Northern Ireland Greenhouse Gas Projections Update - Methodology Report

Based on 2020 Greenhouse Gas Inventory

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Department of
Agriculture, Environment and Rural Affairs

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Contents

Overview

The Northern Ireland (NI) projections are estimated using a projection tool developed to monitor progress towards greenhouse gas (GHG) reduction targets within NI. The tool was designed and updated by Ricardo AEA ltd who lead on compiling the UK (and Devolved Administrations) GHG inventory.

The projection tool is used to project emissions from 2021 to 2031 and considers the reduction in emissions from 1990 to 2031. The results inform progress against different strategies across Government, e.g., NI Programme for Government, NI Climate Action Plan and for UK commitments in relation to Net Zero and Carbon Budgets.

The projections are published on the DAERA website[1] and are updated to reflect the annual update to the greenhouse gas inventory statistics[2]. They project future emissions, based on economic, demographic and other drivers – projections which are inputs into the tool, across National Communication (NC) Sectors[3].

The projections take into account the expected impact of Government policies that have been costed in terms of emissions savings. Policy savings, originally included within the tool, were provided via Future Generations - Analysts' Sub-Group[4] or are estimated as a share of the UK policies (from annex D mentioned below). An audit of the policies in the tool was carried out in 2022 to ensure they remained relevant, and data updated accordingly.

It is recognised that additional policies may need to be incorporated as further initiatives are developed to contribute towards the delivery of the UK's net zero commitment and meet targets set in the new NI climate change legislation[5]. In response to the new legislation, a Climate Action Plan and corresponding sectoral plans are being developed. Once finalised policies and initiatives which provide

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[1] https://www.daera-ni.gov.uk/articles/northern-ireland-greenhouse-gas-projections
[2] https://www.daera-ni.gov.uk/articles/northern-ireland-greenhouse-gas-inventory
[3] National Communication sectors are in accordance with international reporting guidelines from the United Nations Framework Convention on Climate Change (UNFCCC). Descriptions of each sector are available in the annual greenhouse gas statistics report.
[4] The Analysts sub group was a sub group of the future generations working group. Its main aim was to ensure that relevant data was available for the NI GHG inventory estimates and projections. The form of this group may be revised as more recently a Technical Advisory Group has been set-up to advise and consider policies and initiatives under the Climate Action Plan.
[5] Northern Ireland Climate Change Act 2022

emissions savings are developed as part of the Climate Action Plan these will be included in future publications.

The method for projections and input data varies by sector and this is detailed in the sections below. Some sectors are more closely aligned than others, e.g., energy, residential, business and public are all driven by energy derived from fuel combustion whilst agriculture is uniquely driven by livestock numbers and agricultural activity.

The NI Greenhouse Gas Inventory data and the annual Department for Business, Energy & Industrial Strategy (BEIS) energy and emission projections (EEP) provide the data that underpins the projection tool across all sectors as detailed below. The tool also includes conversion factors that are largely derived from the inventory.

The BEIS EEP are a major source of projections data for the tool and provide estimates of future fuel use across various sectors out to 2040. These projections are at the UK level so we use appropriate proportions of these for NI projections. The data updates that are used from the BEIS EEP are listed below.

- Annex F: Final energy demand
- Annex G: Major power producers' generation by source
- Annex D: Policy savings in the projections
- Annex N: Projected emissions of non-CO_2 greenhouse gases; more detailed excel versions of this data for input to our tool is requested from BEIS.

The annexes above provides different scenarios and the scenarios used in the NI projections are discussed in the relevant sectors below. In the latest update to the NI GHG projections tool, the figures from the BEIS EEP: 2021 to 2040 were used. It was noted in these 2021 to 2040 projections, published in December 2022, that to account for the Covid-19 pandemic, some projections are based on 2019 data. This is to avoid long-term distortion to projected energy demand in some sectors caused by the pandemic in 2020.

Energy Supply

Definition of National Communication Sector

Emissions are predominantly from power stations but also coal mining, oil refineries and other fuel production. Emissions are significantly affected by abatement technology at power stations and the type of fuel being produced or combusted.

