capturing $CO_2$ from power stations (such as combined cycle gas turbines) and transporting it to geological storage sites. To date, CCS has had very limited deployment at a global level. Subject to commercial and technical considerations, CCS could facilitate decarbonisation of our electricity sector while allowing an appropriate level of gas fired generation to balance intermittent renewable generation. Commercial viability of CCS will be driven by appropriate carbon price signals emerging post reform of the ETS. DCCAE intends to explore the feasibility of utilising reservoirs of $CO_2$ storage. |

| Mitigation Measures Relating to Assessment of Alternatives | | |
|---|---|---|
| **Reference** | **Mitigation** | **Sector response/proposed action** |
| Built Environment – Increased Performance Requirements for New Builds | Carry out an interim review of the "Towards Nearly Zero Energy Buildings in Ireland – Planning for 2020 and beyond" programme within five years of implementation of the programme to determine the success of implementation of the plan and lessons learned. The study should also consider international best practice in building design and emerging technologies that may be employed to further reduce the proposed target of 45kWh/$m^2$/annum. | Built Environment: Cost optimal performance and NZEB will be assessed in 2018 Cost Optimal calculations as required by Directive 2010/31/EU. |
| Built Environment – Incentivising Demand for Retrofit in the existing Residential Sector | This measure should not be ruled out and it is recommended that within the next five years an economic analysis of the existing and potential funding options is undertaken to consider the optimum approach to incentivise retrofit beyond the existing models and this should be used to inform future iterations of the NMP. | Built Environment: Demand for retrofit in the residential sector is already incentivised through SEAI grant programmes. The need to build further demand is recognised and the research undertaken and approaches being pursued is set out in Chapter 4 including testing new approaches such as the Deep Retrofit Pilot. The objective of these pilots and associated measures is to determine the optimum approach to incentivise retrofit beyond the existing models tailored to what will work effectively in an Irish context. The new Behavioural Economics Unit will also inform the development of future initiatives to build further demand for more and deeper retrofit. |

| Mitigation Measures Relating to Assessment of Alternatives | | |
|---|---|---|
| **Reference** | **Mitigation** | **Sector response/proposed action** |
| Built Environment – Implementation of a national ban on coal and/or peat in domestic heating systems. | In tandem with the development of the National Clean Air Strategy, a feasibility study should be undertaken in the implementation of a ban on the use of coal and/or peat in domestic heating systems. The study should consider the environmental implications in addition to the economic and technical implementation. The outcome of this study should be used to inform future iterations of the NMP. | Built Environment – Consideration of the merits of any such study to inform future iterations of the NMP would need to involve many stakeholders including Environment and Energy perspectives. Any such study would need to have regard to the feasibility, practicality of available alternatives for home heating, potential adverse consequences (including attitudinal impacts on the climate action agenda) and the potential to achieve reductions in the use of such fuels through the market and support schemes.<br>Agriculture: This could also be a driver of demand for increased biomass unless other domestic heating technologies are encouraged. |
| Built Environment – Increase of Carbon Tax on fossil fuels for domestic heating. | An environmental and economic study of the impact analysis for options to increase the Carbon Tax on home heating solid fuels and liquid/gas fossil fuels to levels that promote real behaviour change should be undertaken within the next five years to inform the next phase of NMP development. | Built Environment: Consideration of carbon pricing is an overarching issue that would need to be considered by several Government Departments and ultimately be decided on by Government.<br>DCCAE: Action 3 of the NMP commits to an examination of the impact of carbon tax and future tax rate. |

| Mitigation Measures Relating to Assessment of Alternatives | | |
|---|---|---|
| **Reference** | **Mitigation** | **Sector response/proposed action** |
| Electricity Generation – Large Scale Solar PV | Continue to assess solar PV as part of the development of the Renewable Electricity Support Scheme (RESS) currently under development by DCCAE, while taking account of international best practice. | Electricity Generation: The Programme for Government contains a commitment to facilitate the development of solar energy projects in Ireland. This builds on the 2015 Energy White Paper and recognises that solar has the potential to contribute to our renewable electricity targets and to provide a community dividend, thereby also enhancing citizen participation in Ireland's energy future. In the context of development of the new RESS by DCCAE, to be in place in 2018, analysis is ongoing on a range of technologies, including solar PV.<br><br>Agriculture: This should also include consideration of the impacts of large scale solar PV on land use. |
| Electricity Generation – Large Scale Geothermal | It is recommended that a technical and economic feasibility study is carried out, building on the 2004 report, to consider the option of future development of this energy source in Ireland. | Electricity Generation: Geological Survey Ireland will, over the next five years, continue to assess Ireland's geothermal energy potential, from both shallow and deep sources, including by supporting the research of collaborating organisations. Large-scale shallow heat management in urban areas will be investigated. Targeted deep geological settings will include deeply karstified limestone and fracture zones, requiring exploration by onshore seismic surveys and borehole drilling. |

