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# National Air Pollution Control Programme (NAPCP)



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**Note**

This document conforms to the format for reporting policies and measures under the National Air Pollution Control Programme (NAPCP), in accordance with Article 10(1) of Directive (EU) 2016/2284. This is the first iteration of the NAPCP report for Ireland, which comes under Article 6(10) of Directive (EU) 2016/2284 and is due on 1 April 2019. The NAPCP must report on both air quality and air pollution emissions of NO<sub>x</sub>, SO<sub>x</sub>, NMVOC, NH<sub>3</sub>, and PM<sub>2.5</sub>. It is henceforth to be submitted every fourth year.

## 1. Introduction

### 1.1 Policy context

Reporting of national air pollutants and air quality is an obligation for all European member states. Annual emissions of atmospheric pollutants and limits for ambient air quality are primarily regulated in European member states under the National Emissions Ceilings Directive [2016/2284/EU] (NECD) and the Ambient Air Quality and Cleaner Air for Europe Directive [2008/50/EC] (AAQD) respectively. Where a member state anticipates a breach of these directives at the time of the National Air Pollution Control Plan (NAPCP) drafting, the NAPCP requires that the member state sets out specific actions to address the breach and thereby avoid non-compliance.

The development of this first NAPCP is being undertaken in parallel with a number of other relevant national policy frameworks in Ireland and this presents significant challenges in terms of sequencing and integration. There is a strong, collegiate, motivation in achieving a broad and coherent national response to the numerous environmental challenges facing Ireland. Relevant plans and strategies in the current Irish policy arena include:

#### **National Energy and Climate Plan (NECP)**

A comprehensive draft plan has been submitted and the final NECP is under development. The NECP addresses national ambitions and actions in relation to renewable energy, energy efficiency and climate actions in Ireland. Similar to the NAPCP, the NECP is a required report to the European Commission.

#### **National Development Plan (NDP)**

The NDP presents a sustainable economic development plan for Ireland to guide development patterns and related investments while underpinning the National Planning Framework (NPF)/Project Ireland 2040. Action 8 of the NDP Ireland outlines investment priorities to support transition to a low-carbon and climate resilient society.

#### **Clean Air Strategy (CAS)**

The National Clean Air Strategy will provide an overarching policy framework within which clean air policies can be formulated and given effect in a manner consistent with national, EU and international policy considerations and priorities.

Between the NECP, NDP, CAS and NAPCP there are many overlapping elements that generally offer synergistic environmental outcomes. In this NAPCP several of the broader Policies and Measures

(PaMs) within these plans and strategies are captured in summary form to convey the level of activity in this context in Ireland. However, as required, there is also a more detailed focus on the PaMs that are identified to help address the anticipated exceedance for NH<sub>3</sub> in the 2020 and 2030 NECD phases, as well as the NO<sub>x</sub> and NMVOC exceedances for the 2030 NECD phase. These potential 'additional' measures are discussed in more detail as part of this report.

## 1.2 Summary consultation

This NAPCP reporting incorporates elements from a number of connected National strategies and plans, primarily the Clean Air Strategy and the National Energy and Climate Plan. It should be noted that the NECP incorporates the main actions under the NDP, which in turn underpins the National Planning Framework/Project Ireland 2040. There are efforts to integrate all of these elements in a coherent manner. In parallel, there is also a new All of Government Climate Action plan under development at the time of writing. While this national initiative is not expected to be finalised in time for inclusion in this report the considerable activity underway is noted.

In regard to consultation, the CAS, NECP and NPF have undergone their own independent consultation processes. Links to these consultations are as below, and further details of any individual consultation can be provided on request.

CAS - <http://tiny.cc/NCAS-IRL>

NECP - <http://tiny.cc/NECP-IRL>

NPF - <https://tinyurl.com/NPF-IRL>

In regard to the NAPCP, and in line with the requirement that it would also undergo a consultation process in advance of dissemination of the plan to the EU, the NAPCP has been released for public consultation for the requisite period between the 15<sup>th</sup> April 2019 and 5<sup>th</sup> July 2019.

## 1.3 Layout of the document

The layout of this document has been guided by the Commission Implementing Decision (EU) 2018/1522 of 11 October 2018 which sets out a common format for the National Air Pollution Control Programmes under Directive 2016/2284. Further support was drawn from the Guidance on the elaboration and implementation of the NAPCP under the new National Emissions Ceiling Directive

(Ricardo, 2018<sup>1</sup>). The optional executive summary section has been excluded in favour of delivering a concise yet comprehensive analysis in each of the requisite sections for this first NAPCP report.

## 2. The National Air Quality and Pollution Policy Framework

EU Decision 2018/1522 reference section 2.3.

### 2.1 Policy priorities and their relationship to priorities set in other relevant policy areas

The pollutant-specific quantitative reduction commitments are as defined in Table 1. The ceilings are presented as a proportional reduction in emissions relative to the inventory reported national emissions of the pollutant in 2005<sup>2</sup>. These ceilings are in force for the period from 2020-2029 and then from 2030 onwards where there is an increase of ambition for emission reductions across all pollutants.

Table 1. National Emissions Ceiling Directive reduction commitments from 2020 and 2030 (EU reference 2.3.1.)

NECD Reduction Commitments for the 2020 and 2030 Periods relative to 2005 Base Year	SO <sub>2</sub>	NO <sub>x</sub>	NMVOC	NH <sub>3</sub>	PM <sub>2.5</sub>
<b>Ceilings from 2020-2029</b>	65%	49%	25%	1%	18%
<b>Ceilings from 2030</b>	85%	69%	32%	5%	41%

Ireland recognises the significance of clean air to the health and well-being of its citizens and its environment and is aware of its international obligations in this area. As the population and economy grow, and as sectors develop, there are both challenges and opportunities to be recognised in regard to managing future air quality. In this regard Ireland is fully committed to developing and deploying further measures and initiatives to enhance and protect air quality in parallel with broader national policy priorities of relevance.

<sup>1</sup> Circulated from the Commission – Ricardo reference - Ricardo/ED61728/Issue Number 6

<sup>2</sup> The 2005 inventory value for NO<sub>x</sub> and NMVOC will be the adjusted totals used for compliance values.

As a starting point, the NECD ceilings support this overarching national ambition by requiring reductions in absolute emission levels across every sector in Ireland over time. These improvements, in conjunction with additional measures and local initiatives will also support ongoing successes in managing levels of ambient air quality in line with the AAQD. Under the sectoral headings below, a number of other national policy priorities are identified and discussed briefly in regard to their relationship to air pollution control in Ireland.

### *National Air Quality Priorities*

#### **National Planning Framework/Project Ireland 2040**

The National Planning Framework has been developed under Project Ireland 2040 by the Department of Housing and Local Government. The framework operates as the overarching policy and planning strategy for the social, economic and cultural development of Ireland. The focus of the NPF is to manage and support population growth so that the growth is sustainable in economic, social and environmental terms.

#### **Clean Air Strategy (CAS)**

The development of a Clean Air Strategy is intended to promote policies that will enhance and protect the quality of the air we breathe. The CAS will provide the strategic policy framework necessary to identify and promote integrated measures across all government sectors and policy arenas that are required to reduce air pollution and promote cleaner air, whilst delivering on wider national policy objectives. Having this national strategy will also assist Ireland in developing the necessary policies and measures to support compliance with new and emerging EU legislation and will help with integration with climate policies. The CAS will cover a wide range of policies relevant to transport, energy, home heating and agriculture. Central to this strategy will be the importance of high standards for air quality and the impact on human health.

#### **Sustainable Development Goals**

The 17 Sustainable Development Goals developed by the United Nations, have led to Ireland's formulation of the 2030 Agenda for Sustainable Development, known as the **National Implementation Plan 2018 - 2020**<sup>3</sup>, which lays out Ireland's path to implement the Sustainable Development Goals from 2018-2020. It identifies awareness, participation, support and policy alignment as strategic priorities to guide implementation.

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<sup>3</sup> National Implementation Plan - <https://tinyurl.com/y9jhsq4k>

The Plan also sets out 19 specific actions to implement over the duration of the first National Implementation Plan following the above-mentioned strategic priorities. A total of 169 targets have been identified and through an 'SDG matrix', been assigned to the responsible Government Departments. It is aligned with the policy documents produced for education, agriculture, climate policy, and rural development, amongst others.

### **National Mitigation Plan**

The National Mitigation Plan, introduced by the Climate Action and Low Carbon Development Act 2015, represents an initial step to set Ireland on a pathway to achieve the level of decarbonisation required. It 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.

The measures that we implement through this first Plan will lay the foundations for transitioning Ireland to a low carbon, climate resilient and environmentally sustainable economy by 2050.

### **National Adaptation Framework**

Developed under the Climate Action and Low Carbon Development Act of 2015, Ireland's first National Adaptation Framework (NAF) was published on 19 January 2018. The NAF outlines a whole of government and society strategy to reduce the country's vulnerability to negative effects of climate change and to potentially capitalize on positive ones.

The NAF includes a summary of projected global climate change, European and International policy drivers for adaptation, summary of climate change impacts for Ireland, progress to date on adaptation planning in Ireland, proposals for local authority or regional level adaptation strategies, and implementation and governance arrangements.

### **National Energy and Climate Plan (NECP)**

The NECP is to be submitted to the European Commission by the end of 2019. It is designed to take into account the energy and climate developments to date, levels of demographic and economic growth and include all of the climate and energy measures set out in the National Development Plan 2018-2027. Further iterations of the plan will take into account additional measures and policies as well as the all-of-government climate action plan to be completed in early 2019.

## **Energy White Paper**

The White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015-2030' is a complete energy policy update. It sets out a framework to guide policy and the actions that Government intends to take in the energy sector from now up to 2030.

The paper takes into account European and International climate change objectives and agreements, as well as Irish social, economic and employment priorities. As we progress towards a low carbon energy system, this policy update will ensure secure supplies of competitive and affordable energy to our citizens and businesses.

## **National Renewable Energy Action Plan (NREAP)**

Article 4 of the Renewable Energy Directive requires that each Member State adopt and submit to the European Commission an NREAP. The NREAP sets out individual national targets for renewable share of energy in 2020. There is a requirement that a report on progress be submitted to the European Commission every two years with the final report being submitted in December 2021. To date, Ireland has submitted three reports in 2012, 2014 and 2016. The 2016 report for Ireland states that for 2014 the renewable share of electricity (RES-E) was 22.7%, renewable share of heating (RES-H) was 6.6%, renewable share of transport (RES-T) was 5.2%, and the overall RES share for 2014 was 8.6%, up from 2013 at 7.6%. The targets for 2020 are RES-E 40%, RES-H 12%, RES-T 10% and an overall renewable energy Directive target of 16%.

The National Energy Modelling Group, hosted by SEAI, has established three scenarios – baseline, current trajectory and NREAP/NEEAP policy scenarios. According to Ireland's Energy Projections 2017, Ireland falls short of the 16% target for 2020 under all three scenarios. The current trajectory scenario put Ireland at just over 13% by 2020, therefore missing the 2020 target by approximately 12 Mt CO<sub>2eq</sub>. Failure to meet targets will result in EU fines and could lead to an even greater challenge for meeting targets post-2020 due to less available funding for investment in policy actions and sustainable energy technologies and practices.

## **National Energy Efficiency Action Plan (NEEAP)**

In 2009 Ireland set a target to improve energy efficiency by 20% by 2020, which would equate to 31,925 GWh energy savings. The public sector has committed itself to an even greater challenge of improving energy efficiency by 33% by 2020. Article 24 of the Energy Efficiency Directive requires Member States to submit a NEEAP every three years. Ireland has submitted four NEEAPs to date with the 4<sup>th</sup> iteration being submitted in 2017.

This most recent version provides a comprehensive overview on progress towards targets, measures in place to ensure targets are met and strategies and policies in place across residential, commercial, transport and public sectors.

Under the current trajectory scenario, it is projected that Ireland will miss the 2020 energy efficiency target of 20%. As of 2015 Ireland has achieved 60% of the target leaving us with 12% total energy efficiency, however the current trajectory scenario suggests that Ireland will only achieve 80% of the target by 2020 leaving us with around 16% total energy efficiency, a shortfall of over 3%. It is important that continued policy action is developed to incentivise the uptake of sustainable energy technology and practice so that we can improve overall energy efficiency and subsequently help to improve progress towards achieving renewable energy target as well.

### **EU Environment Action Programme**

The 7th EU Environment Action Programme, which runs till 2020, has set down certain policy and legislative statements to be followed by the Member States. The programme ensures reductions in air pollution and its impacts on ecosystems and biodiversity by 2020 so as not to exceed critical loads and levels, which further dictate strengthened efforts to meet compliance with NECD targets. Air quality improvement is an integral priority. Ireland's Clean Air Strategy is synergetic with this programme.

### **EU Clean Air Policy**

Ireland is currently implementing the EU Clean Air Package, which contains a suite of policies and legislative proposals. The main components include the Clean Air Programme for Europe, the National Emission Ceilings Directive (NECD), and the new Directive to reduce pollution from medium-sized combustion installations.

### **Food Wise 2025**

Food Wise 2025 sets out a ten year plan for the agri-food sector and is part of a series of rolling ten year strategies for the sector.

Food Wise 2025 identifies global growth opportunities which the sector could benefit from including: the ending of milk quotas; a reputation for food safety and controls; a natural competitive advantage in grass-based production; and a world class agri-food industry, backed by strong State support services.

The sub-title of Food Wise is “Local Roots, Global Reach”, reflecting the importance of gaining a deep understanding of what consumers, often in distant markets, really want, and communicating those messages back to Irish farmers and food companies.

Food Wise includes more than 400 detailed recommendations, spread across the cross-cutting themes of innovation, human capital, market development and competitiveness, and sustainability. It projects ambitious growth in exports (an increase of 85% to €19 billion) and employment (an increase of 23,000 in direct and indirect jobs) by 2025.

### **Rural Development Programme (RDP)**

The RDP is part of the EU's Common Agricultural Policy (CAP) and co-ordinates support for Member States' agricultural sectors. Ireland submitted the fifth amendment of its RDP<sup>4</sup> in October 2018. It lays out information regarding direct payments to farmers and market measures, and rural development measures relevant to environment and climate change. Some measures of note in the Irish RDP are training delivered in support of the Green Low-Carbon Agri-Environment Scheme (GLAS)<sup>5</sup> and Organic Farming Scheme. The former measure encourages farmers to engage in environmentally-neutral ways by offering a (maximum) payment of €5,000 per annum based on adopted actions. The latter scheme supports conversion of traditional farmland into organic farms. In broad terms the RDP is an important programme with regard to delivering support and change across the agricultural sector through, amongst other measures, the variety of knowledge transfer programs.

### **Greater Dublin Area Transport Strategy 2016-2035**

The Greater Dublin Area (GDA) strategy<sup>6</sup> provides a transport planning policy and urban logistical considerations in Dublin city and the many surrounding commuter towns. This program includes delivery of better public transport systems, land use planning, and environmental protection in Ireland's most densely populated region. It is a multi-sectoral framework, and incorporates initiatives from Regional Planning authorities, housing authorities, public transport authorities, as well as residents. GDA strategy also works to deliver objectives set out under “Smarter Travel – A Sustainable Transport Future”, which aims to decrease private-car use, and measures to enhance land use integration and introduce behavioural change programmes to promote multi-modality and lower the dependence on private cars. Ultimately, this strategy aims to manage transport and travel in the GDA in an efficient and sustainable manner.

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<sup>4</sup> RDP Summary Booklet - <https://tinyurl.com/ybu279vy>

<sup>5</sup> Farmer Schemes Payment - <https://tinyurl.com/yc52jzw3>

<sup>6</sup> Transport strategy for Greater Dublin Area - <https://tinyurl.com/y895uzmv>

It has strong relevance to national air quality ambitions, in particular efforts to enable and encourage travel by non-motorised modes and increased penetration of cleaner transport technology throughout the national fleet.

