NISRA
Northern Ireland Statistics and Research Agency

Northern Ireland Greenhouse Gas Emissions 2020

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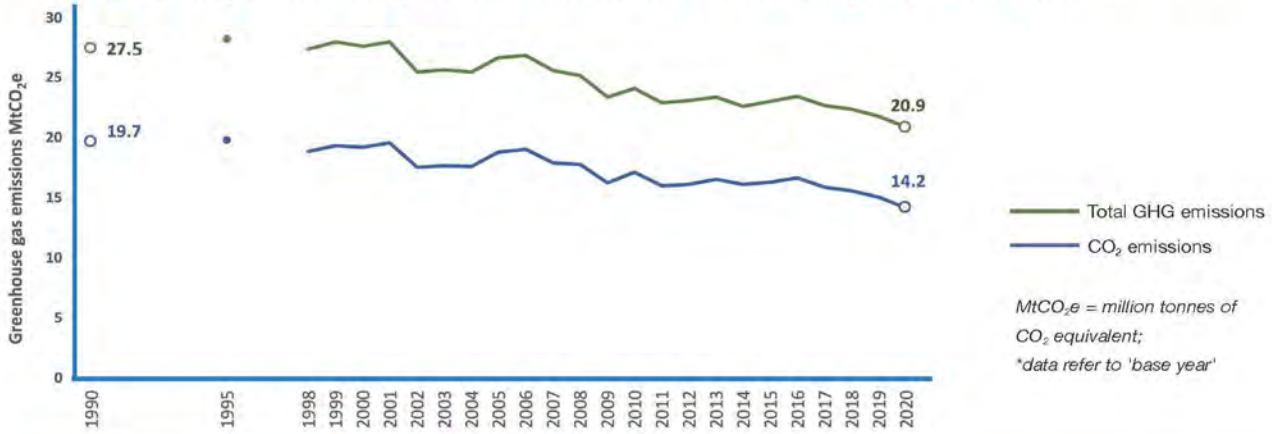
NI Greenhouse Gas Statistics 1990-2020

2020 NI greenhouse gas emissions have decreased by 24% since 1990*



Total greenhouse gas emissions

2020 emissions $MtCO_2e$ **20.9**

2019-2020 % Change **4%**

1990-2020 % Change **24%**

Carbon dioxide emissions

2020 emissions $MtCO_2e$ **14.2**

2019-2020 % Change **6%**

1990-2020 % Change **28%**

Composition of greenhouse gas emissions (%), NI and UK, 2020

NI (20.9 $MtCO_2e$)		UK (405.5 $MtCO_2e$)
68%	Carbon Dioxide	79%
23%	Methane	13%
8%	Nitrous Oxide	5%
1%	Fluorinated and other gases	3%

Agriculture was the largest emitting sector of NI greenhouse gas emissions in 2020

- Agriculture 27%
- Energy Supply 14%
- Residential 14%
- Transport 16%
- Business 13%
- Land use, land use change & forestry 11%
- Waste Management 3%
- Other 2%

Energy Supply delivered the largest reduction in emissions from 1990 to 2020 (-2.5 $MtCO_2e$)

Agriculture	6%
Business	-29%
Energy Supply	-46%
Land use, land use change & forestry	-16%
Residential	-22%
Transport	-2%
Waste Management	-60%
Other	-70%

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Northern Ireland greenhouse gas statistics 1990-2020

Key points

- In 2020, Northern Ireland's net greenhouse gas emissions were estimated to be **20.9 million tonnes of carbon dioxide equivalent ($MtCO_2e$).** This net figure is a result of an estimated 22.0 $MtCO_2e$ total emissions, offset by 1.1 $MtCO_2e$ of emissions removed through sequestration.

- The net figure of 20.9 $MtCO_2e$, in 2020, represents a decrease of 4.2% compared with 2019. The longer-term trend showed a decrease of 23.9% compared with emissions in 1990.

- In 2020, agriculture was the largest emitting sector, responsible for 26.6% of emissions. Transport contributed 16.2% to overall emissions, whilst the residential, energy supply and business sectors contributed 13.7%, 13.6% and 13.4%, respectively.

- The largest decreases between 2019 and 2020, in terms of tonnes of carbon dioxide equivalent, were in the transport (-0.9 $MtCO_2e$) and residential (-0.1 $MtCO_2e$) sectors.

    - The decline in transport emissions reflects the travel restrictions imposed during the COVID-19 pandemic. Reduction in travel is reflected across all vehicle types, but particularly passenger cars and buses.
    - The decline in residential emissions was driven by fuel switching from coal to natural gas, displacing more carbon intensive fuels.

