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Update of the 2019 NAPCP

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Report Details

This document is an update of the National Air Pollution Control Programme report for Ireland, which is provided for under Article 6(10) of Directive (EU) 2016/2284.

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NAPCP V3 2020	09.12.20	Subject to public consultation	Significant update to reflect changes in policy and updated inventories and projections
NAPCP V2 2020	13.02.20	Submitted to Commission	Minor changes following consultation
NAPCP V1 2019	15.04.19	Subject to public consultation and draft submitted to Commission	n/a

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List of Acronyms

AAQD	Ambient Air Quality and Cleaner Air for Europe Directive
ASHP	Air Source Heat Pump
BAT	Best Available Techniques
BER	Building Energy Rating
BEV	Battery Electric Vehicle
CAFÉ	Clean Air for Europe
CAP	Climate Action Plan
CAgP	Common Agricultural Policy
CAS	Clean Air Strategy
CCAC	Climate and Clean Air Coalition
CoPA	The Code of Good Agricultural Practice for the Control of Ammonia Emissions
DAFM	Department of Agriculture, Food and the Marine
DECC	Department of the Environment, Climate and Communications
DoT	Department of Transport
EAP	Environment Action Programme
EEA	European Environment Agency
EMEP	European Monitoring and Evaluation Programme
EPA	Environmental Protection Agency
EU	European Union
EV	Electric Vehicle
FADN	Farm Accountancy Data Network
GDA	Greater Dublin Area
GHG	Greenhouse Gas
GLAS	Green Low Carbon Agri-Environment Scheme
HNV	High Nature Value
ICE	Internal Combustion Engine
IED	Industrial Emissions Directive
IPPC	Integrated Pollution, Prevention and Control
IIR	Informative Inventory Report
LESS	Low Emission Slurry Spreading
LIEN	Large Industry Energy Network

LSZ	Low Smoke Zone
MACC	Marginal Abatement Cost Curve
NAF	National Adaptation Framework
NAP	Nitrates Action Programme
NCT	National Car Testing
NDP	National Development Plan
NEEAP	National Energy Efficiency Action Plan
NECP	National Energy and Climate Plan
NECD	National Emissions Ceilings Directive
NFRV	Nitrogen Fertiliser Replacement Value
NFS	National Farm Survey
NH_3	Ammonia
NMP	Nutrient Management Planning
NMVOC	Non-Methane Volatile Organic Compound
NOx	Nitrogen Oxides
NPF	National Planning Framework
NREAP	National Renewable Energy Action Plan
NSAI	National Standards Authority of Ireland
OECD	Organisation for Economic Co-operation and Development
O_3	Ozone
PfG	Programme for Government
PaM	Policies and Measures
$PM_{2.5}$	Particulate Matter with a diameter less than 2.5 microns
PM_{10}	Particulate Matter with a diameter less than 10 microns
RDP	Rural Development Programme
SDG	Sustainable Development Goals
SE	South East
SEAI	Sustainable Energy Authority of Ireland
SO_X	Sulphur Oxides
SR	Source Receptor
TAMS	Targeted Agricultural Modernisation Schemes
UNECE	United Nations Economic Commission for Europe
UTRAP	Urban Transport Related Air Pollution

VRT	Vehicle Registration Tax
WAM	With Additional Measures
WM/WEM	With Existing Measures
WHO	World Health Organisation

1 Executive Summary

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 Programme (NAPCP) drafting, the NAPCP requires that the member state sets out specific actions to address the potential breach and thereby avoid non-compliance with emission reduction targets.

The first NAPCP was undertaken before the finalisation of a number of other relevant national policy frameworks in Ireland in 2019. Their ongoing evolution at that time presented significant challenges in terms of the sequencing and integration of new official information. The major plans and strategies under development and refinement at that time included:

- The National Energy and Climate Plan (NECP)
- The National Development Plan (NDP)
- The Climate Action Plan (CAP)

As a result, Ireland's 2019 NAPCP was not able to set out the agreed programmes and measures that would bring Ireland into compliance in relation to its commitments to reduced emissions and improved air quality.

This report has been updated to include the programmes and measures that were finalised after the previous NAPCP was submitted and have now been included in the most recent national air pollutant emission inventory and projection data, which was prepared and reported by the Environmental Protection Agency (EPA)[1] in 2020.The report also includes additional information in relation to proposed measures for ammonia, setting out a pathway to compliance.

[1] EPA Informed Inventory Report http://www.epa.ie/pubs/reports/air/airemissions/airpollutantemissions/iir2020/

2 Overview of the Report

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 National Emissions Ceiling Directive (Ricardo, 2018[2]).

The first NAPCP was reviewed by Ricardo Energy and Environment in a report to DG Environment dated the 8th of June 2020. The review process considered the completeness of the review and offered a list of identified gaps. In this update of the report we have endeavored to address all the issues raised as part of the review process.

In relation to the Policies and Measures (PaMs), efforts have been made to properly align them with the NAPCP. We have added details on policy measure types, clarified timelines and flagged the responsible authority. The PaM overviews in Appendix 1 and 2 have been updated with assistance from the EPA which is the relevant competent authority with responsibility for reporting on emission inventories and projections and PaMs under the NECD and the Convention on Long Range Transboundary Air Pollution (CLRTAP).

With regard to non-linear progress on NMVOC and NH_3 some further detail and discussion of this is included now in Section 7.3.

As outlined in the previous NAPCP, the timing and sequencing of national emissions inventory and projections reporting, at a time of substantial policy change, presents a challenge in respect of aligning the NAPCP with the publication of relevant national plans and the associated updating of the national emissions inventory and projections for official reporting.

The major changes in this document are associated with updated national emissions inventory and projections data, updated ambient air metrics, inclusion of further analysis on impacts from key

[2] Circulated from the Commission – Ricardo reference - Ricardo/ED61728/Issue Number 6

defined national policies and a discussion of the role of adjustments[3] in the context of NO_X and NMVOC. There is also a particular focus on the NH_3 compliance challenge and national progress on defining a clear compliance pathway on foot of a recently published marginal abatement cost curve (MACC) analysis.

Section 3 will outline the most recent national, European and international policy developments which are relevant to air quality in Ireland.

Section 4 will demonstrate the progress made to date and outlines the key policies as included in the 2020 Informative Inventory Report (IIR) prepared by the EPA under the 'with measures scenario' detailing those which have already been adopted to deliver improvements; the impact of these policies on future emission projections of air pollutants and air quality in Ireland is set out in Section 5.

Section 6 outlines the key additional measures that are described in the relevant national policy documents which will have additional effects on future emissions of air pollutants and air quality. The impacts of these policy measures as set out in the most recent national emission projections under the 'with additional measures' scenario are outlined in Section 7.

There is a recognition that the PaMs which were included in the most recent national emission projections prepared by the EPA are not sufficient to bring Ireland into compliance for certain air pollutants. Section 8 will set out some of the policies and measures that have been adopted but are not yet been included in the official national emission projections. These measures set out some of the additional actions that will be taken to achieve compliance with the Directive in the coming years.

[3] As per Annex IV, Part 4 NEC Directive

2.1 Programmes and Measures File

For this NAPCP update, the PaMs file has been updated to quantify and detail the key measures adopted by Ireland and their contribution to abatement in the context of the latest April 2020 WAM projection scenario, consistent with the updated national submission under the NECD (2020 EPA IIR).

The PaMs file will be submitted via the webtool following the submission of the main NAPCP document. Details that had previously only been provided in the PaMs file are now incorporated into the main body of this report.

Outlooks have been updated and these are clearly reported. However, whilst the 2020 WAM projection scenario for NH_3 reports progress from the last NAPCP, it does not yet show compliance. As signalled above, the constraint arises in so far as Ireland cannot alter the officially submitted WAM projection at this point due to the projections modelling cycle and more recently published information.

As an interim alternative, a projection for NH_3 that goes above and beyond the national WAM projection scenario has been provided to incorporate the measures identified in new policy documents which are expected to deliver compliance. These updated measures should feature in the forthcoming official projections in March 2021 and are included in Section 8.

2.2 Public and Stakeholder Consultations

This NAPCP reporting format incorporates elements from a number of connected National strategies and plans such as the programmes listed below which have all undergone individual consultation processes.

- Clean Air Strategy
- National Energy Climate Plan
- National Planning Framework
- Ireland's Long-term Strategy on Greenhouse Gas Emissions Reduction
- Ag-Climatise
- The National Climate Action Plan

2.2.1 Consultation on the NAPCP

A draft of the first NAPCP was subject to public consultation over the period 15 April 2019 to 5 July 2019. Over this period, 10 submissions were received, and these are available online at the following link:

https://www.gov.ie/en/consultation/b8d3e-public-consultation-on-the-national-air-pollution-control-programme/

This update to the NAPCP was subject to public consultation over the period 9 December 2020 to 22 January 2021. Over this period, 72 unique submissions were received. A summary of the submissions and additional details will be available shortly at https://www.gov.ie/en/consultation/cf380-public-consultation-on-the-national-air-pollution-control-programme-napcp/.

Consideration was given to the submissions in the finalisation of this NAPCP update. Where it was not possible or appropriate to include them, they have been considered in the finalisation of the Clean Air Strategy and in the ongoing work of the Department.

3 The Policy Framework

EU Decision 2018/1522 reference Section 2.2.1

3.1 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 reported national emissions of the pollutants in 2005. These emission 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_2	NO_x	NMVOC	NH_3	$PM_{2.5}$
Ceilings from 2020-2029	65%	49%	25%	1%	18%
Ceilings from 2030	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 well aware of its international obligations in this area under European and UNECE frameworks. As the population and economy grow, and as sectors develop, there are both challenges and opportunities to be recognised and realised in regard to managing future air quality. Ireland is fully committed to developing and deploying further measures and initiatives to enhance and protect its relatively high standard of air quality in parallel with broader national policy priorities of relevance. The NECD ceilings support this overarching national ambition by requiring reductions in absolute aggregate air pollutant emission levels across the economy in Ireland over time. These broad improvements, in conjunction with additional measures and local initiatives, are expected to support ongoing successes in managing levels of ambient air quality in line with the CAFE Directive.

Between all the policies, plans and strategies outlined in Section 3.2, there are clearly many overlapping elements that generally offer synergistic environmental outcomes, in particular regarding emissions to air. In the original NAPCP submission, several of the PaMs within these plans and

strategies were captured, in summary form, to convey the level of activity in this context within Ireland. There was also a more detailed focus on those PaMs that were identified to help address the anticipated exceedance for NH_3 in the 2020 and 2030 NECD phases, as well as the NO_X and NMVOC exceedances for the 2030 NECD phase. However, there remained a shortfall in regard to the requisite level of NH_3 abatement under the WAM scenario projection, and this has necessitated the development of this updated NAPCP.

Under the policy priorities section below, a number of national and international policy priorities are identified and discussed briefly. However, this is not intended to be a comprehensive overview of all policy developments; instead, these are included so as to highlight other complementing policy priorities in the system. In many cases there is a direct relationship between these policies and their impact on air pollution control in Ireland which is reflected in the programmes and measures outlined in sections 4 and 6. Conversely, while many may lead to improvements in air quality, their specific contributions are not easily quantified.

Finally, Ireland had a general election in February 2020 with coalition Government formation talks having concluded in June 2020. There is now a new Programme for Government[4] (PfG) which will guide new policy formation over the next five years. At the present moment it is too early to incorporate new elements from this programme; however, it is credible to assume that it will introduce further additional policy change in the system in the coming years.

3.2 National Policy Priorities Relevant to Air Quality

3.2.1 Clean Air Strategy (CAS)

The Clean Air Strategy will provide the strategic policy framework necessary to identify and promote integrated measures across 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 framework strategy will also assist Ireland in developing the necessary policies and

[4] Programme for Government 2020

measures to support compliance with evolving EU and international air quality ambitions and will facilitate integration with ambitious climate policies.

The CAS is the strategic complement to the more technical NAPCP and will ensure the delivery of increased ambition in the transport, energy, home heating and agriculture sectors. It should be noted that finalising the CAS has not impacted upon the ongoing work of the Department in ensuring improvements in air quality.

The key priorities for the Clean Air Strategy are to:

- Increase ambition in addressing all sources of air pollution;
- Ensure the integration of clean air considerations into policy development across Government;
- Increase the evidence base that will help us to continue to evolve our understanding of the sources of pollution in order to address them more effectively;
- Enhance regulation and improve the effectiveness of our enforcement systems;
- Promote and increase awareness of the importance of clean air; and,
- Ensure effective oversight and cross-sectoral action to reduce emissions

3.2.2 Climate Action Plan (CAP)

The Climate Action and Low Carbon Development Act 2015 set a plan to shift Ireland onto a pathway of rapid decarbonisation. It initiated the development of the National Mitigation Plan for de-carbonisation, reflecting in particular the central roles of the key Ministers responsible for sectors such as electricity generation, the built environment, transport and agriculture. The initial plan has now been superseded by the Climate Action Plan 2019 – which is a new all-of-Government strategy that defines clearer timelines and responsibilities for more ambitious climate actions. The current CAP includes a number of highly relevant actions to realise the synergies between coherent air and climate policy. Two major examples include the ambition for road transport fleet electrification, as well as an ambitious strategy to support the retrofitting of 400,000 homes with heat pump technology. Whilst the focus for the heat pump target is on the large number of oil fired heating systems in Ireland, there is also scope for substantial residential sector air emission reductions where a partial focus is placed on the solid fuel burning heat market in Ireland. The synergistic potential of these measures for climate policy, and both NECD and AAQ emission outcomes, are the subject of ongoing research that will be shared once available, and incorporated into future updates.

Since the completion of the first NAPCP, the Climate Action Plan 2019 has also been completed and this serves as the main document in regard to defining the actions and measures to be taken as part of efforts to meet national climate policy goals in Ireland, as well as recognising areas of co-benefits for national air pollution outcomes. Many measures from the CAP are included in the most recent official projections (June 2020) With Additional Measures (WAM) scenario. The CAP is an all-of-Government 'living' document that identifies a range of specific actions and timelines for progress on climate action within Ireland. There is of course overlap and alignment with other national and regional plans and strategies. The plan was first released in 2019 and will be updated over time, with the first such update planned for mid-2021. The Programme for Government (PfG) adopted by the new Government in June 2020 is also expected to further influence the plan as part of the next update, with an expectation for further environmental action and ambition.

The Climate Action and Low Carbon Development (Amendment) Bill is an ambitious piece of legislation which is currently being finalised. It commits Ireland, in law, to move to a climate resilient and climate neutral economy by 2050, thereby aligning with broader EU wide ambitions for 2050.

3.2.3 Urban Transport-Related Air Pollution Working Group (UTRAP)

While air pollutant emissions levels in Ireland were generally below EU limits in 2018, the 'Urban Environmental Indicators' report published by the EPA in July 2019 suggested that on certain heavily trafficked streets in Dublin, nitrogen dioxide (NO_2) levels were higher than previously indicated and may even exceed the ambient air quality limits.

In response to this report, the Urban Transport-Related Air Pollution Working Group (UTRAP)[5] was jointly convened by the Department of the Environment, Climate and Communications (DECC) and the Department of Transport (DoT) in autumn 2019.

The primary aim of the group is to examine transport-related air pollution and to develop an evidence-based national policy framework within which local authorities can address the current observed exceedance and any future exceedances.

[5] https://www.gov.ie/en/publication/3f634-urban-transport-related-air-pollution-utrap-working-group/

An interim progress report will be published in Q1 2021, which will provide detailed background information in relation to urban transport issues, ongoing work in the area and initial recommendations for action.

In addition, following the completion of a demand management study focused on five cities (Dublin, Cork, Limerick, Galway and Waterford), a final report will be published later in 2021 which will detail a suite of recommendations designed to support a decrease in NO_2 levels in the urban environment.

3.2.4 Ag-Climatise

Ag-Climatise[6] is a new national roadmap dealing specifically with air and climate emissions from the agri-food sector in Ireland to 2030 and beyond. Given the considerable challenge posed in respect of ammonia emissions abatement in Ireland, this strategy for the agriculture sector is pivotal in terms of setting the new trajectory for compliance with ammonia emission reduction commitments into the future. The document underwent a public consultation that concluded at the start of 2020. The report was published in December 2020.

The document draws upon an updated marginal abatement cost curves developed for the agriculture sector for both ammonia and greenhouse gases, and *inter alia* defines the policy roadmap for compliance in regard to both air and climate goals on the time horizon to 2030 and beyond. As noted, the programmes and measures outlined in Ag-Climatise are not yet fully represented in the official emission projections, however it is anticipated that this will be addressed as part of the official 2021 projections.

3.2.5 Food Wise 2025

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

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[6] https://www.gov.ie/en/publication/07fbe-ag-climatise-a-roadmap-towards-climate-neutrality/

Food Wise 2025 included more than 400 detailed recommendations, spread across the cross-cutting themes of innovation, human capital, market development, competitiveness, and sustainability. It projected 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. Its successor, an agri-food strategy for 2030, is currently being developed.

While such strategies in the agriculture sector could introduce pressure on absolute emissions through the higher levels of activity and herd sizes, this is also an important national and regional sector. As such, managing the balance of policy priorities is important in this context and any increase in activity should be balanced by a concurrent increase in efficiency and the use of appropriate abatement measures to ensure compliance with Ireland's air quality commitments.

3.2.6 National Energy and Climate Plan (NECP)

The NECP addresses national ambitions and actions in relation to renewable energy, energy efficiency and climate actions in Ireland. Under Regulation (EU) 2018/1999 ('the Governance Regulation') Ireland is required to submit the NECP to the European Commission, in a similar vein to the NAPCP.

The NECP[7] was submitted to the European Commission in the latter part of 2020. It considers the energy and climate developments to date, and levels of demographic and economic growth, and it includes all the climate and energy measures set out in the National Development Plan 2018-2027. Further iterations of the plan will take account of additional measures and policies such as may be included in the evolving Climate Action Plan.

3.2.7 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.

[7] https://www.gov.ie/en/consultation/105804-irelands-draft-national-energy-and-climate-plan-necp-2021-2030/

3.2.8 The National Development Plan (NDP) 2018-2027

The NDP is a public capital investment programme which 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 outlines investment priorities to support the transition to a low-carbon and climate resilient society.

3.2.9 Energy White Paper

The White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015-2030' is an energy policy document. It sets out a framework for the energy sector on a time horizon to 2030 to address three core energy policy objectives – sustainability, security of supply and competitiveness. The paper takes into account European and international climate change objectives and agreements, as well as Irish social, economic and employment priorities. This plan is focused on guiding the provision of a stable and secure supply of affordable clean energy in Ireland.

3.2.10 National Renewable Energy Action Plan (NREAP)

Article 4 of Directive 2009/28/EC ('the Renewable Energy Directive') requires that each Member State adopts and submits to the European Commission an NREAP. The NREAP sets out individual national targets for the 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 to be submitted in December 2021. To date, Ireland has submitted four reports, in 2012, 2014, 2016 and 2018. A 2020 update report[8] by the Sustainable Energy Authority of Ireland (SEAI) reports that for 2018, the renewable share of electricity (RES-E) was 33.2%, renewable share of heating (RES-H) was 6.5%, renewable share of transport (RES-T) was 7.2%, and the overall RES share was 11%. The targets for 2020 are RES-E 40%, RES-H 12%, RES-T 10% and an overall energy Renewable Directive target of 16%. Thus, Ireland is currently not on track to comply with the 2020 renewable energy targets[9]. However, the direction of change is positive, and transitions in regard to renewable energy can have positive impacts on national air pollution emissions, albeit that transition to certain fuels (e.g. biomass) can present challenges for air quality.

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8 https://www.seai.ie/publications/2020-Renewable-Energy-in-Ireland-Report.pdf
9 https://www.seai.ie/data-and-insights/seai-statistics/key-publications/renewable-energy-in-ireland/

3.2.11 National Energy Efficiency Action Plan (NEEAP)

In 2009 Ireland set a target to improve energy efficiency by 20% by 2020, which would equate to 31,925GWh energy savings. The public sector committed itself to an even greater challenge of improving energy efficiency by 33% by 2020. Article 24 of the Energy Efficiency Directive required Member States to submit a NEEAP every three years. Ireland has submitted four NEEAPs to date with the 4th iteration[10] having been 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. Energy efficiency actions are often categorised as win-wins in the context of air pollution and climate emissions abatement, and thus progress on this plan is relevant in the overall context of the NAPCP.

Following the publication of legislation under the EU's Clean Energy Package in 2018 Member States no longer have to submit NEEAPs. Reporting requirements in relation to energy efficiency have transferred into the National Energy and Climate Plan.

Whilst progress has been delivered, final determinations for 2020 have yet to be made. Based on latest available data, Ireland had achieved 60% of the energy efficiency 2020 target (i.e. 12.1 of the 20%) at end of 2018. The SEAI's latest projection for 2020 is to achieve 16% improvement of the 20% target.

3.2.12 Rural Development Programme (RDP)

The RDP is part of the EU's Common Agricultural Policy (CAgP) and co-ordinates support for Member States' agricultural sectors. Ireland submitted the eighth amendment of its RDP[11] in July 2020. Broadly, the RDP sets 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-

[10] https://www.gov.ie/en/publication/93ee2-national-energy-efficiency-action-plan-neeap/

11 RDP Summary Booklet - https://www.agriculture.gov.ie/ruralenvironmentsustainability/ruraldevelopmentprogrammerdp2014-2020/

Environment Scheme (GLAS)[12] and the Organic Farming Scheme. The former measure encourages farmers to engage in environmentally neutral actions 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 various knowledge transfer programs. The RDP is also relevant as a conduit by which the increased implementation of emission abatement actions in the agriculture sector might be delivered.

3.2.13 Regional Transport Strategies

The Greater Dublin Area (GDA) strategy[13] provides a transport planning policy and urban logistical plan for Dublin city and the many surrounding commuter towns. The level of transport activity in the GDA means that actions in this region are particularly relevant in regard to road transport emissions for Ireland. This regional program includes delivery of better public transport systems, land use planning, and environmental protection for Ireland's most densely populated region. It is a multi-sectoral framework, and incorporates initiatives from regional planning authorities, housing authorities, public transport authorities and citizens.