Points to note

- The energy supply sub-model was thoroughly reviewed in 2019, based on 2017 inventory, to enable a more granular understanding of how fuel mix is expected to evolve over the coming decade. Outputs are now produced on an annual basis and utilise capacity projections by fuel type and installation, as well as the expected growth of the renewable sector in NI and any current targets for energy generation.

- Within the projections tool there is the option to add targets regarding the transition to various fuels. As per the [Climate Change Act (Northern Ireland) 2020](#), a renewable energy target of at least 80% electricity consumption from renewable sources by 2030 has been included. There is a UK-wide target for coal used for energy generation to be 0% by 2024, however, this is overwritten by the capacity projections which indicate that coal for electricity production will cease in NI in 2023 with the closure of Kilroot coal powered station.

- The data source for the capacity projections by fuel type and installation is the [annual generation capacity statement](#) published by SONI/EirGrid. The generation capacity statement provides electricity demand forecast to 2031 for three scenarios – low, median and high and the median forecast has been employed in this analysis.

- There is also the option to use BEIS (Annex G) data but given that it is UK data apportioned to NI this would not be recommended. The tool calculates growth rates based on this data rather than using absolute values. Growth rates can be calculated by using the EEP reference scenario (this is the

default option), EEP baseline scenario or population projections in order to extend the projections beyond the time series provided by SONI data, i.e., currently available to 2031.

- [Gas Market Operator for NI (GMO NI) forecasts](#) for gas projections are utilised as opposed to forecasts contained within the SONI/EirGrid model.

- Historic power production figures for NI are taken from the BEIS [energy trends publication.](#) Fossil fuel intensity is calculated in the tool using historic data and applied to electricity forecasts to estimate emissions projections.

- Combining GMO NI gas forecasts with the SONI central estimate gives us projections by fuel type in GWh. The emissions factors are applied to these to give us projections in $ktCO_2e$ (kilotonnes of carbon dioxide equivalent).

- Using the data sources above, the fuel mix expected in future is modelled for each year based on the capacity projections from the SONI/EirGrid report. Step changes in the model are smoothed, e.g., projected data will be smoothed over the years to meet the renewable energy target.

There are no policy savings included in this sector as it is believed that the savings from policies will already be included in the data sources used for the modelling and we want to avoid double counting.

Source data

[All-Island Generation Capacity Statement 2022 - 2031, SONI/EirGrid (PDF, 1981KB)](#)

[NI Gas Capacity Statement 2022/23 - 2031/32, GMO NI, (PDF, 4034KB)](#)

[Electricity generation and supply in Scotland, Wales, Northern Ireland and England, 2017 - 2021, BEIS](#)

Limitations

- Given the future developments in this area, it is difficult to forecast energy supply for the future. This will be impacted upon by other areas, e.g., transport for electrification of vehicles, residential and business for heating demand.

- SONI's forecast data on renewables as a fuel for electricity is based on the Department for the Economy's energy strategy (The Path to Net Zero Energy), which includes a target of at least 70% renewable electricity by 2030. However, the Climate Change Act (Northern Ireland) 2022, has since increased this ambition to at least 80% of electricity consumption being from renewable sources by 2030.

- Furthermore, the SONI and GMO NI forecasts will have uncertainties associated with their own data modelling processes, e.g., economic uncertainty, fuel price fluctuation, plant retirement, weather, large sporting/social events, holidays, the long-term impact of the war in Ukraine. The SONI demand forecasts consider economic projections, and the impact of the Covid-19 recovery is accounted for with these. The SONI forecasts are based on an assessment of likely future operating requirements of the plan in light of SEM market conditions, the competitiveness of which is influenced by energy policy. The gas forecasts are the aggregated demand for three generators; Kilroot (open cycle gas turbines only), Ballylumford and Coolkeeragh, the load of any further new gas fired power stations have not been included.

Transport

Definition of National Communication Sector

Includes road transport, domestic shipping and aviation, and aircraft support vehicles. Road transport is the most significant source therefore emissions are affected by vehicle efficiency, distance travelled and number of vehicles.