- Northern Ireland accounted for 5.2% of UK greenhouse gas emissions in 2020. In the UK there has been a 49.9% reduction in emissions between the base year and 2020. During the same period, the reduction in emissions in Northern Ireland was 23.9%, compared to 52.6% in England, 51.0% in Scotland and 40.0% in Wales.

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Statisticians: Hugh McNickle**,** Carol Murphy, Katie Barbour
Email: env.stats@daera-ni.gov.uk

Contents

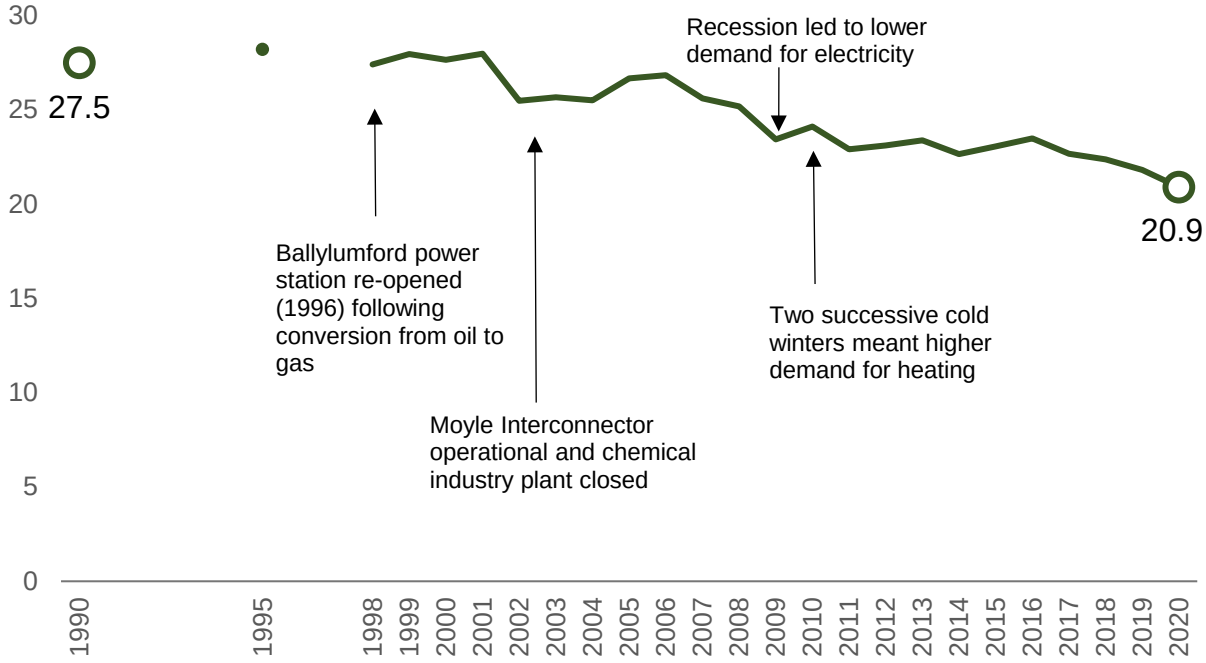
Introduction

The purpose of this statistical bulletin is to summarise the latest published estimates of greenhouse gas emissions for Northern Ireland. The tables these estimates are sourced from is available from the National Atmospheric Emissions Inventory website Devolved Administrations - Greenhouse Gas Reports.

The focus of this report is on 'by source' emissions, which are allocated to the source sector in which they occur. 'End user' emissions, where energy supply emissions are allocated to energy users, are also available.

Northern Ireland Summary

Figure 1: Greenhouse gas emissions
Northern Ireland, 1990, 1995, 1998-2020
$MtCO_2e$

