2015

# Analytical Services Branch

# Northern Ireland Greenhouse Gas Projections Update [excluding LULUCF]

This paper details the impact of the annual update to the Northern Ireland Greenhouse Gas Projection Tool. It projects emissions of greenhouse gases (excluding LULUCF) in Northern Ireland from 2014 to 2025 and considers the reduction in emissions from 1990 to 2025.

Northern Ireland Statistics & Research agency

Analytical Services Branch DOE
Department of the Environment
18/12/2015

# Introduction

The Northern Ireland (NI) Executive proposed in its Programme for Government 2011-15 to work towards a reduction in greenhouse gas (GHG) emissions by at least 35% on 1990 levels by 2025. The Department of the Environment (DoE) tracks progress towards this target by producing emissions projections for Northern Ireland annually.

The previous Northern Ireland Greenhouse Gas Projections Update was provided by Analytical Services Branch (ASB) in December 2014. In June 2015 the Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2013 were published. Since then ASB have worked on a number of additional updates that are applied to the projection tool on an annual basis. The results are discussed in this paper.

Table 1 summarises the key data sources used to project Northern Ireland's GHG emissions. The latest Northern Ireland Greenhouse Gas Inventory (1990-2013) is used as the starting point. Each sector is projected out to 2025 using applicable datasets such as the System Operator for Northern Ireland (SONI) demand forecasts for the power sector, and the Department for Energy and Climate Change (DECC) updated energy projections for a number of different sectors.

The previous Land Use, Land Use Change & Forestry (LULUCF) projections, produced by the Centre for Ecology and Hydrology, are currently under review by DECC as they were found to include errors. These are expected to be corrected and republished by DECC during early 2016, with the latest projections, which would have formed part of this latest update, to follow. For this reason, the projected emissions for Northern Ireland, in this paper, have had to be calculated excluding the LULUCF sector. Therefore, for comparative purposes, any reference to last year's projected emissions has also been adjusted to exclude the LULUCF sector.

**Table 1: Key data sources for 2015 update to NI GHG Projection Tool**

| Dataset | Sector | Source | Latest version |
|---|---|---|---|
| NI Greenhouse Gas Inventory | All sectors | Ricardo-AEA | 1990 - 2013 |
| DUKES conversion factors | All sectors | DECC | 2015 |
| Updated energy projections | All sectors | DECC | 2014-2035 |
| Power generation (historical) | Power | DECC | 2008 - 2013 |
| Power demand (historical) | Power | SONI / Eirgrid | 2008 - 2014 |
| Power demand forecasts | Power | SONI / Eirgrid | 2015 - 2024 |
| Gas demand forecasts | Power / Industry / Domestic | UREGNI | 2015 - 2024 |
| FAPRI-UK GHG projections NI | Livestock / Agricultural Soils | DEFRA/AFBI | 2010-2024 |
| UK non-$CO_2$ GHG emissions projections | Waste | DECC | 2014 – 2035 |
| Mid-Year Population Estimates | Other | NISRA | 2014 |

The impacts of these updates are analysed in the results section of this paper.

# Results by sector

The latest Northern Ireland Greenhouse Gas Inventory estimated 2013 emissions to be 22.4 million tonnes of carbon dioxide ($CO_2$) equivalent. This is a 16% decrease on the 26.6 million tonnes emitted in 1990. The latest update to the Projection Tool projects a decrease of 21%[1] from 2013 to 2025. **Over the period 1990-2025 this would represent a total reduction of 34.1%[1].** This is an increase of almost 2 percentage points over the projection from last year i.e. the 2012 GHG Inventory-based Projection Tool, which projected a 32.3%[1] like-for-like decrease in emissions. The historic (1990-2013) and projected (2014-2025) greenhouse gas emissions for Northern Ireland are shown in a line graph in Figure 1.

Table 2 shows the impact of the various data updates on a sector-by-sector basis. The impact on each sector is considered in isolation. This is preferable to presenting results on an update-by-update basis, because a single data update often affects more than one sector. Table 2 clearly shows the three sectors with the greatest impact upon projected emissions: the power, domestic and waste sectors.

Table 3 shows the impacts of the separately-costed policies on Northern Ireland's overall projected emissions. The term 'separately-costed' refers to policies for which carbon savings have been calculated, either at NI or UK level. There are some policy impacts that are embedded within the sector calculations themselves e.g. the Strategic Energy Framework renewable energy targets. Where possible, NI-specific savings are used, but often no such data exist and a data-driven NI share of UK savings is used.