| Mitigation Measures Relating to Assessment of Alternatives | | |
|---|---|---|
| **Reference** | **Mitigation** | **Sector response/proposed action** |
| Electricity Generation – Eliminate Peat Powered Plants | Undertake a feasibility study to address the measures required to discontinue the combustion of peat for electricity. All options for discontinuation of these plants should be considered and a multi criteria analysis undertaken to determine the optimum approach. Environmental criteria should be the primary driver for the decision making process. This study should be undertaken within the next five years to inform decision making for the next NMP and provide a clear roadmap for the phased cessation of peat in this sector. | Energy: The harvesting of peat for electricity generation is expected to cease by 2030. Currently, one of the three peat-fired electricity generating plants (Edenderry, owned by Bord na Móna) co-fires with biomass at levels in excess of 30%. The two ESB plants, West Offaly and Lough Ree, are technically capable of co-firing with biomass and the owners are currently examining the potential for co-firing. The subsidies currently supporting the generation of electricity from peat in these two power stations will cease by end 2019. This will provide a key incentive for the owners of these plants to convert to co-firing. An issue to be overcome is the development of more cost-effective supply chains of biomass.<br><br>Action 24 of the NMP provides that in line with Bord na Mona's sustainability strategy, DCCAE will oversee a review of the future of peat generation plants. |
| Agriculture – Use of Nitrogen Stabilisers | An economic analysis should be undertaken in potential funding models to support farmers and incentivise the application of nitrogen stabilisers in fertiliser application. | Agriculture: Stabilised nitrogen is already reasonably cost competitive and readily available. Therefore DAFM believes KT as part of nutrient management should be sufficient to increase uptake. Market trends will be monitored to assess if further policy intervention is necessary. |
| Transport – Increase of Carbon Tax on petrol/diesel. | An environmental and economic study of the impact analysis for options to increase the Carbon Tax on petrol/diesel to levels that promote real behaviour change should be undertaken within the next five years to inform the next phase of NMP development. | Transport: An environmental and economic study of the impact analysis for options to increase the Carbon Tax in relation to behaviour change is a cross-sectoral measure which would require further consideration from all relevant sectors.<br><br>DCCAE: Action 3 of the NMP commits to an examination of the impact of carbon tax and future tax rate. |

| Mitigation Measures Relating to Assessment of Alternatives | | |
|---|---|---|
| **Reference** | **Mitigation** | **Sector response/proposed action** |
| Transport – Greater Investment in Public Transport to encourage Modal Shift | A mid-season review of the Capital Investment Plan is due in 2017 and this review should be considered a critical opportunity to consider the long term investment needs in the road network and public transport projects (such as BRT). The development of the NMP and the National Planning Framework should be the key cornerstones informing the transport investment in the Capital Plan. | Transport: The Government is embarking on a Mid-Term Review of the Capital Plan, which will take stock of progress and provide the Government with an opportunity to consider the scope for increased levels of investment, including in the transport sector, taking economic growth and fiscal progress into account. The Minister for Transport, Tourism and Sport continues to make the case for public transport investment to be both increased and accelerated as part of that review in order to address growing transport needs. The NMP and the National Planning Framework are essential roadmaps in informing transport investment in the Capital Plan. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| Built Environment – Various | Any funding mechanism that provides for the installation of biomass burning appliances should specify the environmental performance requirements of these appliance in relation to direct emissions to atmosphere in keeping with European air quality performance standards for appliances. Schemes providing support for the uptake of biomass boilers should require that biomass used meet a set of sustainable acceptance criteria. | Built Environment: Where a project receives funding for a stove, the SEAI inspection process as part of their overall quality assurance programme will also include adherence to the (to be published) air quality guidelines. |
| Built Environment – Various | Projects that involve the installation of large heat pumps should consider an accompanying installation for the generation of renewable electricity, e.g. solar PV panels, to offset the indirect impacts due to the consumption of fossil fuels in the powergen sector. In addition, any new heat pump needs to appropriately sized and that this can be encouraged by supporting the installation in a property that has received an extensive energy efficiency upgrade. This "fabric first" to fuel switching in general is current government policy. | Built Environment: Renewable contribution from heat pumps takes account of increasing numbers of consumers choosing to adopt lower carbon options for heating, as costs of electrical technologies decline.<br>Major Renovations requirements are to be introduced in Building Regulations from 2018 and will set whole building performance requirements to apply cost optimal performance levels. These requirements will be reviewed every five years. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| BE20 | Develop an emission performance standard for all conversion technology utilised as part of RHI scheme. The RHI scheme will outline that sustainable biomass should be from indigenous sources. | Built Environment: DCCAE is considering fuel quality standards, minimum technology and energy efficiency standards and whether an emissions performance standard will form part of the final RHI design. The recent public consultation on the design and implementation of the RHI covered these issues, and final decisions on these have yet to be made.<br><br>The RHI will develop sustainability criteria based around lifecycle gas emissions which in all likelihood will result in biomass from Ireland and Europe becoming the primary source of fuel for the RHI. While there is good quality biomass available internationally, it generally falls down in regard to lifecycle gas emissions criteria.<br><br>Whilst the long-term goal is to establish a sustainable domestic biomass market, the domestic resource of biomass is limited and it is likely that imported biomass will be required to play a role in reaching the RES-H 2020 target.<br><br>Overall, DCCAE are open to putting in place a robust set of sustainability criteria in line with recent proposals at the European Union level. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| RE1, RE2, RE3 and RE6 | Continue to support the implementation of the REFIT schemes.<br><br>Publish revised guidelines for wind energy developments to ensure environmental protection measures are a core requirement of such developments.<br><br>Prior to any future support scheme or update to the existing schemes a review of the uptake by community based/local schemes should be undertaken to determine if barriers exist which could be addressed in future schemes.<br><br>Continue to fund research and incentivise market uptake of new bioenergy sources (such as marine renewable energy) which reduces the demand for land use change. | Electricity Generation: The REFIT schemes have been in place for a number of years and the beneficiaries of various schemes will continue to receive support in line with the terms and conditions of relevant schemes and contractual arrangements in place.<br><br>The commitment within the Programme for Government, to update the Wind Energy Development Guidelines falls within the remit of the DHPCLG. In accordance with this commitment, intensive work is underway which aims to finalise, as a matter of priority, a targeted review of the Guidelines in relation to the issues of noise, shadow flicker and proximity and community participation. The proposed new Guidelines will be subject to Strategic Environmental Assessment before they are finalised by Government. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| | | The Programme for a Partnership Government recognises the importance of community participation in renewable energy projects in both the national and local interest. This builds on the 2015 Energy White Paper commitment to widen the opportunity for community and citizen participation in renewable energy projects. This action means providing a range of mechanisms through which citizens can contribute to and benefit from the transition to a low carbon economy and society.<br><br>The participation of community-designated renewable energy projects is being examined as part of the development of the new renewable electricity support scheme (RESS). A detailed assessment of various models for community participation in renewable energy projects is underway, the results of which will be incorporated into the overall design of the new scheme. The focus of this research will be on identifying the appropriate models for community participation in Ireland.<br><br>The provision on an ongoing basis of Exchequer funding to support ocean research, development and demonstration will be critical to the development and commercialisation of new renewable energy technologies and continues to remain a priority. Funding from the Department's Vote supports the development of the renewable energy test sites in counties Mayo, Galway and Cork, the Integrated Maritime Energy Resource Cluster (IMERC) at Ringaskiddy, and the Prototype Development Fund operated by the SEAI.<br><br>Agriculture: This research could be considered under TRAM and should include bioenergy coming from the agri and forest sector. |