The GDA strategy also works to deliver objectives set out under "Smarter Travel – A Sustainable Transport Future", which aims to decrease private car use, and includes localised measures to enhance land use integration and to introduce behavioural change programmes to promote multi-modality, thereby reducing the dependence on private cars. Ultimately, this strategy aims to manage transport and travel in the GDA in an efficient and sustainable manner. It has particularly strong relevance to national air quality ambitions, given the efforts to enable and encourage travel by non-motorised modes and to support the increased penetration of cleaner transport technology throughout the national fleet. It is also an area that will be affected by the realities of the COVID-19 response, at

12 Farmer Schemes Payment - https://www.agriculture.gov.ie/farmerschemespayments/glas/
13 Transport strategy for Greater Dublin Area - https://www.nationaltransport.ie/wp-content/uploads/2016/08/Transport_Strategy_for_the_Greater_Dublin_Area_2016-2035.pdf

least in the short term. There are comparable plans for Galway[14] and Cork[15], as well as draft strategies for other major regions in Ireland such as Limerick/Shannon.

3.2.14 National Adaptation Framework (NAF)

Developed under the Climate Action and Low Carbon Development Act of 2015, Ireland's first National Adaptation Framework (NAF) was published on the 19th of January 2018. The NAF outlines a whole of government and society strategy to reduce the country's vulnerability to the negative effects of climate change and to capitalise on positive potential. The NAF includes a summary of projected global climate change, European and international policy drivers for adaptation, a summary of climate change impact estimates for Ireland, progress to date on adaptation planning in Ireland, proposals for local authority or regional level adaptation strategies, and implementation and governance arrangements.

3.2.15 COVID-19 Response

The responses to the COVID-19 outbreak and the associated lockdowns have had an impact on activities across many sectors, and this will certainly impact on emission levels in 2020. Early indications confirm net reductions in emissions from energy industries and the transport sector, alongside an increase in residential sector emissions[16], as might be expected. Agricultural emissions do not appear to have been affected. Into the future, various COVID-19 responses may continue to have an impact on air quality. There may be a shift to cycling/walking as people avoid mass transit modes, however, there may similarly be an increase in low-occupancy private car trips due to fears around public transport and the reduced operating capacities that are now in place.

The extent to which these shifts in behaviour occur and the question as to whether they will lead to sustained shifts in behaviour over the longer term is highly uncertain. Furthermore, whilst increased remote working may have a tangible and sustained impact on travel demand and associated

14 Galway transport strategy - https://www.nationaltransport.ie/planning-and-investment/strategic-planning/regional-transport-strategies/galway-transport-strategy/
15 Cork metropolitan area transport strategy - https://www.nationaltransport.ie/planning-and-investment/strategic-planning/regional-transport-strategies/cork-metropolitan-area-transport-strategy/
16 Impact of pandemic on GHG Emissions | SEAI

emissions, the scale of effects will vary by location and over time. There is considerable uncertainty as to how much of this COVID-19 triggered change will remain into the future.

These impacts of COVID-19 and the expected responses over the longer term are not captured in the emission projections included in this updated NAPCP report. However, the expectation is that there will be recognition of COVID-19 related actions and outcomes in the 2021 national emission projections submission, and of course in the 2022 national emission inventory submission for the year 2020. On balance the expectation is that the net aggregate outcome in respect of air pollutant emissions will be favourable overall for air quality in Ireland.

3.3 EU and International Policies and Programmes Relevantto Air Quality

3.3.1 EU Clean Air Policy

In a broader context, Ireland is 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 Directive to reduce pollution from medium-sized combustion installations. These are all directly relevant to the NAPCP and national efforts to address air pollution emissions and to deliver and defend higher standards of ambient air quality for all citizens and the broader environment.

In late 2019, the European Commission carried out a fitness check of the Ambient Air Quality Directives[17]. This entailed a retrospective analysis of whether EU actions are fit for purpose and to identify regulatory burdens, overlaps, gaps and inconsistencies. The analysis indicated that while the Directives are broadly fit for purpose, there was scope for improvement in several areas such as the level of investment in monitoring networks and modelling capacity.

17 https://ec.europa.eu/environment/air/quality/aqd_fitness_check_en.htm

3.3.2 European Green Deal

The European Green Deal is Europe's growth plan to address climate change and environmental degradation while making the EU economy sustainable in the long term. The zero-pollution action plan[18] is central to this and aims to prevent pollution of our air, water and soil. This will involve a strengthening of provisions on monitoring, modelling and air quality plans to help local authorities achieve cleaner air. A revision of air quality standards to align them more closely with the World Health Organization recommendations is also expected.

Another aspect of the European Green Deal that will impact strongly on air quality objectives is the Farm to Fork Strategy which aims to make food systems fair, healthy and environmentally friendly. This will involve, among other things, reductions in the use of pesticides and other hazardous chemicals as well as decreases in fertiliser use and nutrient loss.

3.3.3 The Common Agriculture Policy (CAgP)

The Common Agriculture Policy (CAgP) 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 CAgP. The first provides income support to farmers whilst also introducing efficiency practices for farms that are beneficial for the environment. There are many supporting measures that have helped to work toward mitigation of both climate and air related emissions from the agriculture sector, although in some cases their impact is, as of yet, only developing.

There is a whole territory approach to nitrates implementation such that 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.

CAgP 2021-2027 is currently in development and proposes set higher ambitions for environmental care and climate action through a range of eco-schemes. It is expected the new CAP programme will commence in 2023.

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[18] https://ec.europa.eu/environment/strategy/zero-pollution-action-plan_en#ecl-inpage-208

3.3.4 EU Environment Action Programme (EAP)

The 7th EU Environment Action Programme, which ran until 2020, set down certain policy and legislative statements to be followed by the Member States. The programme sought reductions in air pollution and its impacts on ecosystems and biodiversity by 2020 so as not to exceed critical loads and levels. The 8th EU Environment Action Programme[19] is currently under development.

3.3.5 Industrial Emissions Directive

The Industrial Emissions Directive has been developed by the EU to regulate pollution arising from industrial activities. It involves licensing of all such activities that fall under this Directive. The Directive, whose implementation in Ireland is overseen by the EPA, lays down rules on the integrated prevention and control of pollution arising from industrial activities. Specific regulations contained within the Directive provide for the application for licenses or revised licenses and consideration by the EPA of objections. This can include the holding of hearings and public participation procedures associated with the industrial emissions licensing system administered by the EPA. The IED plays an important role in addressing emissions and driving progress across Irish industry.

3.3.6 Medium Combustion Plant Directive

The EU Medium Combustion Plant Directive (EU 2015/2193) was transposed into Irish regulations in 2017. Their purpose is to limit emissions to the atmosphere from boilers and other stationary combustion plants in the 1-50 MWTH (thermal input) range. It covers all fuel types.

New MCPs are required need to meet specified Emission Limit Values (ELVs), while operators of existing MCPs will not be required to meet specified ELVs until 2025 at the earliest. This will assist in limiting the impact on human health, vegetation and biodiversity which can be caused by air pollution.

3.3.7 Climate and Clean Air Coalition (CCAC)

The Climate and Clean Air Coalition is an initiative under the auspices of the United Nations Environment Programme focused on addressing short-lived climate pollutants on a global scale. Importantly, the CCAC approach integrates clean air and climate action efforts in an integrated way to

[19] https://ec.europa.eu/environment/strategy/environment-action-programme-2030_en

deliver improved outcomes across both themes. The CCAC was formed in 2012, with Ireland joining in 2013.

3.3.8 Sustainable Development Goals (SDGs)

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[20], which lays out Ireland's path to implement the Sustainable Development Goals from 2018 through to the end of 2020. It identifies awareness, participation, supports and policy alignment as strategic priorities to guide implementation. 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', have 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.

3.4 Responsibilities attributed to national, regional and local authorities

This section provides details of the various bodies with responsibilities relevant to the NAPCP. The table below (Table 2) 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.

DECC also continues to engage with a much broader set of stakeholders across government and in the private and NGO sector.

20 National Implementation Plan - https://assets.gov.ie/19344/32f9bdd2aae2464caae37760edd1da04.pdf

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

Name of Authority	Attributed responsibilities in the areas of air quality and air pollution	Source sector under the responsibility of the authority
National Authorities (M)		
Department of Agriculture, Food and the Marine (DAFM)	- Policy making role - Coordinating role - Implementation role - Enforcing role; both direct and indirect. - Reporting and monitoring role	Agriculture
Department of the Environment Climate Action and Communications, (DECC)	- Policy making role - Coordination role - Implementation role - Reporting and monitoring role	Energy, Communications, Natural Resources, Climate Action, Environment
Department of Transport	- Policy making role - Implementation role	Transport
Department of Housing, Local Government and Heritage	- Policy making role - Implementation role - Enforcement role	Built and Natural Environment
Department of Finance	- Policy making role	Fiscal Policy
Office of the Revenue Commissioners	- Implementation role - Enforcement role	Taxation measures
Environmental Protection Agency	- Coordination role - Enforcement role - Reporting and monitoring role - Other (research)	Energy Generation, Industry, Local Authorities
Sustainable Energy Authority of Ireland	- Implementation role - Reporting and monitoring role - Other (research)	Energy, Residential Public Industry
Teagasc	- Reporting and monitoring role (National Farm Survey) - Other (knowledge transfer) - Other (research)	Agriculture
Regional authorities (M)		
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
County and City Authorities	- Implementation role - Enforcement role - Reporting and monitoring role	Built Environment e.g. solid fuels, Agriculture, Industry

4 Progress to date - Current Policies and Measures

EU Decision 2018/1522 reference section 2.4

In this section we detail the progress made by current PaMs in reducing national annual emissions of air pollutants and improving ambient air quality. Progress in relation to the NECD ceilings are dealt with in Section 4.1 and ambient air quality is discussed in Section 4.3. In these sections we also broadly identify the major PaMs introduced in Ireland to drive progress in reducing emissions across the NECD pollutants.

4.1 Progress to date in relation to NECD obligations

EU Decision 2018/1522 reference section 2.4.1

The following datasets relating to annual emissions of NECD pollutants are derived directly from official national emission inventory and projections submissions which were published in June 2020 by the EPA. 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. Further information and commentary on the latest emission projections are also included in the IIR and the latest greenhouse gas emissions projections methodology report[21]. The relevant datasets and reports can be directly sourced at the following links:

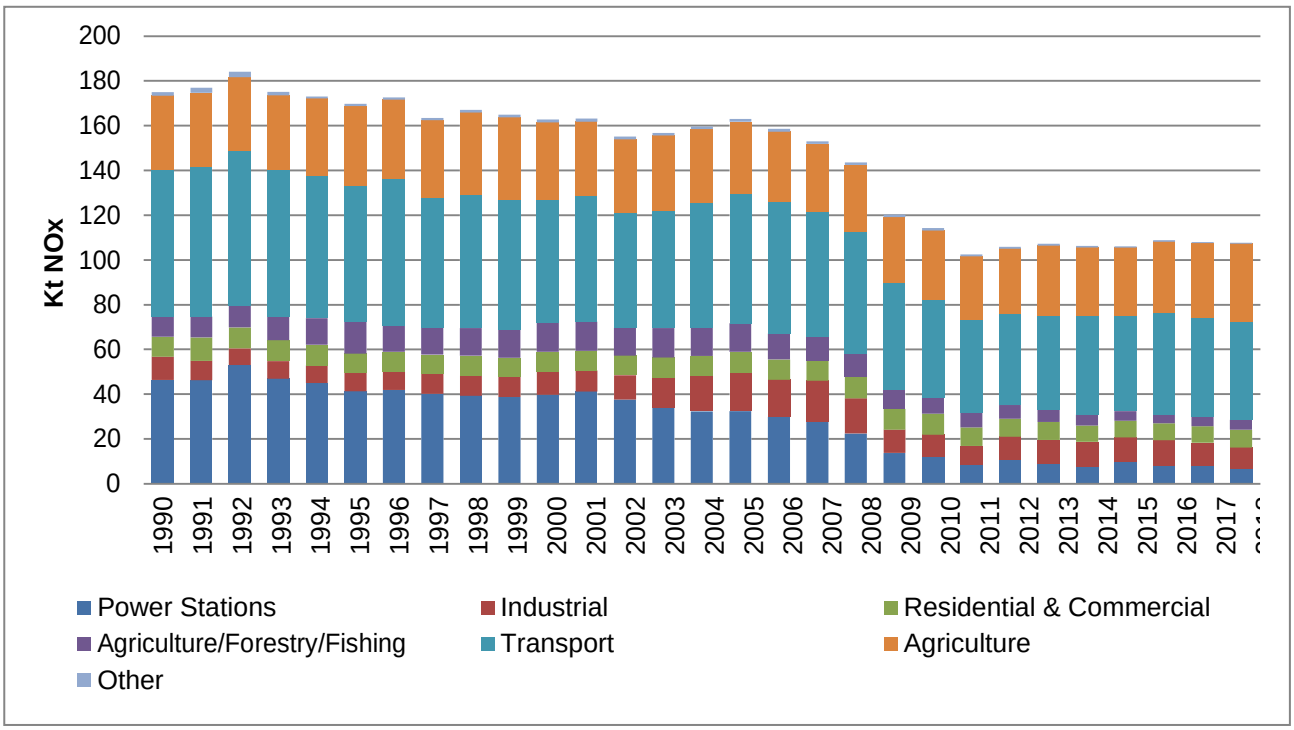
- Ireland's latest inventory and projected emissions of air pollutants (2020 release)
- Ireland's latest informative inventory report (2020 release)
- Ireland's latest NECD projected emissions (2020 release)
- Ireland's GHG projections methodology report (2020 release)

21 The projections methodology report is focused on the GHG projections, but many of the measures and detail are also relevant in an air pollution context also.

4.1.1 Nitrogen Oxides (NO_X)

In terms of compliance with NECD ceilings, Ireland has been in compliance for NO_x since 2011. Road transport is the principal source of NO_x emissions in Ireland at present, accounting for 33% of total national NO_x emissions in 2018. Within that sector, passenger cars and heavy duty vehicles are the most significant emitters. Increased shares of diesel vehicles in the fleet, along with a recovering economy, have been two of the more important developments seen in the transport sector to 2018 in regard to NO_X emissions. The ongoing recovery of activity levels in the construction industry up to 2018 has also seen manufacturing and construction accounting for almost 9% of total national emission of NO_x in 2018. This is largely due to increased cement production. Adjustments[22] have been made in relation to NO_x emissions in compliance with EU Directive 2016/2284. These adjustments have been applied to emissions for all years from 2010-2018.

Figure 1: Emission Trend for Nitrogen Oxides 1990-2018 (EPA, 2020)

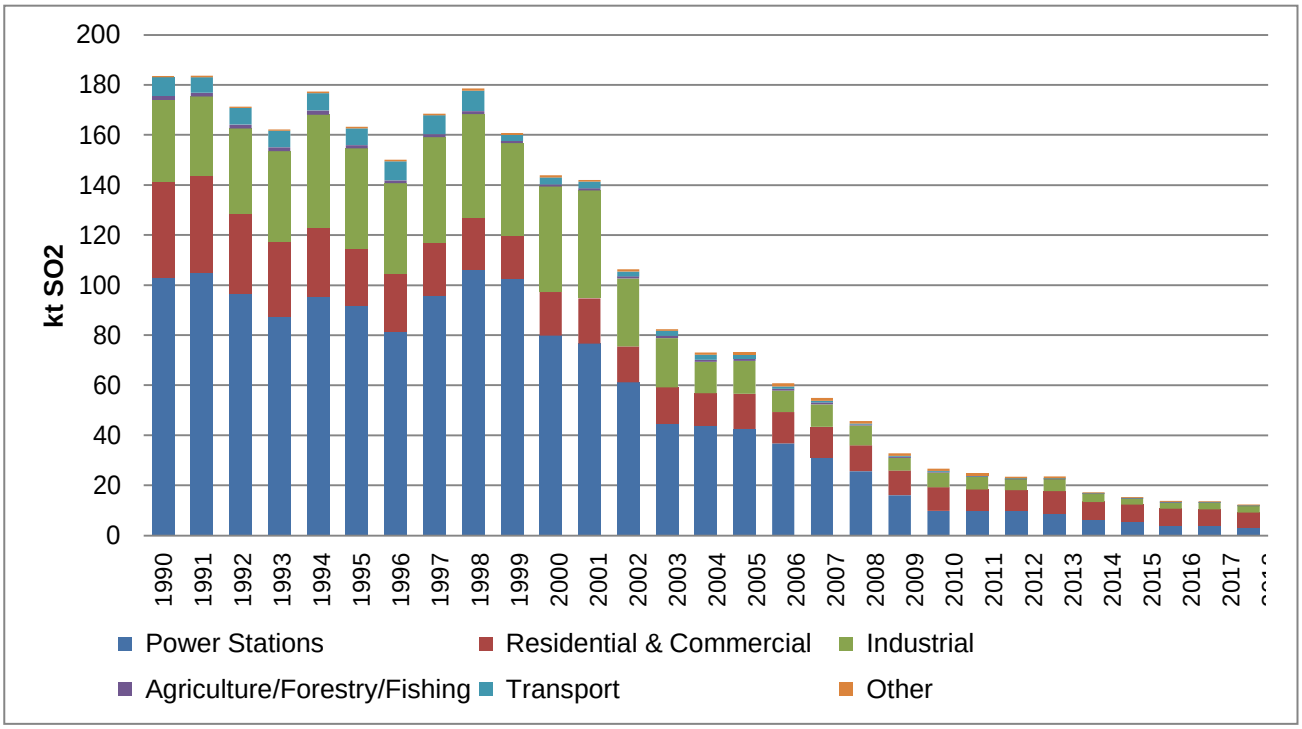


22 As per Annex IV, Part 4 NEC Directive

4.1.2 Sulphur Dioxide (SO_2)

Ireland has been in compliance with the NECD ceilings for SO_2 since 2010 and emissions of SO_2 have been steadily reduced over a long period of time, with a 93% reduction in emissions in 2018 as compared to 1990 levels. Emissions of SO_2 peaked in 1998 due largely to high consumption rates of coal, oil and peat mainly for pubic electricity and heat generation. The subsequent reduction in emissions has occurred across all source sectors, most notably from public electricity and heat generation, which has decreased by over 96% in 2018 from 1990 levels. The use of cleaner fuels supported by enhanced sulphur controls in power generation, residential combustion 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. As of 2018 the residential and commercial sectors account for half of total national SO_2 emissions. Public electricity and heat generation and industry make up much of the balance. Into the future, controls related to residential fuel use will grow in relative importance where there are ambitions for even more aggressive reductions in SO_2 emissions.

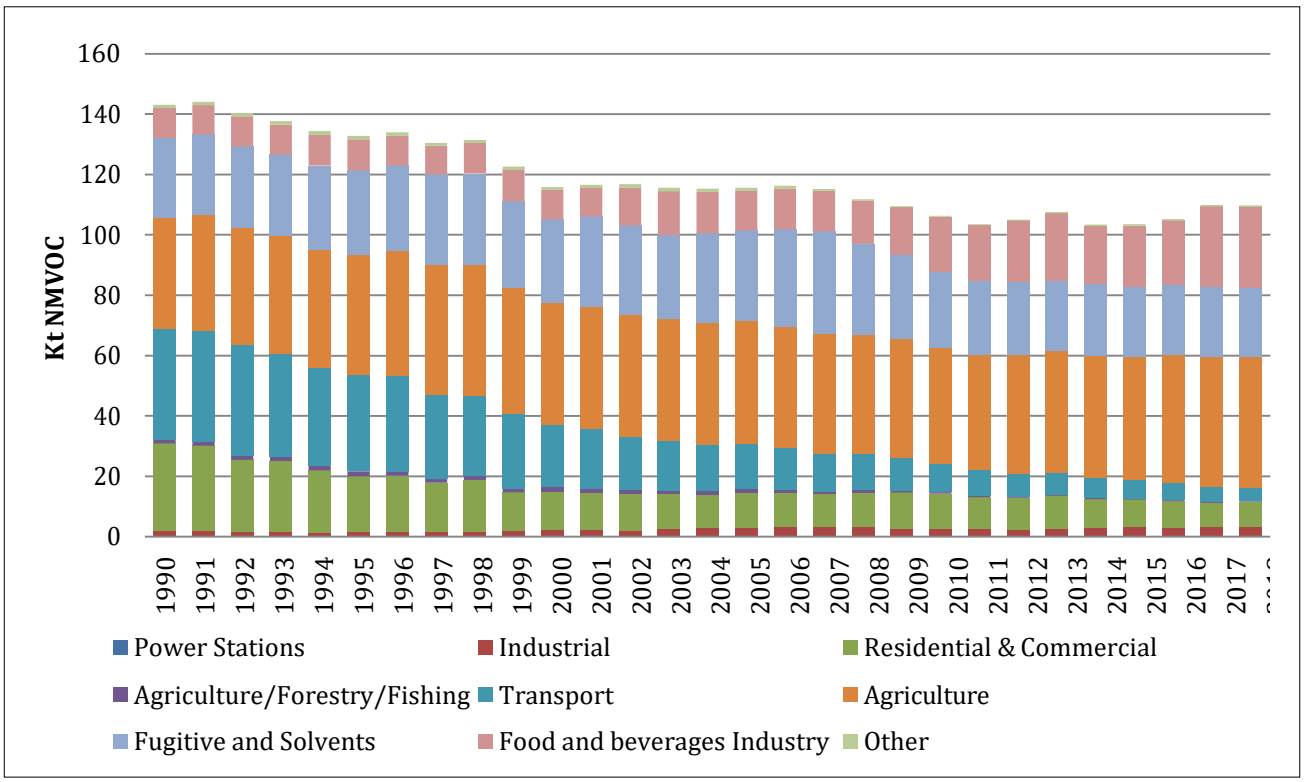
Figure 2: Emission Trend for Sulphur Dioxide, 1990 – 2018 (EPA, 2020)



4.1.3 Non-Methane Volatile Organic Compounds (NMVOC)

Adjusted NMVOC emissions are currently shown to be compliant with the 2010 NECD ceilings. Ireland's most recent Informative Inventory Report (IIR), submitted in 2020, has shown that NMVOC levels have decreased by 23% from 1990 to 2018. It is noted in the IIR that agriculture is now reported as the largest source of NMVOC emissions in Ireland, accounting for approximately 40% of 2018 NMVOC emissions. However, agricultural emissions are not included in the compliance totals for NMVOC. Other substantial sources of NMVOC emissions include combined solvent use and fugitive emissions (oil refining and distribution), which contributed approximately 21% of the 2018 total, and the food and beverage industry, which accounted for almost 25% of total national NMVOC emissions in 2018. Levels of solvent use and emissions from solvents are changing substantially in response to product replacement measures in this context.