### **Industrial Emissions Directive**

The Industrial Emissions Directive has been developed by the EU to regulate pollution arising from industrial activities and involves licensing of all such activities that fall under this Directive. The Directive, overseen by the EPA, lays down rules on the integrated prevention and control of pollution arising from industrial activities. Specific regulation contained within the directive provide for the application of licenses or revised licenses, consideration by the EPA of objections, including the holding of hearings, public participation procedures associated with the industrial emissions licensing system administered by the EPA and the contents of the register of licenses.

## **2.2 Responsibilities attributed to national, regional and local authorities**

This section provides details of the various bodies with responsibilities relevant to the NAPCP. The table includes a list of the principal relevant authorities. In each case the type of authority is indicated (e.g. government, inspectorate, agency), along with their responsibilities in the context of national air quality and air pollution management. The types of responsibility can include:

- Policy making roles
- Implementation roles
- Enforcement roles (e.g. inspections, licensing)
- Reporting and monitoring roles
- Coordinating roles
- Other roles (to be specified)

Table 2. Responsibilities attributed to national, regional and local authorities (EU reference 2.3.2.)

Authority	Type of Authority/Name of Authority	Attributed responsibilities in the areas of air quality and air pollution	Source sector under the responsibility of the authority
<b>National authorities (M)</b>	Department of Agriculture, Food and the Marine (DAFM)	<ul style="list-style-type: none"> <li>- Policy making role</li> <li>- Coordinating role</li> <li>- Implementing role</li> <li>- Enforcing role; both direct or indirect.</li> <li>- Reporting and monitoring role</li> </ul>	Agriculture
	Department of Communications, Climate Actions and Environment (DCCAE)	<ul style="list-style-type: none"> <li>- Policy making role</li> <li>- Coordination role</li> <li>- Implementation role</li> <li>- Reporting and monitoring role</li> </ul>	Energy, Communications, Natural Resources, Broadcasting, Climate Action, Environment
	Department of Transport, Tourism and Sport	<ul style="list-style-type: none"> <li>- Policy making role</li> </ul>	Transport
	Department of Housing, Planning and Local Government	<ul style="list-style-type: none"> <li>- Policy making role</li> </ul>	Built Environment
	Department of Culture, Heritage and the Gaeltacht	<ul style="list-style-type: none"> <li>- Policy making role</li> <li>- Implementation role</li> <li>- Enforcement role</li> </ul>	
	Department of Finance	<ul style="list-style-type: none"> <li>- Policy making role</li> </ul>	
	Environmental Protection Agency	<ul style="list-style-type: none"> <li>- Coordination role</li> <li>- Enforcement role</li> <li>- Reporting and monitoring role</li> <li>- Other (research)</li> </ul>	Energy Generation, Industry
	Teagasc	<ul style="list-style-type: none"> <li>- Reporting and monitoring role (National Farm Survey)</li> <li>- Other (knowledge transfer)</li> <li>- Other (research)</li> </ul>	Agriculture

	Agriculture Knowledge Transfer (KT) Agents	The KT agents work closely with farmers to support the uptake of modern technologies and practices across Irish farms.	Agriculture
<b>Regional authorities (M)</b>	-	-	-
		-	
<b>Local authorities (M)</b>		-	
	County and City Authorities	<ul style="list-style-type: none"> <li>- Implementation role</li> <li>- Enforcement role</li> <li>- Reporting and monitoring role</li> </ul>	Built Environment, Agriculture, Industry

### 3. Progress made by Current Policies and Measures

#### EU Decision 2018/1522 reference section 2.4.

In this section we detail the progress made by current policies and measures (PaMs) in reducing national annual emissions of air pollutants and in regard to improving ambient air quality. Progress in relation to the NECD ceilings are dealt with in Section 3.1 and ambient air quality is discussed in section 3.2. In these sections we also broadly identify the major PaMs introduced in Ireland to drive progress on reducing emissions across the NECD pollutants.

#### 3.1 Progress in relation to NECD obligations

##### EU Decision 2018/1522 reference section 2.4.1.

These datasets relating to annual emissions of NECD pollutants are derived directly from official EPA inventory and forecasts and were released in 2018. Commentary is further informed by the latest Informative Inventory Report (IIR) which offers the most comprehensive detail in regard to how and why historical emissions have changed over time. The relevant datasets and reports can be sourced at the following links.

- [Ireland's latest inventory emissions of air pollutants \(2018 release\)](#)
- [Ireland's latest informative inventory report \(2018 release\)](#)
- [Ireland's latest NECD projected emissions \(2018 release\)](#)

#### **NO<sub>x</sub>**

In terms of compliance with NECD ceilings, Ireland has been in compliance for NO<sub>x</sub> since 2011. Road transport is the principal source of NO<sub>x</sub> emissions in Ireland at present, accounting for approximately 33% of total national emissions in 2016. Within that sector, passenger cars and heavy-duty vehicles are the most significant emitters. An increased share of diesel vehicles in the fleet, along with a recovering economy are two of the more important developments seen in the transport sector in regard to NO<sub>x</sub> emissions. Within other sectors, the ongoing recovery of activity levels in the construction industry has also seen manufacturing and construction accounting for 19% of total national emission of NO<sub>x</sub> in 2016. This is largely due to increased cement production. Adjustments have been made to establish the compliance value for NO<sub>x</sub> emissions in compliance with EU Directive 2016/2284. These adjustments had been applied to emissions for all years from 2010-2016.

#### **SO<sub>x</sub>**

Ireland has been in compliance with the NECD ceilings for SO<sub>x</sub> since 2010 and emissions of SO<sub>x</sub> have been steadily decreasing since 1998, with a 92% reduction in emissions in 2016 compared to 1998 levels. Emissions of SO<sub>x</sub> peaked in 1998 due largely to high consumption rates of coal, oil and peat. The subsequent reduction in emissions has occurred across all sectors, most notably from public electricity and heat generation which has decreased over 96% in 2016 from 1990 levels. The use of cleaner fuels supported by enhanced sulphur controls in power generation, residential combustions and transport, as well as effective licensing and enforcement by the EPA, have all contributed to these steady and sustained reductions in this important acidifying precursor. Currently, commercial, institutional and residential sectors account for half of total SO<sub>x</sub> emissions. Public electricity and heat production emitted approximately 29% of 2016 total SO<sub>x</sub>, and manufacturing and construction made up approximately 19% of the total emissions of the pollutant. Into the future, controls related to residential fuel use will grow in relative importance where there are ambitions for more aggressive reductions in emissions of this pollutant.

### **NMVOC**

NMVOC emissions are currently shown to be compliant with the 2010 NECD ceilings. Ireland's most recent Informative Inventory Report (IIR) submitted in 2018 has shown that NMVOC levels have decreased by about 15% from 2010 to 2016. It is noted that agriculture is now reported as the largest source of NMVOC emissions in Ireland, accounting for approximately 40% of 2016 NMVOC emissions. However, agricultural emissions are not included in the compliance totals for NMVOC. Other substantial sources of NMVOC emissions include combined solvent use, which contributed nearly 40% of the 2016 total, and industrial processes contributing about 13% of the 2016 total. Levels of solvent use and emissions from solvents are changing substantially in response to product replacement and emission controls being implemented.

### **NH<sub>3</sub>**

The latest inventory figures released in 2018 show that 2016 is the first year that NH<sub>3</sub> emissions are above the NECD ceiling since 2010. Agriculture is the dominant emitter of ammonia, with the top five source activities found in the agriculture sector emitting 97% of total NH<sub>3</sub> emissions in 2016. Plant production and agricultural soils alone contribute nearly 52% of 2016 emissions, with cattle (dairy and non-dairy) emitting 38% of NH<sub>3</sub> in 2016. There have been some notable recalculations in the agriculture sector, including revised housing emission factor for slurry-based housing, that have contributed to an 8.5% reduction in emissions that can be seen mainly from the dairy cattle sub-sector across the timeseries.

Teagasc produced a Marginal Abatement Cost Curve for NH<sub>3</sub> mitigation in 2015 (Lanigan et al., 2015), which identified the maximum technical NH<sub>3</sub> abatement potential to be between 11.6 and 13.0 kT by 2030 with employment of best available mitigation techniques, based on scientific, peer-reviewed research. Increasing pressure to implement strong and effective measures in the agriculture sector should have an impact on slowing the rise of emissions.

Agriculture is a substantial sector in terms of its level of activity relative to the size of the overall Irish economy. It is also a sector which is heavily embedded within non-urban communities. As such, parallel priorities with regard to driving economic development, supporting rural employment and building sustainable rural communities all come into play. Emissions of NH<sub>3</sub> have been increasing since 2011, and this is driven in large part by growth plans in the agriculture sector.

### **PM<sub>2.5</sub>**

There is no ceiling in place for PM<sub>2.5</sub> for the current period. The first NECD ceiling comes in force over the 2020-2029 period with greater ambition than for the 2030 period. Levels of PM<sub>2.5</sub> emissions have been on a steady downward trajectory since 2010. Combustion from the residential is the largest source of emissions, with 48% in 2016. There has been a 70% reduction in emissions from residential combustion alone in 2016 from the 1990 level due to reduced coal and peat use and fuel switching to gas, oil and kerosene. Other contributing activities are solvent and other product use (13.5% of 2016 totals) and manufacturing and construction, which contributed nearly 10% of the total PM<sub>2.5</sub> 2016 emissions.

## **3.2 Major PaMs delivering progress**

### **EU Decision 2018/1522 reference section 2.4.1.**

In this section we provide an overview of the major PaMs that are currently in place that have delivered progress in terms of controlling and reducing air pollutant emissions to this point. Disaggregating historical emissions and assigning reductions to individual actions is challenging and problematic in the absence of detailed data, counterfactual cases and so forth. Where the influence on an individual measure or action is easily identified it is recognised, but generally the focus is on categorising and packaging those major interventions that have altered national emission trajectories and assessing the impacts jointly. At a later point in this NAPCP a more detailed estimate is provided for the expected impact of the defined 'additional' measures that are considered to address the identified exceedances for NH<sub>3</sub>, NMVOC and NO<sub>x</sub>.

## Transport

The transport sector is an important source of emissions generally, and NO<sub>x</sub> specifically. There are several key measures supported and implemented in Ireland aimed at reducing emissions from road transport. These measures were designed to control overall transport emissions, reduce congestion, promote fuel efficiency, and in doing so promote health and well-being. Some of these key measures include:

### **Increased penetration and support for higher emission standards and increasingly fuel-efficient vehicles**

Ireland has sought to encourage accelerated penetration of vehicles on higher EURO standards through the promotion of early scrappage schemes. Ireland also introduced carbon weighted vehicle taxation in a bid to encourage increasingly fuel-efficient vehicle penetration in the market. This had the less than desired outcome of encouraging more diesel vehicles into the fleet. However, notwithstanding the impacts of the 'Dieselgate' scandal, the expected performance of the new Euro 6 standard into the future, combined with greater fuel efficiency, should yield improvements in emission reduction outcomes.

The Biofuels Obligation Scheme (BOS) has been effective in assisting Ireland to meet EU renewable energy obligations, and has delivered important GHG reduction with additional co-benefits on air quality. The existing BOS places an obligation on suppliers of road transport fuels to ensure that a proportion of the fuels they place on the market in Ireland are produced from renewable sources. The mix rate for fuel has changed over time from a share of 4.166% in 2010 to 8.695% by volume in 2017.

### **Fuel Standards**

The technical environmental specifications for gas oils, petrol and diesel fuels have been set. These regulations have specific implications for gas oils, reducing Sulphur limits and Sulphur content in heavy oil and marine fuels, biofuels, petrol and diesel fuels.

### **EV Grants and Tax Scheme**

There are 7,647 taxed electric vehicles on Irish roads at the end of December 2018 SEAI has been offering grants of up to €5,000 to consumers of BEVs or PHEVs since 2011. As of the end of 2018, SEAI grants aided the purchase of over 4,600 EVs. Additionally, EVs can qualify for VRT relief of between €2,500 and €5,000 depending on the type of technology being used. It has previously been announced that VRT relief would continue until the end of 2021 for BEVs.

## Encouraging Modal Shift

Currently, active modal<sup>7</sup> share in Dublin is 25.5% and growing at a rate of 8% per annum. The Canal Cordon Count shows that the proportion of journeys by public transport, cycling or walking into Dublin City during peak times has risen to approximately 70% (was 59% in 2010). Census results indicate that cycling to work has shown the largest percentage increase of all means of transport, rising by 42.8% over five years.<sup>8</sup> The current walking share is 14.6% of total transport mode in Ireland and cycling has a 1.7% share.

The National Cycle Policy Framework (2009-2020) set a target that, by 2020, 10% of all trips would be by bike, a review of the policy is underway. This policy supports the broader transport policy for Ireland, Smarter Travel – A Sustainable Transport Future and along with the recent Greenway Strategy continues to develop a strong cycling culture in Ireland.

In relation to public transport, in 2018 there were 266 million PSO public transport journeys provided by Dublin Bus, Bus Éireann, Iarnród Éireann, Luas and Go-Ahead Ireland, this reflects a per annum growth rate of 6.28% compared to 2017. The department of Social Protection provides €80 million annually for the free travel scheme, for which approximately 800,000 citizens are eligible. Bus Éireann received €149 million for school transport services in 2015 from the Department of Education and Skills.

*Under Project Ireland 2040 €8.6 billion has earmarked for investment in public and sustainable transport networks. In the short term, projects such as the Luas Cross City and 10-minute-DART will help manage some of the increasing demand on the transport network. In the medium and longer term funding is provided for the completion of the City Centre Re-signalling Programme, the construction of a new Central Traffic Control Centre for the commuter and intercity rail network, MetroLink and the BusConnects Programme. Project Ireland 2040 also supports the delivery of urban cycling networks in all of the major cities. In addition, under the National Development Plan Ireland has committed to a transition to low-emission buses for the urban public bus fleet, with no diesel-only buses purchased from July 2019. Collectively, these measures will greatly enhance the capacity and attractiveness of the transport system and will provide viable alternatives to private car use. Residential & Commercial*

The strategic approach to the built environment sector focuses upon energy management (understanding the existing energy needs and usage), energy efficiency (reducing usage and making demand more flexible), and fuel switching (meeting the energy demand with less intensive heating solutions).

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<sup>7</sup> Modal share is the percentage of travellers using a particular type of transportation or number of trips per said type of transportation.

<sup>8</sup> [https://www.nationaltransport.ie/wp-content/uploads/2018/05/Canal\\_Cordon\\_Report\\_2017.pdf](https://www.nationaltransport.ie/wp-content/uploads/2018/05/Canal_Cordon_Report_2017.pdf)

To this end, there are packages of measures under each category, and each with a range of actions that have been implemented to date. Examples of measures currently in place or already implemented include:

### **Residential Energy Efficiency**

The Building Energy Rating (BER) system and energy labelling encourages and enables consumers to make more informed decisions about energy efficiency in their homes. This measure links with the envisaged national rollout of Smart meters and the developments in terms of enhanced BER certificates and BER reports. The national Smart Meter rollout is intended to help make energy consumers more aware of their energy consumption and be better empowered to manage and reduce it.

Supporting measures to improve residential energy efficiency largely comprise provision of grant support to encourage and facilitate investment in improving the energy efficiency of homes and premises. The Better Energy Programme comprises a number of schemes, including Better Energy Homes, Better Energy Communities and Better Energy Warmer Homes Schemes. Since 2009, SEAI has provided over €400 million in grant support towards energy upgrades in almost 300,000 homes, supporting around 2,300 jobs per annum in the construction sector.

The warmth and wellbeing pilot scheme is a measure that provides deep retrofits to the homes of people aged 45 and over suffering chronic health conditions relating to the thermal efficiency of their homes. Research on the outcomes and impacts including on reduction in hospital bed nights alleviating pressure on the health system. Approximately 1000 homes will receive deep energy efficiency upgrades, pre and post BER assessments will inform the successful implementation of this measure.