## Mitigation Measures Relating to Assessment of Measures

| Reference | Amendment | Sector response and proposed action |
|---|---|---|
| RE5 | In regulating any future prototype technology the requirements of environmental impact assessment and habitat legislation, as appropriate, should be applied to ensure that this funding mechanism does not have significant negative impacts on environmental receptors. An additional policy should be included as follows: *'All investigative and feasibility studies to be carried out in relation to ocean energy infrastructure must include an environmental appraisal which considers the potential effects on the Natura 2000 Network.'* | Electricity Generation: Responsibility for the consenting of offshore renewable energy projects located on the foreshore is a matter for local authorities and/or An Bord Pleanala, as appropriate. In line with legislative requirements, all plans, projects and activities relating to the construction and deployment of renewable energy infrastructure are subject to Screening for AA and/or AA, whichever is deemed necessary, to ensure that there are no significant effects on European sites and/or no adverse effects to European sites integrity. This ensures that the requirements of Article 6(3) and, where necessary, Article 6(4) of the Habitats Directive will be fully satisfied. To date, prototype technology testing is carried out at marine sites in Galway Bay and off Belmullet, Co Mayo. Both of these sites are subject to environmental appraisal to ensure that the requirements of Article 6(3) and, where necessary, Article 6(4) of the Habitats Directive are fully satisfied. Given that many of the projects under the '*Prototype Fund*' currently relate to much lower Technology Readiness level scales than those suitable to pre-commercial deployment, DCCAE recommends that the proposed recommendation be amended to the following:<br><br>*'Investigative and feasibility studies carried out in relation to the at sea deployment of an ocean energy infrastructure must be screened for AA to consider the potential effects on the Natura 2000 Network. Based on the screening exercise the relevant competent authority will confirm the level of further environmental appraisal required'* |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| RE7 | It is recommended that the DCCAE commission research on future demand for interconnection requirements, including the technical, regulatory and economic aspects. | Electricity Generation: The Department intends to commission research in 2017 into the merits of further electricity interconnection for Ireland. The study is proposed as a means to provide evidence for the further development of national policy on electricity interconnection. The study will embrace economic and technical aspects. In parallel with this national policy initiative, the CER has commenced a process that will see the development of a regulatory policy for electricity interconnectors. |
| RE8 | Undertake a feasibility study to identify the most suitable replacement low carbon technology for the Moneypoint Power Station. All options for the plant should be considered and a multi criteria analysis undertaken to determine the optimum approach. Environmental criteria should be a key driver for the decision making process. This study should be undertaken within the next two years to inform decision making for the next NMP and provide a clear roadmap for the future of the Moneypoint facility. | Electricity Generation: The Government's 2015 Energy White Paper and the 2016 Programme for a Partnership Government both commit to identifying, before 2020, the most suitable replacement low carbon generation technology for Moneypoint. In the context of that commitment, the DCCAE will examine the work done to date in relation to the future of Moneypoint. A wider study, currently underway by the ESB, which will examine all potential technologies, and other issues such as system stability, site issues, and security of supply will also be examined by the DCCAE. These studies together with discussions with ESB and other stakeholders such as EirGrid and CER will be considered by DCCAE and inform the need for a feasibility study. |