Points to note

- Aviation is projected separately to road transport. Remaining emissions, e.g. railways and shipping, are projected using population projections growth rates from the latest year. In the 2020 GHG Inventory, this accounts for 7% of total transport emissions.

- For aviation, [UK aviation forecasts](#) are used to calculate annual growth rates which are applied to the latest emissions data for NI aviation. As these forecasts were 2017-based, adjustments were made to take into account the impact of COVID-19 on the aviation sector. There are no policy savings for this part of the transport sector.

- For road transport, UK growth rates are calculated using the EEP baseline scenario and applied to NI emissions data for the latest year.

Savings for policies, named below, are removed from this sector

Policy	NI-specific data available	NI share of UK impact (and calculation of that share)
Public transport	✓	
Car fuel efficiency policies		✓ (NI/UK ratio of cars/vans)
HGV fuel efficiency policies		✓ (NI/UK ratio of road transport emissions)
LGV fuel efficiency policies		✓ (NI/UK ratio of road transport emissions)
Transport biofuels (RTFO 8%)		✓ (NI/UK ratio of road transport emissions)
Streamlined Energy and Carbon Reporting		✓ (NI/UK ratio of road transport emissions)

Source data

[Department for Transport, UK Aviation Forecasts](#)

Limitations

- The method for this sector applies UK growth rates to NI emissions data. The road transport sector in NI varies from UK. There are less ultra-low emissions vehicles in NI than the UK (0.9% compared to 2.2%[6]), more diesel cars (56% compared to 36%[7]) and the average CO_2 emissions from licensed cars varies (133.7g/km in NI[8] compared to 136.4g/km in the UK, in 2021[6]).

- Unfortunately there is no up-to-date data for NI on vehicle kilometres travelled (vkt) but looking at data from 2014, there was less motorway driving and more rural driving in NI (14% and 54% of total vkt respectively) than the UK (20% and 42% respectively). Therefore, using UK growth rates increases the uncertainty associated with the projected emissions for this sector. Policy savings for NI are also limited.

Residential

Definition of National Communication Sector

Includes fuel combustion for heating, cooking, garden machinery, gases released from aerosols and inhalers, and emissions released from the breakdown of products such as detergents. Emissions are affected by energy efficiency, heating and hot water demands, and the fuel type for domestic combustion.

Points to note

- UK growth rates are calculated using the EEP baseline scenario. NI emissions data for the latest year are converted into fuel use (GWh) using the Digest of UK Energy Statistics (DUKES) conversion factors and then

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[6] [VEH0206 Licensed cars at the end of the year by CO2 emission and VED band](#)
[7] [VEH1103 Licensed road using vehicles by body and fuel type](#)
[8] [Indicator 5.1 NI Carbon Intensity Indicators Data tables](#)

projected using the UK growth rates. GMO NI forecasts data, taken from the NI Gas Capacity Statement (PDF, 4034KB), is substituted for gas.

- UREGNI's Final Price Determination for 2023 has been used to split projections by domestic and business.

- Non-CO_2 projections are taken from BEIS EEP data at the UK-level, growth rates are calculated from these. All growth rates calculated are applied to the latest inventory data to project emissions into the future.

Savings for policies, named below, are removed from this sector.

Policy	NI-specific data available	NI share of UK impact (and calculation of that share)
Boiler Replacement Scheme	✓	
Code for Sustainable Homes	✓	
Heating Replacement Programme (heating)	✓	
Heating Replacement Programme (insulation/glazing)	✓	
Warm Homes Scheme	✓	
Renewable Heat Incentive	✓	
Gas Extension to West	✓	
Uplift of Part F (Conservation of Fuel and Power) of The Building Regulations (Northern Ireland) 2012 and 2021	✓	
F-gas regulation (2015)		✓ (NI/UK ratio of residential emissions)
Products policy		✓ (NI/UK ratio of residential emissions)

Source data

NI Gas Capacity Statement 2022/23 - 2031/32, GMO NI, (PDF, 4034KB)

Limitations

- UK growth rates applied to NI emissions data will increase uncertainty within the projections since there are variations between the UK and NI, e.g., the NI gas network is less developed than the UK.