### **Commercial & Public Sector Energy Efficiency**

There have been several important policies implemented in the commercial and public sector to improve energy efficiency. The Energy Efficiency Obligation Scheme is a regulatory based measure with a target of 550GWH per year of energy savings. Carbon tax and Energy Audits for (non-SME) businesses were introduced in 2015. As well as a mandated 33% energy efficiency target for public sector bodies that aims to deliver c.3,240 GWH in energy savings through energy efficiency improvements by 2020. About half of this target has been achieved to date.

The launch of the Public Sector Energy Efficiency Action Plan in 2016 is aimed at intensifying effort to ensure the public sector target (which encompasses a range of measures relating to the built environment) can be met by 2020.

The Large Industry Energy Network (LIEN) programme was launched in 2000 and is an ongoing measure. This is the main support measure to deliver energy efficiency savings in the business sector. It is estimated to achieve 642 kt of CO<sub>2</sub> mitigation by 2020. The SEAI SME Programme was launched in 2008 and is also ongoing with estimated CO<sub>2</sub> mitigation potential of 114 kt by 2020.

### **Smoky Coal Ban**

Residential solid fuel combustion for heating purposes generates emissions of both air pollutants and GHGs, with corresponding impacts on human health, the environment and global climate change. Combustion of bituminous coal, other coal and peat in the residential sector is a significant source of harmful toxic emissions to air, including PM<sub>2.5</sub>, PAH, and NO<sub>x</sub>. The Low Smoke Zone, also known as the Smoky Coal Ban, came into effect in Dublin in the 1990s. This has been heralded as an effective environmental policy intervention and was the precursor to considerable improvements in urban air quality and observed health impacts in Dublin. Emissions of CO<sub>2</sub> per dwelling has fallen by 49% over the period 1990-2014. This is attributed to consumers switching away from coal and peat to lower CO<sub>2</sub> emitting fuels such as gas, oil and renewables<sup>9</sup>.

A ban on the burning of smoky coal and other prohibited fuels, as well as the marketing, sale and distribution, now applies in all Low Smoke Zones (LSZs) in Ireland. The smoky coal ban allowed a significant fall in respiratory problems and premature deaths from the effects of burning smoky coal in the existing LSZs. Approximately 8,000 deaths have been averted in Dublin since the implementation of this policy in 1990's. The original ban in Dublin is cited widely as a successful policy intervention and has become something of an icon of best practice within the international clean air community.

### **Sulphur in Coal**

Coal sold in Ireland for home heating must meet certain minimum requirements regarding Sulphur content. Limiting Sulphur content of smoky coal helps to protect human health and the environment by reducing air pollution, especially in Winter. A traceable audit system has been established by the National Standards Authority of Ireland (NSAI) called the SWiFT7 certificate. Those placing smoky coal on the market must have the SWiFT7 certificate to show compliance with the 0.7% Sulphur limit and must also be registered with the EPA.

### *Electricity Generation*

Combustion in power plants and energy production, or the energy industries sector, has a significant impact on both GHG emissions and emissions of key air pollutants such as NO<sub>x</sub> and SO<sub>x</sub>.

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<sup>9</sup> Energy in Ireland 1990-2014 – Page 71.

## REFIT Support Schemes

The REFIT (Renewable Energy Feed-in Tariff) schemes are the current primary support mechanisms for renewable electricity. The schemes were designed to provide certainty to renewable electricity generators by providing them with a minimum price for each unit of electricity exported to the grid over a 15 year period. The REFIT schemes have been designed to incentivise the development of renewable electricity generation in order to ensure Ireland meets its goal of 40% of electricity coming from renewable sources by 2020. It is funded by the Public Service Obligation (PSO) which is paid for by all electricity consumers. Non combustion renewables like wind and solar power contribute to both climate and clean air goals.

In line with the sustainability strategy outlined by Bord na Mona, there is a plan to phase out the use of peat in electricity generation and replace it with increasing shares of biomass for co-firing. PSO support for the Edenderry peat-fired plant expired in 2015, and is now receiving support via the REFIT 3 fiscal incentive to encourage the use of biomass in co-firing. Bord na Mona has committed to a 2030 deadline to end peat harvesting for electricity generation. Similar to Edenderry, PSO support for two ESB peat stations West Offaly and Lough Ree will expire in 2019. These two stations may also move to co-firing with biomass and would then be eligible for the REFIT 3 fiscal support.

## *Agriculture*

There are a range of measure in place in Ireland that are working to achieve an approach to carbon neutrality in the agriculture and land use sector that does not compromise sustainable food production. In 2018, Teagasc produced a Marginal Abatement Cost Curve for greenhouse gas mitigation identifying potential of measures focused in the areas of agricultural mitigation, land-use mitigation (mainly carbon sequestration) and energy mitigation (Lanigan et al., 2018). The Common Agriculture Policy (CAP) has made an increasingly significant contribution to the environmental sustainability of the EU agri-food sector in recent years. There are two core pillars of the CAP, the first provides income support to farmers while introducing efficiency practices for farms that are beneficial also for the environment. The second pillar focuses on the Rural Development Plan (RDP) and is the framework for sustainable management of the natural environment in which agriculture activity takes place. There are many supporting measures that have helped to work toward mitigation of both climate and air related emissions from the agriculture sector, including:

**CAP Pillar 1 –Nitrates Action Programme (NAP)** - There is a whole territory approach to nitrates implementation so all farmers are obliged to abide by nutrient management planning which has many synergies with reducing ammonia due to the efficient use of animal manure.

The Nitrates Action Programme gives effect to the Nitrates Directive; in late 2017 Ireland agreed with the European Commission on its fourth NAP for the period 2018-2021. The Nitrates Action Programme agreed includes a balanced programme of measures supporting the objectives of achieving good water quality while at the same time encouraging sustainable and efficient agricultural practices. The Nitrates Directive permits only spreading manures and slurries in line with the foreseeable nutrient requirement of the receiving crop or grassland with respect to nitrogen and phosphorous, also taking into account the existing nutrient content in the soil and the nutrients from other fertilisers. Also, not spreading manures and slurries when the receiving land is water saturated, flooded, frozen or snow covered.

The measures in Ireland's derogation take account of the growing numbers of derogation farmers who are farming at intensive stocking rates, and also environmental objectives for water, climate change and ammonia which Ireland must achieve. For example, a new condition for derogation farms has been included in that from 2018, at least 50% of slurry must be applied by 15 June and after that it must be applied by using low emission slurry spreading (LESS) equipment.

The Department of Agriculture, Food and the Marine does not encourage burning agricultural residues. The burning of green waste is currently permitted as a time limited activity under the Waste Management Act. The burning of growing vegetation is regulated under the Wildlife Act. Legislation pertaining to burning is referred to in other policies also, for example, policy relating to air quality, waste management and biodiversity legislation.

In certain instances farmers use burning to facilitate use of more marginal agricultural land, for example, burning scrub and clearing green material. In the case of burning, the introduction of targeted vegetation management and follow up prescribed grazing by livestock should help reinvigorate upland conservation landscapes and the farming activity and husbandry that support healthy upland habitats and the services they provide.

When considering the disposal of green waste for example from reclamation or hedgerow trimmings, this is governed under the Waste Management (Prohibition of Waste Disposal by Burning) Regulations 2009. These regulations came into force on the 31<sup>st</sup> of July 2009 and were amended in 2013 S.I. No. 504 of 2013. Waste Management (Prohibition of Waste Disposal by Burning) (Amended) Regulations 2013. The regulations require that all other more environmentally friendly methods of treatment of green waste, such as reduction, reuse, and recycling by shredding, composting or wood chipping are preferably used before disposal by burning.

Properly managed, small scale cooperative burning actions should be notified to the local authority and conducted only during the permitted burning period in line with DAFM Prescribed Burning Code of Practice guidelines. Under the Clean Air Strategy, a national analysis of these preferred options will be undertaken to better inform practice on the ground, for example through nationally adopted guidelines.

The Department has produced guidelines for land managers considering the use of fire on their land<sup>10</sup> and has also supported and encouraged the development of a number of local level fire management groups and partnerships aimed at improving awareness and understanding of the responsible use of fire as a land management tool.

**Low Emissions Spreading Systems** – The use of LESS equipment such as dribble-bar, trailing shoe/hose, band spreading or injection can reduce ammonia emissions compared to splash plates by decreasing the surface area of manure in contact with the air.

Low emission slurry spreading techniques, such as band spreading or trailing shoe, place the slurry in bands or lines on the soil or crop, rather than the entire surface as with a conventional splashplate method. Slurry applied with a low emission method has been shown to reduce ammonia losses compared to splashplate application. Low emission slurry spreading techniques combined with adequate application timing helps to decrease ammonia emissions and consequently increases the nitrogen fertiliser replacement economic value (NFRV). For example, a  $\geq 25\%$  reduction in ammonia losses for a trailing shoe technique compared to splashplate<sup>11</sup>, have been shown to occur.

### **Beef Data and Genomics Programme**

This measure collects data and collates it into a breeding index. This index helps farmers to select robust and resource efficient suckler cow replacements thus lowering the intensity of emissions by improving the quality and efficiency of the national beef herd. By 2017 there were over 24,000 applicants to the programme and approximately 1 million animals genotyped. It is estimated that there will be a 4.5% improvement in carbon efficiency per animal by 2020.

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<sup>10</sup> <https://www.agriculture.gov.ie/media/migration/forestry/firemanagement/CofPPrescribedBurningFinal90212.pdf>

<sup>11</sup> Teagasc (2016). Major & Micro Nutrient Advice for Productive Agricultural Crops.

## **Knowledge Transfer Programme**

This programme facilitates the transfer of knowledge of information from research and advisory services to farmer discussion group networks that cover a wide range of topics including sustainability and farm efficiency practices that lead to mitigation of harmful emissions. To date, knowledge transfer groups on sustainability such as nutrient management planning have over 20,000 participants.

## **Origin Green**

The Origin Green sustainability programme operates on a national scale to unite government, the private sector and food producers in a common vision to improve the environmental performance of individual farms and food production. The Origin Green program has conducted over 137,000 carbon footprint audits across Ireland.

## **Teagasc National Farm Survey**

Ireland's capacity in Farm Accountancy Data Network (FAND) data collection under the Teagasc National Farm Survey substantially exceeds the data requirements set out by the EU. Developments in recent years mean that the National Farm Survey now incorporates environmental as well as economic variables, making it possible to track developments in environmental efficiency. Through the FAND, Teagasc has championed the future development of the FAND as an environmental monitoring tool.

## **Code of Good Agricultural Practice**

The Code of Good Agricultural Practice for reducing ammonia emissions is a guidance document that outlines the best practice measures for removing or lowering ammonia emissions associated with agricultural activities. The measures outlined in the Code are voluntary measures, however, it is expected to play an important role in delivering further ammonia reductions from the Irish Agricultural sector. The code has been drafted in early 2019 for consultation and will thereafter be finalised.

### 3.3 Progress in relation to improving air quality

#### EU Decision 2018/1522 reference section 2.4.2.

The EPA are the competent authority for assessing Irish ambient air quality. The assessment of the air we breathe is achieved through the implementation of two pieces of environmental legislation – S.I. No. 180 of 2011 and S.I. No. 58 of 2009. Practically, this is assessed through a national network of air monitoring stations, as of 2017 there are 29 stations across Ireland. A range of pollutants are annually assessed and reported both nationally through the EPA's National Air Quality Indicators report<sup>12</sup> and internationally through the European Environment Agency<sup>13</sup>.

In 2017, no exceedances of the EU legislative limits were observed. However, when assessed against the more stringent World Health Organisation (WHO) guideline levels, four pollutants of concern are revealed which will be monitored closely for the future:

- PM<sub>10</sub> and PM<sub>2.5</sub> levels mainly linked to residential solid fuel use and transport emissions from diesel engines as well as from tyre and brake abrasion.
- NO<sub>2</sub> levels in urban centres associated with transport emissions
- O<sub>3</sub> levels at a regional scale in part due to the impacts of transboundary ozone
- PAH levels due to the burning of fossil fuels

With regards to the WHO guideline values, the following were the number of exceedances for 2017 observed by the national monitoring network. PAH was also assessed against the EEA reference value.

- PM<sub>10</sub> daily guideline value was exceeded at 11 sites
- PM<sub>2.5</sub> daily guideline value was exceeded at 9 sites
- PM<sub>2.5</sub> annual guideline value was exceeded at 1 site
- O<sub>3</sub> guideline value was exceeded at 9 sites
- NO<sub>2</sub> hourly guideline value was exceeded at 1 site
- PAH EEA reference value was exceeded at 4 sites

Based on the existing evidence the major threats to good air quality in Ireland are observed from residential solid fuel use throughout Ireland and transport emissions in our urban centres.

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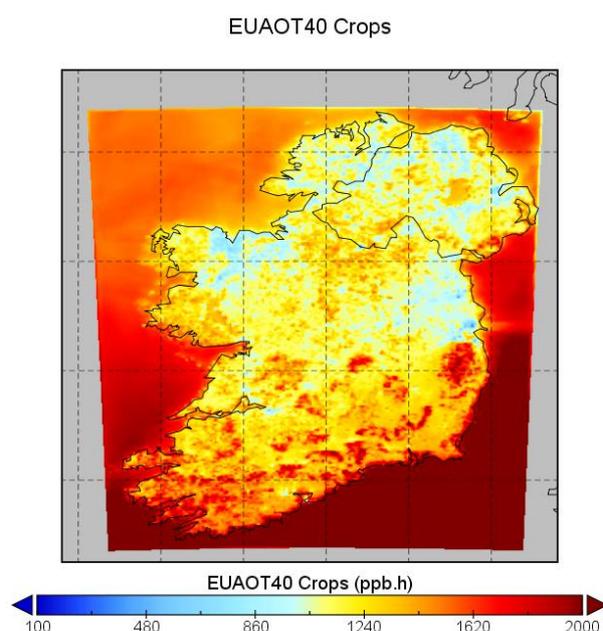
<sup>12</sup> EPA (2018). *Air Quality in Ireland 2017 – Indicators of Air Quality*. Available at: <http://tinyurl.com/y2zolq42>

<sup>13</sup> Ireland's latest inventory emissions of air pollutants (2018 release) and [Ireland's latest NECD projected emissions \(2018 release\)](#)

The EEA have estimated that approximately 1150 premature deaths in Ireland can be attributed to air pollution in 2017. The EPA is currently upgrading and expanding the Ambient Air Quality network through a 5-year programme funded by the Department of Communications, Climate Action and Environment. This will eventually lead to a doubling in size of the existing network to allow for the provision of more real time information on air quality throughout the country.

Figures 1-5 below are modelled concentrations of the 2015 inventory for air pollutant emissions. The results included in the figures show the results of the EMEP<sup>14</sup> model with national reference simulation in 2015 for European indicators AOT40 (O<sub>3</sub>)<sup>15</sup>, PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, and NO<sub>x</sub>. These maps have been produced as part of an EPA funded research project ConAir, which is led by EnvEcon<sup>16</sup>. The maps are included as being of relevance to the NAPCP. However, at the time of writing the project has not been formally completed, nor have the maps been released for publication.

Figure 1. Modelled three-months (May-July) EUAOTO 40 (ppb.h) in 2015

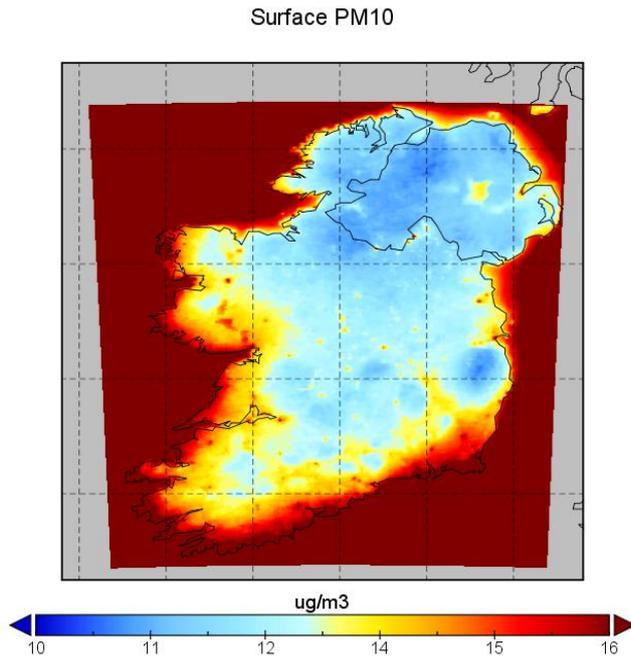


As seen in Figure 1, AOT40 values are in general highest in the southern part of Ireland. The highest model grid value was 2394 ppb·h. As such no region is estimated to exceed the European long-term AOT40 objective level of 3000 ppb·h in 2015.