## Mitigation Measures Relating to Assessment of Measures

| Reference | Amendment | Sector response and proposed action |
|---|---|---|
| AF1 | Consideration should be given to the inclusion of this measure in the draft NMP without additional information to support the GHG reduction credentials. In future negotiations with the EU on CAP reform the DAFM should request the option of including GHG based measures within the mandatory GAEC requirements across the EU. | Agriculture: This measure should be included in the NMP. Given that the Nitrates directive forms a key component of CAP cross compliance and Ireland has a whole territory approach to its implementation, it forms a key measure to limit nitrogen applications to land and to limit stocking intensity.<br>Also it is recognised that GAEC and greening requirements of Pillar 1 form a key means to protect soil carbon pools such as under permanent pasture. In Ireland's case it is estimated that the carbon pool under grassland extends to 2.2bn tonnes $CO_2$eq.<br>Under the current CAP reform discussion just commenced it is recognised that climate action should form an important element of the future CAP. However it should be noted that CAP is common across MS so there must be general agreement. |
| AF2 | DAFM should undertake annual reviews of the reported reductions under GLAS to correlate the gains reported under this scheme against the annual emissions trends reported by the EPA for the Agriculture Sector. Such a measure will be required to track the real gains achieved by measures such as the GLAS. | Agriculture: The impact of all RDP Schemes is captured under the evaluation plan for the RDP, and this is done on an annual basis – this includes impacts on agricultural emissions as a context indicator. There are additional evaluation questions to be answered in 2017 and 2019 as part of enhanced evaluation reporting requirements and any specific or additional analysis on contributions towards mitigation can be incorporated where relevant under GLAS or other relevant Schemes to answer a series of common evaluation questions (CEQs), which are quite broad and seek to identify actions which make contributions under various focus areas under the RDP. DAFM is open to considering incorporation of any additional information to facilitate answering the additional CEQs in particular. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| AF4 | It is recommended that this measure is removed from the draft NMP in the absence of further details on the GHG reduction capacities offered by the BETTER Farm programme. While the programme has its merits, it offers little net gain in relation to mitigation of GHG measures. | Agriculture: In the National Mitigation Plan, four measures have been highlighted (AF4 & AF7 BETTER Farms, AF5 Pasture Profit Index and AF9 Carbon Navigator). Each of these measures as stand alone would do little to reduce GHG emissions. However, taken as part of a linked strategy between research, KT and policy, they are key tools for achieving climate targets.<br><br>The Better farms programme is also a key means of using the farming media to communicate with farmers the merits of improved animal breeding, animal health and soil and grassland management which are key components of reducing emissions intensity of production and thus the concept of producing more with less. The BETTER farm programme is a key demonstration tool with which to improve uptake of measures. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| AF5 | As part of the PPI tool, an analysis of the environmental implications of each of the grass varieties should be undertaken to determine the net benefits/impacts associated with grass types. Where net negative impacts are identified for any variety this should be communicated to farmers and the continued use of such varieties should be reviewed. | Agriculture: The Pasture Profit Index was developed in order to help farmers maximise utilisation of pasture by paddock grazing, along with optimising levels of Lime, NPK will help to maximise output per livestock unit. Taken in isolation, maximising grass growth might lead to an increase in GHG due to increased use of fertilisers. However, combined with nutrient management planning and optimised slurry management, optimal pasture utilisation could reduce $N_2O$ and also enhance carbon sequestration as long as overstocking does not occur. Grassland sequestration via enhanced growth and slurry management is estimated at a maximum of 0.3 Mt $CO_2$-e yr-1. The related, PastureBase Ireland aims to get livestock out to grass early and ensure an adequate supply of good-quality leafy grass. This will reduce methane emissions by minimising the amount of silage and supplemental feed in the diet and improving feed quality and promote grass regrowth. |
| AF6 | Carry out a detailed emissions study on the combustion of all types of ABP employed in Ireland to devise a set of guidance/regulations to restrict the use of combustion installations where there is no net negative emission to atmosphere. | Agriculture: DAFM has concerns in relation to this recommendation on the basis that there are already environment led regulations – EU Animal By-Products Regulations – that take account of air quality issues |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| AF9 | Annual reviews of the update in the Carbon Navigator should be undertaken to correlate the gains reported under this scheme against the annual emissions trends reported by the EPA for the Agriculture Sector. Such a measure will be required to track the real gains achieved by measures such as the Carbon Navigator and Origin Green. | Agriculture: Teagasc and Bord Bia have jointly developed the Farm Carbon Navigator, an on-farm KT tool to aid farmers and advisors in selecting cost-effective/cost-beneficial mitigation options that are customised for their individual farming system and environment. Importantly it is a simple tool, free of jargon, to help farmers decide what will work on their farm. These cost-effective mitigation measures were identified in the 2012 MACC (Schulte et al. 2012). Bord Bia publish an annual sustainability report which describes trends in Carbon navigator results.<br><br>Teagasc also prepare annual sustainability indicators as part of the national farm survey work. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| AF10 | Afforestation in sensitive catchments e.g. FPM catchments, oligotrophic lakes and hard water lakes, should be carefully considered, subject to the requirements of Article 6(3) and, where necessary, Article 6(4) of the Habitats Directive. While the top eight FPM catchments are being prioritised, the strategy for the remaining 19 remains unclear within the plan. | Agriculture: The Forest Service Forestry & Freshwater Pearl Mussel (FPM) Requirements have been in force since the year 2008, and apply to all forestry activities, including afforestation, within 6km of Freshwater Pearl Mussel populations in rivers designated as special areas of conservation (SAC) for the species. The DAFM's Plan for Forestry and FPM in Ireland is currently being drafted, and this will apply to all 27 FPM catchments, including the Priority 8.<br><br>The Forest Service applies AA Screening, and where necessary, AA, regarding any possibility of a significant effect on a NATURA site arising from regulated forestry activities. Further safeguards are laid down in the Land Types for Afforestation and the Environmental Requirements for Afforestation documents and the Acid Sensitivity Protocol, all available on the DAFM website (the latter within the Forestry Standards Manual). Furthermore, DAFM's Native Woodland Scheme is being used to develop new native woodlands and to restore existing native woodlands (including conversion from conifer forest to native woodland), to (inter alia) deliver water-related ecosystem services (as reflected in the DAFM's Woodlands for Water document). DAFM also assesses forest and water research and related demonstration projects, from HYDROFOR to the KerryLIFE FPM project, on a continual basis. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| T3 and T18 | To further incentivise purchase and operation of the Low Emission Vehicles (LEV) (Measures T3 and T18) DTTAS should carry out an economic analysis to consider the options for further subsidies for these vehicles and how such measures may be financed. As outlined in Section 8.7.2 of the SEA Environmental Report, an alternative for consideration relates to the further increase in carbon tax on fossil fuels (over and above that proposed in T20) in transport with subsequent ring fencing of these funds for more sustainable transport and/or alternative fuels. | Transport: The Low Emission Vehicles (LEV) Taskforce was established in line with the commitment within The Programme for a Partnership Government. The main objective of this taskforce is to consider and investigate the range of measures available to Government to accelerate the take-up of low carbon technologies, especially EVs. The options for further subsidies of LEVs and how such measures will be financed will be analysed in this context.<br>DCCAE: Action 3 of the NMP commits to an examination of the impact of carbon tax and future tax rate. |
| T11 | The integration of the transport measures listed in the draft NMP and any broader principles relating to sustainable travel should be fully incorporated and enhanced into the National Planning Framework to ensure the potential for synergy between the plans is maximised. | Transport: During the development of the NPF, DHPCLG, the NTA and DTTAS are working together closely to secure better integration of land use and transport planning to deliver efficient and cleaner transport. |
| T21 | Future development of the Biofuels Obligation Scheme under Measure T21 should ensure that the biofuel blend is maintained at less than 15% in the absence of any new research on the broader environmental implications. | Transport: It is intended that the biofuel obligation will be incrementally increased on a sustainable basis between 2018 and 2020 to assist meeting the renewable transport target of 10% in 2020. The incremental increases will take cognisance of any new research developments including those on the broader environmental implications. It is proposed to hold a consultation on further increases to the obligation rate to 2020 in 2017. |