No update has yet been undertaken with regard to the sensitivity analysis work which attempts to estimate the uncertainty around the projection. The consideration of uncertainty around the updated projection is therefore limited to the sensitivity analysis from last year. Assuming no change to uncertainty scenarios or the underlying error, this would then suggest that the latest projected reduction in GHG emissions of 34.1% between 1990 and 2025 could be as much as 12.5 percentage points lower or 13.7 percentage points higher than the central estimate. This gives a suggested uncertainty range of **21.6% - 47.8%**.

**Power**
A number of updates have impacted the power sector. The updated DECC historical electricity generation and supply figures had a minimal impact on historic emissions. The updated GHG Inventory also had minimal impact on historic emissions but the latest year, 2013, was higher than anticipated due to an increase in coal burning in power stations which then fed through into the emissions projection. The Utility Regulator gas demand forecasts and the SONI demand forecasts similarly had a very small impact. The Northern Ireland Executive's target for renewable electricity remains at 40%. The programme for government target of 20% by 2015 has been met. Under the current proposals for Northern Ireland Renewables Obligation closure to onshore wind, DETI has advised that there is enough on-shore wind generation in the pipeline to get to 30% of electricity consumption from renewable sources by 2020. We have used this figure in the projection tool. All these updates **reduced** the projected emissions reduction by 2025 **by 1.9 percentage points**, with the adjustment to the policy on renewable generation alone accounting for a very significant 1.4 percentage points. The remaining 0.5 percentage points were due to the GHG Inventory and updated energy and emissions projections from DECC.

**Industry**
The latest GHG Inventory, latest gas demand figures from the Utility Regulator and updated UK-level energy projections were applied to the industry sector. These latest growth rates (Utility Regulator and energy projections) led to reduced emissions in earlier years and higher emissions in later years which will have decreased the projected reduction when compared with the previous year, ignoring policy updates. DETI also provided updates to Renewable Heat Incentive, as well as Gas extension, policy savings. Savings from these two policies alone contributed +1.0 percentage point to the NI emissions reduction, however, when combined with the other updates, the overall impact for the sector was to **increase** the NI emissions reduction **by 0.4 percentage points**.

**Aviation**
There has been only one update to this sector. The latest GHG Inventory led to an increase in historic emissions which has been projected outwards to 2025. This resulted in a small **reduction (0.1 percentage point)** on the projected GHG reduction 1990-2025.

**Road Transport**
The road transport sector has been updated using the latest GHG Inventory and the updated UK-level energy projections. The latest inventory showed an increase in historic emissions and the projected energy demand for transport was also revised upwards. The combined impact of both is a **0.5 percentage point decrease** to NI's projected emissions reduction 1990-2025.

**Commercial**
This sector has seen updates to the GHG Inventory and the UK-level energy projections. The projected energy demand for coal was revised upwards which would have increased projected emissions in this sector, however, the addition of policy savings relating to Fluorinated Gases Regulations and Building Regulations, as well as an update to the Renewable Heat Incentive savings, counteracted this effect and led to an overall **0.6 percentage point increase** to the NI projected emissions reduction 1990-2015.

**Domestic**
There have been a number of updates to the domestic emissions projection. The latest GHG Inventory, updated gas forecasts from the Utility Regulator, updated UK-level energy projections for the domestic sector and updated NI-level estimated policy savings. The combined effect of all updates has been to **increase** NI's projected emissions reduction by a further **1.8 percentage points**. The increase was due in a large part to the inclusion of Building Regulation policy savings (adding 0.9 percentage points to NI projected emissions reduction), as well as updates to the savings from the Renewable Heat Incentive and the inclusion of savings from Fluorinated Gases Regulations.

**Livestock**
This year, there has been an update of the Department for Environment, Food & Rural Affairs FAPRI-UK GHG projections as well as the latest GHG Inventory. The updated GHG Inventory revised livestock emissions upwards by approximately 15-20% across all years. The impact on NI's projected GHG emissions 1990-2025 was to **lessen** the reduction by **0.6 percentage points**. The relatively large impact despite the small change is because this sector accounts for a large proportion of NI's overall emissions: 16% in 1990, 19% in 2013 and projected to be 24% in 2025.

**Agricultural Soils**
There has been an update of the Department for Environment, Food & Rural Affairs FAPRI-UK GHG projections for agriculture this year as well as the latest GHG Inventory. The inventory reduced emissions across all years by approximately 25%, with the earlier years experiencing a slightly lower percentage reduction than the later years once the FAPRI projections have been incorporated and this leads to an overall **increase** of **0.8 percentage points** in NI's projected 1990-2015 emissions reduction.