<sup>14</sup> EMEP (2018) Transboundary particulate matter, photo-oxidants, acidifying and eutrophying components, [EMEP Status Report 1/2018](#), ISSN 1504-6192 (online)

<sup>15</sup> The AOT40 (= Accumulated Ozone exposure over a Threshold of 40 ppb (=80 µg/m<sup>3</sup>)) for vegetation is the accumulated excess of hourly ozone concentrations above 80 µg/m<sup>3</sup> between 8:00 and 20:00 CET (Central European Time) in the months of May, June, July, i.e. the growth season. This indicator is designed for the protection of crops and natural vegetation. The European long-term AOT40 objective is 3000 ppb·h.

<sup>16</sup> <http://conair.envecon.eu/>

Figure 2. Modelled surface annual mean PM<sub>10</sub> concentrations 2015

For PM<sub>10</sub>, sea salt is the dominating aerosol source. Thus, the concentrations are highest over the sea and areas close to the coastline. The annual mean PM<sub>10</sub> value for the model domain, including the ocean, is estimated at 15.9 ug/m<sup>3</sup>, whereas the maximum annual average grid value is 28.2 ug/m<sup>3</sup>. For PM<sub>10</sub> the WHO guidelines are for 20 ug/m<sup>3</sup> annual and 50 ug/m<sup>3</sup> daily.

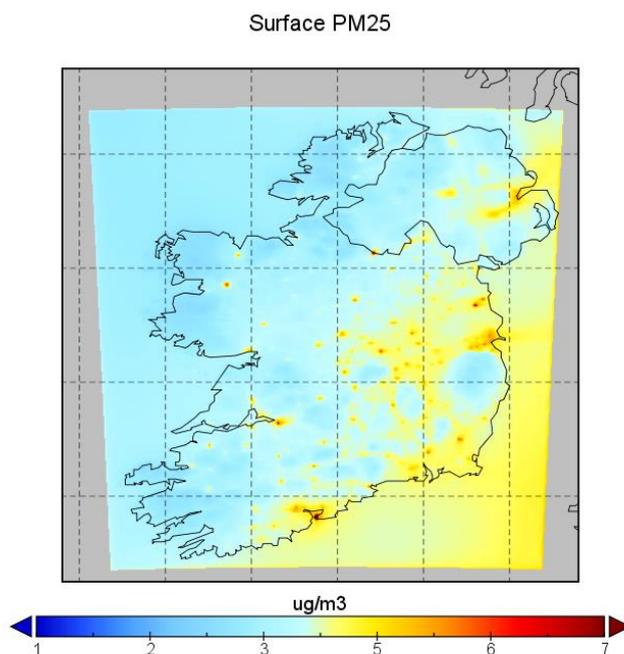
Figure 3. Modelled surface annual mean PM<sub>2.5</sub> concentrations in 2015

Figure 3 demonstrating the concentrations of PM<sub>2.5</sub> shows that the highest PM<sub>2.5</sub> concentrations are found in urban areas and close to the main roads. The annual average PM<sub>2.5</sub> concentration for the entire Irish domain is estimated as 3.7 µg/m<sup>3</sup>, whereas the maximum grid value is 10.3 µg/m<sup>3</sup>. The WHO guidelines for PM<sub>2.5</sub> are 10 µg/m<sup>3</sup> annual mean and 25 µg/m<sup>3</sup> daily mean.

Figure 4 and 5. Modelled surface annual mean NO<sub>2</sub> and NO<sub>x</sub> concentrations in 2015

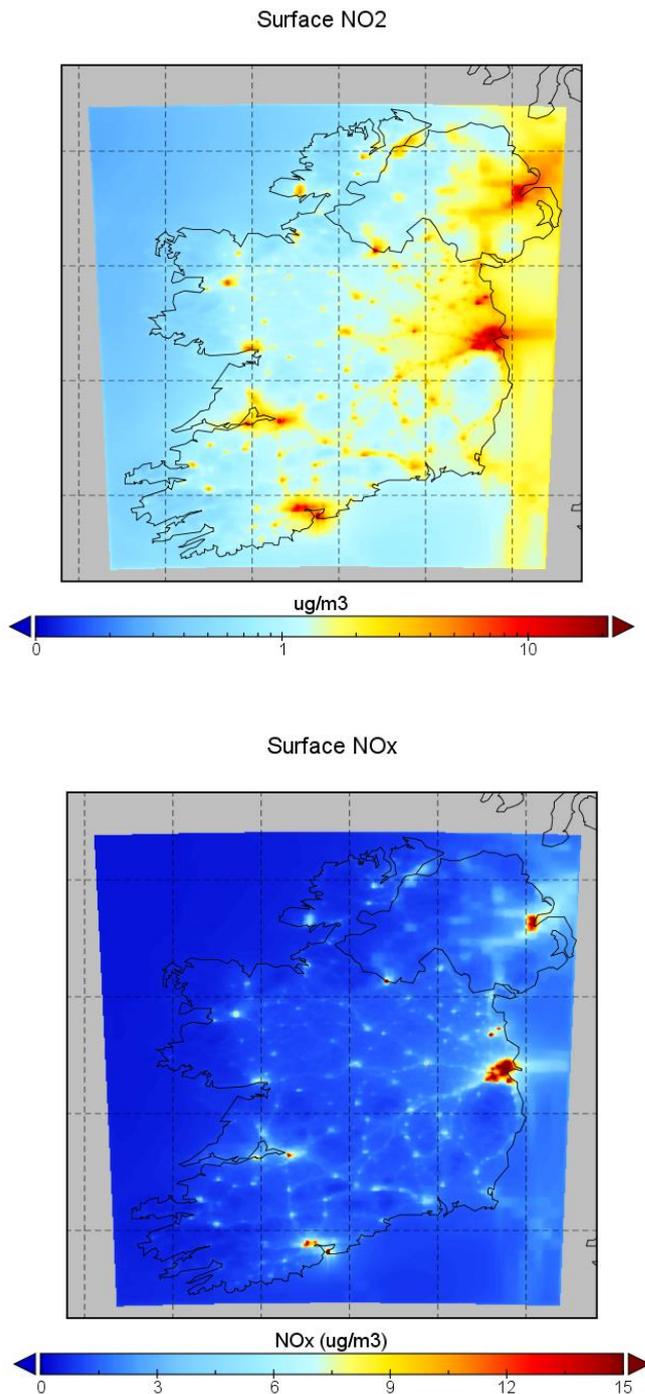


Figure 4 shows the concentrations of NO<sub>2</sub>; where the highest concentrations are found in urban areas, but the main roads can also be seen as high concentration areas. The NO<sub>2</sub> average value for the entire domain is 1.2 µg/m<sup>3</sup> while for Dublin the annual average concentrations (for a single 2 km grid) is 22.2 µg/m<sup>3</sup>. Figure 10 shows the concentration for NO<sub>x</sub>. The WHO Guidelines for NO<sub>x</sub> are 40 µg/m<sup>3</sup> annual mean and 200 µg/m<sup>3</sup> in a 1 hour period.

### 3.4 Current transboundary impact of national emissions sources

#### EU Decision 2018/1522 reference section 2.4.3.

In future reporting Ireland may utilise the GAINS Ireland model to more explicitly quantify and present the expected impact of emission scenarios in terms of broader European outcomes. However, in this first NAPCP we rely on the evidence from relevant community modelling. Source receptor (SR) relationships define the estimated transfer of pollutants that occur in one location to another location. These can be between specific grid cells or between specific defined country regions. The relationships indicate the change in either air pollutant concentrations or pollutant deposition that arise in one location as a result of changes in emissions elsewhere. The EMEP SRs are country to country, and have been estimated most recently for the year 2016 as part of the 2018 EMEP status report (EMEP, 2018). Specifically, the SR values in that report reflect the differences that occur in response to a 15% reduction in a given pollutant in another location.

The full tables and listings of values are available at [www.emep.int](http://www.emep.int). However, in broad terms for oxidised nitrogen and oxidised sulphur deposition the largest share of changes generally arises in areas of the North Sea and Atlantic. In terms of corresponding land-based deposition, the changes, as expected, have the greatest impact in Ireland with only a modest impact on the nearest neighbouring member state (Great Britain). For reduced nitrogen deposition, the largest change is again reported for the Atlantic and North Sea, with a near equal impact on outcomes in Ireland. In this case however, there are also notable impacts in Great Britain and modest impacts in France. In regard to PPM and PM<sub>2.5</sub> there is a negligible impact on outcomes beyond Irish shores reported as part of the EMEP analysis.

## 4. Projected Further Evolution ('With Existing Measures')

### EU Decision 2018/1522 reference section 2.5.

The purpose of this section is to present the official emissions outlook to 2030 under the national WM scenario and to assess compliance with the NECD in the 2020 and 2030 periods.

Adjustments have been made to forecast emission of NO<sub>x</sub> and NMVOC to reflect flexibilities under Article 4 and 5 of the NECD. This mainly allows for the removal of agriculture emissions from the accounting of emissions from both pollutants, as well as the removal of a portion of the food and beverage industry (emissions from spirit production) from the accounting of NMVOC. With the adjusted compliance totals, Ireland is shown to expect compliance with 2020 ceilings for NO<sub>x</sub> and NMVOC before falling out of compliance in both cases for the 2030 ceiling. NH<sub>3</sub> presently exceeds the emission ceiling in both the 2020 and 2030 phases. SO<sub>2</sub> and PM<sub>2.5</sub> remain in compliance for both 2020 and 2030 phases.

All emission data for all pollutants up to 2016 are based on the official IIR inventory submission from 2018. Forecast emissions are based on the latest draft projections provided by the Environmental Protection Agency (EPA) for all years from 2017-2035. The air pollutant projections prepared by the EPA for the draft NAPCP take into account projected activity data from a number of responsible authorities, including updated energy projections provided by the SEAI in October and November 2018, and agriculture activity data provided by Teagasc in April 2018 which considers the impact of Food Wise 2025 for the agriculture sector.

As the latest inventory (1990-2017) was not finalised at the time of writing, the emissions projections included in the draft are projected from the 2016 inventory baseline year. This is consistent with the approach taken for the GHG projections that were prepared for the draft NECP which was published in December 2018. The projections WM scenario assumes that no additional policies and measure, beyond those already in place by the end of 2017, are implemented. The projections WAM scenarios assumes implementation of the WM scenario and additional policies and measures, such as those included in Ireland's NDP 2018-2027. The WAM scenario will be detailed in the next section of this report, section 5.

The EPA is also preparing updated air pollutant emissions projections for reporting under the NECD (2016/2284/EU) and the Convention on Long Range Transboundary Air Pollution. The deadline for this reporting is 15<sup>th</sup> March 2019. Whilst some key underpinning projected activity data will remain unchanged compared to the emissions projections included in the draft NAPCP, for example energy and agriculture activity projections, there are a number of updates currently being undertaken

including projecting from the 1990-2017 inventory baseline and transport related tasks which may result in changes to the emissions projections.

Table 3. Projected emissions and emission reductions (WM) scenario (EU reference 2.5.1.)

Pollutants	Total emissions (kt)				Projected % emission change from 2005			2020-2029 Ceiling (%)	2030 Ceiling (%)
	2005	2020	2025	2030	2020	2025	2030		
<b>SO<sub>2</sub></b>	71.76	13.07	11.57	10.44	- 82%	- 84%	- 85%	- 65%	- 85%
<b>NO<sub>x</sub></b>	129.78 <sup>17</sup>	60.76	53.43	50.27	- 53%	- 59%	- 61%	- 49%	- 69%
<b>NMVOC</b>	65.33 <sup>15</sup>	46.00	45.82	48.66	- 30%	- 30%	- 26%	- 25%	- 32%
<b>NH<sub>3</sub></b>	113.29	123.27	127.12	129.71	+ 9%	+12%	+ 14%	- 1%	- 5%
<b>PM<sub>2.5</sub></b>	22.83	14.03	11.57	12.72	- 39%	- 49%	- 44%	- 18%	- 41%
<b>Date of official emission projections</b>					July 2018				

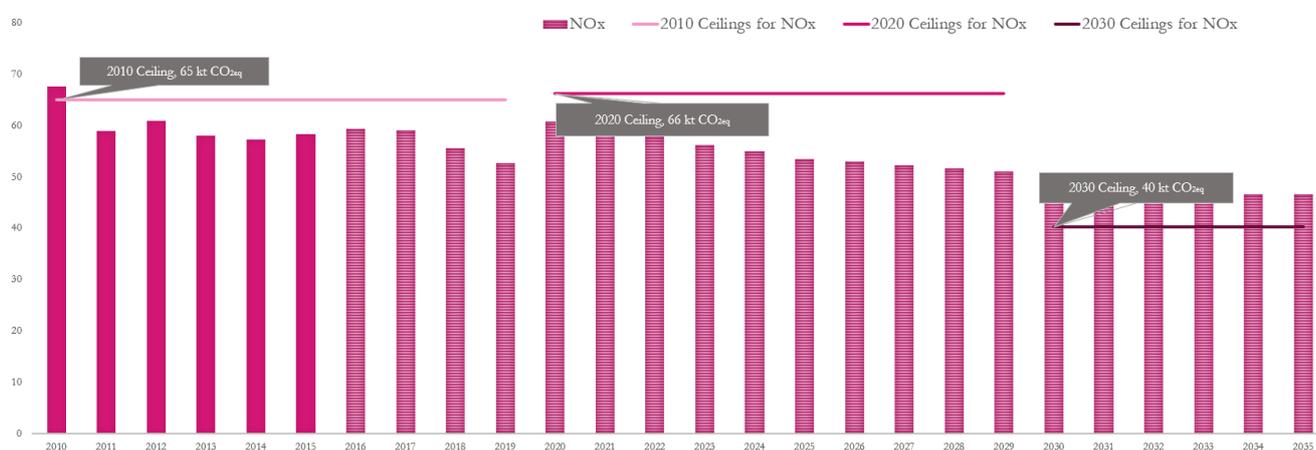
## NO<sub>x</sub>

NO<sub>x</sub> emissions in Ireland are projected under the WM scenario to remain in compliance until 2029. However, with the further tightening of the ceiling for NO<sub>x</sub> from 2030, and with emissions somewhat plateauing from 2029 under the most recent forecasts, Ireland is currently projected to be out of compliance in 2030, with a slowly increasing gap to compliance from that point onwards. Measures are identified later in this report that are estimated to offer adequate further reductions in national NO<sub>x</sub> emissions for 2030 and beyond.

<sup>17</sup>, <sup>15</sup> 2005 base year totals for NO<sub>x</sub> and NMVOC are estimates that have not been confirmed in an official inventory submission, the figures have been manually calculated to account for the adjustments for compliance assessment. Agriculture emissions have been subtracted from actual reported emission inventory in 2005 in order to determine the compliance total. From the 2018 inventory submission, NO<sub>x</sub> total emissions are reported as 161.69 kt in 2005, minus emission from all agriculture sectors the compliance total is estimated to be 129.78 kt. NMVOC total emissions are reported in the 2018 inventory submission as 119.25 kt in 2005, minus emissions from the agriculture sector and the food and beverage industry the compliance total is estimated to be 65.33 kt.