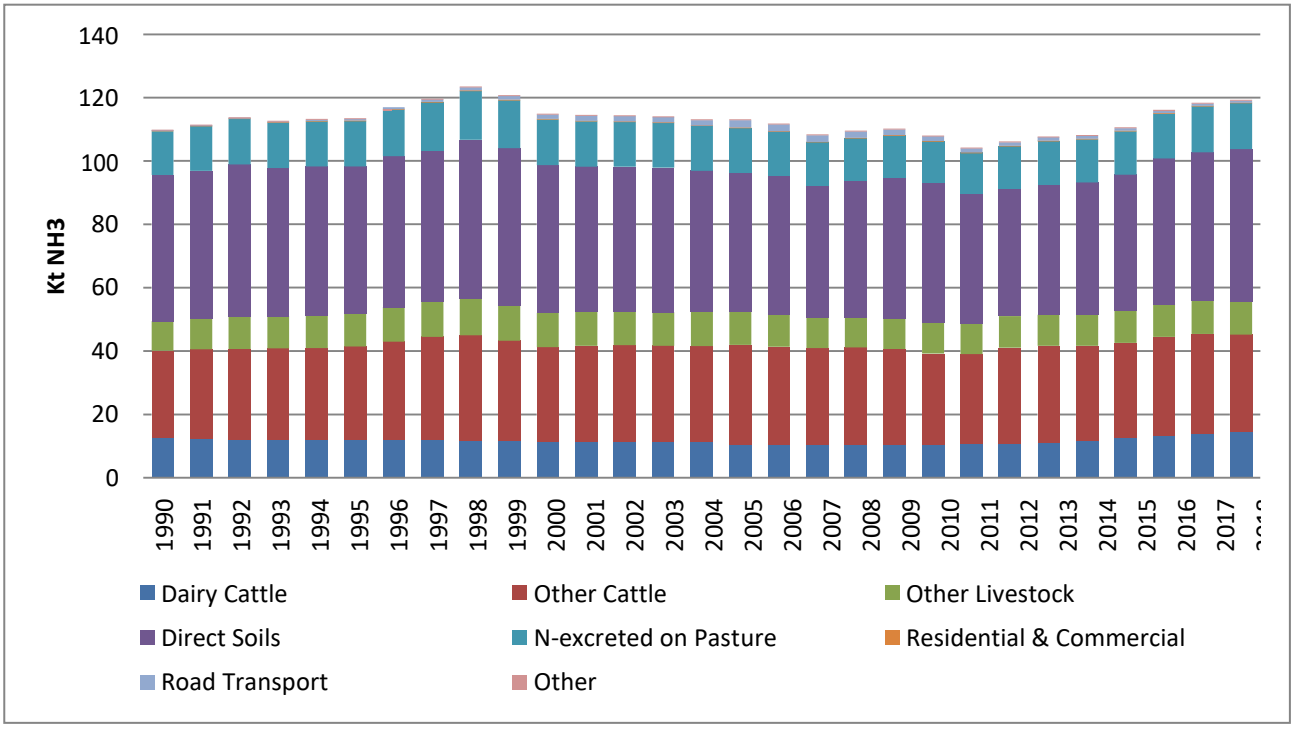
Figure 3: Emission Trend for Non-Methane Volatile Organic Compounds 1990 – 2018 (EPA, 2020)



4.1.4 Ammonia (NH_3)

The latest inventory figures released in 2020 show that NH_3 emissions are above the 2010 NECD ceiling. Agriculture is the dominant source sector. The categories of manure management, animal manure applied to soil, and nitrogen from urine and dung deposited by animals during grazing accounted for almost 89% of the national total in 2018. The high level of emissions on pasture (part of direct soil emissions) are linked to the comparatively short period of time which the livestock spend housed. Overall, the sector accounts for almost 99% of the national total of NH_3. Emissions of NH_3 have been increasing since 2011, and this is driven in large part by strategies to develop and grow the sector in Ireland.

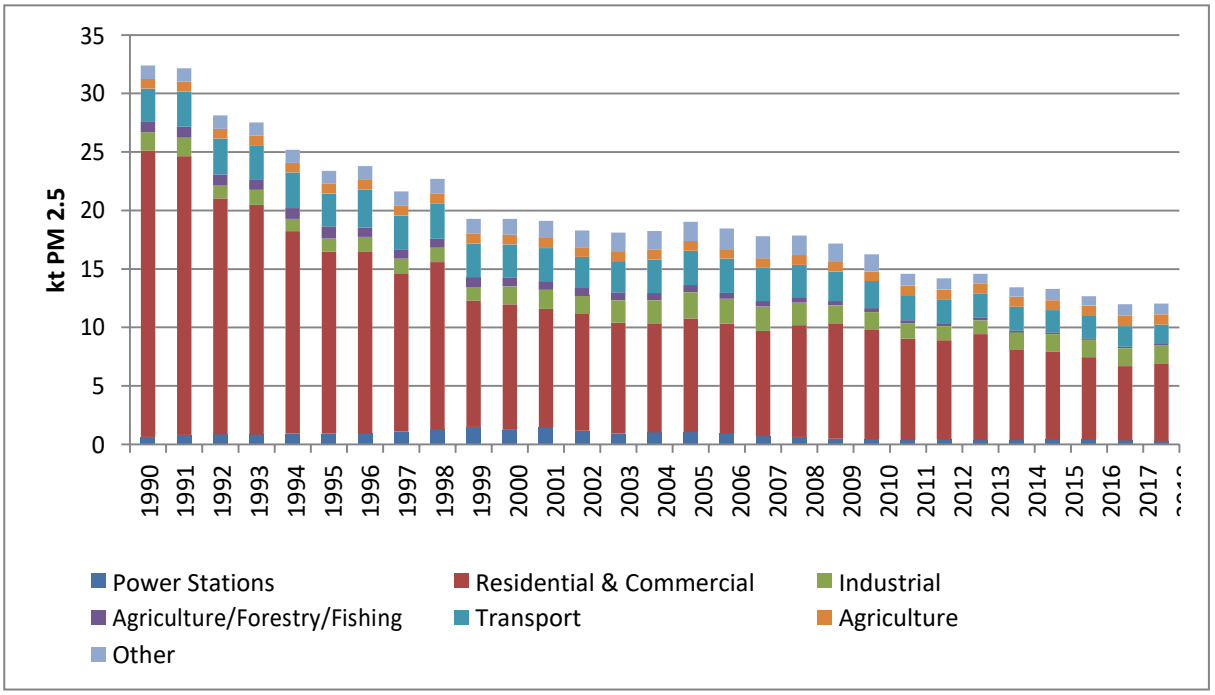
Figure 4: Emission Trend for Ammonia, 1990 – 2018 (EPA, 2020)



4.1.5 Particulate Matter ($PM_{2.5}$)

The first NECD ceiling for $PM_{2.5}$ covers the 2020-2029 period, and this is followed by a more ambitious ceiling then for the 2030 onwards period. Levels of $PM_{2.5}$ emissions have been on a steady downward trajectory since 2010. The 2020 IIR reports national $PM_{2.5}$ emissions of 12.04kt in 2018. This is well below the 2020 ceiling of 15.6kt, which is positive given that $PM_{2.5}$ is an air pollutant of particular relevance to the scale and incidence of human health impacts. Combustion from the residential and commercial sector remains the largest source of emissions, accounting for almost 55% of the national total of $PM_{2.5}$ emissions in 2018. There has however been a 73% reduction in emissions from residential and commercial sources in 2018 relative to 1990 levels. This has been heavily influenced by shifts away from coal and peat use toward cleaner fuels and heating choices.

Figure 5: Emission Trend for PM2.5, 1990 – 2018 (EPA, 2020)



4.2 Main existing Policies and Measures delivering progress

EU Decision 2018/1522 reference section 2.4.1

In this section we provide an overview of selected major PaMs that are currently in place and have delivered progress in terms of controlling and reducing air pollutant emissions in Ireland up to this point in time. In short, this section deals with historical progress as captured within the official national emission inventory to date. Disaggregating historical emissions and assigning reductions to individual actions is of course challenging and problematic in the absence of detailed data and counterfactual cases. As such, where the influence on an individual measure or action is easily identified, it is recognised, but generally the focus in this section is on categorising those major interventions that are believed to have altered national emission trajectories substantively up to this point in the official national emission inventory.

4.2.1 Transport

The transport sector is a significant source of emissions to air generally, and specifically NO_x, NMVOC and $PM_{2.5}$. Between 1990 and 2018 the sector has achieved a 34% reduction in NO_X (fuel used basis), an 88% reduction in NMVOC, and a 41% reduction in $PM_{2.5}$. There are several key measures supported and implemented in Ireland that have aimed to reduce emissions from road transport. These measures have been designed to control overall transport emissions, reduce congestion, promote fuel efficiency, and in doing so promote health and well-being. The key measures are outlined below.

4.2.1.1 Increased support for higher emission standards and increasingly fuel-efficient vehicles

Ireland has sought to encourage accelerated penetration of vehicles on higher Euro standards through early scrappage schemes. Ireland has 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, and these effects have been

studied in some detail via counterfactual analysis as part of an OECD research paper[23]. The introduction of the NO_X charge from 2020 will serve to somewhat counter this. However, notwithstanding the increased share of diesel vehicles, and the particular impacts of issues linked to the 'Dieselgate' scandal, the expected performance of the latest Euro 6 standard, now and into the future, combined with greater fuel efficiency, should yield sustained improvements in transport emission reduction outcomes. Despite growth in activity levels, Ireland's NO_X emissions from transport have remained steady from 2010 through to 2018.

4.2.1.2 EV Grants and Tax Scheme

The Sustainable Energy Authority of Ireland (SEAI) has been offering grants of up to €5,000 to consumers of Battery Electric Vehicles (BEVs) or Plug-In Hybrid Electric Vehicles (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. The ambitions for EV penetration outlined in the CAP[24] should see ongoing support in this context to accelerate the fleet transition towards electrification. It is also expected that the extended scope of market offerings at more competitive prices towards the middle of the decade will be key factors in accelerating the transition of the fleet at that time. However, to this point, the impact of EVs in terms of reduced air pollutant emissions remains modest.

4.2.1.3 Fuel Standards

The technical environmental specifications for gas oils, petrol and diesel fuels have been set at an EU level and transposed into Irish legislation. 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. Fuel standards have been a particularly effective upstream control in this context.

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23 Report available at https://www.oecd-ilibrary.org/environment/an-sssessment-of-the-social-costs-and-benefits-of-vehicle-tax-reform-in-ireland_952e7bff-en

24 840,000 electric passenger cars, 95,000 electric vans and trucks, and 1,200 electric buses by 2030.

4.2.1.4 Encouraging Modal Shift

The 2019 Canal Cordon Count for Dublin[25] reports that since 2010 there has been an increasing modal share for the sustainable transport modes (walking, cycling and public transport). The overall mode share for sustainable modes was 70% - representing the highest levels since canal cordon counts commenced in 2006. This represents important progress for Ireland's capital city.

On a broader national scale, the most recent national census results indicate that cycling to work has shown the largest percentage increase of all means of transport, rising by 42.8% from 2011 to 2016. Walking to work also increased in that timeframe. However, the 2016 census indicated that walking and cycling account for only 12% of commuting activity. Nonetheless, the next census (2022) should report progress in response to subsequent cycling and walking infrastructure investments. However, it is also to be expected that COVID-19 will dramatically influence updated figures in this context.

The new PfG includes statements of intent regarding substantial investment in cycling infrastructure that are expected to support further growth in active travel modes in Dublin and beyond.

In relation to public transport, in 2018 there were 266 million PSO public transport journeys provided by the transport companies 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.

4.2.2 Residential and Commercial Built Environment

The built environment sector is an important source of emissions of SO_2, NMVOC and $PM_{2.5}$. Between 1990 and 2018 the sector has achieved an 84% reduction in SO_2, a 72% reduction in NMVOC, and a 73% reduction in $PM_{2.5}$. The strategic approach to the built environment sector focuses upon energy management (understanding existing energy needs and usage), energy efficiency (reducing usage and making demand more flexible), and fuel switching (meeting the energy demand with less emissions-intensive heating solutions). There are specific packages of measures under each

25 https://www.nationaltransport.ie/wp-content/uploads/2019/04/Canal_Cordon_Report_2018.pdf

category, each with a range of actions that have been implemented to date. Measures implemented include:

4.2.2.1 Residential Energy Efficiency

Since 2002, Ireland's building regulations[26] have been steadily improved (in 2002, 2011, 2019) to ensure increased energy efficiency through Part L Conservation of Fuel and Energy. Ireland also operates a Building Energy Rating (BER) system and the associated energy labelling encourages and enables consumers to make more informed decisions about the energy efficiency of their homes. As of September 2020, Ireland is approaching one million homes with BER certificates.

In parallel with the BER system, Ireland provides a range of grant schemes focused on improving residential energy efficiency. The Better Energy Programme comprises a number of schemes, including Better Energy Homes, Community Energy Grants Community Energy Grant schemes and Better Energy Warmer Homes Schemes. Since 2009, the SEAI has provided over €600 million in grant support towards energy upgrades in over 400,000 homes, supporting around 2,300 jobs per annum in the construction sector. The Warmth and Wellbeing pilot scheme is an example of another measure that provides deep retrofits to the homes of people living with chronic respiratory conditions. Research on the outcomes and impacts include consideration of the health impacts of improving the thermal comfort of the homes.

4.2.2.2 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 requiring larger energy suppliers to achieve energy savings among customers and across all sectors. Carbon tax and Energy Audits for (non-SME) businesses were introduced in 2015. The public sector has a mandated 33% energy efficiency target that aims to deliver circa 3,240GWh in energy savings through energy efficiency improvements by the end of 2020. The Climate Action Plan (2019) and the Programme for Government (2020) have set new and more ambitious targets for 2030: a 50% energy efficiency improvement; a new 50% absolute emissions reduction target, and a requirement for all

[26] https://www.gov.ie/en/publication/1d2af-building-regulations/

public buildings to achieve a minimum 'B' BER rating. The SEAI Public Sector Energy Efficiency Programme,[27] an energy management and advisory programme, supports the sector in achieving its targets. The Public Sector Energy Efficiency Action Plan, published in 2017, is aimed at intensifying efforts to ensure the public sector target (which encompasses a range of measures relating to the built environment) can be met by the end of 2020. The Public Sector Partnership Pathfinder Retrofit (2017) provides capital funding for pathfinder retrofit projects aimed at testing building retrofit approaches and developing a retrofit model that can be replicated across the wider public sector, including schools.

The Large Industry Energy Network (LIEN) programme is an Energy Efficiency Network for large businesses with an annual energy bill of over €1 million. Launched in 2000, it is estimated it will achieve 642kt of CO_2 mitigation by 2020[28]. Funding is also provided to businesses and public sector organisations that undertake design, construction and commissioning of projects that use the Excellence in Energy Efficient Design (EXEED) certification[29] process. The SEAI SME Programme[30] was launched in 2008 and is also ongoing with estimated CO_2 mitigation potential of 114kt by 2020. Whilst many efficiency measures focus on the CO_2 impact, the broader impact of energy efficiency can also deliver on air quality outcomes.

4.2.2.3 Solid Fuel Regulation

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 products (such as manufactured ovoids and anthracite), wood and peat in the residential sector is a significant source of harmful toxic emissions to air, including $PM_{2.5}$, PAH, and NO_x. Smoky Coal has been regulated in specific Low Smoke Zones (LSZ), with the first zone having come into effect in Dublin in 1990. This policy has been recognised internationally as an effective air policy intervention and has served as a precursor to considerable

27 https://www.seai.ie/business-and-public-sector/public-sector/public-sector-energy-programme/

28 https://www.seai.ie/business-and-public-sector/large-business/lien/

29 https://www.seai.ie/business-and-public-sector/business-grants-and-supports/exeed-certified-grant/

30 https://www.seai.ie/business-and-public-sector/small-and-medium-business/

improvements in urban air quality and observed health impacts in Dublin. These changes were attributed to consumers switching away not just from smoky coal, but from all solid fuels more generally, towards fuels which produce less air pollution.

A ban on the burning of smoky coal and other prohibited fuels, as well as their marketing, sale and distribution, now applies in all Low Smoke Zones (LSZs) in Ireland. Since the last NAPCP, an additional 13 towns have been included under the ban as of September 2020, such that it now covers all towns in the country with populations of more than 10,000 people[31].

The intention is to develop new regulations which will go beyond the scale and scope of the current legislation, to ensure a significant increase in Ireland's air quality which will in turn help to improve public health.

A public consultation document[32] has been published in relation to the development of new legislation to regulate to a broader extent the use of solid fuels in the residential sector in Ireland.

The consultation will focus particularly on the issue of air pollution caused by the burning of solid fuels for residential heating, and the contribution of various solid fuels to air pollution. This process is intended to provide an opportunity for all stakeholders, such as householders, consumers, retailers, producers and industry to provide input in the development of new and more comprehensive regulation in this area.

4.2.2.4 Sulphur in Coal

Coal sold in Ireland for home heating must meet certain minimum requirements regarding sulphur content. Limiting the 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.

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31 https://www.gov.ie/en/collection/77db4-low-smoke-zone-maps/

32 https://www.gov.ie/cleanair

4.2.3 Electricity Generation

The electricity generation sector is a key source of emissions of SO_2 and NO_X. Between 1990 and 2018 the sector has achieved a 97% reduction in SO_2, and an 86% reduction in NO_X. Change in the sector has been driven by licensing controls, a focus on increased renewable generation, specific retrofit schemes, and reduced dependence on solid fuels such as coal and peat.

4.2.3.1 Renewable Energy Feed-in Tariff (REFIT)

The REFIT schemes support renewable electricity development in Ireland. 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 support Ireland in meeting its renewable energy targets. It is funded by a Public Service Obligation (PSO) levy which is paid for by all electricity consumers. Non-combustion renewables such as wind and solar power contribute to both climate and clean air goals. These schemes and supporting actions are supporting a gradual shift away from more polluting forms of power generation (i.e. coal and peat generation), to enable higher shares of renewables alongside gas-fired generation.

4.2.3.2 Peat Phase Out

In line with the sustainability strategy outlined by Bord na Móna, there is a plan in place to phase out the use of peat in electricity generation. The Public Service Obligation 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. The WM scenario reflects the commitment by Bord na Móna to end peat harvesting for electricity generation by 2030. Similar to Edenderry, PSO support for two ESB peat stations West Offaly and Lough Ree expired in 2019. Ultimately the wind-down of peat-fired generation in Ireland has had a positive impact on air quality outcomes from this sector.

4.2.3.3 Moneypoint Retrofit

Moneypoint power station is Ireland's only coal-fired power plant. Over a period of time, starting in 2008, the plant underwent a €355m retrofit to cut emissions of both SO_2 and NO_x at the plant. This played a major part in national SO_2 emissions from the power sector dropping from circa 31kt in 2007 to just under 10kt in 2010. Similarly, national NO_X emissions from the power sector reduced from 27kt in 2007 to just under 12kt in 2010.

4.2.4 Agricultural Package

The WM scenario in the April 2020 ammonia projections does not include estimates for the impact of any agricultural measures which are already in place; it is instead a continuation of the current inventory with updated projections of animal numbers (as set out in the EPA IIR 2020[33]).

4.3 Progress in relation to improving ambient air quality

EU Decision 2018/1522 reference section 2.4.2

The EPA is 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. At the end of 2020 there were 88 monitoring stations across Ireland, including 24 stations added in 2019, and another 14 added in 2020. A range of air pollutants are annually assessed and reported both nationally through the EPA's National Air Quality Indicators report[34] and internationally through the European Environment Agency[35]. Information is also available to the public through the EPA website using Ireland's Air Quality Index for Health[36].

The EPA is continuing to upgrade and expand the Ambient Air Quality network through a five-year programme funded by the Department of the Environment, Climate and Communications. This has already led to a trebling of real-time monitoring across Ireland and is now on track to deliver a 107-station network. This will allow for the provision of more real-time information on air quality throughout the country.

Given this recent and ongoing expansion of the network, it is difficult to provide a longer assessment of the changes in monitored air quality over time.

In 2019, a measured exceedance of the EU legislative limits was observed for NO_x. This was at an urban traffic station in Dublin. There were no other exceedances observed of the EU limit values.

33 Ireland's latest inventory and projected emissions of air pollutants (2020 release)
34 EPA (2020). *Air Quality in Ireland 2019* Available at: https://www.epa.ie/pubs/reports/air/quality/epaairqualityreport2019.html
35 Ireland's latest inventory emissions of air pollutants (2020 release) and Ireland's latest NECD projected emissions (2020 release).
36 Air Quality Index for Health available at https://airquality.ie/

However, when assessed against the more stringent World Health Organisation (WHO) levels, emissions limits for particulate matter were breached at a number of monitoring sites across the country in 2019. There were also four stations where the European Environment Agency reference level for PAH was exceeded. These issues are predominantly as a result of the burning of solid fuel in residential properties.