**Waste**
Two updates have impacted the waste sector. Firstly the updated GHG Inventory increased NI waste sector emissions across all years, with the earlier years increasing by a greater proportion than the later years. Secondly updated UK level projections and specifically requested NI-shares have had little impact on the trend out to 2025. Most of the impact comes from the GHG Inventory update, with the net effect on NI's projected reduction in emissions 1990-2025 being an **increase** of **1.5 percentage points**.

**Uncertainty**
This projection is subject to change as methodologies are continually refined and more robust data sources are developed. However, irrespective of the routine updates, there are further uncertainties around aspects such as the impact of economic conditions; the extent to which assumed policy impacts will actually be achieved; and known weaknesses in existing data. A sensitivity analysis was performed on last year's projection which examined the effects that various economic and policy impacts, and possible data improvements, could have on the projected emissions. A similar analysis has not yet been undertaken this year so the consideration of uncertainty is limited to the sensitivity analysis around last year's projection. However, this assumes that the underlying Inventory error and uncertainty scenarios remain unchanged, which is unlikely to b e the case and hence should only be taken as general guidance.

Taking the best and worst cases from last year's projection, and accounting for uncertainty from the GHG inventory and then removing the LULUCF sector suggests that the projected reduction in GHG emissions of 34.1% between 1990 and 2025 could be as much as 12.5 percentage points lower or 13.7 percentage points higher than the central estimate. This gives a suggested uncertainty range of

**21.6% - 47.8%**. For details of how this was calculated see the full sensitivity analysis report relating to last year's projection, available from the DOE website - https://www.doeni.gov.uk/publications/sensitivity-analysis-around-2012-based-ni-greenhouse-gas-emissions-projections.

# Conclusion

Northern Ireland's latest greenhouse gas projection estimates that emissions in 2025 will be 16.5 million tonnes of carbon dioxide equivalent. This projection is based on the 2013 NI Greenhouse Gas Inventory, and would represent a **34.1% decrease on emissions in 1990** (25.1 million tonnes). The overall change to last year's 2012-based projected emissions reduction of +1.9 percentage points is the result of a number of data updates. The sectors with the greatest impacts compared to last year's projections were power, domestic and waste.

The projected emissions on the chart in Figure 1 show a gradual reduction in GHG emissions from the latest known year (2013) to 2025. The dip in 2014 comes from DECC's updated energy and emissions projections which uses published energy statistics for 2014 to account for a known decrease in domestic energy use due in part to warmer weather (at the UK level). The rate of change lessens in 2020, as visualised by the shallower slope, this is primarily because the projection tool assumes no further change in the percentage of electricity generated from renewable sources beyond 2020.

No update has yet been undertaken with regard to the sensitivity analysis work which attempts to estimate the uncertainty around the projection. The consideration of uncertainty around the updated projection is therefore limited to the sensitivity analysis from last year. Assuming no change to uncertainty scenarios or the underlying error, this would then suggest that the latest projected reduction in GHG emissions of 34.1% between 1990 and 2025 could be as much as 12.5 percentage points lower or 13.7 percentage points higher than the central estimate. This gives a suggested uncertainty range of **21.6% - 47.8%**.

It is important to note that the figures discussed above do not take account of the LULUCF sector and should be compared with last year's projection with the LULUCF sector similarly excluded. As mentioned earlier in this paper, LULUCF projections published last year are currently being revised and the update that would have been expected this year has been delayed. Whilst it is not possible to determine the size or direction of the impact that the addition of this sector, it has in recent updates changed the overall projection by at most 2 percentage points. However the size of the impact and its direction will be quantified once the LULUCF data become available and the updates can be made.

## Table 2: Impact of updates on projected greenhouse gas emissions by sector

*Guidance on interpreting this table:*

- *The first row shows emissions in 1990 and 2025 before any updates are applied and the percentage reduction 1990 to 2025. This is a reduction, so '32.3' can be interpreted as 'emissions in 2025 are projected to be 32.3% lower than emissions in 1990'.*
- *The bottom row shows the same information after **all updates** have been applied. So '34.1' can be interpreted as 'emissions in 2025 are projected to be 34.1% lower than emissions in 1990'.*
- *The rows between the top and bottom row consider the impact of each sector update in isolation. This tells you the impact at the NI level of updating that sector. A positive number in the 'impact' column indicates that updating this sector boosted NI's emissions reduction i.e. a larger reduction.*
- *e.g. the power sector had an impact of -1.9 percentage points. This means that updating the power sector changed NI's projected reduction between 1990 and 2025 by -1.9 percentage points from a 32.3% reduction to a 30.3% reduction.*