| Mitigation Measures Relating to Assessment of Measures | | |
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| **Reference** | **Amendment** | **Sector response and proposed action** |
| T23 | Any development of a National Policy on Parking should be devised primarily based on the hierarchy of environmental impact with primacy for walking, cycling, followed by public transport, followed by low emission vehicles (such as electric vehicles) and finally private petrol/diesel vehicles. The policy needs to provide precise guidelines for local authorities and should be rigorously enforced to ensure the policy is not employed as a revenue stream and retains integrity as an effective environmental measure. A trial implementation in a number of areas should be considered. | Transport: Development of a National Policy on Parking is a key longer-term objective of DTTAS. Parking requirements and behaviour will be strongly influenced over the coming years by a range of factors including the further advancement of an integrated public transport system, the emerging role of a sharing economy approach to vehicle ownership and use and implementation of a new National Planning Framework. These and other evolving considerations will need to be given due regard in building such a policy. |

| Broader Mitigation Measures presented in the SEA Environmental Report | | |
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| **Reference** | **Amendment** | **Sector response/proposed action** |
| Monitoring and implementation | Establishment of an interdepartmental planning and monitoring group. | Implementation of the National Mitigation Plan will require strong governance and accountability, including oversight by the Oireachtas, independent advice from the Climate Change Advisory Council and as coordination across Government supported by continuing investment and robust technical and analytical input.<br><br>A National Mitigation Plan Steering Group will be established to drive implementation of the Plan. The Steering Group will meet at least once every quarter and will report to the relevant Cabinet Committee.<br><br>Reported progress on implementation will be via Annual Transition Statements, provided for in the Climate Action and Low Carbon Development Act 2015. The Annual Transition Statement will include an annual progress report on the implementation of the National Mitigation Plan from 2018 onwards. |
| Behaviour change in the Transport Sector | Set up a Behavioural Economics Unit for the transport sector. | DTTAS has dedicated Sustainable Transport and Climate Change Units that employ latest research, best practices and international experience when developing and reviewing policies. In addition, DTTAS proposes that a Behavioural Economics Working Group will be established in 2017 to investigate the most effective methods to motivate substantial modal shift. Furthermore, the Behavioural Economics Unit within SEAI will consider the transport sector whilst evaluating clean energies in Ireland and DTTAS will study their findings. |

| Mitigation Measures presented in the Natura Impact Statement | | |
|---|---|---|
| **Reference** | **Amendment** | **Sector response/proposed action** |
| Proposed New Mitigation Measure 1 | Include the following European Site Protection Policy:<br>*Ensure that all plans, projects and activities requiring consent [as defined under Part 1 of the Birds and Natural Habitats Regulations 2011, as amended] arising from the National Mitigation Plan are subject to Screening for Appropriate Assessment and/or Appropriate Assessment, whichever is deemed necessary, to ensure there are no likely significant effects on European Sites and/or no adverse effects to European Site integrity. The requirements of Article 6(3) and, where necessary, Article 6(4) of the Habitats Directive must be fully satisfied.*<br>Further detail is provided for in **Section 7.1** of the NIS. | Electricity Generation: Responsibility for consenting of electricity generation projects under the planning code is a matter for local authorities and/or An Bord Pleanala, as appropriate. In line with legislative requirements, all projects relating to the construction of renewable electricity generation infrastructure remain subject to Screening for AA and/or AA, whichever is deemed necessary, to ensure that there are no significant effects on European sites and/or no adverse effects to European sites integrity. The requirements of Article 6(3) and, where necessary, Article 6(4) of the Habitats Directive will be fully satisfied. County development plans may also contain objectives to support renewable energy as well as environmental protection and all development plans are subject to AA.<br>Transport: DTTAS is supportive of this inclusion.<br>Agriculture: While it is largely a procedural recommendation which is already a legal requirement, it serves to remind as to these legal obligations for any plan project or activity coming under the Birds and Natural Habitats Regulations 2011. However, care should be taken not to have retrospective impact on existing plans and programmes already covered under separate AA/NIS processes. Suggested re wording as follows: |

| Mitigation Measures presented in the Natura Impact Statement | | |
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| **Reference** | **Amendment** | **Sector response/proposed action** |
| *Proposed New Mitigation Measure 1 (continued)* | | "Ensure that **any new** plans, projects and activities requiring consent [as defined under Part 1 of the Birds and Natural Habitats Regulations 2011, as amended] arising from the National Mitigation Plan are subject to Screening for AA and/or AA, whichever is deemed necessary, to ensure there are no likely significant effects on European Sites and/or no adverse effects to European Site integrity. The requirements of Article 6(3) and, where necessary, Article 6(4) of the Habitats Directive must be fully satisfied." |
| Proposed New Mitigation Measure 2 | Include the following European Site Protection Policy:<br>*All investigative and feasibility studies to be carried out in relation to any of the four sectors (built environment, electricity generation, agriculture/ forest and transport) must include an environmental appraisal which considers the potential effects on the Natura 2000 Network.*<br>Further detail is provided for in **Section 7.1** of the NIS**.** | Electricity Generation: Responsibility for consenting of electricity generation plans, projects and activities is a matter for local authorities and/or An Bord Pleanala, as appropriate. All investigative and feasibility studies to be carried out in relation to renewable electricity generation which require AA will include an environmental appraisal which considers the potential effects on the Natura 2000 Network.<br>Transport: DTTAS is supportive of this inclusion.<br>Agriculture: This is a useful suggestion and should be taken into account. |