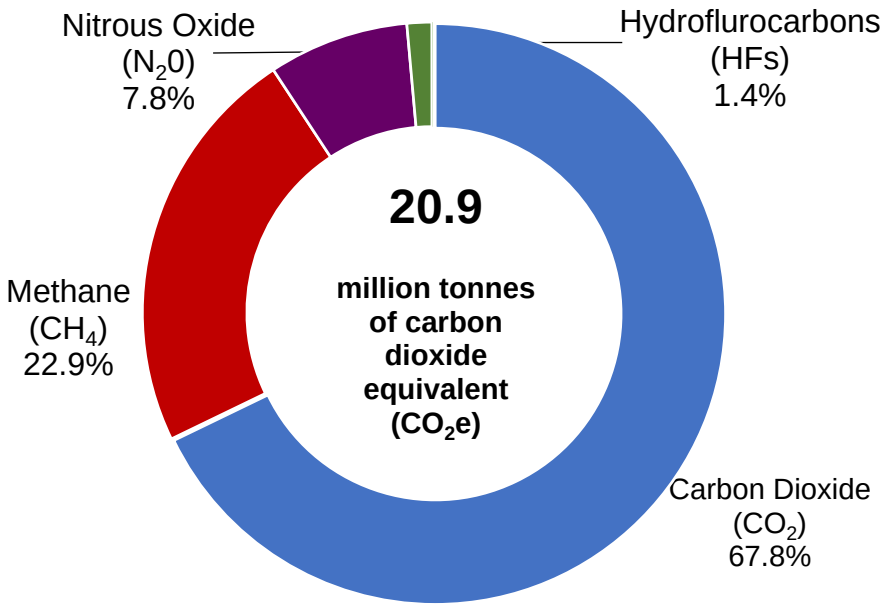


- In 2020, Northern Ireland's net greenhouse gas emissions[1] were estimated to be 20.9 million tonnes of carbon dioxide equivalent ($MtCO_2e$). This was a decrease of 4.2% compared to 2019 (Figure 1).

[1] Net emissions refers to total emissions minus removals of carbon dioxide from the atmosphere by carbon sinks in the land use change sector. The land use change sector is the only sector that consists of emissions and removals. Net emissions excludes emissions from international aviation and shipping.

- The longer-term trend showed a decrease of 23.9% compared to 27.5 $MtCO_2e$ in the base year (Figure 1). The base year is 1990 for carbon dioxide, methane and nitrous oxide, and 1995 for the fluorinated gases[2].

Figure 2: Greenhouse gas emissions by gas type[3]
Northern Ireland, 2020



- Carbon dioxide accounted for 67.8% of all greenhouse gas emissions in Northern Ireland (14.2 $MtCO_2e$) in 2020. The proportions of other greenhouse gases were methane 22.9%, nitrous oxide 7.8% and hydrofluorocarbons 1.4% (Figure 2).

- Northern Ireland contributed 5.2% of total UK greenhouse gas emissions, whilst accounting for 2.8% of the UK's population in 2020[4]. Latest estimates show Northern Ireland accounted for 2.3% of UK's economic output (Gross Value Added) in 2020[5].

- In terms of emissions per capita, Northern Ireland produced the equivalent of 11.0 tonnes of CO_2 per person compared with a UK figure of 6.0 tonnes of CO_2 per person.

[2] Given the small differences involved, all references to '1990', within tables and figures, refer to 'base year' estimates as provided by the Greenhouse Gas Inventory. Please see 'Further Information' for more details.
[3] There are zero amounts of PFC and NF_3 and a minimal amount of SF_6 recorded in Northern Ireland and, as such, these gases are not included in the chart above.
[4] Population estimates for the UK, England and Wales, Scotland and Northern Ireland
[5] Annual estimates of regional gross domestic product

- Northern Ireland contributed 5.2% of all UK greenhouse gas emissions, which stood at 405.5 $MtCO_2e$.

- Methane emissions, attributable to Northern Ireland, made up 9.3% of all UK methane emissions. Similarly, nitrous oxide emissions, attributable to Northern Ireland, made up 7.8% of all UK nitrous oxide emissions.

- Agricultural sources (26.6%) accounted for a higher proportion of emissions in Northern Ireland than other parts of the UK due to the greater relative importance of agriculture to the Northern Ireland economy.

- In England, the proportion stood at 9.0%; for Wales, it stood at 15.6% and for Scotland the proportion of emissions, due to agriculture, stood at 18.4%.