| Sector | Baseline emissions 1990 ($MtCO_2e$) | Projected emissions 2025 ($MtCO_2e$) | Projected emissions reduction 1990 to 2025 (%) | Impact on total NI reduction (percentage points)[2] |
|---|---|---|---|---|
| 2012-GHGI based projection[1] | 24.8 | 16.8 | 32.3 | - |
| *Impact of sector update, in isolation, on NI level emissions* | | | | |
| Power | 24.8 | 17.3 | 30.3 | -1.9 |
| Industry | 24.8 | 16.7 | 32.6 | +0.4 |
| Aviation | 24.8 | 16.9 | 32.2 | -0.1 |
| Road Transport | 24.9 | 17.0 | 31.7 | -0.5 |
| Commercial | 24.8 | 16.7 | 32.8 | +0.6 |
| Domestic | 24.4 | 16.1 | 34.1 | +1.8 |
| Agri. forestry, fishing combustion | 24.8 | 16.8 | 32.4 | +0.1 |
| Livestock | 25.3 | 17.3 | 31.7 | -0.6 |
| Agricultural Soils | 24.1 | 16.2 | 33.0 | +0.8 |
| Waste | 25.4 | 16.8 | 33.8 | +1.5 |
| Other Sources | 24.9 | 16.9 | 32.2 | - |
| *Combined impact of all sector updates together* | | | | |
| **2013-GHGI based projection** | 25.1 | 16.5 | **34.1** | +1.9 |

**Table 3: Impact of separately-costed policies on projected greenhouse gas emissions**

| Policy | NI-specific data? | NI share of UK data? | Impact on projected NI reduction 1990-2025 (perc. points) |
|---|---|---|---|
| *Industry sector* | | | |
| Renewable Heat Incentive | ✔ | | +0.7 |
| Gas Extension to West | ✔ | | +0.3 |
| National Products Policy | | ✔ | +0.1 |
| Fluorinated Gases Regulations | | ✔ | +0.0 |
| Gas Extension to East Down | ✔ | | +0.0 |
| Carbon Reduction Commitment | | ✔ | +0.0 |
| Climate Change Agreements | | ✔ | 0.0 |
| *Road Transport sector* | | | |
| Car Fuel Efficiency Policies | | ✔ | +1.3 |
| Transport Biofuels | | ✔ | +1.1 |
| HGV Fuel Efficiency Policies | | ✔ | +0.2 |
| Van Fuel Efficiency Policies | | ✔ | +0.2 |
| Travelwise Initiative | ✔ | | +0.1 |
| PSV Fuel Efficiency Policies | | ✔ | 0.0 |
| *Commercial & Public sectors* | | | |
| Fluorinated Gases Regulations | | ✔ | +0.5 |
| National Products Policy | | ✔ | +0.5 |
| Part F - Building Regulations | ✔ | | +0.2 |
| Carbon Reduction Commitment | | ✔ | +0.2 |
| Renewable Heat Incentive | ✔ | | +0.1 |
| Energy Performance of Buildings Directive | | ✔ | 0.0 |
| *Domestic sector* | | | |
| Renewable Heat Incentive | ✔ | | +1.0 |
| Part F – Building Regulations | ✔ | | +0.9 |
| National Products Policy | | ✔ | +0.9 |
| Heating Replacement Programme | ✔ | | +0.3 |
| Boiler Replacement Scheme | ✔ | | +0.2 |
| Fluorinated Gases Regulations | | ✔ | +0.2 |
| Warm Homes Scheme | ✔ | | +0.2 |
| Gas Extension to West | ✔ | | +0.1 |
| Gas Extension to East Down | ✔ | | +0.0 |
| Code for Sustainable Homes | ✔ | | +0.0 |
| *Agricultural Soils sector* | | | |
| Nitrate Action Plan and Manure Efficiency Technology Scheme | ✔ | | +0.0 |

*Notes:*

*[1]Projection results exclude the LULUCF sector as updated LULUCF projections, published by DECC, were not available at time of these analyses. For comparison purposes, the LULUCF sector has also been removed from last year's analyses so figures quoted will differ from the content of last year's paper.*

*[2]Individual sector impacts may differ by ±0.1 percentage point when compared to impacts derived from differencing the **already rounded** figures from the table. Furthermore they do not precisely sum to overall total, again due to rounding.*

*Table 3 is not an exhaustive list of all policies included in the model. Some policy impacts are embedded within the sector calculations themselves e.g. Strategic Energy Framework renewable energy targets.*

*Carbon savings associated with individual policies have been provided by individual Departments. Impacts are shown to one decimal place although direction of impact is shown if impact is small.*

**Figure 1: Total GHG emissions from latest greenhouse gas inventory (1990-2013) and updated projection tool (2014-2025)**