| Mitigation Measures presented in the Natura Impact Statement | | |
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| **Reference** | **Amendment** | **Sector response/proposed action** |
| *Proposed New Mitigation Measure 2 (continued)* | | However, the need to oblige all studies is questionable and may lead to unnecessary additional costs, where not necessarily relevant. In any case proposed measure 1 will override in legal terms where specific threats or significant issues are likely to arise.<br><br>Suggested rewording as follows:<br><br>"All investigative and feasibility studies to be carried out in relation to any of the four sectors (built environment, electricity generation, agriculture/ forest and transport) must include an environmental appraisal which considers the potential effects on the Natura 2000 Network, **where appropriate**." |
| Proposed New Mitigation Measure 3 | Include the following Protection Policy in order to highlight statutory obligations in relation to nature conservation, with a particular emphasis on habitats/species protected under the Habitats Directive:<br><br>The DCCAE in conjunction with the DHPCLG and SEAI will produce guidance to outline the potential ecological constraints (e.g. presence of bat species, Pine marten and potential disturbance to other species) that need to be considered prior to retrofitting premises with energy efficiency measures such as attic and internal/external wall insulation. The guidance should place a particular emphasis on habitats/ species protected under the Habitats Directive, but should also outline protection afforded to habitats/ species under the Wildlife Act 1976 (as amended). | Built Environment: SEAI will continue to have due regard to the relevant Guidance that already exists e.g. the Code of practice for the energy efficient retrofit of dwellings (SR54 of 2014) which inter alia points to the Bat Mitigation Guidelines which provides advice on how to minimise the impact of works on bats, and draw the attention of relevant operators to such guidance where it may be relevant to works supported through SEAI supported programmes. Should additional guidance be necessary, SEAI will consult with relevant stakeholders to develop appropriate further guidance. |

| Mitigation Measures presented in the Natura Impact Statement | | |
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| **Reference** | **Amendment** | **Sector response/proposed action** |
| *Proposed New Mitigation Measure 3 (continued)* | The guidance should outline the processes that need to be followed should protected habitats/species be encountered, namely the AA process and any NPWS licensing that may be required.<br><br>This guidance should be aimed for use by approved suppliers for the various residential/commercial retrofitting schemes as well as for use by applicants to the schemes to ensure European protected habitats/species are considered at the earliest stage of the process. | |
| Proposed New Mitigation Measure 4 | Any funding mechanism that provides for the funding or installation of biomass burning appliances should specify the environmental performance requirements of these appliances in relation to direct emissions to atmosphere in keeping with European air quality performance standards for appliances.<br><br>Schemes providing support for the uptake of biomass boilers should require that biomass used be supplied from sustainable sources.<br><br>Further detail is provided for in **Section 7.1** of the NIS**.** | Agriculture: Biomass boilers are currently funded under the TAMS II Scheme, however only proprietary biomass boilers shall be used. They are required to be installed in strict accordance with the manufacturers' instructions and shall only be used to heat pig houses. DAFM would have no issue with the appliances specifying the environmental performance requirement in relation to direct emissions.<br><br>DAFM also has a horticulture scheme that supports use of biomass burners.<br><br>Built Environment: Where a project receives funding for a stove, the SEAI inspection process as part of their overall quality assurance programme will also include adherence to the (to be published) air quality guidelines. |
| Proposed New Mitigation Measure 5 | Carry out a detailed emissions study on the combustion of all types of ABP employed in Ireland to devise a set of guidance/regulations to restrict the use of combustion installations where there is no net negative emission to atmosphere.<br><br>Further detail is provided for in **Section 7.1** of the NIS**.** | Agriculture: DAFM has concerns in relation to this recommendation on the basis that there are already environment led regulations – EU Animal By-Products Regulations – that take account of air quality issues. |

| Mitigation Measures presented in the Natura Impact Statement | | |
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| **Reference** | **Amendment** | **Sector response/proposed action** |
| Proposed New Mitigation Measure 6 | Afforestation in sensitive catchments e.g. of the Freshwater Pearl Mussel (FPM), oligotrophic lakes and hard water lakes, should be carefully considered, subject to the requirements of Article 6(3) and, where necessary, Article 6(4) of the Habitats Directive. While the top eight FPM catchments are being prioritised, the strategy for the remaining 19 remains unclear within the plan.<br><br>Further detail is provided for in **Section 7.1 in the NIS.** | Agriculture: The Forest Service Forestry & Freshwater Pearl Mussel Requirements have been in force since the year 2008, and apply to all forestry activities, including afforestation, within 6km of Freshwater Pearl Mussel populations in rivers designated as SACs for the species. The DAFM's Plan for Forestry and FPM in Ireland is currently being drafted, and this will apply to all 27 FPM catchments, including the Priority 8.<br><br>The Forest Service applies AA Screening, and where necessary, AA, regarding any possibility of a significant effect on a NATURA site arising from regulated forestry activities. Further safeguards are laid down in the Land Types for Afforestation and the Environmental Requirements for Afforestation documents and the Acid Sensitivity Protocol, all available on the DAFM website (the latter within the Forestry Standards Manual). Furthermore, the Department's Native Woodland Scheme is being used to develop new native woodlands and to restore existing native woodlands (including conversion from conifer forest to native woodland), to (inter alia) deliver water-related ecosystem services (as reflected in the DAFM's Woodlands for Water document). The Department also assesses forest and water research and related demonstration projects, from HYDROFOR to the KerryLIFE FPM project, on a continual basis. |