Adjustments have been made to establish the compliance value for NO<sub>x</sub> emissions in compliance with EU Directive 2016/2284. These adjustments had been applied to emissions for all years from 2010-2016 and from 2020 all agriculture emissions will be stripped from the accounting of compliance totals for NO<sub>x</sub>. In order to avoid a confusing gap and/or spike in emissions levels for the years 2017-2019 in figure 6 below, an adjusted compliance total has been manually calculated based on a similar method. Adjustments to establish a compliance value for NO<sub>x</sub> have had an impact on the calculation of ceiling values as well, as these values are calculated as a percentage of the 2005 inventory. However, in order to have an appropriate benchmark for gauging compliance using the compliance total, the same adjustments have had to be applied to the historical 2005 inventory figure.

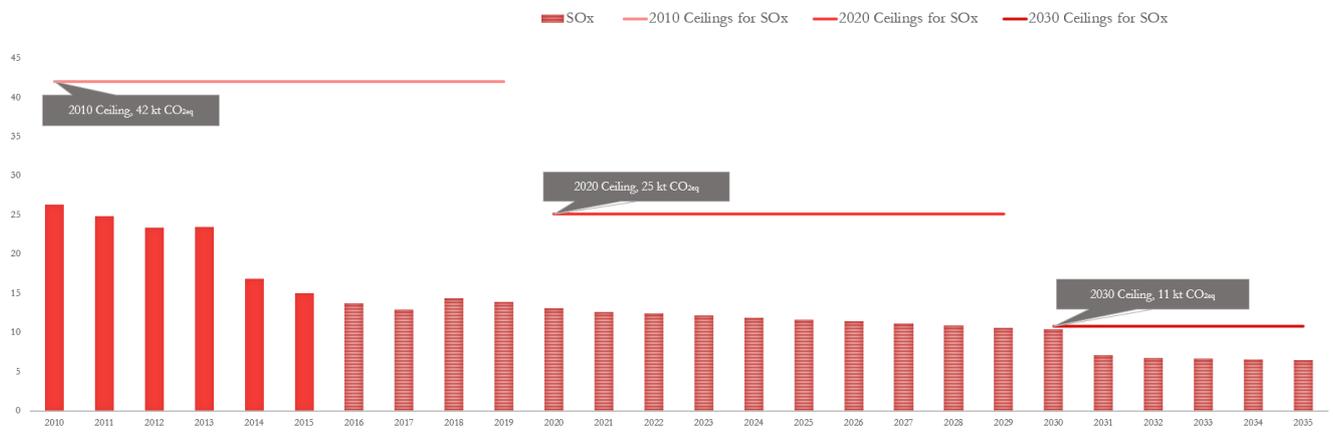
Figure 6. 2018 Inventory, Projections (WM) and NECD Obligation – NO<sub>x</sub> in kt



## SO<sub>x</sub>

Ireland is projected to remain in compliance for the ceiling periods from 2020 and 2030. This compliance status is projected to remain beyond 2030. In addition to controls on sulphur content of fuels, this is largely due to further progress being made in the energy efficiency of homes and buildings and the effective implementation of a range of policies and measures to support that effort.

Figure 7. 2018 Inventory, Projections (WM) and NECD Obligation – SO<sub>x</sub> in kt

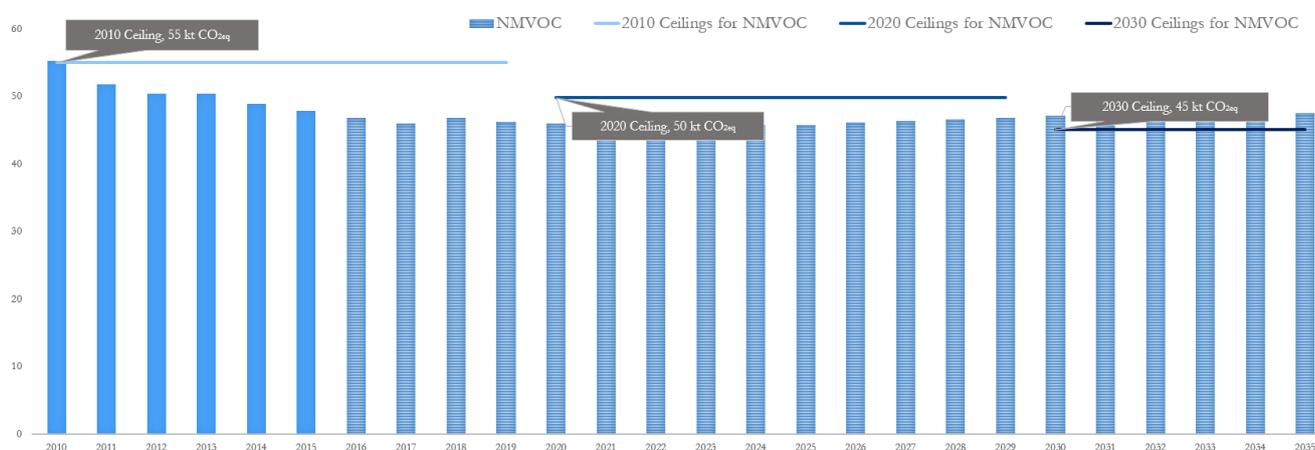


## NMVOC

NMVOC emissions are expected to remain in compliance until the end of the 2020-2029 period. From 2030 onwards, emissions of NMVOC in Ireland are estimated to exceed the 2030 ceiling. From 2016 emission levels, the emissions trajectory for NMVOC somewhat plateaus, while the ceilings become increasingly more stringent. In order to avoid being out of compliance in 2030, additional measures will be required.

Adjustments to establish a compliance value for NMVOC, in accordance with EU Directive 2016/2284, have led to a recalculation of ceiling values since these values are calculated as a percentage of the 2005 inventory. In order to have an appropriate benchmark for gauging compliance using the compliance total, the same adjustments have had to be applied to the historical 2005 inventory figure. This required stripping out the agriculture emissions and a proportion of the emission from the food and beverage industry.

Figure 8. 2018 Inventory, Projections (WM) and NECD Obligation – NMVOC in kt



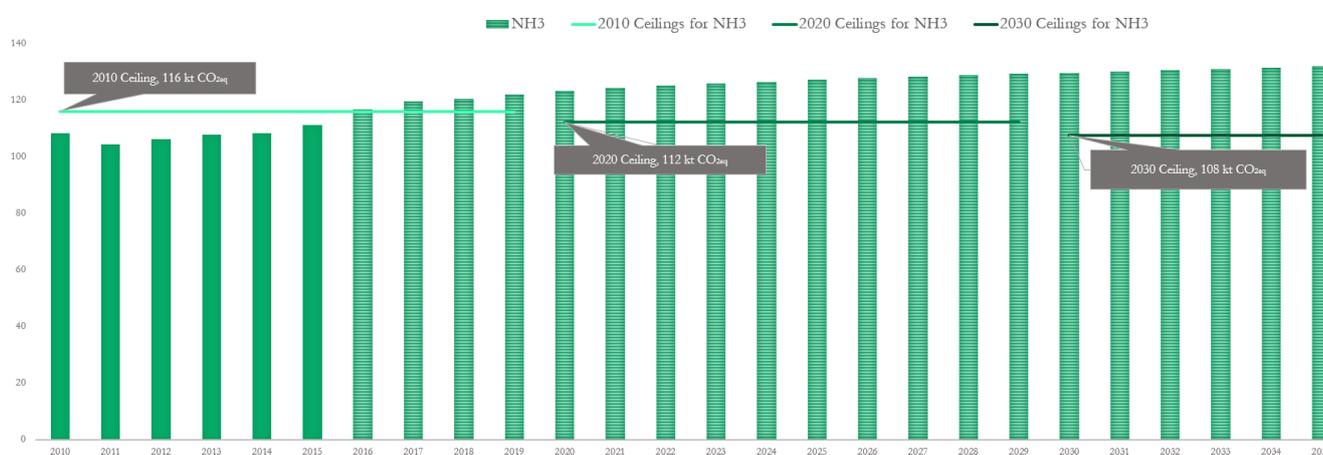
## NH<sub>3</sub>

The latest EPA emission inventory reports ammonia emissions increasing steadily from 2016, with the gap to compliance with NECD ceiling in the year 2020 projected to be growing out to 2029. The projected gap widens further still in the year 2030, as a result of the tighter ceiling in that phase and continued growth in emissions of NH<sub>3</sub> from the agriculture sector. NH<sub>3</sub> presents the greatest challenge to Ireland's compliance with the NECD.

The growth in emissions of NH<sub>3</sub> since 2011 has been driven in large part by realization of the opportunity to avail of Ireland's comparative advantage in milk production afforded by the removal of

EU Milk quota (i.e. Food Wise 2025), (i.e. Food Wise 2025), which have resulted in increases in cattle populations, dairy production, N-fertilizer use and the use of urea as an inorganic fertilizer. However, actions and the implementation of measures that focus on improving farm efficiency and mitigating harmful emissions have led to some decoupling of increased production with rising emissions. The rate of NH<sub>3</sub> increases has significantly lowered since 2011 and is projected to slow even more<sup>18</sup>. Whilst greater efficiencies must be sought, and there are further abatement options available, it is a substantial challenge in this sector to reconcile activity growth with a declining NH<sub>3</sub> ceiling. Further options to progress towards compliance are detailed later in this report.

Figure 9. 2018 Inventory, Projections (WM) and NECD Obligation – NH<sub>3</sub> in kt

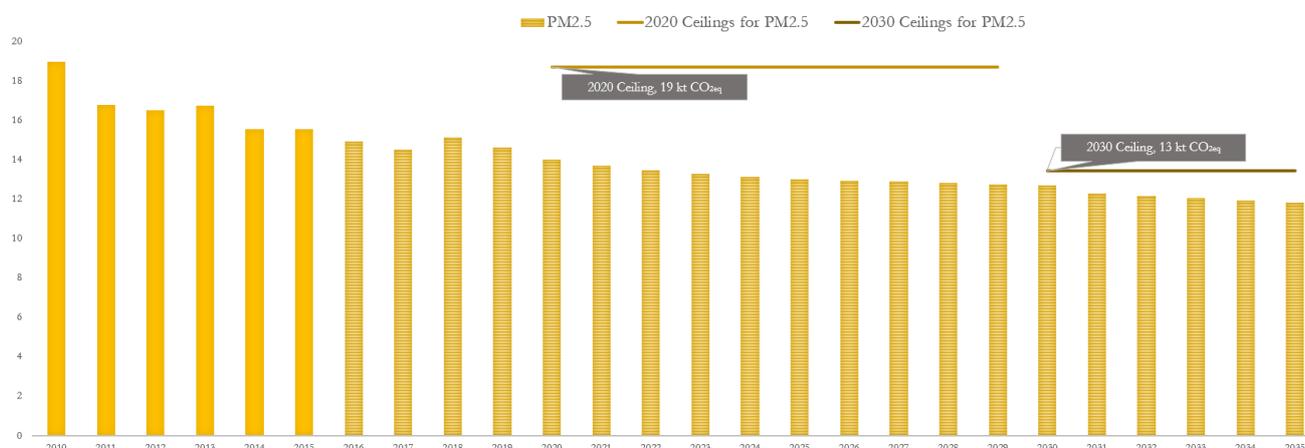


## PM<sub>2.5</sub>

PM<sub>2.5</sub> is projected to stay in compliance with NECD ceilings for all periods out to 2030 and beyond. There are modest decreases in the level of PM<sub>2.5</sub> after adjustments in the emission inventory. Air projections indicate a gradual decrease in PM<sub>2.5</sub> levels from 2017 onwards.

Although compliant on the basis of the current outlook, PM<sub>2.5</sub> is the key driver of health impacts from air pollution and further ambition and progress is planned. Measures to be defined as part of broader national climate and energy strategies are expected to deliver additional progress on PM<sub>2.5</sub> emission reductions. These additional measures include a substantial increase in the penetration of heat pump technologies in the residential sector and ambitious plans for electrification of the transport fleet. Furthermore, there is a planned review of aluminum production that will be investigated which is expected to have a significant impact on levels of PM<sub>2.5</sub> emissions. The results of this review will be included in the next IIR submission for 2019.

<sup>18</sup> Average annual increase in NH<sub>3</sub> from 2011 to 2016 – 2.5 kt. Average projected annual increase in NH<sub>3</sub> from 2016 to 2020 – 1.6 kt. Average projected annual increase in NH<sub>3</sub> from 2020 to 2030 – 0.6 kt. Average projected annual increase in NH<sub>3</sub> from 2030 to 2035 – 0.4 kt.

Figure 10. 2018 Inventory, Projections (WM) and NECD Obligation – PM<sub>2.5</sub> in kt

#### 4.1 Projected impact on improving air quality

##### EU Decision 2018/1522 reference section 2.5.2.1.

As of 2017, on the basis of the existing monitoring network, Ireland does not show any exceedances with regard to EU legislation for ambient air quality. However, Ireland's performance in relation to ambient air quality on the basis of the WHO guidelines highlights that there are further improvements to be made.

Based on the WHO guidelines, in 2017 there were exceedances of daily PM<sub>10</sub> at 11 sites, and exceedances of daily PM<sub>2.5</sub> at 9 sites<sup>19</sup>. There were also exceedances of annual PM<sub>2.5</sub> at 1 site. Ozone had an exceedance recorded at 1 site, hourly NO<sub>2</sub> was exceeded at 1 site, and PAH was also exceeded at 1 site. Further improvements and measures would aim to reduce emissions of these pollutants further, regardless of not showing any exceedances within the EU legislative guidelines.

The main sources for much of the ambient air pollution are urban transport and residential solid fuel use. Measures to increase the use of electric vehicles and have less petrol and diesel cars on the road, as well as measures to displace residential solid fuel use through heat pumps will likely have a positive impact on ambient air quality. Additionally, plans to double the network for monitoring stations for air quality through the development of the National Ambient Air Quality Monitoring programme will be of value in better monitoring and managing national air quality.

Ireland is not expecting exceedances of EU ambient air pollution limits going forward, and there is still an expectation that measures and policies will have a further positive impact on air quality to 2030 and beyond.

<sup>19</sup> PM<sub>10</sub> and PM<sub>2.5</sub> are both mainly associated with residential solid fuel use and transportation emissions from diesel engines.

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## 5. Policy Options Under Consideration

### EU Decision 2018/1522 reference section 2.6.

There are a wide range of policies and measures that can be considered in order to assist Ireland with meeting compliance targets for 2020 and 2030. In general, most of these measures are listed in several core documents – the Clean Air Strategy (CAS), the NECP, the agriculture marginal abatement cost curve and the NMP. Since the focus will be on addressing emissions where Ireland is expected to be out of compliance, the priority options will be in the agriculture sector, transport and energy.

It should be noted that the key measures that are highlighted in this report and prioritized by Government are policies and measures that work to align the challenges of air and climate. The objective is to develop and implement measures that effectively support an integrated plan that will benefit the whole of the environmental challenge.

### 5.1 Details concerning the options under consideration

#### EU Decision 2018/1522 reference section 2.6.1.

The full list of all policy and measure options under consideration for meeting compliance have been organized into a template that meets the format requirements outlined in the EU Decision 2018/1522. However, due to the size and complexity of this template it will be kept separate from this report as an Appendix. The Appendix file is an excel file named “NAPCP Measures Template”. Since the priority is to focus on the options that are going to help Ireland reduce emissions of pollutants that are expected to have exceedances, the selected core options from the full list of options in the NAPCP Measures Template file are listed in table 4 and table 5 below. These options relate specifically to the NO<sub>x</sub> and NMVOC exceedance in the 2030 phase and the NH<sub>3</sub> exceedances in all phases. Additional detail and information in relation to these and all other measures are included in the NAPCP Measures Template file and will be uploaded to the relevant Eionet database once available.