The programmes and measures set out in section 4.2 contribute towards reductions in overall emissions levels and also localised ambient emissions. Although quantification and attribution of their impact is not currently carried out, this is being considered in the context of the Clean Air Strategy for inclusion in the next NAPCP.

4.3.1 Modelled Concentrations for Ambient Air

Figures 6 to 11 below are modelled concentrations of the 2015 inventory for ambient air pollutant emissions. The results included in the figures show the results of the EMEP[37] model with national reference simulation in 2015 for European indicators AOT40 (O_3)[38], PM_{10}, $PM_{2.5}$, NO_2, and NO_x. These maps have been produced as part of the EPA-funded research project ConAir[39], which was led by EnvEcon Decision Support[40] . The modelled maps are included as being of relevance to the broader context of the NAPCP. An update of this modelling is currently being developed by the EPA and should be completed before the next iteration of the NAPCP.

In addition, the EPA has developed a number of pollutant maps of modelled pollutant levels for NOx, $PM_{2.5}$ and PM_{10} for Dublin which are also included below.

37 EMEP (2018) Transboundary particulate matter, photo-oxidants, acidifying and eutrophying components, EMEP Status Report 1/2018, ISSN 1504-6192 (online)

38 The AOT40 (= Accumulated Ozone exposure over a Threshold of 40 ppb (=80 µg/m³)) for vegetation is the accumulated excess of hourly ozone concentrations above 80 µg/m³ 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.

39 https://www.epa.ie/researchandeducation/research/researchpublications/researchreports/research286.html

40 http://conair.envecon.eu/

Figure 6: Modelled (May-July) Ozone Levels, EURATO (ppb.h) in 2015

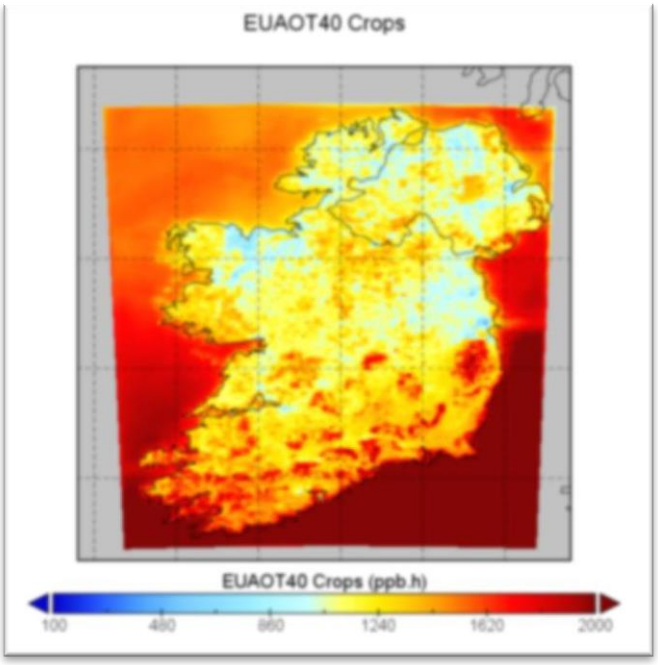
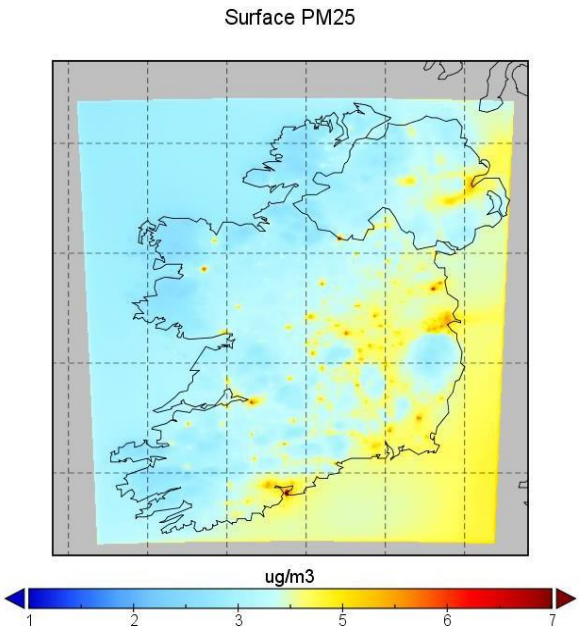


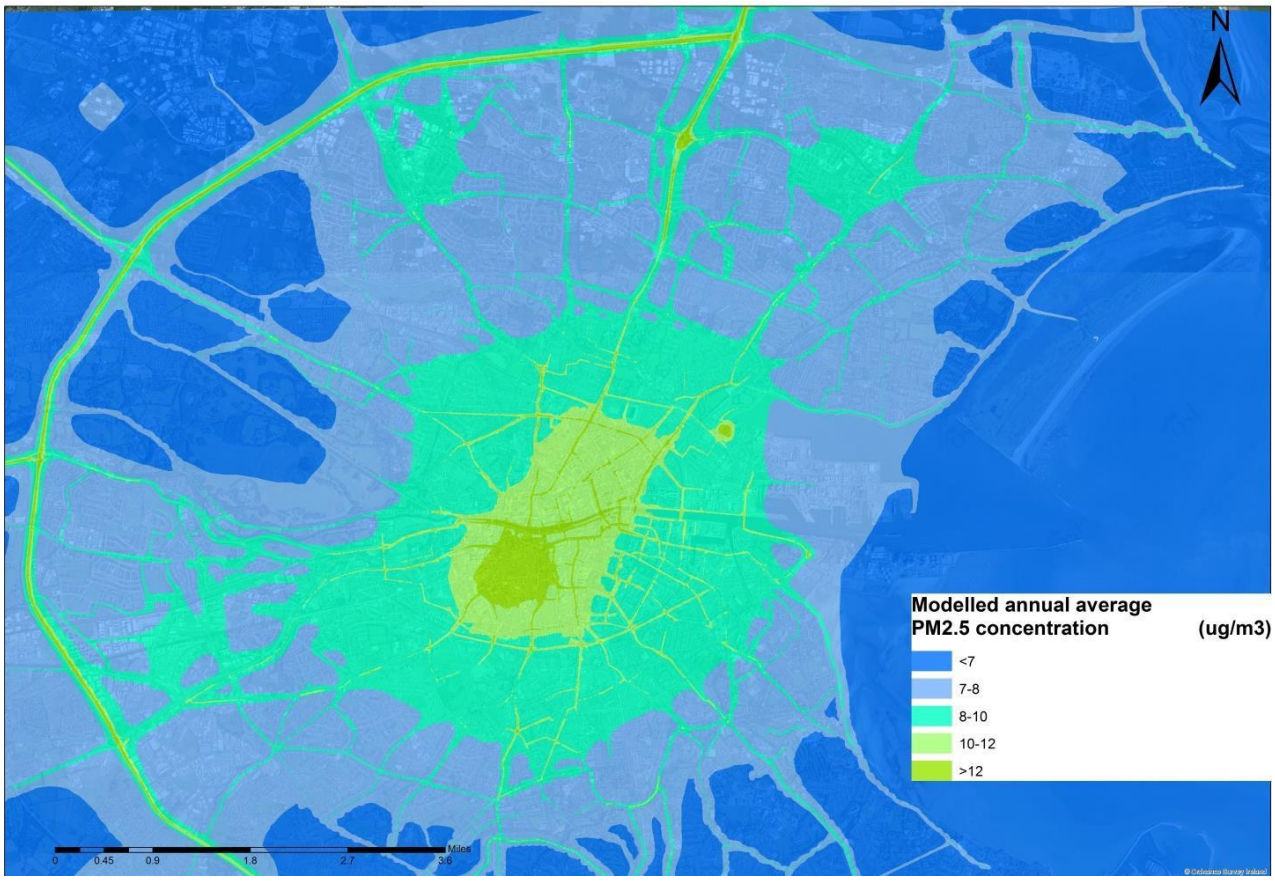
Figure 7: Modelled surface annual mean $PM_{2.5}$ concentrations in 2015



As seen in Figure 6, AOT40 values are in general highest in the southern part of Ireland. The highest model grid value was 2394 pbb.·h. As such no region was estimated to exceed the European long-term AOT40 objective level of 3000 ppb.·h in 2015.

Figure 7 presents the concentrations of $PM_{2.5}$ and shows that the highest $PM_{2.5}$ concentrations are found in urban areas and close to the main roads. The annual average $PM_{2.5}$ concentration for the entire Irish domain was estimated at 3.7µg/m^3, whereas the maximum grid value was 10.3µg/m^3. The WHO guidelines for $PM_{2.5}$ are 10µg/m^3 annual mean and 25µg/m^3 daily mean. The urban concentrations are further demonstrated for the Dublin region in Figure 8 below.

Figure 8: Modelled annual average PM2.5 concentration



Additional research is underway by EnvEcon Decision Support and Nilu, relating to the potential impact of targeting ASHP retrofit installations into areas of higher residential PM concentrations as a means of countering specific relative hot spots from residential combustion. This will be released in due course.

Figure 9 below shows the concentrations of NO_2 where the highest concentrations were found in urban areas, but the main roads were also noted as high concentration areas. The NO_2 average value for the entire domain was 1.2µg/m^3 while for Dublin the annual average concentrations (for a single 2 km grid) were 22.2µg/m^3 as further outlined in Figure 11. Figure 10 shows the concentration for NO_x. The WHO Guidelines for NO_x are 40µg/m^3 annual mean and 200µg/m^3 in a 1hour period.

Figure 9: Modelled surface annual mean NO_2 concentrations in 2015

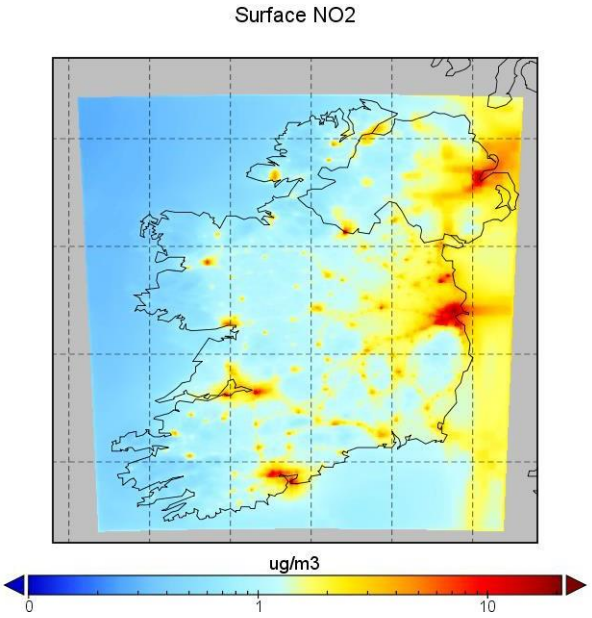


Figure 10: Modelled surface annual mean NOx concentrations in 2015

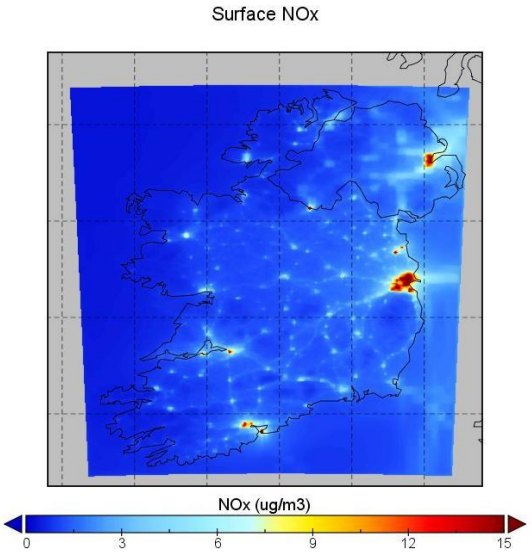
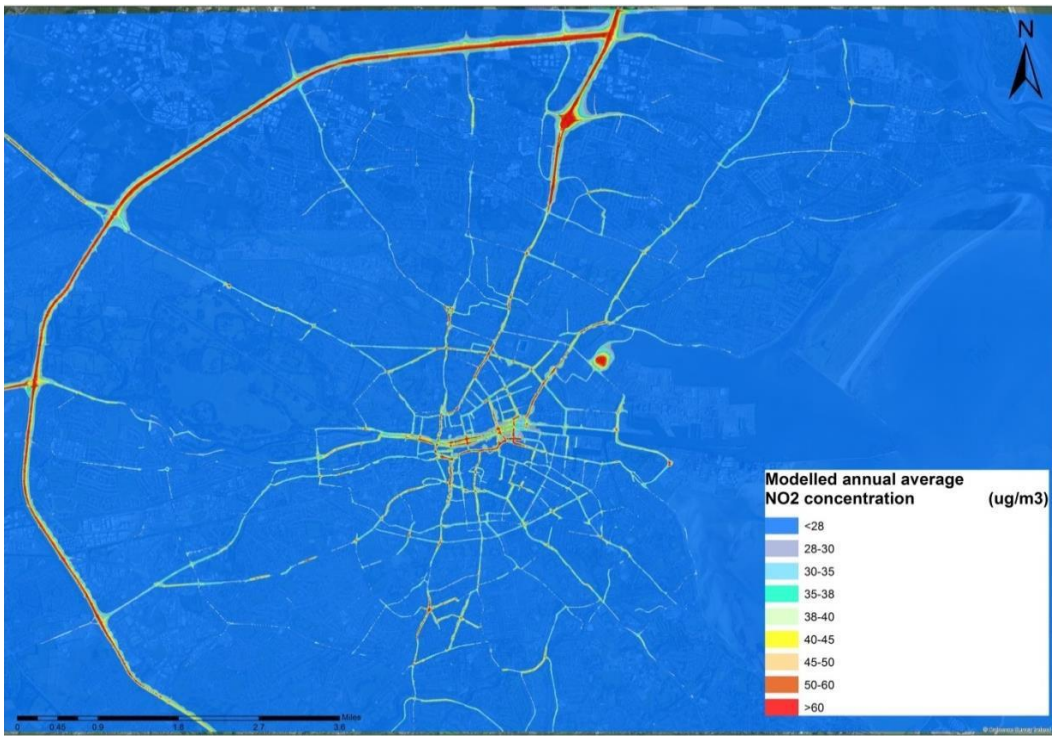


Figure 11: Modelled annual average NO_2 concentration



4.4 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 transboundary outcomes. However, in the first NAPCP, and this update, 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 arises in one location as a result of changes in emissions elsewhere. The EMEP SRs are country to country and have been estimated 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. However, in broad terms for oxidised nitrogen and oxidised sulphur deposition, the largest share of changes in Irish emissions 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 country (Great Britain and Northern Ireland). 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 $PM_{2.5}$ there is a negligible impact on outcomes beyond Irish shores reported as part of the EMEP analysis.

5 Projected Progress ('With Existing Measures')

EU Decision 2018/1522 reference section 2.5.

The purpose of this section is to present the officially submitted emission projections outlook to 2030 under the national WM scenario and to assess compliance with the NECD in the 2020 and 2030 periods. The focus is therefore on how those existing measures are expected to impact on projected emissions and associated compliance.

NH_3 exceeds the emission ceilings in both the 2020 and 2030 phases under the WM outlook and presents a particular challenge. SO_2 and $PM_{2.5}$ remain in compliance for both 2020 and 2030.

As noted in section 3, all emissions data for all pollutants up to 2018 are based on the official national inventory submission from 2020. Projected emissions in this section are then based on the latest WM projections as provided by the Environmental Protection Agency (EPA) for all years from 2019 to 2030. The air pollutant projections provided by the EPA for this updated NAPCP take into account projected activity data from a number of responsible authorities, including updated energy projections provided by the SEAI, and updated agriculture activity data provided by Teagasc for the official 2020 projections.

Uncertainties

Changes have been made to the projected emissions of NO_x and NMVOC to reflect permitted changes under Article 4 and 5 of the NECD. Article 4 allows for the removal of agricultural emissions from the accounting of emissions from both pollutants for compliance purposes. The NMVOC projections also present a scenario with adjustments that further exclude a portion of the food and beverage industry emissions (from spirit production) from the accounting of the NMVOC emissions for compliance purposes[41].

41 On the basis that NMVOCs from category 2.H (Spirits) were included in the 1990-2015 inventory for the February 2017 Inventory submission (after the 2016 NEC Directive came into effect).

The 2005 inventory values for NO_x and NMVOC presented in this NAPCP update are the adjusted totals used for NECD compliance values. These are drawn from the "Annex 1 Ireland 1990 – 2018 v1" file released in February 2020. The NECD compliance totals include the following explanatory note:

The 'National Total for Compliance (NECD)' includes the 'National Total (based on fuel sold)' corrected for i) approved adjustments and flexibilities to national totals and, if applicable, ii) national totals based on transport fuel used, as well as iii) the subtraction of sectors 3B + 3D (Livestock and Agri Other) for NO_x and NMVOC (only from 2020 onwards and for the year 2005 as a basis for emission reduction commitment calculations), according to the NEC Directive, Article 4/3(d).

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

	Total emissions (kt), consistent with inventories for year x-2 or x-3 (year to be specified) (M)				Projected % emission change achieved compared with 2005 (M)			National emission reduction commitment for 2020-2029 (**% reduction** compared with 2005 levels) (M)	National emission reduction commitment from 2030 (**% reduction** compared with 2005 levels) (M)
Pollutants (M)	2005 base year	2020	2025	2030	2020	2025	2030		
SO_2	73.07	13.61	11.13	9.04	- 81%	- 85%	- 88%	65%	85%
NO_x	131.05	76.24	59.9	49.08	- 42%	- 54%	- 63%	49%	69%
Total* NMVOC	75.11	69.21	70.28	70.28	- 8%	- 6%	- 6%	25%	32%
Adjusted** NMVOC	66.58	49.61	49.89	49.06	- 25%	- 25%	- 26%	25%	32%
NH_3	113.2	118.45	122.25	123.22	+ 5%	+ 8%	+ 9%	1%	5%
$PM_{2.5}$	19.03	13.14	12.2	10.85	- 31%	- 36%	- 43%	18%	41%
Date of emission projections (M)					April 2020				

Table 3 includes no adjustments or special notes regarding SO_2, NH_3 or $PM_{2.5}$. In the case of NO_X, agricultural source categories 3B and 3D are removed from the 2005 inventory base and projections to assess compliance (Article 4 of 2016 NECD). In the case of NMVOC, the same exclusions for agricultural sources 3B and 3D are made, as well as a further adjustment to remove category 2.h.2 (NMVOC from spirits) that is again applied to both the 2005 inventory base and projections for the

purpose of the compliance assessment[42]. The broader outlook then, when using the adjusted perspective for NMVOC, suggests that the WM scenario will deliver compliance across all but NO_X and NH_3 in the 2020 phase. However, NO_X and NMVOC are both expected to exceed the ceilings in 2030. NO_X is expected to be in compliance if the inventory adjustment is accepted for 2020.

The impact of inventory adjustments on a longer time horizon to 2030 are more difficult to assess as their effect will change. Nonetheless Ireland does note the proximity of both NO_X and NMVOC to the ceiling thresholds under the WM outlook and will therefore consider adoption of the additional measures that need to be deployed to achieve compliance as necessary.

Overall, NH_3 is recognised as remaining the major challenge for compliance in both compliance phases of the NECD when using the WM projections of 2020.

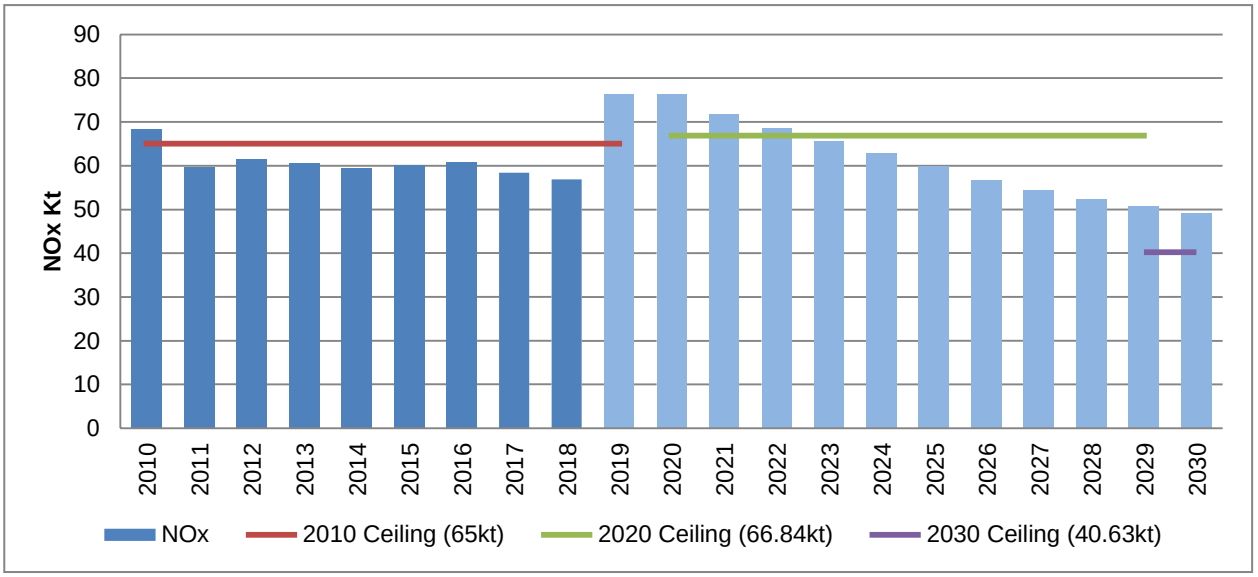
5.1.1 NO_x

NO_x emissions in Ireland are projected to be in non-compliance in 2020 until the end of 2022 under the WM scenario. From 2023, NO_x emissions are projected to be in compliance until the end of 2029. However, with the further tightening of the ceiling for NO_x from 2030, and with emissions somewhat plateauing from 2029 under the most recent emission projections, Ireland is currently projected to be non-compliant in 2030.