# Annex 3 – Key Milestones in the Development of Climate Policy and Legislation

| Year | Milestone | Lead |
|---|---|---|
| **2011** | Publication of a comprehensive policy review which set the backdrop for a new and constructive national debate on the climate challenge | DECLG |
| **2012** | Publication of the *Programme for the development of national climate policy and legislation* | DECLG |
| | Public Consultation – developing climate policy and legislation | DECLG |
| | Publication of *Towards a New National Climate Policy: Interim Report of the NESC Secretariat (June 2012)* | NESC Secretariat |
| | Publication of *Ireland and the Climate Change Challenge: Connecting 'How Much' with 'How To'. Final Report of the NESC Secretariat to the Department of Environment, Community and Local Government (December 2012)* | NESC Secretariat |
| **2013** | *Report on the Outline Heads of the Climate Action and Low Carbon Development Bill 2013* | Joint Oireachtas Committee on the Environment, Culture and the Gaeltacht |
| | Public Consultation – Development of an Agriculture Sectoral Low Carbon Roadmap | DAFM |
| | Public Consultation – *2050 Low Carbon Roadmaps Electricity Generation Sector – Scoping Report* | DCENR |
| | Public Consultation – *Preparation of Low Carbon Roadmap for Transport* | DTTAS |
| **2014** | Public Consultation – *Scoping Report on Low Carbon roadmapping for the Built Environment Sector* | DECLG, DCENR |
| | Publication of the *National Policy Position on Climate Action and Low Carbon Development* | DECLG |
| **2015** | Publication of the *Climate Action and Low Carbon Development Bill 2015* | DECLG |
| | Public Consultation – *A discussion document on the potential for greenhouse gas mitigation within the Agriculture and Forestry Sector* | DAFM |

| Year | Milestone | Lead |
|---|---|---|
| | Seminar – Information Exchange on Mitigation – Transport | DTTAS |
| | Consultation Seminar – Potential for greenhouse gas mitigation in the Agriculture and Forest Sector | DAFM |
| | Engagement of consultants to undertake Strategic Environmental Assessment and Appropriate Assessment of the National Mitigation Plan | DECLG |
| | Public Consultation – *Invitation to submit views on the development of Ireland's first National Low Carbon Transition & Mitigation Plan* | DECLG |
| | Public Consultation – *Strategic Environmental Assessment (SEA) Scoping Report for the National Mitigation Plan* | DECLG |
| | Enactment of the Climate Action and Low Carbon Development Act 2015 | DECLG |
| **2016** | Establishment of the Climate Change Advisory Council | DECLG |
| | Publication of the first statutory *Annual Transition Statement 2016* | DCCAE |
| | Publication of *Climate Change Advisory Council First Report* | CCAC |
| **2017** | Publication of *Briefing Document on Ireland's First National Mitigation Plan* | DCCAE |
| | Public Consultation: *Draft National Mitigation Plan, Strategic Environmental Assessment Environmental Report and Appropriate Assessment Natura Impact Statement* | DCCAE |
| | Publication of Ireland's first statutory National Mitigation Plan | DCCAE |

# Annex 4 – Climate Action and Low Carbon Development National Policy Position Ireland

National climate policy in Ireland –

- recognises the threat of climate change for humanity;
- anticipates and supports mobilisation of a comprehensive international response to climate change, and global transition to a low carbon future;
- recognises the challenges and opportunities of the broad transition agenda for society; and
- aims, as a fundamental national objective, to achieve transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050.

The wider context for national climate policy includes –

- existing and future obligations of the State under international agreements;
- the commitment by Ireland to the United Nations Framework Convention on Climate Change (herein after referred to as the Convention), and its ultimate objective of achieving stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system – to be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner;
- the European Union objective, in the context of necessary reductions according to the Intergovernmental Panel on Climate Change by developed countries as a group, of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990;
- existing and future obligations of the State under the law of the European Union; and
- the evolution of climate policy within the European Union and at a wider international level under the Convention.

The evolution of climate policy in Ireland will be an iterative process, based on the adoption by Government of a series of national plans over the period to 2050. Greenhouse gas mitigation and adaptation to the impacts of climate change will be addressed in parallel national plans – respectively through National Low-Carbon Roadmaps and National Climate Change Adaptation Frameworks.

The National Low-Carbon Roadmaps and the National Climate Change Adaptation Frameworks will constitute key pillars of the process through which Government will develop and progress, mitigation and adaptation policy in order to enable the State to pursue and achieve transition to a low carbon, climate-resilient and environmentally sustainable economy in the period to 2050. The series of national plans will be adopted and reviewed on a structured basis, with authority set down in primary legislation, to ensure a coherent and comprehensive policy across all key sectors, and to provide maximum clarity and policy certainty for business and stakeholders generally. The structural basis for national plans on mitigation and adaptation will reflect Government commitment to transparency and inclusiveness. Accountability on national policy will include annual reporting to Dáil Éireann.

The low carbon roadmapping process will be guided by a long-term vision of low carbon transition based on –

- an aggregate reduction in carbon dioxide ($CO_2$) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors; and
- in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

The National Climate Change Adaptation Framework will articulate a strategic policy context for appropriate action at a sectoral and local level, in response to the impacts of climate change in Ireland in the shorter and longer term. The objective of the Framework will be to inform and mobilise an integrated approach, involving all stakeholders on all institutional levels, to ensure that adaptation measures are taken and implemented, including through incorporation into future investment plans where appropriate, to manage and reduce sectoral and local vulnerability to the negative impacts of climate change. The Framework will provide a clear mandate for Government Departments, agencies and local authorities to develop and implement sectoral and local adaptation plans.