Table 4. NECP Emission Reduction Measures

		Expected emission reduction per annum (kt)												
Name	Description	Type of PaM	2020				2025				2030			
			SO <sub>x</sub>	NM VO C	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>x</sub>	NM VO C	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>x</sub>	NM VO C	PM <sub>2.5</sub>	NO <sub>x</sub>
<b>Low Carbon Heating</b>	170,000 heat pumps in existing residential buildings by 2030.													
<b>Electricity Generation</b>	Moneypoint closes at the end of 2025. <sup>20</sup>					2.94	0.026	0.303	3.795					
	Moneypoint closes at the end of 2030. <sup>21</sup>									3.018	0.075	0.312	4.371	
<b>Electric Vehicles</b>	Increase from 0.25 to 0.5 million EVs (BEV and PHEV at a 3:1 ratio) on the road by 2030.			0.06			0.247				1.386		0.642	
	Increase from 0.25 to 0.5 million EVs (BEV and PHEV at a 3:1 ratio) on the road by 2030.			0.62	-0.09		0.53		0.19		2.78		1.52	

<sup>20</sup> The emission reduction estimates represent the reductions in emissions from power stations from 2025 to 2026 under the WAM scenario. Therefore, only showing a single year drop in emissions and could have some reductions not directly associated with the closing of Moneypoint included.

<sup>21</sup> The emission reduction estimates represent the reductions in emissions from power stations from 2030 to 2031 under the WM scenario. Therefore, only showing a single year drop in emissions and could have some reductions not directly associated with the closing of Moneypoint included.

For agriculture ammonia abatement in particular, the goal is to strike a balance between the type of growth that is envisaged in Food Wise 2025 with the pressure to limit emissions. To this end sustainable growth scenarios (SGS) were created in 2015 and updated in 2018 to reflect more recent animal number projections. The measures that are included under agriculture are options that will need to be explored further in so far as their efficacy and implementation is concerned, with most primary concern over uptake rates. The potential impact of these options will be sensitive to uptake rates and given that these options still do not address the full estimated gap for NH<sub>3</sub> to meet compliance, further options will also need to be assessed.

There are two scenarios listed for the agriculture options – scenario 1 (S1) has the full list of options with the assumption of enhanced uptake and earlier adoption, scenario 2 (S2) focusses only of those measure where there are already existing policy frameworks in place to support enhanced an earlier adoption (i.e. a more focused list of measures). Both scenarios are listed in the table below.

Table 5. Agriculture Ammonia Abatement Options

Name		Description	Type of PaM	Expected NH <sub>3</sub> emission reduction per annum (kt)			
				2025		2030	
				S1	S2	S1	S2
<b>Land spreading Measures</b>	Trailing hose (non-dairy) – adoption target 42% (S1 & S2)	The landspreading measures comprise a number of related farm management actions that will reduce the ammonia emissions associated with slurry spreading. These include: a continued transition from summer application to spring application of manure (using splashplate application) and use of low-emission application methods for both cattle and pig slurry. This measure interacts with the measure “extended grazing”, since an extension of the grazing season will reduce the amount of manure stored.	Source-based pollution control	1.1	1.1	1.14	1.14
	Trailing hose (pigs) – adoption target 0% (S1 & S2)			0		0	
	Trailing shoe (pigs) – adoption target 100% (S1 & S2)			0.45	0.45	0.46	0.46
<b>ATMS (dairy/non-dairy) – adoption target 0%(S1 &amp; S2)</b>		Altered Timing Management System (ATMS) reduces ammonia emissions following land spreading by timing application for favourable weather conditions. This measure is primarily effective with cattle slurry which has a higher dry matter, and hence emission factors, than pig slurry. This measure can also be extended to altered time of day application (ie. evening spreading) as there is evidence this can reduce emissions by 20%. The main	Source-based pollution control, Voluntary agreements	0		0	

		challenge associated with this measure is verification of targeted spreading and the generation of activity data for inclusion in national inventories.					
<b>Urea Stabilisers – Adoption target 100% (S1 &amp; S2)</b>				4.0	3.9 6	4.1 5	4.15
<b>Bandspreader or Trailing shoe</b>	Trailing shoe (dairy) – adoption target 100% (S1 & S2)	These application techniques reduce ammonia losses and also increase the fertilizer replacement economic value (NFRV) of slurry, and therefore reduce the total fertilizer N inputs and reduce associated reactive N emissions from soil. This occurs by reducing the surface area exposed for volatilisation. Trailing shoe is more effective at reducing volatilisation, as the slurry is placed directly on the soil beneath the sward.	Source-based pollution control	4.46	4.4 6	4.4 2	4.42
	Trailing shoe (non-dairy) - adoption target 42% (S1 & S2)			1.62	1.6 2	1.7 2	1.72
<b>Aerated open manure storage under cages to dry manure (poultry) – adoption target 60% (S1)</b>		Ammonia emissions from battery deep-pit or channel systems can be lowered by reducing the moisture content of the manure by ventilating the manure pit.	Source-based pollution control, Voluntary agreements	0.16		0.1 6	
<b>Covering outdoor storage (dairy/non-dairy) – adoption target</b>		Covers include tight lids, floating covers and LECA balls. Tight lids: This is the most effective measure to reduce	Source-based pollution	1.58	0.9	1.7	1.02

<b>100% (S1 &amp; S2)</b>	emissions from slurry stored in tanks or silos. These covers are well sealed to minimize air exchange, but are costly and the ability to retrofit onto existing external storage depends on whether they can be modified to accept the extra load. Floating covers: floating cover sheeting may be a type of plastic, canvas, geotextile or other suitable material. It is ideal for small earth banked lagoons or tanks that cannot take the structural load of tight lids. However, they are difficult to implement on tanks, especially those with high sides. LECA covers can be easily applied to non-crusting pig manure or more dilute dairy slurry. Crusting of slurries (where a crust is allowed to form on top of the open slurry tanks for the entire storage period), and a crust to form on the indoor tanks when animals are turned out to pasture and to spread was not considered as effective, in practice both of these opportunities are fully used.	control		6	1	
<b>Covering outdoor storage (pigs) – adoption target 20% (S1)</b>		Source-based pollution control	0.62		0.63	
<b>Amendment of poultry litter with Alum – adoption target 70% (S1)</b>	Applications of aluminum sulphate, commonly referred to as alum, to poultry litter have been shown to decrease P runoff from lands fertilized with litter and to inhibit NH <sub>3</sub> volatilization. Alum will reduce ammonia emissions from the houses, both by reducing its production in the litter and by reducing ventilation needs. The total reduction has been estimated to be between 60-70%. The reduction in pH may also persist during land spreading of litter, further reducing ammonia loss or lowering soil pH, need for some research		0.23		0.23	

	to test soil effect and interaction with soil fertility goals.					
<b>Feeding Strategies</b>	These strategies have the advantage that they can reduce emissions from both storage and upon application to the land. Reducing crude protein (CP) content can reduce both N excreted and the proportion of N in urine and lead to a reduction in ammonia and N <sub>2</sub> O emissions (Lynch et al. 2008, Meade et al. 2011).					
<b>Reduce Crude Protein (pigs) – adoption target 30%</b>	Involving diet manipulations in crude protein diets for pigs. This strategy will result in reduced N <sub>2</sub> O and ammonia emissions. Decreased dietary CP content can also lessen manure volume produced per animal due to lower water consumption.	Source-based pollution control, Voluntary agreements	1.79		1.8 2	
<b>Fertilizers</b>	Ammonia emissions associated with fertilizer applications are dependent on fertilizer type, weather and soil conditions.					
<b>Low emission fertilisers</b>	Ammonia emissions associated with fertilizer applications are dependent on fertilizer type, weather and soil conditions. Emissions from urea-based fertilizers are much greater than from ammonium or nitrate fertilisers because rapid hydrolysis of urea will cause localised increases in pH. Optimising timing of application or the stabilisation of urea with a urease inhibitor can reduce ammonia emissions to levels not significantly different to ammonium	Source-based pollution control, Voluntary agreements				

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	nitrate fertilisers based on Irish research (Forrestal et al., 2016) <sup>22</sup> . Urease inhibitors work by moderating the rate of conversion of urea to ammonium carbonate by directly inhibiting the action of the enzyme urease.					
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<sup>22</sup> Forrestal, P.J., Harty, M., Carolan, R., Lanigan, G.J., Watson, C.J., Laughlin, R.J., McNeill, G., Chambers, B. and Richards, K.G. 2016. Ammonia emissions from urea, stabilised urea and calcium ammonium nitrate: insights into loss abatement in temperate grassland. *Soil Use and Management*. 32: 92-100. [doi: 10.1111/sum.12232](https://doi.org/10.1111/sum.12232)

The CAS measures do not suit the table format of the Appendix file 'NAPCP Measures Template', therefore they are listed and detailed here. DCCAE have identified this list of measures with the intention of including them in the preliminary draft of the CAS. These measures are arbitrarily divided into three categories for presentation in the NAPCP. These are – Category 1 (actionable policy measures), Category 2 (supporting measures), and Category 3 (policy exploration, development, and actions for better governance).

The category 1 measures are those which can be readily modelled/analysed for impact. Category 2 measures are secondary or supporting in that they may have an impact, but will be reliant on some assumption and further detail to recognize them for analysis. Category 3 measures are relevant actions in the broader policy context and relevant to the fundamental issue and process. They are more about governance, policy exploration and development. The measures are listed under these categories below.

#### Category 1 – Actionable Measures

1. Ensure that clean air considerations are addressed in the implementation of the Alternative Fuels Infrastructure Directive, in particular that no new non-zero emission vehicles to be sold in Ireland post 2030.
2. No NCT Cert will be issued for non-zero emission cars post 2045.
3. Transition to low emission, including electric buses, for the urban public bus fleet with no diesel only buses purchased from 1 July 2019.

#### Category 2 – Supporting Measures

1. Determine appropriate incentives to promote low/no smoke alternatives to solid fuels.
2. Support the transition from solid fuels including through Deep Retrofit Pilot of householders and links with other relevant support schemes e.g. Ballymahon Pilot for peat users and future initiatives.
3. Support the development of legislation for minimum solid fuel quality standards specifically for biomass.
4. SEAI Better Energy Communities Scheme to promote reduced air pollution through grant aid EcoDesign compliant appliances only from 2019 where solid fuel appliances are supported.
5. Ensure that the Local Authority Energy Efficiency Retrofit Programme promotes clean air considerations when funding heating systems to reflect the shift from solid fuel use for heating in existing publicly funded housing.

6. Engage with Stove Manufacturing Industry to promote early uptake of Eco Design Regulation ready stoves.
7. Review the need for a national accreditation scheme for the installation of solid fuel boilers and flues.
8. Deliver effective enforcement of illegal use, marketing, sale and distribution of bituminous fuel, including by resourcing a regional approach.
9. Upgrade existing SWIFT 7 standard for verification of certain solid fuels to a national Irish Standard (IS).
10. Conduct pilot retrofit project on public buses as set out in 'Our Sustainable Future' the National Sustainable Development Strategy.
11. Transition diesel buses in the urban public bus fleet to lower emitting alternatives under the BusConnects programme while promoting and the small public service vehicle industry to use low-emission fleet
12. Support the procurement of low emission (greenhouse gas and air pollutants) public vehicles in line with the National Green Public Procurement Programme and the Cleaner Vehicles Directive 2009/33/EC and its successor.
13. Develop a national communications and awareness campaign on Clean Air in particular on solid fuel use and health impacts.

### Category 3 – Policy Exploration, Development, and Better Governance

1. Develop a regional approach to support enforcement of air legislation taking consideration of the lessons from the regional approaches adopted for waste, water and climate legislation.
2. Review the need to reference a product standard for emissions from (i) biomass appliances installed to meet Building Regulation renewable energy requirements and (ii) consider appropriate requirements for ground floor stove installations.
3. Commission detailed research study on solid fuel use in the residential sector to improve national (i) fuel statistics and (ii) air pollution emission inventories.
4. Conduct a roadside exhaust emissions monitoring study using remote sensing techniques for road vehicles.
5. Review and implement the provision of publicly available Real-time Air Quality Data from prioritised IED sites.
6. Implement mandatory appliance air quality specifications and wood fuel sustainability specifications as part of the Support Scheme for Renewable Heat.

7. Consider new research on emerging Air Quality issues such as agricultural burning, shipping emissions, Ultra Fine particles, non-road mobile machinery.

8. Continue to support the EPA Environmental Research Programme to fund high quality clean air and climate research.

## 5.2 Impacts on air quality and the environment

### EU Directive 2018/1522 reference section 2.6.2.

As mentioned in earlier sections of this report, Ireland is not anticipating ambient air quality exceedances based on the evidence from the current monitoring network and expected developments in total emissions. However, using the more stringent WHO guidelines for air quality, there are four air pollutants that need to be continuously monitored and reduced in order to achieve an even higher standard of air quality in Ireland. These pollutants are PM<sub>10</sub> and PM<sub>2.5</sub>, which are mainly associated with residential solid fuel burning and transport emission from diesel; NO<sub>2</sub> typically found in higher concentration in urban centers and associated with transport and congestion; O<sub>3</sub> at a regional scale and in part due to impacts of transboundary ozone; and PAH, due to burning of fossil fuels.

- PM is linked to poor respiratory health of humans and animals, it causes damage and soiling of buildings and can reduce visibility. The WHO guidelines for PM<sub>2.5</sub> are 10 µg/m<sup>3</sup> annual mean and 25 µg/m<sup>3</sup> daily mean. For PM<sub>10</sub> the guidelines are for 20 µg/m<sup>3</sup> annual and 50 µg/m<sup>3</sup> daily.
- Ozone can be very dangerous for human health, it is also damaging for crops and vegetation. The WHO guidelines for Ozone are 100 µg/m<sup>3</sup> in an 8hour period.
- SO<sub>2</sub> contributes to acidification and eutrophication of soil and water. The WHO guidelines are for 20 µg/m<sup>3</sup> daily and 500 µg/m<sup>3</sup> in a 10minute period.
- NO<sub>x</sub> has been shown to have adverse effects on human health, particularly negative respiratory impacts, it contributes to acidification and eutrophication of soil and water, it is an Ozone precursor and a source of PM through reactions with other pollutants. The Who Guidelines are 40 µg/m<sup>3</sup> annual mean and 200 µg/m<sup>3</sup> in a 1hour period.

Poor air quality was estimated to have contributed to approximately 1150 premature deaths in Ireland in 2017. As many of the key ambient air pollutants in Ireland are associated with transport and residential solid fuels, the key policies to address the negative impacts of poor air quality will be the measures focused on vehicles and residential combustion.

### 5.3 Compliance with emission reduction commitments in the Agriculture sector

The agriculture sector is the key source of emissions of NH<sub>3</sub>, which are currently above NECD ceilings in the 2020 and 2030 phases. The agriculture sector has set out in Food Wise 2025 the intention to grow the sector and at the same time move towards carbon neutrality and sustainability. The Sustainable Growth Scenario (SGS) has been established with policy options that offer varying degrees of abatement dependent on uptake and penetration rates.

The table below includes additional details concerning the measures from Annex III Part 2 to Directive (EU) 2016/2284 targeting the agriculture sector to comply with the emission reduction commitments.

Table 6. Compliance in the Agriculture sector (EU reference 2.6.4.)