- The same limitations will apply here as did in the energy sector since the same data sources are used for gas projections. Furthermore, the data used to split the gas forecasts between domestic and business is not regularly updated, normally at 6 yearly intervals. The 2023 final price determination was used in this year's update of the projections tool and previously it was the 2017 determination.

- This sector doesn't account for changes to renewable energy or alternative energies for heat in the future.

Business

Definition of National Communication Sector

Includes emissions from stationary combustion in the industrial and commercial sectors, industrial off-road machinery, and refrigeration and air conditioning.

Points to note

- UK growth rates are calculated using the EEP baseline scenario. NI emissions data for the latest year are converted into fuel use (GWh) using DUKES conversion factors and then projected using the UK growth rates. GMO NI projections data, taken from the NI Gas Capacity Statement (PDF, 4034KB), is substituted for gas.

- UREGNI's Final Price Determination for 2023 has been used to split projections by residential and business.

- Non-CO$_2$ projections are taken from BEIS EEP data at the UK-level, growth rates are calculated from these. All growth rates calculated are applied to the latest inventory data to project emissions into the future.

Savings for policies, named below, are removed from this sector.

Policy	NI-specific data available	NI share of UK impact (and calculation of that share)
Renewable Heat Incentive	✓	
Uplift of Part F (Conservation of Fuel and Power) of The Building Regulations (Northern Ireland) 2012 and 2021	✓	
Gas Extension to West	✓	
Energy Performance of Buildings Directive		✓ (NI/UK ratio of business emissions)
Carbon Reduction Commitment		✓ (NI/UK ratio of business emissions)
F-gas regulation (2015)		✓ (NI/UK ratio of business emissions)
Products policy		✓ (NI/UK ratio of business emissions)
Streamlined Energy and Carbon Reporting		✓ (NI/UK ratio of business emissions)

Source data

NI Gas Capacity Statement 2022/23 - 2031/32, GMO NI, (PDF, 4034KB)

UREGNI's Final Price Determination for 2023

Limitations

- UK growth rates applied to NI emissions data will increase uncertainty within the projections since there are variations between the UK and NI, e.g., the NI gas network is less developed than the UK.

- The same limitations will apply here as did in the energy sector since the same data sources are used for gas projections. Furthermore, the data used to split the gas forecasts between domestic and business is not regularly updated, normally at 6 yearly intervals. The 2023 final price determination was used in this year's update of the projections tool and previously it was the 2017 determination.

- This sector doesn't account for changes to renewable energy or alternative energies for heat in the future.

Public

Definition of National Communication Sector

Includes emissions from fuel combustion in public sector buildings (e.g. public administration, defence, education and health and social work). Emissions are predominantly affected by fuel type.

Points to note

- UK growth rates are calculated using the EEP baseline scenario. NI emissions data for the latest year are converted into fuel use (GWh) using DUKES conversion factors and then projected using the UK growth rates. Growth rates calculated are applied to the latest inventory data to project emissions into the future.

Savings for policies, named below, are removed from this sector.

Policy	NI-specific data available	NI share of UK impact (and calculation of that share)
Products policy		✓ (NI/UK ratio of commercial emissions)
Carbon Reduction Commitment		✓ (NI/UK ratio of commercial emissions)
Streamlined Energy and Carbon Reporting		✓ (NI/UK ratio of commercial emissions)

Limitations

UK growth rates applied to NI emissions data will increase uncertainty within the projections since there are variations between the UK and NI, e.g., the NI gas network is less developed than the UK.

No NI policies are included for this sector.

Industrial process

Definition of National Communication Sector

Includes all emissions from industry except fuel combustion and therefore includes chemical and metal production, and mineral products (e.g. cement and lime). Emissions are significantly affected by abatement technology.

Points to note

- This sector is projected solely in the remaining sources tab of the projection tool. The projections for this sector are flattened based on the latest year of the inventory.