It is also noted that adjustments have been made to NO_x emissions in compliance with EU Directive 2016/2284. These adjustments have been applied to emissions for all years from 2010-2018 and from 2020 all agriculture emissions will be removed for the accounting of compliance totals for NO_x.

42 On the basis that NMVOCs from category 2.H (Spirits) were included in the 1990-2015 inventory for the February 2017 Inventory submission (after the 2016 NEC Directive came into effect).

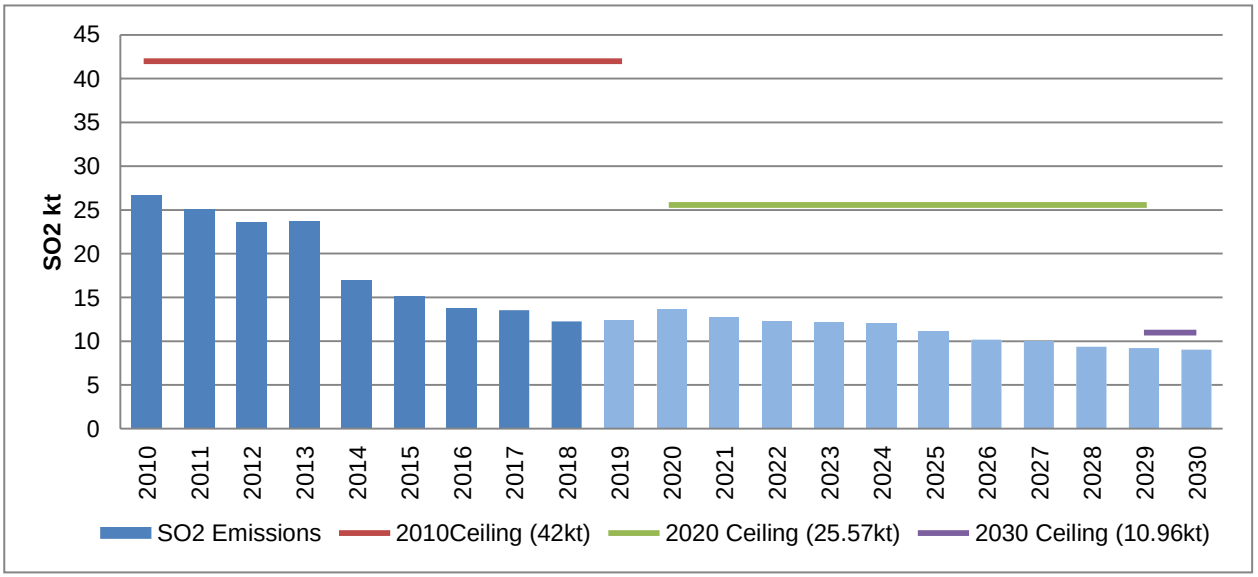
Figure 12: 2020 Inventory, Projections (WM) and NECD Obligation – NOx in kt (based on EPA, 2020)



5.1.2 SO_2

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 13: 2020 Inventory, Projections (WM) and NECD Obligation – SO_2 in kt (based on EPA, 2020)



5.1.3 NMVOC

NMVOC emissions are in compliance with the 2010 ceiling for the inventory period from 2010-2018. Approved adjustments have been made to the inventory NMVOC emissions from 2010-2018 in accordance with EU Directive 2016/2284. Specifically, NMVOC emissions are adjusted following the recognition of 'new' sources in the inventory. These include removal of categories 3B and 3D relating to manure management and inorganic N fertilisers, as well as adjustments to emissions from category 2H2 relating to the food and beverages industry. The former category has accounted for approximately a 40kt adjustment each year between 2010 and 2018, whilst the latter category has accounted for between 12kt and 20kt in a given year over the same period. These adjustments are detailed in the informative inventory report (see section 3.1) and have been approved up to the 2018 inventory.

In the period from 2019-2030 in Figure 14, total NMVOC emissions with the removal of agricultural categories 3B and 3D only are presented. Ceilings are unadjusted and show exceedances for both the 2020 and 2030 periods under the WEM. However, under Figure 15, adjustments relating to category 2H2 are applied to both forecast emissions and the ceilings (through a revised base year adjustment), and this outlook shows compliance with the 2020 ceilings and non-compliance for the 2030 period. This WM outlook for 2030 onwards therefore suggests additional measures will be required to achieve compliance with the adjusted 2030 ceiling.

Figure 14: 2020 Inventory, Projections (WM) and NECD Obligation – Total NMVOC in kt (based on EPA, 2020)

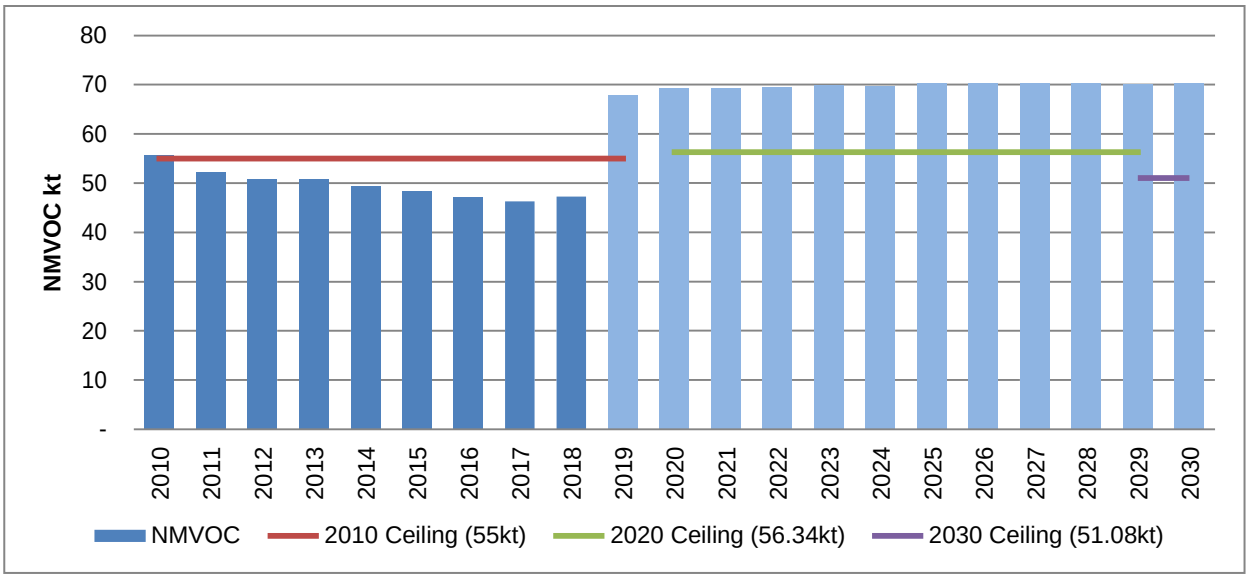
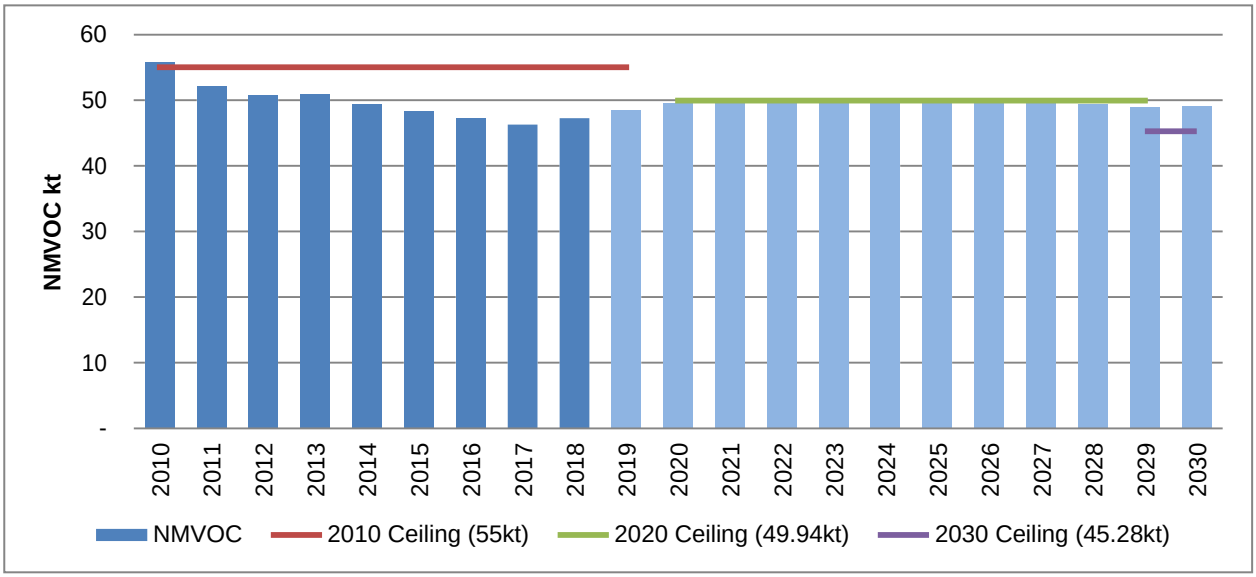


Figure 15: 2020 Inventory, Projections (WM) and NECD Obligation – Adjusted NMVOC in kt (based on EPA, 2020)



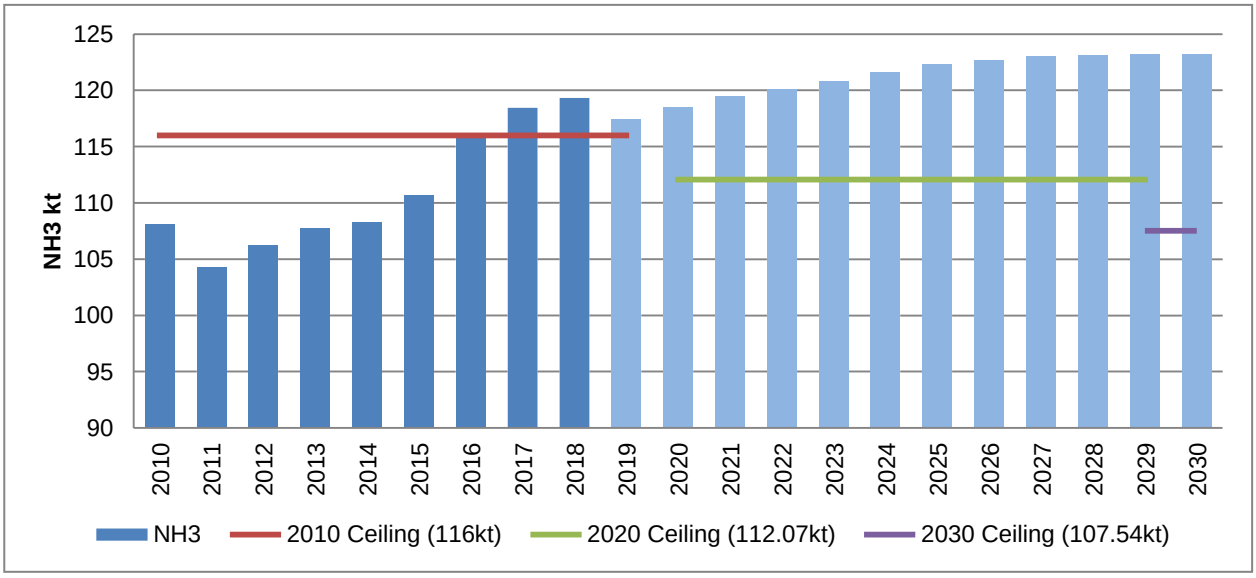
5.1.4 NH_3

The latest EPA emission inventory reports ammonia emissions increasing steadily between 2011 and 2018, with non-compliance with the 2010 NECD ceiling occurring in the years 2016, 2017 and 2018 as illustrated in Figure 16. In this figure the WM projections (light blue) for 2019 were expected to be at 117kt which is lower than the reported inventory amounts for 2018. Even if this reduction in emissions is observed when the inventory data is complete for 2019, ammonia emissions are expected to be higher than the NECD ceiling until 2020. The gap to compliance with NECD ceiling beyond 2020 is projected to increase each year to 2029 under the WEM scenario. The projected gap widens further still in the year 2030, as a result of the tighter ceiling in that phase. NH_3 presents the greatest challenge to Ireland's compliance with the NECD.

The growth in reported emissions of NH_3 between 2011 and 2018 has been driven in large part by changes in milk production following the removal of EU milk quotas, and industry strategies to grow the value of the sector (e.g. Food Harvest 2020 and Food Wise 2025). The sector has seen increases in cattle populations, dairy production and N-fertiliser use. However, the implementation of measures that focus on improving farm efficiency and mitigating harmful emissions have led to some decoupling of the increased production from rising emissions. 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_3 ceiling. Figure 16 presents the changes in reported emissions (dark blue), ceilings and projections (light blue) for NH_3 under the WM scenario.

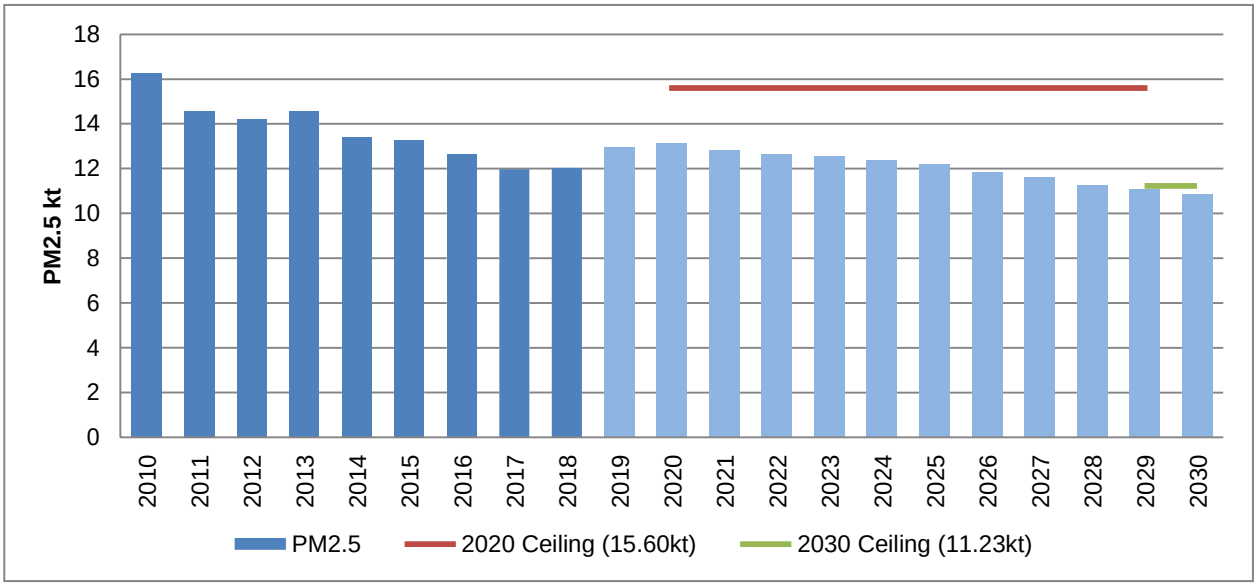
Figure 16: 2020 Inventory, Projections (WM) and NECD Obligation – NH_3 in kt (based on EPA, 2020)



5.1.5 $PM_{2.5}$

$PM_{2.5}$ is projected to stay in compliance with NECD ceilings for all periods out to 2030 and beyond under the WM scenario outlook. Although compliant on the basis of the current outlook, $PM_{2.5}$ is the key driver of health impacts from air pollution and further ambition and progress is planned on the basis that there are no 'safe' levels of air pollution from a health perspective. Measures in the CAP, NECP and CAS are expected to deliver additional progress on $PM_{2.5}$ emission reductions. These additional measures include a substantial increase in the penetration of heat pump technologies and fabric retrofit in the residential sector. Given the relevance of the residential sector to national $PM_{2.5}$ emissions, targeting the replacement of higher emitting sources (e.g. solid fuel use for home heating) would deliver greater benefits than simply pursuing an aggregate penetration target for less air polluting sources (e.g. replacing oil and gas boilers). Such targeting is not represented in the WM outlook, but is being considered under parallel research.

Figure 17: 2020 Inventory, Projections (WM) and NECD Obligation – $PM_{2.5}$ in kt (based on EPA, 2020)



6 With Additional Measures Selected for Adoption by Sector

EU Decision 2018/1522 reference section 2.7

The measures detailed in this section represent the major measures that are accounted for in the officially submitted WAM scenario, that deliver progress over and above the emission projection outlook for the WM projections in Section 5. The results of the potential emissions reductions from these additional measures on the overall WAM scenario emission outlook is captured in section 7, and greater detail is included in the PaM update. It is stressed again that all the measures are already adopted and were accepted for inclusion in the WAM at the time of the official EPA projections submission in April 2020.

6.1.1 Built Environment Sector

The Climate Action Plan sets a goal of achieving 600,000 heat pump installations by 2030. This includes 400,000 to be retrofitted into existing homes. The plan also sets a goal of achieving 500,000 'B2' building energy retrofits by 2030 in Ireland. These two measures combined will deliver a greater reduction in energy demand from the built environment, and can serve to both decarbonise and clean emissions from the sector.

As of the most recent 2016 census, over 10% of households still relied on coal and peat for home heating, with over 40% still reliant on oil. Whilst the CAP has a carbon focus on displacing oil users, it is also recognised that a targeting of homes using solid fuel for both retrofit and heat pump installation can offer a valuable dividend in terms of air, climate and just transition outcomes. Research is forthcoming to quantify the potential of such targeting.

There are twelve key measures in place to support these targets which are included in the WAM scenario and the PaMs file and their impact is outlined in more detail in Appendices 1 and 2.

Table 4: Built Environment Sector PaM's and Descriptions

Measure (PaM file ref)	Description
Better Energy Communities (44107)	The Better Energy Communities scheme, introduced in 2012, supports sustainable energy upgrades to existing buildings, services, facilities and processes in the community sector. It promotes projects with an aggregation of upgrades across sectors within a single project and favours projects where deeper retrofit can be demonstrated.
Better Energy Homes (73085)	Stimulating energy-efficiency actions to reduce energy usage by homeowners and the general public. Sustainable Energy Authority of Ireland grant-aids householders who want to make their homes more energy-efficient by providing incentives towards the implementation of energy efficiency measures including attic and wall insulation and heating controls with efficient boilers and/or solar thermal.
Deep Retrofit Pilot (32691)	Deep retrofit is the significant upgrade of a building toward nearly zero energy requirements where the whole home is viewed as a system with respect to its energy performance. The core principle of the Deep Retrofit Pilot Programme is fabric first, i.e. maximising insulation to minimise energy demand. A highly efficient heating system will further reduce the energy consumed to meet the reduced energy demand. Mechanical ventilation is also required in order to ensure good indoor air quality. Deep Retrofit Pilot Programme requires that all homes funded through the Deep Retrofit Pilot Programme must achieve a minimum Building Energy Rating (BER) of A3 with an uplift in the BER of a minimum of 150 kWh/m2/yr. Airtightness of no more than 5 m3/hr/m2 must be achieved, hence the requirement for mechanical ventilation. Data monitoring – to monitor whole house performance and heating system performance – must also be provided for a period of three years. SEAI provides funding of up to 50% of the total energy-capital costs, project management and BER design/consultancy costs combined. There is a higher rate of subvention, up to 95%, for voluntary housing association homes and the private homes of those that are in energy poverty. However, this is only available as part of a wider project that includes non-energy poor homes and the energy poor component must make up no more than 25% of the total number of homes in each project. The 95% funding is not applicable for local authority housing. The With Additional Measures Scenario assumes a higher level of activity as a result of the 2019 CAP.
Heat Pump Supports – Domestic (84728)	A grant of up to €3,500 towards the capital cost of an electric heat pump is available to homeowners through an SEAI scheme. Homes must achieve a minimum heat loss requirement in order to be eligible. Under the With Additional Measures scenario it is assumed that 385,000 existing residential oil boilers, gas boilers and electric heaters are replaced with heat pumps.
Other Domestic Retrofit (44077)	Additional housing retrofits, over and above existing SEAI programmes. The combined level of retrofits is determined by policy ambition in the CAP (500,000 homes to BER B2 or above by 2030). Ramp-up rate as per MACC trajectory for CAP.
Public Sector Capital Exemplars (72411)	The programme is intended to create scalable investment in energy efficiency across key segments of the public sector. This includes the demonstration of best practice retrofit approaches, project procurement and delivery approaches, and testing pilot measures. The overall intent of this programme is to create and stimulate a long term renovation strategy in these key segments, grow capacity, and delivery savings. The With Additional Measures Scenario assumes that delivery of savings continues until 2040.
Public Sector Programme (21408)	The programme aims to increase energy efficiency by providing a range of funded services including advice, mentoring and training to participating Public Sector bodies. Implementation of measures to enable the public sector contribute to its requirement to improve its energy efficiency by 50% by 2030 and for all public buildings to achieve a "B" BER rating by 2030 as per the CAP.