	Is the PaM included in the national air pollution control programme? Yes/No.	If yes, indicate section/page number in programme.	Has the PaM been applied exactly? Yes/No If no, describe the modifications that have been made.
A. Measures to control ammonia emissions			
1. Member States shall establish a national advisory code of good agricultural practice to control ammonia emissions, taking into account the UNECE Framework Code for Good Agricultural Practice for Reducing Ammonia Emissions of 2014, covering at least the following items:	Yes: See Note 1		Yes: See Note 1
(a) nitrogen management, taking into account the whole nitrogen cycle;	Yes		Yes

	Yes	
(b) livestock feeding strategies;		Yes
	Yes	
(c) low-emission manure spreading techniques;	Yes	Yes
		Yes
(d) low-emission manure storage systems;	Yes	
		Yes
(e) low-emission animal housing systems;	Yes	
		Yes
(f) possibilities for limiting ammonia emissions from the use of mineral fertilisers.		
2. Member States may establish a national nitrogen budget to monitor the changes in overall losses of reactive nitrogen from agriculture, including ammonia, nitrous oxide, ammonium, nitrates and nitrites, based on the principles set out in the UNECE Guidance Document on Nitrogen Budgets	No: See Note 2	No: See Note 2
3. Member States shall prohibit the use of ammonium carbonate fertilisers and may reduce ammonia emissions from inorganic fertilisers by using the following approaches:	No: See Note 1, 2 & 3	No: See Note 1,2 & 3
(a) replacing urea-based fertilisers by ammonium nitrate-based fertilisers;	No	No
	No	
(b) where urea-based fertilisers continue to be applied, using methods that have been shown to reduce ammonia emissions by at least 30 % compared with the use of the reference method, as specified in the Ammonia Guidance Document;		No
	No	
(c) promoting the replacement of inorganic		No

<p>fertilisers by organic fertilisers and, where inorganic fertilisers continue to be applied, spreading them in line with the foreseeable requirements of the receiving crop or grassland with respect to nitrogen and phosphorus, also taking into account the existing nutrient content in the soil and nutrients from other fertilisers.</p>		
<p>4. Member States may reduce ammonia emissions from livestock manure by using the following approaches:</p>	<p>Yes: See Note 1 &amp; 4</p>	<p>Yes See Note 1 &amp; 4</p>
<p>(a) reducing emissions from slurry and solid manure application to arable land and grassland, by using methods that reduce emissions by at least 30 % compared with the reference method described in the Ammonia Guidance Document and on the following conditions:</p>	<p>Yes</p>	<p>Yes</p>
<p>(i) only spreading manures and slurries in line with the foreseeable nutrient requirement of the receiving crop or grassland with respect to nitrogen and phosphorous, also taking into account the existing nutrient content in the soil and the nutrients from other fertilisers;</p>	<p>Yes</p>	<p>Yes</p>
<p>(ii) not spreading manures and slurries when the receiving land is water saturated, flooded, frozen or snow covered;</p>	<p>Yes</p>	<p>Yes</p>
<p>(iii) applying slurries spread to grassland using a trailing hose, trailing shoe or through shallow or deep injection;</p>	<p>Yes</p>	<p>Yes</p>

(iv) incorporating manures and slurries spread to arable land within the soil within four hours of spreading.	See Note 1, 5 & 6	See Note 1, 5
(b) reducing emissions from manure storage outside of animal houses, by using the following approaches:	Yes	& 6 Yes
(i) for slurry stores constructed after 1 January 2022, using low emission storage systems or techniques which have been shown to reduce ammonia emissions by at least 60 % compared with the reference method described in the Ammonia Guidance Document, and for existing slurry stores at least 40 %;	No – crust formation  Yes	No – crust formation  Yes
(ii) covering stores for solid manure;	Yes	Yes
(iii) ensuring farms have sufficient manure storage capacity to spread manure only during periods that are suitable for crop growth.	Yes	Yes
(c) reducing emissions from animal housing, by using systems which have been shown to reduce ammonia emissions by at least 20 % compared with the reference method described in the Ammonia Guidance Document;	Yes	Yes
(d) reducing emissions from manure, by using low protein feeding strategies which have been shown to reduce ammonia emissions by at least 10 % compared with the reference method described in the Ammonia Guidance Document.	Yes	Yes

B. Emission reduction measures to control emissions of fine particulate matter (PM<sub>2.5</sub>) and black carbon

- |  |                        |                        |
|--|------------------------|------------------------|
| <p>1. Without prejudice to Annex II on cross-compliance of Regulation (EU) No 1306/2013 of the European Parliament and of the Council (1), Member States may ban open field burning of agricultural harvest residue and waste and forest residue. Member States shall monitor and enforce the implementation of any ban implemented in accordance with the first subparagraph. Any exemptions to such a ban shall be limited to preventive programmes to avoid uncontrolled wildfires, to control pest or to protect biodiversity.</p>   | <p>Yes: See Note 7</p> | <p>Yes: See Note 7</p> |
| <p>2. Member States may establish a national advisory code of good agricultural practices for the proper management of harvest residue, on the basis of the following approaches: (a) improvement of soil structure through incorporation of harvest residue; (b) improved techniques for incorporation of harvest residue; (c) alternative use of harvest residue; (d) improvement of the nutrient status and soil structure through incorporation of manure as required for optimal plant growth, thereby avoiding burning of manure (farmyard manure, deep- straw bedding).</p> | <p>No: See Note7</p>   | <p>No: See Note 7</p>  |

C. Preventing impacts on small farms

In taking the measures outlined in Sections A and B, Member States shall ensure that impacts on small and micro farms are fully taken into account. Member States may, for instance, exempt small and micro farms from those measures where possible and appropriate in view of the applicable reduction commitments	Yes: See Note 2	Yes: See Note 2
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**Note 1: A Code of Good Agricultural Practice for the Control of Ammonia Emissions (CoPA)** is being launched and will take account of the UNECE Framework Code for Good Agricultural Practice for Reducing Ammonia Emissions of 2014. It covers the following items:

- (a) nitrogen management, taking into account the whole nitrogen cycle;
- (b) livestock feeding strategies;
- (c) low-emission manure spreading techniques;
- (d) low-emission manure storage systems;
- (e) low-emission animal housing systems;
- (f) possibilities for limiting ammonia emissions from the use of mineral fertilisers.

**Note 2: Nitrates Action Programme (NAP)** - There is a whole territory approach to nitrates implementation so all farmers are obliged to abide by nutrient management planning which has many synergies with reducing ammonia due to the efficient use of animal manure. The Nitrates Action Programme gives effect to the Nitrates Directive; in late 2017 Ireland agreed with the European Commission on its fourth NAP for the period 2018-2021. The Nitrates Action Programme agreed includes a balanced programme of measures supporting the objectives of achieving good water quality while at the same time encouraging sustainable and efficient agricultural practices. The implementation and enforcement of the requirements of the Nitrates Directive is to a very high standard. The Nitrates Directive permits only spreading manures and slurries in line with the foreseeable nutrient requirement of the receiving crop or grassland with respect to nitrogen and phosphorous, also taking into account the existing nutrient content in the soil and the nutrients from other fertilisers. Also, not spreading manures and slurries when the receiving land is water saturated, flooded, frozen or snow covered.

The measures in Ireland's derogation take account of the growing numbers of derogation farmers who are farming at intensive stocking rates, and also environmental objectives for water, climate change and ammonia which Ireland must achieve. For example, a new condition for derogation farms has been included in that from 2018, at least 50% of slurry must be applied by 15 June and after that it must be applied by using low emission slurry spreading (LESS) equipment.

The impacts on small and micro-farms are fully taken into account in measures outlined in Section A (measures to control ammonia emissions) and Section B (emission reduction measures to control emissions of fine particulate matter and black carbon). Family run farms in Ireland make up the fabric of Irish agriculture with the more intensive specialist dairy farms being located in the south and south east of the country and more extensive beef and sheep farms in the midlands and western regions.

Average farm size of 32.5 ha is quite small compared to other Member States. Larger scale farms are located in the southern and eastern regions; farm output is much higher in these regions also. Over 60% of farms have an extensive stocking rate of under 85 kg livestock manure nitrogen per ha. The western regions have the most extensive farming systems.

With regards to farming enterprises over two thirds of sheep farms were in the Border, Midlands and Western region, while the South East (SE) region contained almost 80% of tillage farms and 77.2% of dairying farms. Beef production was more common in the border, midlands and western region, where it accounted for almost six in ten of all farms (59.7%). In contrast under half (44.9%) of farms in the SE region were engaged in specialist beef production. There are in excess of 16,000 specialist milk producers concentrated mainly in the southern and eastern regions.

The purpose of the Nitrates Directive (SI No. 605 of 2017) is to give effect to Ireland's NAP for the protection of waters from agricultural sources<sup>23</sup>. Measures within the Regulations take account of small and micro-farms such as:

Farm Management (capacity of storage facilities for manure for sheep): The capacity to store manure from sheep on a holding is 6 weeks, with capacity for ruminants being greater. This accounts for farming enterprises where livestock may be outwintered, commonage, extensively grazed, the amount of manure produced on the holding does not exceed 140 kgN per hectare per annum and as stated above 2/3 of sheep farmers were in the extensively farmed regions of the BMW.

The adoption rate for landspreading measures utilising low emission slurry spreading techniques are envisaged to be between 50 to 80% to 2030, this method of spreading is most suitable to intensive farming enterprises, such as dairy farming enterprises. The remainder of slurry being produced on extensive farms.

**Note 3: Fertiliser types** - In Ireland all our Nitrogen fertiliser, are imported. Nitrogen is not manufactured or produced at all and therefore ammonium carbonate fertilisers are not imported.

In Ireland, CAN (calcium ammonium nitrate fertiliser <28% N) is used over ammonium nitrate-based fertilisers. Over 80% of straight nitrogen sold in Ireland is CAN.

Urea fertiliser coated/ incorporated with a urease inhibitor is available on the market and is used to protect against ammonia loss.

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<sup>23</sup> <https://www.agriculture.gov.ie/media/migration/ruralenvironment/environment/nitrates/2017/SINo605271217.pdf>

Nutrient management planning tools are used by the majority of Irish farmers to minimise the use of inorganic fertilisers and optimise the use of organic fertilisers. For example, the Teagasc Nutrient Management Planning (NMP) Online tool was produced to allow agricultural consultants and advisers formulate nutrient management plans for farmers, taking into account enterprise type, land-use, soil type and as well as other agronomic and farm management criteria. It allows ensures that soil fertility is optimised and also compliance with the limits set under the Nitrates Regulations<sup>24</sup>. Also, the CoPA encourages use and adoption of nutrient management planning promoting the the replacement of inorganic fertilisers by organic fertilisers. The Nitrates Directive permits only spreading manures and slurries in line with the foreseeable nutrient requirement of the receiving crop or grassland with respect to nitrogen and phosphorous, also taking into account the existing nutrient content in the soil and the nutrients from other fertilisers.

**Note 4: Targeted Agricultural Modernisation Schemes (TAMS)** - Spring application promoted and LESS incentivised. The Department of Agriculture, Food and the Marine (DAFM) oversee and administer the Targeted Agricultural Modernisation Schemes (TAMS). This scheme supports capital investment in a number of target areas which will promote, among other things, sustainability, e.g. the purchase of low emissions slurry spreading equipment, also grants towards farm nutrient storage.

**Note 5:** Ireland's maritime climate favours a **grass-based system of livestock production**. Typically, livestock in Ireland are fed a grass-based diet (grazed grass and grass silage) and spend about 60% of their time on pasture. Indeed, grazing has been classified as a cost-effective Category 1 abatement technique in the Guidance Document for Preventing and Abating Ammonia Emissions from Agricultural Sources, associated with lower emissions than confined housing systems. A grazing system of production it has one of the greatest potentials to reduce ammonia emissions.

**Note 6:** As stated above, there is a whole territory approach to nitrates implementation so all farmers are obliged to abide by nutrient management planning which has many synergies with reducing ammonia due to the efficient use of animal manure. Additionally, the new **best available technique (BAT) guidelines** published in February 2017 used under Integrated Pollution, Prevention and Control (IPPC) licensing for pig and poultry enterprises above thresholds will result in changes which reduce ammonia emissions.

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<sup>24</sup> <https://www.teagasc.ie/about/our-organisation/connected/online-tools/teagasc-nmp-online/>

**Note 7:** The Department of Agriculture, Food and the Marine does not encourage burning agricultural residues. The burning of green waste is currently permitted as an exempted activity under the waste management act regulations. The burning of growing vegetation under the wildlife act. Legislation pertaining to burning is referred to in other policies also, for example, policy relating to air quality, waste management and biodiversity legislation.

In certain instances farmers use burning as a management tool to maintain the productivity of agricultural land, burning scrub and clearing green material. In the case of burning as a land management tool, the introduction of targeted vegetation management and follow up prescribed grazing by livestock will help reinvigorate upland conservation landscapes and the farming activity and husbandry that support healthy upland habitats and the services they provide.

When considering the disposal of green waste for example from reclamation or hedgerow trimmings, this is governed under the Waste Management (Prohibition of Waste Disposal by Burning) Regulations 2009. These regulations came into force on the 31<sup>st</sup> of July 2009 and were amended in 2013 S.I. No. 504 of 2013. Waste Management (Prohibition of Waste Disposal by Burning) (Amended) Regulations 2013. The regulations require that all other more environmentally friendly methods of treatment of their green waste such as reduction, reuse, and recycling by shredding, composting or wood chipping before disposal by burning.

Properly managed, small scale cooperative burning actions, should be conducted during the permitted burning period in line with DAFM Prescribed Burning Code of Practice guidelines.

The Department has produced guidelines for land managers considering the use of fire on their land<sup>25</sup> and has also supported and encouraged the development of a number of local level fire management groups and partnerships aimed improving awareness and understanding of the responsible use of fire as a land management tool.

The Department of Agriculture also provides specialist guidance to the forestry sector on forest fire management related issues, most notably the issuance of Fire Danger Notices to the sector prior to periods of high fire risk weather, and the monitoring and analysis of fire activity and fire behaviour during these periods.

## **Abbreviations:**

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<sup>25</sup> <https://www.agriculture.gov.ie/media/migration/forestry/firemanagement/CofPPrescribedBurningFinal90212.pdf>

**BAT:** Best Available Techniques

**CoPA:** The Code of Good Agricultural Practice for the Control of Ammonia Emissions

**DAFM:** Department of Agriculture, Food and the Marine

**IPPC:** Integrated Pollution, Prevention and Control

**LESS:** Low Emission Slurry Spreading

**MACC:** Marginal Abatement Cost Curve

**NAP:** Nitrates Action Programme

**TAMS:** Targeted Agricultural Modernisation Schemes

## 6. Measures and Policies Selected for Adoption by Sector

### EU Decision 2018/1522 reference section 2.7.

The measures detailed in this section have been selected from the list of options in the previous section and the associated appendix file, to be implemented, with their estimated impacts included in the WAM scenario. The results of the potential emissions reductions from these additional measures on the overall emission outlook WAM is shown in section 7.

#### 1) *Further Deployment of Electric Vehicles (0.5million EVs by 2030)*

Low and zero emission vehicles need to become the default option for new car purchases, enabled by the corresponding charging and refueling infrastructure, and, more broadly, new technology adoption and innovation. There are several key policy and mitigation options for electrifying the transport sector in Ireland. In the context of road transport, there needs to be a broad roll-out of charging infrastructure, consideration of subsidies, tax, and registration incentives, and policies to encourage a transition away from internal combustion engines (ICEs).

#### *The Low Emission Vehicle Taskforce*

To help support the transition to EVs an interdepartmental *Low Emission Vehicle (LEV) Taskforce* was established in December 2016 to consider a wide range of measures and options available to Government to accelerate the take-up of low carbon technologies in the road transport sector, including EVs. The LEV Taskforce is jointly chaired by the Department of Transport, Tourism and Sport (DTTAS) and the Department of Communications, Climate Action and Environment (DCCA). It included representatives from across the public sector and has consulted widely with industry, stakeholders and representative groups.

There are a number of the current incentives available to encourage EV uptake in Ireland. The continued support of the LEV Taskforce recommendations are kept under review in light of increasing EV uptake rates, the closing price differential with conventionally fuelled vehicles and the need for appropriate long-term signalling to the market of the progressive move towards LEVs. DPER will also undertake a review of EV supports as part of its 2019 programme of spending reviews.<sup>26</sup>

Encouraging uptake and behavioral change will be critical factors in reducing emissions from the transport sector. It will be necessary to address the concerns that are creating hesitation among

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<sup>26</sup> <http://www.dttas.ie/sites/default/files/publications/public-transport/english/low-emission-vehicle-lev-taskforce-progress-report/e6934-appendix-2-lev-taskforce-progress-report.pdf>

consumers and preventing them from adopting new technology. Among these concerns are issues related to refueling infrastructure networks, range anxiety and economic considerations such as upfront capital, resale value and maintenance costs. Improving public awareness and information dissemination will help to encourage greater public acceptance for new technologies and should help to support the necessary uptake required to meet the 0.5 million EV target for.

According to fleet modelling research that EnvEcon have conducted, there are some valuable potential reductions in NO<sub>x</sub> and NMVOC under a range of scenarios where Ireland achieves incrementally higher shares of BEV and PHEV penetration in the total vehicle stock by 2030. In order to achieve the full EV target, EVs will need to be deployed in the public fleet and taxis. Measures to support the uptake of EVs under each of these categories are included in Table 7 below.