Limitations

- Consideration needs to be given as to whether we really expect parts of this sector to flatten in terms of emissions. A better estimation of emissions in future might be to continue along a similar trajectory to the historic emissions.

Agriculture

Definition of National Communication Sector

Includes emissions from livestock, agricultural soils, stationary combustion, and off-road machinery. Emissions are affected by the number of livestock, the quantity of fertiliser applied to land, and the intensity of activity.

Points to note

- As with other sectors, the starting point is the latest inventory year. Projections for most agricultural emissions, excluding fuel use, are provided by Defra and based on the FAPRI-UK modelling. The agricultural projections being used in the tool are based on the 1990 to 2020 GHG inventory.

- Fuel use projections are taken from the EEP baseline scenario. Growth rates are calculated for all sources of agricultural projections and applied to the latest inventory year emissions.

Savings for policies, named below, are removed from this sector.

Policy	NI-specific data available	NI share of UK impact (and calculation of that share)
Nitrate Action Plan and Manure Efficiency Technology Scheme	✓	

Source data

Agriculture emissions based on the GHG inventory and the FAPRI-UK agricultural forecasts: provided directly by Defra

Limitations

- Projections are not included in the tool by animal type.

Land Use Change

Definition of National Communication Sector

This covers sinks and sources of emissions from land use, land use change and forestry. Sinks remove GHGs from the atmosphere whilst sources emit GHGs. Emissions are affected by deforestation rates and land management.

Points to note

- Projections for the land use, land use change and forestry (LULUCF) sector are taken from BEIS/Centre for Ecology & Hydrology (CEH)/Forest Research (FR) projections that are normally updated annually to align with the inventory calculations. We take a central scenario from those and use the projections to calculate growth rates which are applied to the latest inventory emissions for NI.

- There are no policy savings included in this sector as it is believed that the savings from policies will already be included in the data sources used for the modelling and we want to avoid double counting.

Source data

LULUCF projections: provided directly from BEIS

Limitations

- The LULUCF projections being used in the tool are 1990 to 2019 GHG inventory based; figures have been carried forward from the previous year as none are available for the current inventory (1990 to 2020). Between the 2019 and 2020 NI GHG inventories, there have been various revisions such that emissions have been revised up across most of the time series but in the three most recent comparable years (2017 to 2019) they have been revised

down. The overall effect of this is the base year to 2019 trend has changed from a 9% increase in the 1990 to 2019 NI GHG inventory to a 16% decrease in the 1990 to 2020 NI GHG inventory (AR4 based comparisons).

Further limitations for this sector will be updated when information becomes available on the 1990 to 2019 inventory based LULUCF projections. Previous limitations relating to the 2017 inventory based LULUCF projections were as follows:

- The LULUCF projections assume that the UK land area remains constant.

- The central LULUCF projection is used for the central NI projections and uses forest planting rates according to funding secured for grants within each country. After 2021, planting rates drop to 10% of the 2008-2009 average planting rate reflecting the lack of secured funding that time horizon as of June 2019. This aligns with the 'forests of our Future' pledge.

- Deforestation is estimated using a rate of conversion to settlement at the 2009-2018 average. The share of private woodland managed for production remains constant. Cropland management, grassland management and peat extraction remain constant from 2018.

Waste Management

Definition of National Communication Sector

Emissions include those from waste disposed at landfills, wastewater treatment, and waste incineration. Emissions are affected by regulation of landfills and the proportion of waste that is recycled.

Points to note

- Detailed non-CO_2 emissions projections (part of BEIS EEP) are sent to us via email each year. This outlines UK-level projections by gas and activity name, growth rates are calculated using that data. For landfill methane emissions, a share of the UK projections is taken using the NI/UK Split in waste emissions

from the Defra model (called Melmod) which is used for the inventory emissions estimates. This is provided directly to SASB from the inventory consultants. Growth rates are calculated using the projections data and are applied to the latest inventory emissions data for NI

- There are no policy savings included for this sector.

Limitations

- UK growth rates applied to NI emissions data will increase uncertainty within the projections since there may be variations between the UK and NI, e.g. there is less methane capture at landfills in NI.

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