Smart Meter Roll-Out – Household (62855)	The smart meter upgrade introduces smart meters across all Irish homes and business over a six-year period (2019 - 2024). It will be delivered in a phased approach, commencing with an initial delivery of 250,000 meters over 2019 - 2020. The First phase will predominantly be a meter replacement programme for customers whose current meter have reached maturity and require replacement. From 2020 the delivery of smart meters will significantly increase as approximately 500,000 smart meters will be installed in each of the four subsequent years, which cover both Phase 2 and Phase 3. The allocation of smart meters during all three phases will be across all customers through ESBN's installation plan. Customers will have the opportunity to request a smart meter and those customers who do will be prioritised in the smart meter installation plan. The programme will involve the nation-wide replacement of over two million electricity meters, affecting all customers over a six-year period. Smart meters will make it possible for customers to have better information on their actual energy usage, end estimated bills and introduce new smart services and products such as Time of Use tariffs and smart Pay-As-You-Go. This will empower customers to take control of their energy usage and make more informed decisions about their energy usage.
Warmer Homes Scheme (80880)	This measure targets vulnerable and fuel poor homes and provides funding for the installation of domestic energy efficiency upgrades via regional not-for-profit organisations and private contractors. The With Additional Measures Scenario assumes a higher level of activity as a result of the 2019 CAP.
Warmth and Wellbeing Pilot (90141)	The Warmth & Wellbeing scheme is an initiative led by the Department of Communications, Climate Action and Environment (DCCAE) in conjunction with the Department of Health (DoH), the Health Service Executive (HSE) and Sustainable Energy Authority of Ireland (SEAI). It aims to make homes warmer and healthier to live in by providing extensive, deeper energy efficiency upgrades to those in energy poverty that are living with chronic respiratory conditions. The scheme is currently available in Dublin 8, 10, 12, 22 and 24; however, if the pilot is deemed successful, based on findings from research being carried out in parallel, the scheme may be rolled out nationwide in the future. Most homes are receiving external wall insulation, attic insulation and new efficient heating systems. A smaller percentage is also receiving new windows and doors (where current are single glazed or no longer performing thermally). To date, SEAI have not installed any renewable technologies on these homes, however are looking to carry out some such works in the future. 90-95% of heating systems installed are high efficiency gas boilers. The With Additional Measures Scenario assumes a higher level of activity as a result of the 2019 CAP.
2019 Building Regulations – Dwellings (53532)	NZEB (Nearly Zero Energy Buildings) will be introduced to all new domestic buildings, it sees a reduction in the energy performance of approximately 25% compared to the previous 2011 regulations. Also required is a Renewable Energy Ratio of 20%, meaning that 20% of the primary energy use must be from renewables onsite or nearby. The regulations also introduced Major Renovation. For Domestic projects this has been defined in the regulations as applying where external walls are cladded or drylined or structure replaced and requires the heating system and ceiling insulation is upgraded to meet minimum standards or alternatively the building achieves a B2 Building Energy Rating
Heat Pump Non Domestic (77422)	Through the Support Scheme for Renewable Heat consumers in industrial, services and public sectors can avail of a grant towards the cost of an electric heat pump. The grant, administered by SEAI, can cover up to 30% of eligible costs.

6.1.2 Transport Sector

The Climate Action Plan sets a goal of achieving almost one million EVs on the road in Ireland by 2030. This is to be comprised of 840,000 passenger EVs, 95,000 electric light goods vehicles, and 1,200 low-emission buses. The accelerated transition is to be supported by the provision of corresponding charging infrastructure, as well as packages of supports including subsidies, tax advantages, and other policies to encourage a transition away from internal combustion engines (ICEs) building on the measures and supports outlined in section 4.2.1. Additional renewables targets have also be set as part of the 2019 CAP, and while the impact of these on air pollution have not been estimated yet, they are adopted and will feature in future inventory and projections. As such we have included for completeness.

Measure (PaM file ref)	Description
Electric Vehicle Deployment (49420)	Grant support for new electric vehicles. Electric vehicles were identified as an important element in efforts to achieve both energy efficiency and renewable energy targets as part of the EU Climate Change-Energy Package. The With Additional Measures scenario assumes 935,000 Electric Vehicles on the road by 2030. This includes approximately 550,000 battery electric vehicles and 288,000 plug in hybrid electric vehicles.
Renewables – With Additional Measures scenario – Transport component (61444)	This measure encompasses the development of renewable energy in transport. For example, it is assumed that the Biofuel Obligations Scheme is developed further. Incremental increases are assumed to occur with 10% blend for petrol (E10) and a 12% blend for diesel (B12) in place in 2030. Under the With Additional Measures scenario assumes Ireland will have achieved 33.5% renewable (RES-T) share in 2030.

6.1.3 Agricultural Sector

The agriculture sector is the major source of NH_3 emissions in Ireland, accounting for over 99% of the national total. It is also a source of NMVOC and NO_X. Between 1990 and 2018 the sector has seen growth in total NH_3 emissions from approximately 109kt to 118kt.

In 2018, Teagasc produced a Marginal Abatement Cost Curve for greenhouse gas mitigation identifying potential measures focused in the areas of agricultural mitigation, land use mitigation (mainly carbon sequestration) and energy mitigation (Lanigan et al., 2018). Measures in the 2018 MACC included options that had been implemented to various degrees, albeit that the focus was on identifying thresholds of future abatement potential. Whilst the emissions trajectory has been upward for much of the last decade, there have been initiatives and actions working to counter or supress emissions growth from the sector.

For the agricultural sector, the WAM scenario includes the physical management measures which were also included in the GHG projections and Climate Action Plan. The specific measures that are included in the WAM package are listed below along with the expected level of implementation by 2030. The implementation is assumed to increase linearly to 2030 with the exception of the reduction of crude protein in pigs which is assumed to occur from 2020.

A number of other measures which have been adopted are not included in the WAM scenario yet. This includes the effects of Economic Breeding Index or Beef genomics (more details in Chapter 8), as data was not available on the impact of these and it is currently difficult to include genomic related measures in emission savings calculations. It is envisaged that these programmes will be incorporated in future projections should the data and approaches to do so become available.

Measure (PaM file ref)	Description
Reduction in the crude protein content of pig feed (12851)	Reduction in the crude protein content of pig feed by 1%
Low emission spreading (LESS) of pig slurry (32288)	Low emission spreading of pig slurry: 94% of slurry spread by LESS by 2030 with a 50:50 split between trailing hose and trailing shoe application
Low emission spreading (LESS) of cattle slurry (96259)	50% of dairy cow slurry applied through LESS with a 50:50 split between trailing hose and trailing shoe; 50% of other cattle slurry applied through LESS with a 50:50 split between trailing hose and trailing shoe
Introduction of clover into grass swards (62603)	Introduction of clover into grass swards equivalent to a saving of 17,400 tonnes of fertiliser nitrogen in 2030
Inhibited urea (13374)	Replacement of 50% of the calcium ammonium nitrate fertiliser applied to grassland with inhibited urea products

6.1.4 Power Generation and Renewables

Moneypoint is Ireland's sole coal-burning electricity generation plant. As of 2020 Ireland also has peat fired power generation. As part of the With Additional Measures scenario two peat stations are assumed to run on 100% peat to the end of 2020 and PSO support finishes at the end of 2019. For 2020 the operation of the peat plants is determined by the electricity market. The third peat station operates to the end of 2023 with 30% co-firing. In this scenario the Moneypoint power station is

assumed to operate in the market up to end 2024 at which point it no longer generates electricity from coal as set out in the Climate Action Plan.

Additional renewables targets have also be set as part of the 2019 CAP, while the impact of these on air pollution have not been estimated yet, they are adopted and will feature in future inventory and projections. As such we have included for completeness.

Measure (PaM file ref)	Description
Replacement of coal fired electricity generation with natural gas (63495)	This measure concerns the replacement of coal fired electricity generation with natural gas fired electricity generation. Under the With Additional Measures scenario, the coal fired electricity generation plant is assumed to operate in the market up to end 2024 at which point it no longer generates electricity from coal.
Renewables – With Additional Measures scenario – Electricity component (62667)	This measure encompasses the development of renewable energy in electricity generation (RES-E). This is mainly a result of further expansion in wind energy (comprising 3.5 GW offshore and approximately 8.2 GW onshore). Expansion of other renewables (e.g. solar photovoltaics) also occurs under this scenario. The With Additional Measures scenario assumes Ireland will have achieved 70% renewable (RES-E) share in 2030.
Renewables – With Additional Measures scenario – Heat component (87100)	This measure encompasses the development of renewable energy for heat. The With Additional Measures scenario assumes Ireland will have achieved 24% renewable heat (RES-H) share in 2030.

6.1.5 Other Industry and Enterprise

A number of other measures have also been introduced which are not specifically built environment related, as instead they support industry, enterprise and the public sector to take other measures to improve energy efficiency and enhance awareness, skills and education within their organisations.

Measure (PaM file ref)	Description
Accelerated Capital Allowance for Energy Efficient Equipment (43352)	The Accelerated Capital Allowance for Energy Efficiency Equipment (ACA), introduced in 2008, aims to improve the energy efficiency of Irish companies by encouraging them to purchase energy saving technologies. The ACA is a tax incentive for companies paying corporation tax and aims to encourage investment in energy efficient equipment. The ACA offers an attractive incentive whereby it allows companies to write off 100% of the purchase value of qualifying energy efficient equipment against their profit in the year of purchase. The With Additional Measures Scenario assumes that delivery of savings continues until 2040.
CHP Deployment – Public and Business sectors (88008)	The CHP Deployment programme provided grants for selected renewable and alternative heat sources and was designed to prime the market and to establish a supply chain. The CHP Deployment programme provided grant aid towards the installation of small scale CHP, up to 1 MWe at sites with a suitable heat load. The With Additional Measures Scenario assumes that delivery of savings continues until 2040.
EXEED Certified Grant (88101)	EXEED Certified (Excellence in Energy Efficiency Design) is an energy efficiency design management process. The process sets out steps for designing in energy efficiency and energy management into design projects, for both new investments and upgrades to existing assets. The EXEED Grant Scheme was launched in 2016 with an incentive of up to €500,000 for industrial and commercial businesses to use the EXEED process to design in energy efficiency and energy management into their new or existing assets. One of the purposes of the EXEED process is to move away from looking at energy efficiency measures in isolation. Instead EXEED's scope treats an asset as an energy system and converges on a solution that ranks the priority of different energy efficiency investments relative to that system. The With Additional Measures Scenario assumes that delivery of savings continues until 2040.
Sustainable Energy Authority of Ireland Large Industry Programme (49049)	The Large Industry Energy Network (LIEN) is a voluntary network, facilitated by the Sustainable Energy Authority of Ireland, of companies working to maintain strong energy management and environmental protection practices. The With Additional Measures Scenario assumes that delivery of savings continues until 2040.
Small and Medium Enterprises (SME) Programme (69529)	The programme aims to increase energy efficiency in SMEs through providing advice, mentoring, training and grant-funding to participating SMEs. The With Additional Measures Scenario assumes that delivery of savings continues until 2040.

6.1.6 Cross-Sectoral measures

There are two cross sectoral measures included in the WAM scenarios which target improvements across a range of sectors. These are (i) the national carbon tax which aims to reduce energy consumption in the residential and transport sectors and (ii) the Supplier Obligation Scheme which aims to increase the uptake of energy efficiency measures across a number of sectors.

Measure (PaM file ref)	Description
Carbon Tax (38579)	Incorporates a price signal for carbon on the non-ETS sector, specifically fuels used for heating and transport. The tax applies to petrol, diesel, kerosene, marked gas oil (for agricultural use), Liquid Petroleum Gas (LPG), fuel oil, natural gas, coal and commercial peat. Under the With Additional Measures scenario the carbon tax increases to €80 per tonne of CO2 by 2030.
Supplier Obligation Scheme (67648)	The Energy Efficiency Obligation Scheme (EEOS) is being implemented pursuant to the Energy Efficiency Directive 2012, Article 7. The Directive imposes a legal obligation on Member States to achieve new savings each year from 1 January 2014 to 31 December 2020 of 1.5% of the annual energy sales to final customers of all energy distributors and all retail energy sales companies by volume, averaged over the most recent three-year period prior to 1 January 2013. The target is cumulative, which means that it is based on incremental annual savings that deliver a total volume of savings at the end of the obligation period in 2020. Ireland has chosen to effect the provisions of Article 7(9) of the Directive, opting to combine alternative policy measures and an energy efficiency obligation scheme to meet the national target. Obligated parties under the EEOS are energy distributors and retail energy sales companies that have market sales in Ireland of greater than 600 GWh final sales in any relevant year, regardless of the sector they supply. Obligated parties' targets are allocated according to their proportion of energy market sales volume in Ireland. Member States are obliged to put in place measurement, control and verification systems to verify savings by obligated parties. The positions against targets for each year are to be achieved, audited and finalised by 31 March of the following year. The target allocated to obligated parties is 550 GWh PPE for the period 2014 to 2016, 625GWh PPE for 2017 and 700GWh PPE from 2018 to 2020. This is sub-sectoralised as 75% non-residential, 20% residential and 5% energy poverty residential. The minimum achievement for the period 2014-2016 is Year 1 60%, Year 2 75% cumulative and Year 3 90% cumulative. From Year 4 onwards, the minimum cumulative achievement will be 95% cumulative. Obligated parties can choose to achieve energy savings independently or through partnerships with service providers in the market. The scheme permits the exchange of validated savings between obligated parties in certain circumstances. Obligated parties can buyout up to a maximum of 30% of their total cumulative target, whether or not they have achieved their minimum cumulative target. For any portion of the minimum annual target not achieved, exchanged or bought out, a penalty will be imposed. The price of buyout and penalty will be set and published by the Minister and reviewed as appropriate. In the Residential and Energy Poverty sectors energy savings from energy conservation measures are calculated using deemed credits per measure based on Building Ratings under EPBD. In the Non-Residential sector scaled or measured savings based on ISO 50015, IPMVP or equivalent are used to calculate savings. Project data is uploaded to SEAI bespoke systems and is subject to Evaluation and Audit.

6.1.7 PaMs for Consideration and Adoption

In the previous NAPCP there were 34 PaMs presented for consideration. In this update there are 29 which have been selected for adoption as outlined in the sections above and included in the PaM's tool.

To ensure coherence, these measures build upon the existing cross-Government measures that are already delivering results but have been intensified to reflect our increased ambition for greenhouse gas and air pollutant reductions. The measures currently adopted and included in the IIR put Ireland back on a pathway to compliance for all the main pollutants with the exception of ammonia.

New policies and measures are currently being developed across Government as part of the update to the Climate Action Plan for 2021, and these will also have an impact on air quality emissions. Currently there is no data available on the impact of these measures so it was not possible to include them for consideration in this update.

7 Projected 'With Additional Measures' Scenarios

EU Decision 2018/1522 reference section 2.8

This section provides details the official WAM emission projections for Ireland. These are the latest officially submitted emission projections available at the time of compiling this updated NAPCP.

7.1 Projected emission reductions (WAM)

In Table 5 the data shows that under the WAM scenario outlook, SO_2 and $PM_{2.5}$ are both in compliance for both the 2020 and 2030 ceilings. In the case of NMVOC, emissions under the WAM scenario (excluding emissions from agricultural categories 3B and 3D) are projected to exceed the 2020 and 2030 targets. In the scenario with adjustments, that also exclude emissions from spirit production[43], the emission projections predict compliance with the 2020 target. Under this scenario emissions in 2030 are projected to be 45.3kt which is approximately 0.08kt above the emission reduction target for 2030. In the case of NO_X compliance is achieved on the outlook for 2025 to 2030 period, with an exceedance in the early part of the 2020 to 2025 period only. However, as noted in Section 4, it is expected that the inventory adjusted compliance total for NO_X will see compliance achieved in the 2020 phase also. Nonetheless it is noted that NO_X and NMVOC are close to their compliance limits in 2030 and therefore will be carefully monitored over time. Table 5 also shows that under the WAM scenario NH_3 remains in non-compliance in the 2020 and 2030 phases. However, for the first time, the WAM scenario outlook for NH_3, includes additional measures specific to agriculture that deliver notable improvements over the performance anticipated in Table 3 for the WM scenario NH_3 outlook. Discussions for individual air pollutants are presented in this section and greater detail on specific measures and their contributions (where available) are included in the PaM update attached with this submission.

43 On the basis that NMVOCs from category 2.H (Spirits) were included in the 1990-2015 inventory for the February 2017 inventory submission (after the 2016 NEC Directive came into effect).

Table 5: 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 change achieved compared with 2005 (M)			National emission reduction commitment for 2020-2029 (% reduction compared with 2005 levels) (M)	National emission reduction commitment from 2030 (% reduction compared with 2005 levels) (M)
	2005 base year	2020	2025	2030	2020	2025	2030		
SO_2	73.07	13.41	8.25	5.74	- 82%	- 89%	- 92%	65%	85%
NO_x	131.05	74.41	52.65	39.64	- 43%	- 60%	- 70%	49%	69%
Total NMVOC	75.11	68.8	68.5	66.6	- 8%	- 9%	- 11%	25%	32%
Adjusted NMVOC	66.58	49.23	48.15	45.36	- 26%	- 28%	- 32%	25%	32%
NH_3	113.2	118.45	114.73	111.85	+ 5%	+ 1%	- 1%	1%	5%
$PM_{2.5}$	19.03	12.9	10.85	8.27	32%	43%	57%	18%	41%
Date of emission projections (M) - April 2020									

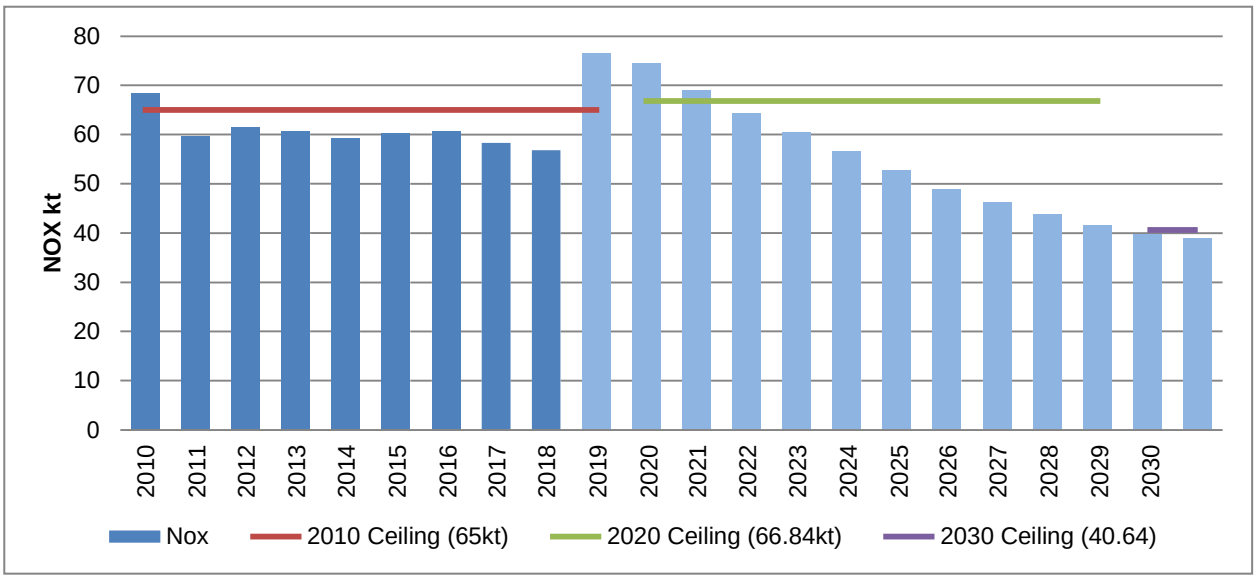
As with Table 3, Table 5 includes no adjustments or special notes regarding SO_2, NH_3 or $PM_{2.5}$. Again for NO_X, agricultural categories 3B and 3D are removed from the 2005 inventory base and projections to assess compliance (as per Article 4 of 2016 NECD). For NMVOC, the same adjustments for agricultural categories 3B and 3D are included, as well as the further adjustment to remove 2.h.2 (NMVOC from spirits) that is again applied to both the 2005 inventory base and emission projections for the purpose of compliance assessment.

7.1.1 NOx

The WAM outlook for NO_X shows compliance from 2022 onwards with the 2020 ceiling, and from the outset for the 2030 ceiling. The emission reductions are driven largely by reductions in the transport sector, which are associated with electrification and the gradual penetration of cleaner Euro standard vehicles across both passenger cars and commercial fleets. Whilst the official emission projections for 2019 to 2021 show an exceedance, revisions to the projections in line with COVID-19 impacts and post COVID-19 actions (e.g. remote working, less motorised travel) may also contribute to lower emissions than in those years prior to 2020. This will be captured in the 2021 official national emission projections. However, on review of the compliance figure for 2018 and the outlook where adjustments

related mainly to Euro standard failures remain to be made, we note that the compliance trend to 2018 is likely to be comfortably below the 2020 ceiling if adjustments are allowed and applied.

Figure 18: 2020 Inventory, Projections (WAM) and NECD Obligation – NOx in kt (based on EPA, 2020)



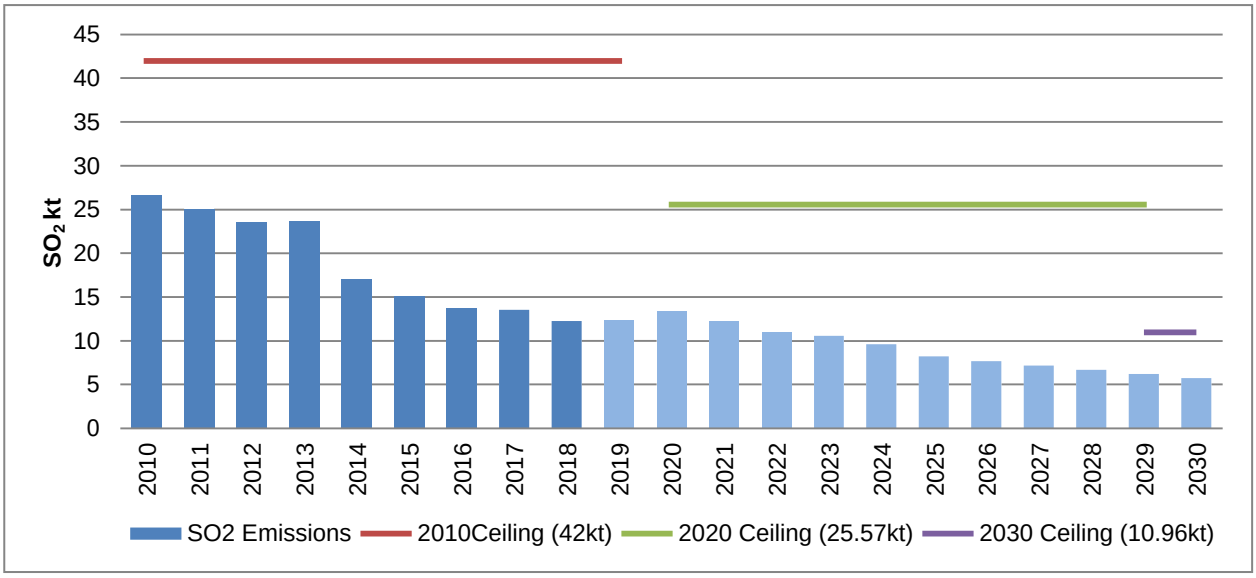
Recent agreed NO_X adjustments for the 2018 inventory amounted to over 10kt for the road transport sector alone. Thus, whilst substantial actions are envisaged in the transport sector on the time horizon to 2030 and beyond, it is not anticipated that Ireland will have a compliance issue with NO_X in the coming phase. See Table 9.2a in Chapter 9 of Ireland's Informative Inventory Report for more details on the compliance adjustments[44] included.