Table 7. Measures to support electric vehicle uptake

Supporting Action	Description	Responsible Authority
<b>Continuation of SEAI Grant and VRT Relief</b>	The SEAI has been offering grants of up to €5,000 to consumers of BEVs or PHEVs since 2011. EVs can qualify for VRT relief of between €2,500 and €5,000 depending on the type of technology being used. It has previously been announced that VRT relief would continue until the end of 2021 for BEVs.	SEAI
<b>Charging Infrastructure</b>	The roll out of the plug-in charge stations has also allowed for the EV concept to become more mainstream and adoptable. According to the EU Directive 2014/94/EU, it is recommended that at least one public charge station be provided for every ten EVs. In Ireland, there are currently over 650 standard publicly accessible electric vehicle chargers and almost 80 fast chargers, which are generally focused around the national road network.	ESB, SEAI

<b>BusConnects Programme</b>	<p>Ireland has committed to no longer purchase any more diesel-only buses for the urban public bus fleet from July 2019 and to transition to low-emissions bus technologies, such as electric buses, in line with the BusConnects programme.</p> <p>Low emission bus trials are underway to test a range of different fuels and technologies on real bus routes in Dublin City and Cork City. The buses are fitted with portable emissions measurements systems (PEMS) which will measure the exhaust emissions of the vehicle as it travels. The bus trials commenced in December 2018 and are expected to run until April 2019.</p>	DublinBus, DTTAS
<b>SPSV Grant Scheme</b>	<p>From 2018, an 'electric SPSV grant scheme' offering nationwide grants for the purchase of new and second-hand electric vehicles specifically for Ireland's taxi, hackney and limousine industry has been supported through DTTAS' Green Public Transport Fund. Grant monies of up to €7,000 for BEVs and up to €3,500 for PHEVs are available.</p>	DTTAS
<b>EV Toll Incentive Scheme</b>	<p>The Electric Vehicle Toll Incentive Scheme was developed through the <i>Low Emission Vehicle Taskforce</i> as part of a wider suite of incentives aimed at supporting the national transition towards lower emitting vehicles. The reduced tolling regime was introduced to encourage private car commuters who regularly use tolled roads to consider switching to EVs. It is estimated that there are approximately 400,000 heavy toll users in Ireland and so reduced tolls act as a meaningful incentive for a large number of vehicle owners. The Scheme was launched in July 2018 and is administered by Transport Infrastructure Ireland. BEV and PHEVs qualify for 50% and 25% toll reductions respectively up to a maximum €500 annual threshold for private vehicles and a maximum annual threshold of €1,000 for commercial vehicles (greater off-peak rates also apply to the M50 toll).</p>	DTTAS

## 2) Heat Pump Installation (170,000 heat pumps installed by 2030)

According to CSO data from 2015, only 4.9% of households use electricity as the central mode of heating, even as heat pumps as residential heating technology offer high energy efficiency along with numerous health and environmental benefits. Investment in heat pumps can offer potential long-term benefits for household energy efficiency and energy bills. The considerable upfront expenditure, however, poses a financial barrier to higher rates of uptake. These costs are offset to a considerable extent through heat pump grants put forth by the SEAI, amounting to €3,500.

Even as heat pumps present a significant opportunity for environmental improvement and steps towards a cleaner and greener future, the crux of the matter is to accelerate uptake to reap the most benefit as soon as possible. Additionally, it is very important to consider where heat pumps are being installed and what energy or fuel sources are being displaced. In other words, if 170,000 new heat pumps are installed in new homes between now and 2030 the impact on current overall emission levels may be less, however, if 170,000 heat pumps are installed in existing homes replacing heating systems that include solid fuel burning then the impact could be very substantial indeed.

This measure would be monitored by the SEAI with support from DCCAE. The following are some additional measures that can aid in achieving the ambitious target for more widespread use of heat pumps for residential heating:

Table 8. Measures to support heat pump uptake

Supporting Action	Description	Responsible Authority
<b>BER Assessment of Building Stock</b>	BER assessment of all homes in Ireland by 2021 will aid in generating data about the housing stock in Ireland, which will further inform targeted measures for deployment of heat pumps. Currently, about 775k buildings out of ~2million have been rated. All of Government Plan has put a timeline to 2021 to introduce a compulsory BER rating system for all buildings.	SEAI
<b>Innovative Financing</b>	Provision of grants, along with innovative financing schemes is important to incentivise investment by homeowners in heat pump technology. Some proposals for market-based financing have been previously proposed, including private finance, Pay-as-you-save, and employer-based schemes.	SEAI
<b>Free</b>	Currently private cost of ~€200-€500 is incurred in home assessment to determine compatibility of a heat pump in	SEAI

<b>Assessment</b>	one's home. There is uncertainty in this investment on the part of the homeowner as the house may turn out to be unsuitable for heat pump installation, and the cost of assessment would be deemed as wasted.	
<b>Community-scale retrofits</b>	Spatial analysis of BER data to recognise communities with lower energy efficiency homes should be undertaken for developing targeted retrofitting programmes – both deep and shallow, as required.	SEAI
<b>Shallow retrofits</b>	By conducting shallow retrofits in certain dwellings which are close to the acceptable form for heat pump installation, they can be made eligible for upgrade to heat pump technology, and likely at a lower cost than a complete shift from fossil-fuel-powered heating systems to heat pumps.	SEAI
<b>Greater incentives for heat pump installation in new builds and renovations</b>	This suggestion binds with policy framework condition of promotion of sustainable settlement as well as the rule to raise the minimum BER of all buildings undergoing renovation to B. It also follows from a potential action plan to support switches from oil-fired boilers to heat pumps, along with the provision of roof solar, in at least 350,000 homes, with 175,000 delivered by 2025.	SEAI
<b>Further development of heat pump technology</b>	Innovation in heat pump technology may lead to lowering its cost, and subsidies towards it can be adjusted as the market prices change. The Ecodesign Framework Directive (2009/125/EC) will also help encourage innovation in home heating systems and can be used in conjunction with higher investment in such endeavors in Ireland.	

### 3) Electricity Generation

Moneypoint is Ireland's sole coal burning electricity generation plant. The closure or conversion of this plant in 2025 or 2030 will have a bearing on the national emissions profile. Under the WAM scenario the plant is closed in 2025.

## 7. Projected 'With Additional Measures' Scenarios

### EU Decision 2018/1522 reference section 2.8.

The information provided herein is quantitative in nature and is informed by the forecasting team at the EPA. National emission reduction commitments are as put forth by the government of Ireland to the EU.

#### 7.1 Projected emission reductions (WAM)

From the full list of options that have been included in section 5 of this report, three key measures selected for adoption have been detailed in section 6 above, namely the increase from 250,000 EVs to 500,000 EVs by 2030, the target for 170,000 new heat pumps to be installed residentially by 2030, and for the Moneypoint coal-fired power plant to close in 2025 rather than 2030. These are in addition to other broader national policies that are expected to deliver emission reductions, such as the energy efficiency and renewable energy initiatives. The three key measures and those broader actions are shaping the WAM scenario and the further emission reductions that are demonstrated in table 9 below. The options that are listed under the agriculture sector have not yet been adopted and are therefore not reflected in the WAM scenario.

Table 9. Projected emissions reductions WAM (EU reference 2.8.1.)

Pollutants (M)	Total emissions (kt), consistent with inventories for year x-2 or x-3 (year to be specified) (M)				Projected % emission reduction achieved compared with 2005 (M)			National emission reduction commitment for 2020-2029 (%) (M)	National emission reduction commitment from 2030 (%) (M)
	2005 (base year)	2020	2025	2030	2020	2025	2030		
<b>SO<sub>2</sub></b>	71.76	13.01	11.25	7.08	-82%	-84%	-90%	- 65%	- 85%
<b>NO<sub>x</sub></b>	129.78 <sup>27</sup>	60.34	52.26	44.26	-54%	-60%	-66%	- 49%	- 69%
<b>NMVOC</b>	65.33 <sup>17</sup>	46.17	45.76	46.45	-29%	-30%	-29%	- 25%	- 32%
<b>NH<sub>3</sub></b>	113.29	122.32	126.15	128.69	+8%	+11%	+14%	- 1%	- 5%
<b>PM<sub>2.5</sub></b>	22.83	14.11	13.01	12.22	-38%	-43%	-46%	- 18%	- 41%
<b>Date of official emission projection</b>					.2019				

## 7.2 Non-linear emission reduction trajectory

### EU Decision reference section 2.8.2.

Regarding the national emission reduction commitments, Member States shall take the necessary steps to ensure that anthropogenic emissions of NECD pollutants are limited. The indicative levels of those emissions shall be determined by a linear reduction trajectory from the emission levels established for 2020 and the emission levels defined by the reduction commitments for 2030. However, where the emissions for 2025 cannot be limited in accordance with the determined reduction trajectory, Member States will be required to explain the reason for the deviation and describe the measures that would bring the Member State back on track with their reduction trajectory to 2030.

<sup>27</sup>, <sup>17</sup> 2005 base year totals for NO<sub>x</sub> and NMVOC are estimates that have not been confirmed in an official inventory submission, the figures have been manually calculated to account for the adjustments for compliance assessment. Agriculture emissions have been subtracted from actual reported emission inventory in 2005 in order to determine the compliance total. NO<sub>x</sub> total emissions are reported as 161.69 kt in 2005, the compliance total minus agriculture is 129.78 kt. NMVOC total emissions are reported as 119.25 kt in 2005, the compliance total minus agriculture and the food and beverage industry is 65.33 kt.

Article 4(2) of the NECD 2016/2284 states that if it is economically or technically more efficient, and provided that from 2025 there is a return to the reduction trajectory such that the commitments for 2030 are not compromised, then a Member State may follow a non-linear reduction trajectory. The non-linear trajectory must be explained and the reasons for following it in the national air pollution control program (NAPCP) to be submitted to the Commission.

It is the responsibility of the Member State to justify how maintaining a linear trajectory would incur disproportionate costs. Disproportionate costs and/or disproportionately expensive measures, are not clearly defined but may include, for example, poor or delayed implementation at national level that give rise to uncertainties, fines and delays, administrative burdens, high opportunity costs, monitoring costs, or information costs.

Costs of abatement are somewhat predictable and can be used to rationalize deviation from the linear reduction path. For example, in Ireland where an abatement technology is set to become operational post-2020, for instance the Eco-design stoves in 2022, emissions might be reported higher than the linear trajectory for the year of implementation however the expected reduction will bring the trajectory back on track with the reduction path thereafter.

Since reporting of air quality improvements and environmental impacts are to be done for 2020, 2025 and 2030, emission reduction figures for these years will be readily available in order to project a sufficiently informed emissions trajectory.

### 7.3 Flexibilities

#### EU Decision 2018/1522 reference section 2.8.3.

The new NEC Directive allows Member States some flexibilities in achieving compliance for air pollution and they must report doing so, after which the rationale for their use is considered by the European Commission for approval. Flexibilities granted to the Member States include<sup>28</sup>:

1. Adjustments in inventory: Member States may establish, in accordance with Part 4 of Annex IV, adjusted annual national emission inventories for sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds, ammonia and fine particulate matter where non-compliance with their national emission reduction commitments would result from applying improved emission inventory methods updated in accordance with scientific knowledge.
2. Pollutant swaps or offsets: In cases where a Member State is unable to reduce the level of emissions of a certain pollutant to meet the specified national emissions reduction commitments

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<sup>28</sup> From report on “A Critical Guide to The New National Emission Ceilings Directive”

(NERC), even after having implemented all cost-effective measures, they may be permitted to exceed certain NERCs for a maximum of five years, subject to a number of qualifying criteria. The Member State must compensate the non-compliance of one pollutant by an equivalent emission reduction of another qualifying pollutant. Qualifying pollutants are those for which the NERC is tighter than that would be the case by implementation of all cost effective measures, known at the time the NERC was set. For Ireland the qualifying pollutants are PM<sub>2.5</sub> and SO<sub>2</sub> (see Table 10). The current estimated margin of over compliance for either of these pollutants, and thus the scope for offsetting, is comparatively minor. However, it may be the case that additional lower cost emission reductions for PM<sub>2.5</sub> or SO<sub>2</sub> could be implemented, for example, by transitioning from residential solid fuel, to allow greater offsetting of more costly measures for other pollutants.

Table 10. Pollutant Swaps

Pollutant	NEC and Gothenburg Ceilings (from 2010)	TASP 16 Optimised Scenarios	2016/2284 National Emissions Ceiling Directive				Pollution Swap Permitted (NECD >TASP16)
			2020		2030		
<b>Sulphur dioxide (SO<sub>2</sub>)</b>	42	82%	25.1	(-65%)	10.8	85%	3%
<b>Nitrogen oxides (NO<sub>x</sub>)</b>	65	71%	66.2	(-49%)	40.2	69%	-2%
<b>Volatile Organic Compounds (VOCs)</b>	55	39%	49.8	(-25%)	45.2	32%	-7%
<b>Ammonia (NH<sub>3</sub>)</b>	116	10%	112.2	(-1%)	107.6	5%	-5%
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	N/A	32%	18.7	(-18%)	13.5	41%	9%

TSAP 16: [http://www.iiasa.ac.at/web/home/research/researchPrograms/air/policy/TSAP\\_16b.pdf](http://www.iiasa.ac.at/web/home/research/researchPrograms/air/policy/TSAP_16b.pdf)

3. Rolling 3-year average: The new Directive allows Member States to calculate their emissions based on a three-year average in the event of an exceptionally cold winter or an exceptionally dry summer.

4. Exceptional events related to the energy sector: This flexibility allows the Member State to breach the NERC limit in case of unforeseeable adverse events, and when all reasonable efforts have been put in place to meet the NERC and additional measures would lead to disproportionate costs, substantially jeopardized national energy security or posed a substantial risk of energy poverty to a significant part of the population. The State must keep the period of non-compliance as short as possible.

Use of flexibilities is to be made in case of unplanned non-compliance with emission reduction commitments, but is not unconditional. The State must ensure compliance to the emission reduction commitment within five years and the excess is to be compensated for in each year the State is non-compliant.

## **8. Public Consultation and Competent Authorities Consultation**

Member States shall consult the public and competent authorities in the initial draft of the NAPCP prior to its finalization. The consultation should be designed and laid out in a way that encourages participation and be undertaken at a time when all PaMs are still under consideration, all options remain open, and at a point in the process when it is still possible to change the content of the plan based on the feedback and responses from the consultation.

The recommended content to be included in the NAPCP following the public consultation should include:

1. An outline of the procedures taken for consultation, specifically the method and timeframe.
2. Summary of the outcomes of the consultation with respect to the selection of measures and the consideration of the most suitable instruments and actions to implement the selected measures.
3. If a transboundary consultation was required, provide a summary the outcomes of the transboundary consultation.
4. Provide or list any information on where the full list of result from the consultation can be found.

**Additional information on the NECP public consultation:**

The current phase of public consultation on the NECP is only a presentation of the template and process, and will only be receiving feedback from stakeholders regarding Part 1, Section A, sub-sections 1,2 and 3. The policies and measures that are being included in the initial consultation are listed under 7 headings:

- GHG emissions and removals
- Renewable energy
- Energy efficiency
- Energy security
- Electricity interconnectivity
- Energy transmission infrastructure
- Market integration
- Energy poverty
- Research, innovation and competitiveness

The NECP assumptions summary table only focusses on 5 measures:

- Biofuel blend
- Low carbon heating
- Electricity generation
- EVs
- Energy efficiency

All of the measures in the NECP assumptions table are included in the initial public consultation documents along with additional complimentary measures. Measures that highlight financial support and regional cooperation are listed under all headings of the consultation. The consultation document does not provide any great detail on the measures and simply lists them descriptively. However, the document does ask for stakeholders to consider the National Mitigation Plan, The National Development Plan 2018-2027 and the Effort Sharing Regulation to suggest any further measures that should be taken. There are currently 63 submission made and posted on the DCCAE website.