Key issues for consideration in the on-going evolution of national climate policy include –

- the need to take a long-term view, having regard to –
  - obligations of the State under the law of the European Union or any international agreement to which Ireland is a Party;
  - likely future greenhouse gas mitigation commitments of the State and the economic imperative for early and cost-effective action; and
  - the requirement to be able to act quickly in response to economic and environmental occurrences and circumstances;
- the promotion of sustainable development;
- the need to ensure that objectives are achieved at the least cost to the national economy and that any measures adopted to achieve those objectives are cost-effective, and do not impose an unreasonable burden on the Exchequer;
- the need to take advantage of environmentally sustainable economic opportunities both within and outside the State;
- the need to ensure a coherent and cost-effective approach to the twin challenges of sustainable food production and climate change in the agriculture and land use sector;
- relevant scientific or technical advice; and
- relevant research on effective measures for mitigation and adaptation.

# Annex 5 – Acronyms

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|---|---|
| **AA** | Appropriate Assessment |
| **ABP** | Animal By Products |
| **ACA** | Accelerated Capital Allowance |
| **AER** | Alternative Energy Requirement |
| **AFOLU** | Agriculture, Forestry and Other Land Use |
| **BAU** | Business As Usual |
| **BEC** | Better Energy Communities |
| **BEH** | Better Energy Homes |
| **BER** | Building Energy Rating |
| **BEV** | Battery Electric Vehicle |
| **BEWH** | Better Energy Warmer Homes |
| **CAP** | Common Agricultural Policy |
| **CBA** | Cost Benefit Analysis |
| **CCAC** | Climate Change Advisory Council |
| **CCGT** | Combined Cycle Gas Turbine |
| **CCS** | Carbon Capture and Storage |
| **CEF** | Connecting Europe Facility |
| **CER** | Commission for Energy Regulation |
| **$CH_4$** | Methane |
| **CNG** | Compressed natural gas |
| **$CO_2$** | Carbon Dioxide |
| **$CO_2$eq** | Carbon Dioxide equivalent |
| **COFORD** | Council for Forest Research and Development |
| **D/Finance** | Department of Finance |
| **DAFM** | Department of Agriculture, Food and the Marine |
| **DCCAE** | Department of Communications, Climate Action and Environment |
| **DES** | Department of Education & Skills |
| **DHPCLG** | Department of Housing, Planning, Community and Local Government |
| **DJE** | Department of Justice and Equality |
| **DJEI** | Department of Jobs, Enterprise and Innovation |
| **DPER** | Department of Public Expenditure and Reform |
| **DTTAS** | Department of Transport, Tourism and Sport |
| **EEA** | European Economics Area |
| **EIP** | European Innovation Partnership |
| **EPA** | Environmental Protection Agency |
| **ESC** | Environmental Sustainability Committee |
| **ESD** | Effort Sharing Decision |
| **ESR** | Effort Sharing Regulation |

| | |
|---|---|
| **ETS** | Emissions Trading Scheme |
| **EU** | European Union |
| **EXEED** | Excellence in Energy Efficient Design |
| **FAB** | Functional Airspace Block |
| **FBB** | Forest-based Biomass |
| **FIRM** | Food Institutional Research Measure |
| **FORI** | Forest Research Ireland |
| **GDP** | Gross Domestic Product |
| **GHG** | Greenhouse Gas |
| **GLAS** | Green Low Carbon Agri-Environment Scheme |
| **GNP** | Gross National Product |
| **GWh** | GigaWatt hours |
| **HGV** | Heavy Goods Vehicle |
| **HSE** | Health Service Executive |
| **ICAO** | International Civil Aviation Organisation |
| **IEA** | International Energy Agency |
| **IFA** | Irish Farmers Association |
| **IMERC** | Integrated Maritime Energy Resource Cluster |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **ITS** | Intelligent Transport Systems |
| **kha** | thousand hectares |
| **KT** | Knowledge transfer |
| **kt** | kilotonne |
| **ktoe** | kilotonne of oil equivalent |
| **kWh** | kiloWatt hours |
| **LEV** | Low Emission Vehicle |
| **LNG** | Liquid Natural Gas |
| **LULUCF** | Land Use, Land Use Change and Forestry |
| **MACC** | Marginal Abatement Cost Curve |
| **Mt** | Million tonnes |
| **MW** | MegaWatt |
| **$N_2O$** | Nitrous Oxide |
| **NDC** | Nationally Determined Contributions |
| **NDCA** | National Dialogue on Climate Action |
| **NEEAP** | National Energy Efficiency Action Plan |
| **NESC** | National Economic and Social Council |
| **NMP** | National Mitigation Plan |
| **NORA** | National Oil Reserves Agency |
| **NPF** | National Planning Framework |
| **NPWS** | National Parks and Wildlife Service |

| | |
|---|---|
| **NTA** | National Transport Authority |
| **NZEB** | Nearly Zero Energy Buildings |
| **OECD** | Organisation for Economic Co-operation and Development |
| **OPW** | Office of Public Works |
| **OREDP** | Offshore Renewable Energy Development Plan |
| **PHEV** | Plug-in Hybrid Electric Vehicle |
| **PJ** | PetaJoule |
| **PSO** | Public Service Obligation |
| **PV** | Photovoltaic |
| **RDP** | Rural Development Programme |
| **REFIT** | Renewable Energy Feed-in Tariff |
| **RES** | Renewable Energy Share |
| **RES-E** | Renewable Energy Share – Electricity |
| **RES-H** | Renewable Energy Share – Heat |
| **RESS** | Renewable Electricity Support Scheme |
| **RES-T** | Renewable Energy Share – Transport |
| **RHI** | Renewable Heat Incentive |
| **RTP** | Rural Transport Programme |
| **SAC** | Special Areas of Conservation |
| **SEA** | Strategic Environmental Assessment |
| **SEAI** | Sustainable Energy Authority of Ireland |
| **SEM** | Single Electricity Market |
| **SME** | Small and Medium Enterprises |
| **TAMS** | Targeted Agricultural Modernisation Schemes |
| **TRAM** | Technical Research and Modelling Group |
| **TSO** | Transmission System Operator |
| **UN** | United Nations |
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **VRT** | Vehicle Registration Tax |

# Annex 6 – References

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