44 http://www.epa.ie/pubs/reports/air/airemissions/airpollutantemissions/

7.1.2 SO_2

The WAM scenario outlook for SO_X extends the gap between estimated future emissions and the defined ceilings further again than in the WM scenario with emissions reducing to a 2030 level some 92% below the emissions reported in 2005 in Ireland.

Figure 19: 2020 Inventory, Projections (WAM) and NECD Obligation – SO_2 in kt (based on EPA, 2020)



7.1.3 NMVOC

The WAM outlook for NMVOC is presented in the same manner as the WM outlook for NMVOC in section 4.1.3. Specifically, Figure 20 presents total NMVOC emissions with the removal of agricultural categories 3B and 3D only. Ceilings are unadjusted and exceedances persist for both the 2020 and 2030 periods under the WAM. However, under Figure 21, adjustments relating to category 2H2 are applied to both projected emissions and the ceilings (through a revised base year adjustment), The outlook under the adjusted WAM of Figure 21 shows compliance with the ceiling from 2020-2029, and a marginal compliance with the ceiling from 2030 onwards.

Performance in regard to this latter ceiling will be kept under review and will be considered as part of the implementation of the CAS to consider what further additional measures will be required into the future.

Figure 20: 2020 Inventory, Projections (WAM) and NECD Obligation – Total NMVOC in kt (based on EPA, 2020)

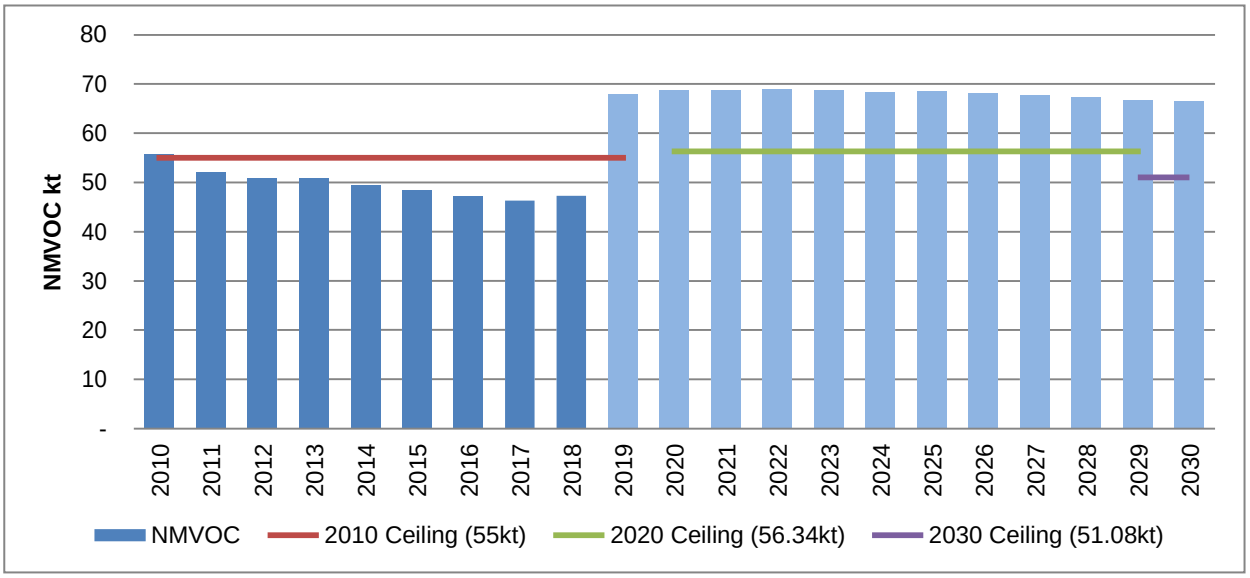
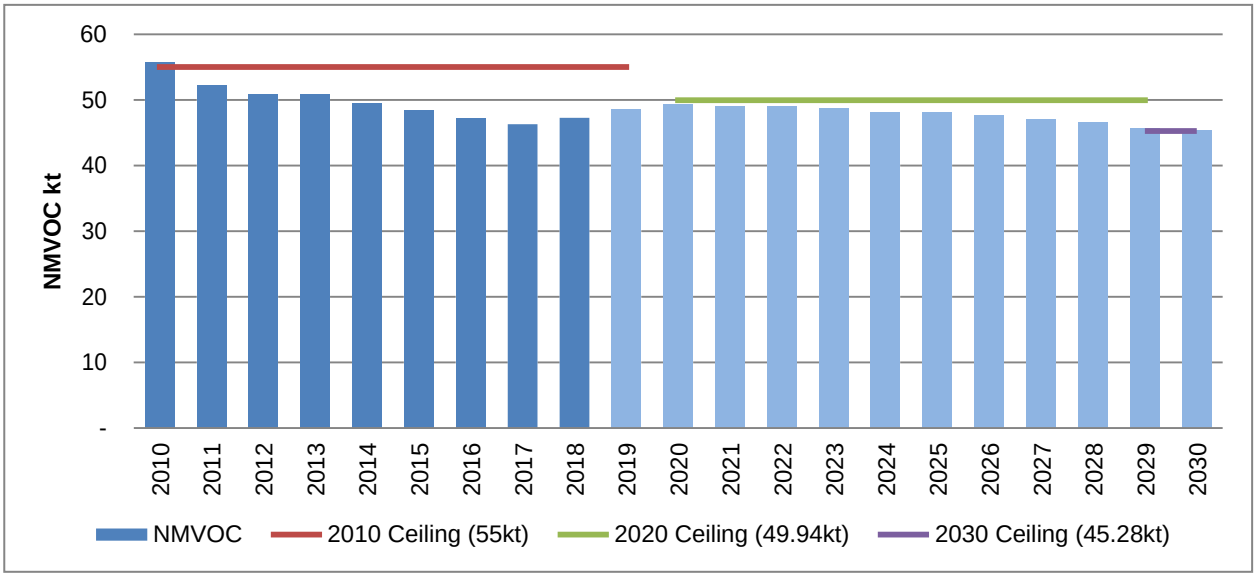


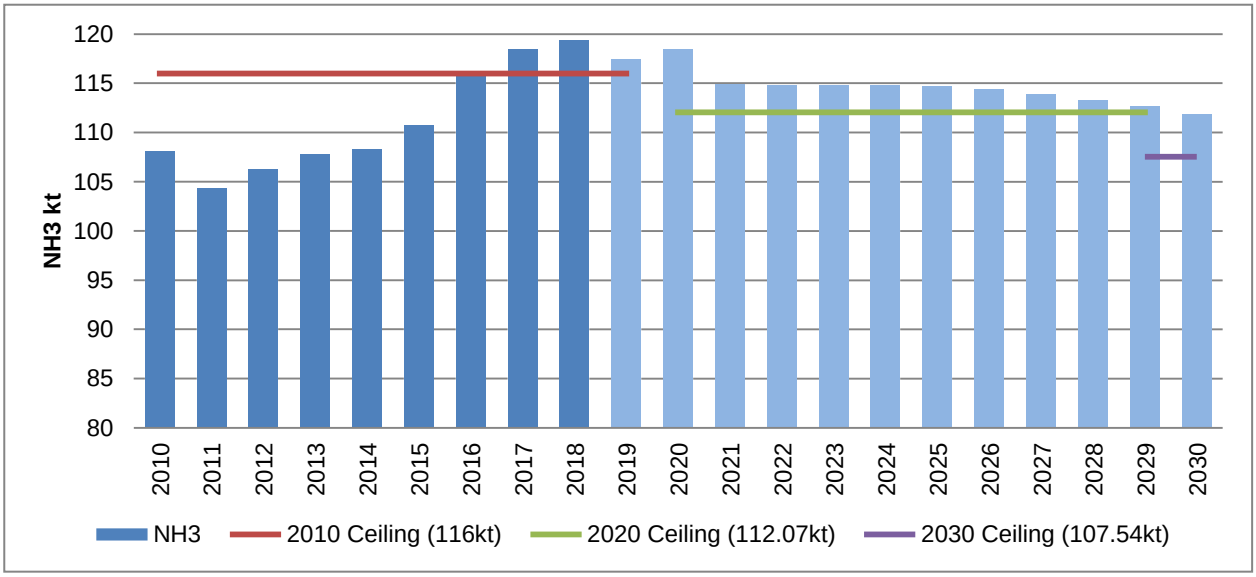
Figure 21: 2020 Inventory, Projections (WAM) and NECD Obligation – Adjusted NMVOC in kt (based on EPA, 2020)



7.1.4 NH_3

Previous agriculture projections have included a small difference between the WEM and WAM scenarios (related to the one nitrogen use efficiency measure under the WAM scenario). The April 2020 projections now incorporate the Teagasc GHG MACC as it was included in the 2019 Climate Action Plan, and the impacts of these measures have been incorporated into the WAM scenario projections where possible. In the past the distinction between the scenarios has been focused on energy sectors, and so this development marks progress regarding the refinement of forecast activities and actions relating to the agriculture sector. Nonetheless, whilst some measures have been incorporated into the NH_3 outlook, which breaks somewhat from the rise and plateau that have been in evidence in the past, it is apparent from Figure 22 that further action is required. Future proposed measures are outlined in more detail in Section 8.

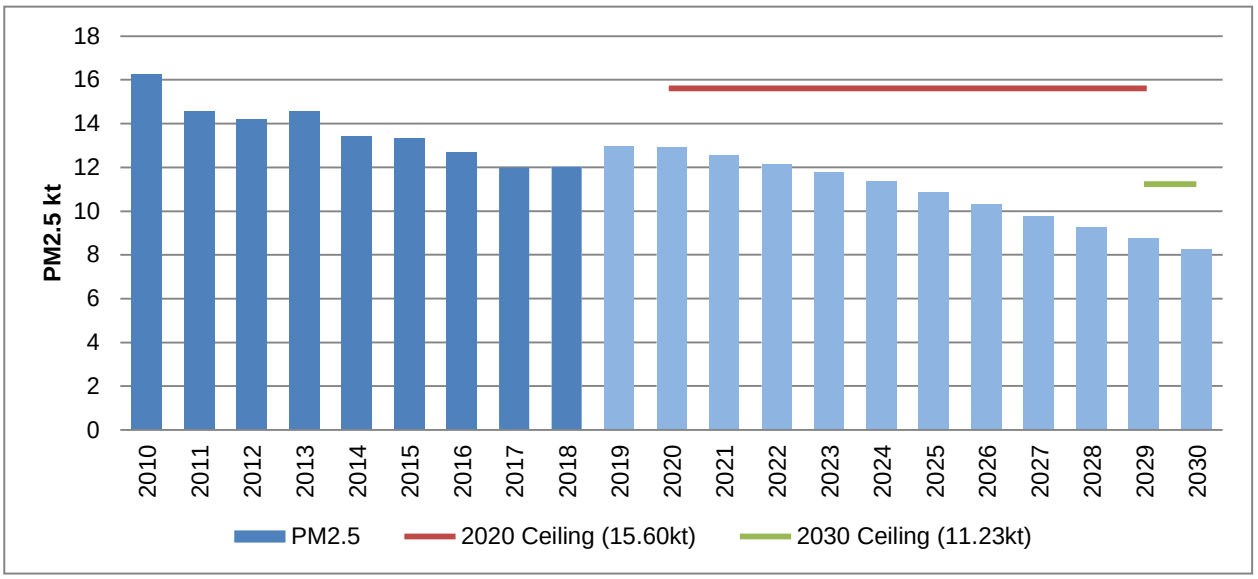
Figure 22: 2020 Inventory, Projections (WAM) and NECD Obligation – NH_3 in kt (based on EPA, 2020)



7.1.5 $PM_{2.5}$

The WAM scenario outlook for $PM_{2.5}$ is encouraging and shows a steady abatement trajectory out to 2030. Ultimately, whilst efforts to identify and address 'hot spots' of fine particulates will continue into the future for this key pollutant, on an aggregate national scale the expected progress under the NECD is encouraging.

Figure 23: 2020 Inventory, Projections (WAM) and NECD Obligation – $PM_{2.5}$ in kt (based on EPA, 2020)



7.2 Non-linear emission reduction trajectory

EU Decision reference section 2.8.2

The graphs included in this section show that under the current WAM scenario outlook from the official submitted projections, Ireland will follow a progressive reduction pathway between 2020 and 2030 for SO_2, NO_X, $PM_{2.5}$ and adjusted NMVOC emissions. The exception is NH_3 where the graphs show a non-linear emissions reduction trajectory up to 2030.

In general the outlook for the agriculture sector in terms of activity and emissions remains somewhat unsettled at this point in time. The ultimate impact of Brexit on Irish agriculture is unquestionably relevant to the outlook, in particular for the beef herd, but it remains unknown as to how exactly these matters and final trade agreements will develop.

Similarly, the latest marginal abatement cost curve for NH_3 has yet to be applied in the context of the future WAM, and therefore the implications of the selected measures from that menu will not impact on the emissions outlook until updated national emission projections are submitted in 2021. As such, whilst agriculture still retains a non-linear emission reduction trajectory, this is expected to change in the next official emission projections submission.

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[45]:

1. Adjustments in inventory estimates: 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.

45 From report on “A Critical Guide to The New National Emission Ceilings Directive”

Adjustments to inventory estimates have been made, approved by the EU Commission, and are expected to continue. Details of the adjustments are set out in the Informative Inventory Report which has been referenced earlier in this updated NAPCP.

2. Rolling three-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.

This flexibility is not currently being applied.

3. Exceptional events related to the energy sector: This flexibility allows the Member State to breach the NERC limit in the 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 jeopardise national energy security or pose 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.

This flexibility is not currently being applied.

7.4 Projected impacts on ambient air quality and the environment

EU Decision 2018/1522 reference section 2.5.2.1 and 2.6.2

Ireland does not currently have the ability to provide detailed projections in relation to future ambient air quality for either the WM or WAM scenarios. This functionality is being considered as part of the Clean Air Strategy. For now, pollutant levels across the monitoring network are being closely monitored.

Overall, given the general trajectory of national emissions as well as the sustained record of a high level of AAQD compliance in Ireland, Ireland is not anticipating any sustained exceedances of EU ambient air pollution limits into the future.

Using the more stringent WHO guidelines for air quality, four air pollutants warrant closer observation. These pollutants are PM_{10} / $PM_{2.5}$, which are mainly associated with residential solid fuel burning and transport emissions from diesel; NO_2, which is typically found in higher concentrations in urban centers and is associated with fossil fuel powered transport and congestion; O_3 at a regional scale, in part due to the impacts of transboundary ozone; and PAH, associated with the burning of fossil fuels.

Measures outlined in both the WM and WAM scenarios which encourage active travel, increased use of public transport and increase the number of electric vehicles on the road can also contribute to a reduction in localised emissions from the road transport sector. Similarly, measures to retrofit the built environment will cut energy demand and emissions from the residential sector, whilst initiatives to replace fossil fuel heating systems with heat pumps can similarly have a positive impact on ambient air quality, specifically where solid fuel sources are targeted.

There is a credible expectation that the measures and policies described in both scenarios will continue to have a further positive impact on aggregate national emissions, and thereby ambient air quality to 2030 and beyond.

The expansion of the network of monitoring stations through the National Ambient Air Quality Monitoring programme has been of value in regard to monitoring and managing national air quality. It is acknowledged that this increased monitoring activity may help to identify new ‘hotspot’ areas where further action and initiatives are required into the future to tackle more localised impacts that can be missed on the broader scale assessments. In addition the EPA has secure EU LIFE funding for further development modelling and forecasting, which will feed into the next NAPCP.

8 Additional Policy Options under Consideration

The updated PaM submission attached to this NAPCP update includes the details that were available in the earlier part of 2020 when the most recent (April 2020) national emission projections were developed. As indicated from the outset however, it is expected that further measures will be included in the next national emission projections in 2021 that will account for some of more recent policy developments that are not yet recognised in the WAM scenario described in Section 6.

It should also be noted many of the measures highlighted in this report and prioritised by Government are policies and measures that work to align the challenges of both air and climate. The objective of more recent national strategies and plans has been to develop and implement packages of measures that effectively support an integrated approach to dealing with climate, air and broader environmental challenges.

Ireland is projected to be on track to achieve compliance with the emissions ceilings for SO_2 and $PM_{2.5}$ by 2030 with a reasonable margin of compliance. However in relation to NO_X and NMVOCs, while compliance is indicated to be achieved by 2030, the compliance margin is smaller. These issues are being considered in the finalisation of the Clean Air Strategy which will establish a framework for the development of additional measures to be developed to increase the margin of compliance.

Additionally, using the most recent projections, Ireland is still expected to exceed all NH_3 emissions limits. However significant advancements have been made in this regard since the last NAPCP submission and the last projections were produced.

The priority of this section of the document is to focus on the options that are available to help Ireland reduce emissions of pollutants that are expected to be close to their ceiling values, or indeed exceed the NECD ceiling limits for 2030.

8.1 Agriculture

8.1.1 Teagasc MACC 2020

Teagasc have developed an updated marginal abatement cost curve (MACC) for NH_3 which indicates a menu of options that can deliver the necessary compliance in the 2020 and 2030 periods. As of September 2020, a new ammonia MACC has been produced and released by Teagasc[46]. Table 6 presents an excerpt from the 2020 MACC which suggests up to 15.26kt of NH_3 abatement potential. Figure 24 details some of the main options.

Table 6: Excerpt from the NH_3 MACC of abatement potential and net marginal costs associated with individual measures (Teagasc, 2020)

Pathway	Average NH3 abatement (kt) per annum (2021-2030)	Average cost per annum (€'million) (2021-2030)	€ per kg NH2 abated
Crude Protein - Dairy	0.48	-€10.05	-€20.97
Clover	0.35	-€3.97	-€11.32
Crude Protein - Pigs	0.11	-€0.71	-€6.44
Protected Urea	3.11	-€7.15	-€2.30
Liming	0.31	-€0.33	-€1.06
Covered Stores - Pigs	0.19	-€0.002	-€0.01
LESS - Bovine	9.04	€12.64	€1.40
Covered Stores – Bovine	0.55	€0.80	€1.47
Amendments – Pig Slurry	0.18	€0.85	€4.68
LESS - Pigs	0.30	€1.71	€5.77
Amendments – Poultry	0.08	€0.97	€12.75
Amendments – Bovine	0.47	€13.03	€27.78
Poultry Manure – Drying	0.09	€3.07	€34.70
Total	15.26	€10.86	

However, the latest WAM projections from April 2020 were prepared prior to the latest ammonia MACC being available and thus the official national emission projections cannot at present indicate the path to compliance. However, it is expected that subject to availability of the necessary information, the 2021 official projections will adopt additional measures and higher penetration rate

46 https://www.teagasc.ie/media/website/publications/2020/NH3-Ammonia-MACC.pdf

targets for key NH_3 measures that will deliver the additional cumulative abatement required to achieve compliance.

Figure 24 is not an official projection but provides a scenario of what a possible pathway could look like. This scenario illustrates the mitigation potential identified in the latest agricultural MACC for ammonia, which is expected to inform the basis upon which subsequent official national emission projections for NH_3 are prepared. Note that the projected period in the draft MACC documentation does not extend beyond 2030, and as such the outlook remains static from 2030 onwards.

Figure 24: 2020 Inventory, a Projections scenario with full MACC mitigation applied and NECD Obligation – NH_3 in kt (Envecon Decision Support, 2020)

The impact of the new NH_3 MACC is illustrated in Figure 24. It brings a 50% replacement of CAN with inhibited urea forward to 2025 compared to 2030 in the national emission projections. With respect to clover, the savings in the reported WAM scenario equate to 15% of dairy farmers (in the Teagasc national farm survey) adopting, whereas the new NH_3 MACC suggests 25%. For cattle slurry, the new NH_3 MACC adopts a target of 75% spread using LESS by 2025 and 90% by 2030. The new MACC suggests that the crude protein content in the weaner, finisher stage 1 and stage 2, feed could be reduced by 1%, 2% and 2% points respectively without adversely affecting output in 2021 and in all subsequent years. For pig slurry, the NH_3 MACC assumes that a total of 60% of all pig slurry spread is to be applied using low emissions slurry spreading by 2022. This increases to 75% by 2025 and 90% by 2030. It is assumed that half of the slurry is applied by trailing shoe and half by trailing hose.

All the other measures in the new MACC are therefore additional to what has been included in the reported WAM scenario.

8.1.2 Teagasc National Farm Survey

Ireland's capacity in Farm Accountancy Data Network (FADN) data collection under the Teagasc National Farm Survey[47] 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 FADN, Teagasc has championed the future development of the FADN as an environmental monitoring tool. Manure management practice data from the NFS[48] will be incorporated in the 2021 national emission inventory submission estimates for the agriculture sector and it is expected that as new data becomes available it will also be incorporated into future inventory and projection scenarios where appropriate.

8.1.3 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 of both ammonia and greenhouse gases by improving the quality and efficiency of the national beef herd. By 2017 there were over 24,000 applicants to the programme and approximately one million animals genotyped. It is estimated that there will be a 4.5% improvement in carbon efficiency per animal by 2020.

8.1.4 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. This is a critical program with regard to delivering practice change into the future in the sector.

47 https://www.teagasc.ie/rural-economy/rural-economy/national-farm-survey/

48 https://www.teagasc.ie/rural-economy/rural-economy/national-farm-survey/national-farm-survey-reports/

8.1.5 Origin Green

The Origin Green[49] 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 programme has conducted over 137,000 carbon footprint audits across Ireland. These audits focus on measuring key production efficiencies at farm level. Improving efficiencies in these areas contributes to reducing greenhouse gas and ammonia emissions

8.2 Other Measures

8.2.1 Renewable Electricity Support Scheme (RESS)

RESS is a competitive auction-based scheme which invites renewable electricity generation projects to bid for capacity and receive a guaranteed price for the electricity they generate.

The primary policy objective of RESS is delivery of renewable electricity in a sustainable, cost effective and secure framework. However, there are broader policy objectives delivered under RESS, namely technology diversification and support for community ownership and participation.

The Terms and Conditions for the first RESS auction (RESS-1) competition were published in February 2020. The RESS auction qualification window closed at the end of April and qualification results were accepted in July 2020. Formal State Aid notification of the scheme was received from the EU Commission in July 2020. The final RESS-1 results were approved by Government in September 2020.

All successful RESS-1 projects are in receipt of a notice of award. These projects are required to commence operation before 2023 at the latest.

Key learnings from RESS-1 are currently being reviewed. The development of the second RESS auction (RESS-2) has commenced along with preparation of a timetable for future auctions.

8.2.2 Changes to timeline of Peat Phase Out

Both peat fired electricity generation plants, Edenderry and Moneypoint were awarded REFIT 3 letters of offer for 30% of capacity co-firing. However this was subject to the granting of relevant planning permissions to co-fire, with the original planning for both sites expiring on 31 December 2020. ESB

49 https://www.origingreen.ie/

has announced West Offaly and Lough Ree ceased producing electricity at the end of 2020 and will be decommissioned in the coming years.

Additionally all Bord Na Móna peat harvesting has formally ceased in 2020 with the last harvest having been completed in 2019. Bord na Móna will continue to supply customers with peat briquettes up to 2024 from stocks of peat which have already been harvested.

9 Appendix 1: WAM Emission Reduction Measures

	2020					2025					2030				
Built Environment															
	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)
Better Energy Communities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0197	0.0372	0.0469	0.0385	0.0000	0.0557	0.0568	0.0757	0.0603
Better Energy Homes	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0423	0.0797	0.1006	0.0825	0.0001	0.0601	0.1171	0.1516	0.1242
Deep Retrofit Pilot	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0038	0.0072	0.0091	0.0074	0.0000	0.0054	0.0106	0.0137	0.0112
Heat Pump Supports	0.0000	0.0002	0.0001	0.0000	0.0000	0.0000	0.1270	0.0430	0.0018	0.0036	0.0000	0.3921	0.1328	0.0057	0.0112
Other Domestic Retrofit	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.1534	0.2893	0.3651	0.2995	0.0007	0.4534	0.8838	1.1443	0.9372
Public Sector Capital Exemplars	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0115	0.0009	0.0020	0.0014	0.0000	0.0288	0.0023	0.0053	0.0025
Public Sector Programme	0.0000	0.0375	0.0029	0.0060	0.0068	0.0000	0.2113	0.0163	0.0363	0.0262	0.0000	0.4792	0.0376	0.0873	0.0409
Smart Meter Roll-Out - Household	0.0000	-0.0005	-0.0002	0.0000	0.0000	0.0000	-0.0017	-0.0004	-0.0001	-0.0001	0.0000	-0.0029	-0.0003	-0.0002	-0.0001
Warmer Homes Scheme	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0096	0.0182	0.0229	0.0188	0.0000	0.0137	0.0267	0.0346	0.0283
Warmth and Wellbeing Pilot	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0017	0.0032	0.0041	0.0034	0.0000	0.0024	0.0048	0.0062	0.0051
Heat Pump Supports – Non Domestic	0.0000	0.0249	0.0014	0.0011	0.0094	0.0000	0.0382	0.0019	0.0021	0.0090	0.0000	0.0299	0.0014	0.0020	0.0034
Building Regulations 2019	n/e	n/e	n/e	n/e	n/e	n/e	n/e	n/e	n/e	n/e	n/e	n/e	n/e	n/e	n/e

	2020					2025					2030				
	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)
Transport															
Electric Vehicle Deployment	0.0033	0.1522	0.0002	0.0186	0.0067	0.0071	0.3230	0.0004	0.0403	0.0143	0.0439	2.0951	0.0027	0.2490	0.0923
Renewables (Transport)	N/e	N/e	N/e	N/e	N/e	N/e	N/e	N/e	N/e	N/e	N/e	N/e	N/e	N/e	N/e
Agriculture															
Reduction in the crude protein content of pig feed	0.8573	#	#	#	#	0.8697	#	#	#	#	0.8936	#	#	#	#
Low emission spreading (LESS) of pig slurry	0.0703	#	#	#	#	0.2498	#	#	#	#	0.4399	#	#	#	#
Introduction of clover into grass swards	IE*	#	#	#	#	IE*	#	#	#	#	IE*	#	#	#	#
Low emission spreading (LESS) of cattle slurry	1.0287	#	#	#	#	3.7862	#	#	#	#	6.5419	#	#	#	#
Inhibited urea	1.7748	#	#	#	#	2.5917	#	#	#	#	3.3792	#	#	#	#

IE* - Reduction of fertiliser N requirements as a result of N fixation/fertiliser replacement value from the inclusion of clover in grass swards. Savings are combined with Inhibited urea PAM due to the interdependence of both measures.

	2020					2025					2030				
	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)	NH3 (kt)	NOx (kt)	SOx (kt)	NMVOC (kt)	PM2.5 (kt)
Power Generation and Renewables															
Replacement of coal fired electricity generation with natural gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4870	0.6926	-0.0250	0.6400	0.0000	0.0000	0.0000	0.0000	0.0000
Renewables	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E
Other Industry and Enterprise															
Accelerated Capital Allowance	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0094	0.0005	0.0006	0.0022	0.0000	0.0197	0.0010	0.0014	0.0020
CHP Deployment - Public and Business sectors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0222	0.0052	0.0027	0.0013	0.0000	0.0592	0.0140	0.0073	0.0034
EXEED Certified Grant	0.0000	0.0043	0.0006	0.0004	0.0009	0.0000	0.0462	0.0066	0.0049	0.0061	0.0000	0.0939	0.0142	0.0108	0.0068
Sustainable Energy Authority of Ireland Large Industry Programmes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3065	0.1066	0.0398	0.0411	0.0000	0.7950	0.2830	0.1058	0.0944
Small and Medium Enterprises (SME) Programme	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0166	0.0013	0.0029	0.0021	0.0000	0.0415	0.0033	0.0076	0.0035
Cross Sectoral Measures															
Carbon Tax	0.0022	0.2889	0.0419	0.0324	0.0184	0.0068	0.8923	0.1304	0.1003	0.0572	0.0082	1.1548	0.1644	0.1316	0.0725
Supplier Obligation Non-Grant	0.0005	0.1007	0.006	0.0152	0.015	0.0011	0.2082	0.0123	0.0333	0.0218	0.0012	0.226	0.0132	0.0375	0.0169

10 Appendix 2: Programmes and Measures (WAM) by Sector

Name of individual PaM or package of PaMs (M):	PaM File No.	Currently planned year of adoption (M):	Currently planned timetable for implementation (M)		Currently planned timetable for review (M):	Competent authorities (M)
			Start year	End year		
Built Environment Sector (Section 6.1.1 NAPCP)						
Better Energy Communities	44107	2012	2012	2040	2021-2022	**SEAI**
Better Energy Homes	73085	2011	2011	2040	2021-2022	**DECC/SEAI**
Deep Retrofit Pilot	32691	2017	2017	2040	2021-2022	**SEAI**
Heat Pump Supports – Domestic	84728	2018	2018	2030	2021-2022	**SEAI**
Heat Pump Supports – non Domestic	77422	2019	2019	2027	2021-2022	**SEAI**
Other Domestic Retrofit	44077	2019	2019	2030	2021-2022	**SEAI/DECC**
Public Sector Capital Exemplars	72411	2017	2017	2040	2021-2022	**DECC**
Public Sector Programme	21408	2019	2019	Beyond 2030	2021-2022	**DECC**
Smart Meter Roll-Out – Household	62855	2019	2019	Beyond 2030	2021-2022	**DECC**
Warmer Homes Scheme	80880	2019	2019	Beyond 2030	2021-2022	**DECC**
Warmth and Wellbeing Pilot	90141	2019	2019	Beyond 2030	2021-2022	**DECC**
2019 Building Regulations	53532	2019	2040	2040	2023	**DHLGH**

Name of individual PaM or package of PaMs (M):	PaM File No.	Currently planned year of adoption (M):	Currently planned timetable for implementation (M)		Currently planned timetable for review (M):	Competent authorities (M)
			Start year	End year		
Transport Sector (Section 6.1.2 NAPCP)						
Electric Vehicle Deployment	49420	2011	2011	2030	2021-2022	**DECC/SEAI**
Renewables - Transport component	61444	2019	2021	2030	2021-2022	**DECC/DoT**

Name of individual PaM or package of PaMs (M):	PaM File No.	Currently planned year of adoption (M):	Currently planned timetable for implementation (M)		Currently planned timetable for review (M):	Competent authorities (M)
			Start year	End year		
Agriculture Sector (Section 6.1.3 NAPCP)						
Reduction in the crude protein content of pig feed	12851	2019	2019	Beyond 2030	2023	**DAFM**
Low emission spreading (LESS) of pig slurry	32288	2017	2017	Beyond 2030	2023	**DAFM**
Introduction of clover into grass swards	62603	2020	2020	Beyond 2022	2023	**DAFM**
Inhibited urea	13374	2015	2015	2030	2023	**DAFM**
Low emission spreading (LESS) of cattle slurry	96259	2017	2017	Beyond 2030	2023	**DAFM**

Name of individual PaM or package of PaMs (M):	PaM File No.	Currently planned year of adoption (M):	Currently planned timetable for implementation (M)		Currently planned timetable for review (M):	Competent authorities (M)
			Start year	End year		
Power Generation Sector (Section 6.1.4 NAPCP)						
Replacement of coal fired electricity generation with natural gas	63495	2019	2024	2025	n/a	**DECC**
Renewables – Electricity component	62667	2019	2019	2030	2021-2022	**DECC/CRU**
Renewables – Heat component	87100	2019	2019	2030	2021-2022	**DECC/SEAI**

Name of individual PaM or package of PaMs (M):	PaM File No.	Currently planned year of adoption (M):	Currently planned timetable for implementation (M)		Currently planned timetable for review (M):	Competent authorities (M)
			Start year	End year		
Other Industry and Enterprise (Section 6.1.5 NAPCP)						
Accelerated Capital Allowance for energy efficient equipment	43352	2008	2008	2040	2021-2022	**DoF**
CHP Deployment – Public and Business sectors	88008	2011	2011	2040	2021-2022	**SEAI**
EXEED Certified Grant (EXEED Grant Scheme)	88101	2016	2016	2040	2021-2022	**SEAI**
Sustainable Energy Authority of Ireland Large Industry Programme	49049	1995	1995	2040	2021-2022	**SEAI**
Small and Medium Enterprises (SME) Programme	69529	2007	2007	2040	2021-2022	**SEAI**

Name of individual PaM or package of PaMs (M):	PaM File No.	Currently planned year of adoption (M):	Currently planned timetable for implementation (M)		Currently planned timetable for review (M):	Competent authorities (M)
			Start year	End year		
Cross Sectoral Measures (Section 6.1.6 NAPCP)						
Carbon Tax	38579	2010	2010	2030	2021/2022	**Revenue Commissioners**
Supplier Obligation Non-Grant	67648	2014	2014	2030	2021-2022	**DECC/SEAI**

12 Appendix 3: Compliance with emission reduction commitments in the Agriculture sector

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 (M) If no, describe the modifications that have been made.
A. Measures to control ammonia emissions (M)			
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	Section 5.1.3	Yes: See Note 1
(a) nitrogen management, taking into account the whole nitrogen cycle;	Yes		Yes
(b) livestock feeding strategies;	Yes		Yes
(c) low-emission manure spreading techniques;	Yes		Yes (See 12.1.1.1)
(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.	Yes		Yes
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		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	Section 5.1.3	No: See Note 1,2 & 3
(a) replacing urea-based fertilisers by ammonium nitrate-based fertilisers;	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 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.	No		No
4. Member States may reduce ammonia emissions from livestock manure by using the following approaches:	Yes	Section 5.1.3	Yes See Note 1 & 4
(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:			
(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;	Yes		Yes
	Yes		Yes

(ii) not spreading manures and slurries when the receiving land is water saturated, flooded, frozen or snow covered;	Yes		Yes
(iii) applying slurries spread to grassland using a trailing hose, trailing shoe or through shallow or deep injection;	Yes		Yes
(iv) incorporating manures and slurries spread to arable land within the soil within four hours of spreading.	Yes		See Note 1, 5 & 6
(b) reducing emissions from manure storage outside of animal houses, by using the following approaches:			
(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 %;	Yes		Yes
(ii) covering stores for solid manure;	No – crust formation		No – crust formation
(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		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.			

B. Emission reduction measures to control emissions of fine particulate matter ($PM_{2.5}$) and black carbon (M)			
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.	Yes	Section 5.1.3	Yes: See Note 7
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).	No	Section 5.1.3	No: See Note 7
C. Preventing impacts on small farms (M)			
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 (M)	Yes	Appendix 3: Note 8	Yes: See Note 8

12.1.1.1 Low Emissions Spreading Systems

The use of LESS equipment such as 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. Such systems are now gaining traction in the sector with more ambitious transitions planned for the future.

Low emission slurry spreading techniques place the slurry in bands or lines on the soil or crop, rather than the entire surface as with a conventional splash plate method. Slurry applied with a low emission method has been shown to reduce ammonia losses compared to splash plate application. Low emission slurry spreading techniques combined with appropriate application timing helps to decrease ammonia emissions and consequently increases the nitrogen fertiliser replacement value (NFRV). For example, a ≥25% reduction in ammonia losses for a trailing shoe technique compared to splash plate[50] has been shown to occur.

12.1.1.2 Note 1: The Code of Good Agricultural Practice for Reducing Ammonia Emissions from Agriculture

In November 2019, in line with the requirements of the NEC directive, the Department launched a Code of Good Agricultural Practice for Reducing Ammonia Emissions from Agriculture[51]. This Code is a guidance document, that outlines the best practice measures for removing or lowering ammonia emissions associated with agricultural activities. The objective of the Code is to provide best guidance on farm practices that will reduce ammonia emissions from agricultural and land management practices. The measures outlined in the Code are voluntary measures to help farmers identify appropriate actions for their individual farm enterprise. The measures contained within the Code are not exhaustive and are not intended to be taken in isolation. There are co-benefits to be obtained from reducing emissions to air, including reducing loss of nutrients to water bodies and reducing biodiversity loss. The measures in the Code complement good agricultural practices for the

50 Teagasc (2016). Major & Micro Nutrient Advice for Productive Agricultural Crops.

51https://www.agriculture.gov.ie/ruralenvironmentsustainability/climatechangebioenergybiodiversity/codeofgoodagriculturalpracticeforreducingammoniaemissions/

protection of waterbodies. The good practice measures give guidance on reducing emissions from these key areas:

- Limiting ammonia emissions from the use of mineral fertilisers;
- Manure application and low-emission manure spreading techniques;
- Animal feeding strategies;
- Animal housing systems;
- Manure storage systems.

12.1.1.3 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 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. In addition, it does not allow spreading manures and slurries when the receiving land is water saturated, flooded, frozen or snow covered.

The measures in Ireland's nitrates 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. In 2019 a review of Ireland's nitrates derogation was conducted to examine further opportunities for derogation farmers to improve efficiencies and continue to reduce their environmental footprint with regard to water, climate and air quality. The review was conducted against the background of derogation farms being a very significant intensive cohort and the increasing area being farmed under the derogation. Public consultation was an important element of the review process and provided an opportunity for stakeholders to submit their views as regard the derogation and related issues. The purpose of the public consultation was to seek

views on the potential revisions to the terms and conditions of the previous nitrates derogation.

Following this consultation, a Nitrates Expert Group examined all submissions and provided the recommendations in relation to how derogation farmers can improve their nutrient use efficiency and environmental footprint[52]. The proposed new measures were aimed at further strengthening the protection of water and attaining optimum soil fertility that is consistent with both efficient agricultural production and effective water quality protection as well as focusing on building greater awareness of how agriculture and our natural resources must co-exist and achieve equilibrium in balancing production with environmental sustainability. For example, with reference to Low Emission Slurry Spreading (LESS) the Group recommended that all slurry on the holding must be spread by LESS from the 12/1/2021. These recommendations were included for the 2020 Nitrates Derogations Terms and Conditions[53].

12.1.1.4 Note 3: Fertiliser Types

In Ireland all our nitrogen fertiliser is 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. In 2019, approximately half of nitrogen sold was straight N and other compound N. Approximately 67% of straight nitrogen sold in Ireland was CAN.

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

Since 2016 an online Nutrient Management Planning (NMP) tool (similar to proposed FaST under CAP reform 2020) has been available to Irish farmers with the aim of improving the

52https://www.agriculture.gov.ie/media/migration/ruralenvironment/environment/nitrates/2019/derogationforms/NitratesExpertGroupDerogationReviewReportMLU240719.pdf

53https://www.agriculture.gov.ie/media/migration/ruralenvironment/environment/nitrates/2020/NitratesDerogation2020TermsConditions260320.pdf

nutrient status of soils and thereby reducing the level of chemical fertiliser usage on Irish farms. Improving nutrient management has been identified as a key target of both Food Harvest 2020 and Food Wise 2025. These documents set out a strategy for the future of the agri-food sector which targets economic progress while also addressing the environmental impact of future growth targets.

Studies by Teagasc show that soil fertility has fallen in Ireland over the past decade, with only one in ten soils tested as being in good overall fertility. NMP online focuses on providing improved baseline information to farmers so they are better able to understand the issues and challenges relating to soil fertility on their own farms.

To date adaption rates of NMP has been high on Irish farms with 49,400 NMP plans created and submitted to the Department of Agriculture, Food & the Marine under the Green, Low Carbon Agri-Environment Scheme, with a further 7,200 NMP plans being updated and reviewed by agricultural advisors for their Nitrates Derogation clients. NMP 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[54] 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 ensures that soil fertility is optimised and also compliance with the limits set under the Nitrates Regulations[55].

Also, the Code of Good Agricultural Practices for Reducing Ammonia Emissions encourages use and adoption of NMP promoting 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.

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54 https://www.teagasc.ie/environment/soil/nmp/
55 https://www.teagasc.ie/about/our-organisation/connected/online-tools/teagasc-nmp-online/

12.1.1.5 Note 4: Targeted Agricultural Modernisation Schemes (TAMS)

The Department of Agriculture, Food and the Marine (DAFM) oversees and administers the Targeted Agricultural Modernisation Schemes (TAMS). Spring application is promoted and LESS is incentivised under this scheme. This scheme also 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, and also provides for grants towards farm nutrient storage.

12.1.1.6 Note 5: Grass-based system of livestock production

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. It is also important to realise that our grass-based system of farming for cattle and sheep is recognised as having a low level of ammonia emissions. Grazing systems have been shown to provide a 50% reduction in ammonia emissions in comparison to confined systems of production[56].

12.1.1.7 Note 6: Best available technique (BAT) guidelines

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 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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56 Economic Commission for Europe, Executive Body for the Convention on Long-range Transboundary Air Pollution (2014). Guidance document on preventing and abating ammonia emissions from agricultural sources. ECE/ EB.AIR/ 120. https://www.unece.org/fileadmin/DAM/env/documents/2012/EB/ECE_EB.AIR_120_ENG.pdf

12.1.1.8 Note 7: Agricultural Burning

The Department of Agriculture, Food and the Marine (DAFM) does not encourage burning agricultural residues. The burning of green waste is currently permitted as an exempted activity under the waste management act regulations and requires contact with the local authority. The burning of growing vegetation is dealt under the Wildlife Act 1976 and is illegal between 1st March and 31st August in any year. 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. The act of burning can only go ahead with a Burning Plan after consultation with the local authorities, agencies and neighbours.

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 31st of July 2009 and were amended in 2013 S.I. No. 504 of 2013. (the 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.

DAFM has produced guidelines for land managers considering the use of fire on their land[57] and has also supported and encouraged the development of a number of local level fire

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57 https://www.agriculture.gov.ie/media/migration/forestry/firemanagement/CofPPrescribedBurningFinal90212.pdf

management groups and partnerships aimed improving awareness and understanding of the responsible use of fire as a land management tool.

DAFM 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.

DAFM is not promoting burning as a management method. There are a number of EIP projects[58] focusing on upland management which include the promotion of high nature value (HNV) farming to prevent land abandonment by managing scrub through grazing and making it economically viable for upland farmers.

12.1.1.9 Note 8: Impacts on small and micro-farms

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). In recent years small farms have received increased attention in policy circles; especially in the context of the role they play in rural areas, in protecting the landscape and environment and in terms of the need to improve the economic and social conditions on small-scale farms[59].

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

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58 https://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/europeaninnovationpartnership/EIP-AGRI%20Operational%20Group%20Booklet%202019%20proof%202.pdf

59 https://www.teagasc.ie/media/website/publications/2017/Small-Farms-Survey.pdf

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 regions, 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[60]. Measures within the Regulations take account of small and micro-farms.

60https://www.agriculture.gov.ie/media/migration/ruralenvironment/environment/nitrates/2017/SINo605271217.pdf