Emissions by Sector

Figure 3: Greenhouse gas emissions by sector (%)[6]
Northern Ireland, 2020

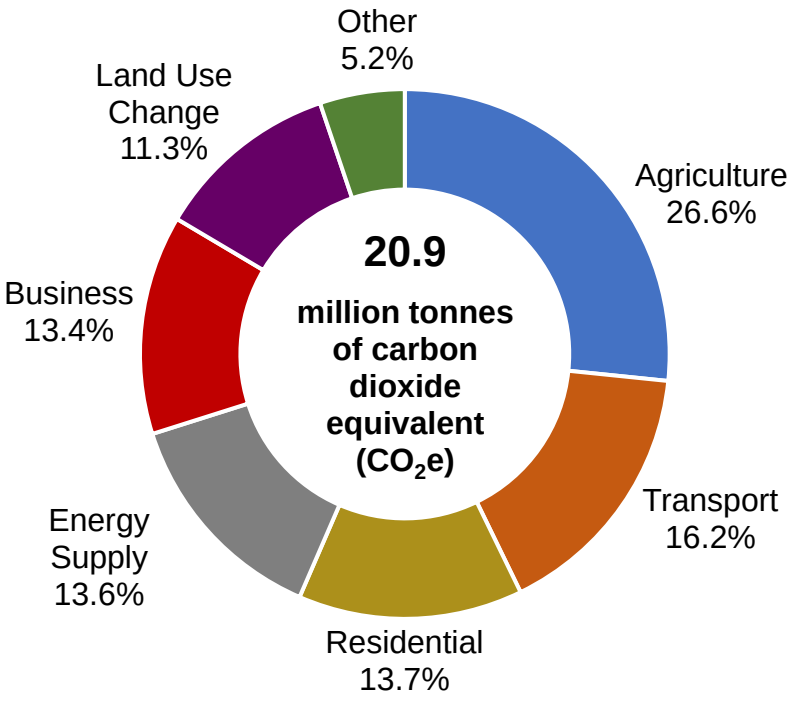


Table 1a: Greenhouse gas emissions by sector, change in $MtCO_2e$
Northern Ireland; Base year, 2019, 2020

$MtCO_2e$

Sector	Base year	2019	2020	Change base year to 2020	Change 2019 to 2020
Agriculture	5.3	5.6	5.6	0.3	0.0
Business	3.9	2.7	2.8	-1.1	0.1
Energy Supply	5.3	2.8	2.8	-2.5	0.1
Industrial Process	0.8	0.2	0.2	-0.5	0.0
Land Use Change	2.8	2.4	2.4	-0.5	0.0
Public	0.4	0.1	0.1	-0.3	0.0
Residential	3.7	3.0	2.9	-0.8	-0.1
Transport	3.4	4.3	3.4	-0.1	-0.9
Waste Management	1.8	0.7	0.7	-1.1	0.0
Total	**27.5**	**21.8**	**20.9**	**-6.6**	**-0.9**

[6] Other consists of Waste Management (3.4%), Public (<1%) and Industrial Process (1.1%).

Table 1b: Greenhouse gas emissions by sector, % change
Northern Ireland; Base year, 2019, 2020

$MtCO_2e$

Sector	Base year	2019	2020	% change base year to 2020	% change 2019 to 2020
Agriculture	5.3	5.6	5.6	5.8	0.2
Business	3.9	2.7	2.8	-28.9	2.6
Energy Supply	5.3	2.8	2.8	-46.4	2.5
Industrial Process	0.8	0.2	0.2	-71.0	-4.5
Land Use Change	2.8	2.4	2.4	-16.3	-0.7
Public	0.4	0.1	0.1	-67.2	-2.3
Residential	3.7	3.0	2.9	-22.2	-3.4
Transport	3.4	4.3	3.4	-1.9	-21.5
Waste Management	1.8	0.7	0.7	-60.1	-1.8
Total	**27.5**	**21.8**	**20.9**	**-23.9**	**-4.2**

- As shown in Figure 3, the largest sectors in terms of emissions in 2020 were agriculture (26.6%), transport (16.2%), residential (13.7%) and energy supply (13.6%). The remainder of emissions were produced by business (13.4%), land use change (11.3%) and other (5.2%) sectors.

- The majority of sectors showed a decreasing trend since the base year. The largest decreases, in terms of tonnes of carbon dioxide equivalent, were in the energy supply, business and waste management sectors (Table 1a, Figure 4).

    - The energy supply sector has experienced a fall in emissions of 2.5$MtCO_2e$, due mainly to fuel switching from coal and oil to natural gas;

    - The drop in emissions from the business sector (1.1$MtCO_2e$) reflects reductions in emissions from the food and drink industries, as well as a reduction in emissions from fossil fuels combusted for heat and power production in industry;

    - The reduction in emissions from the waste sector (1.1 $MtCO_2e$) is due to the continued process of methane capture and oxidation systems within landfill sites.

- Between 2019 and 2020, emissions from the transport sector showed the largest sectoral decrease (21.5%) (Table 1b, Figure 4) this is due to the travel restrictions imposed during the COVID-19 pandemic. Reduction in travel is reflected across all vehicle types, but particularly passenger cars and buses. Of the total reduction in emissions, within the transport sector (-0.9 $MtCO_2e$), road traffic contributed 84.9% of this reduction and domestic aviation accounted for 11.6% of the decrease.

- Agriculture was the only sector which showed higher emissions in 2020 than in the base year (Table 1a, 1b, Figure 4). Emissions from agriculture have increased by 5.8%, this reflects the increase in livestock numbers over this period, however, it is partly offset by lower nitrogen fertiliser applications.

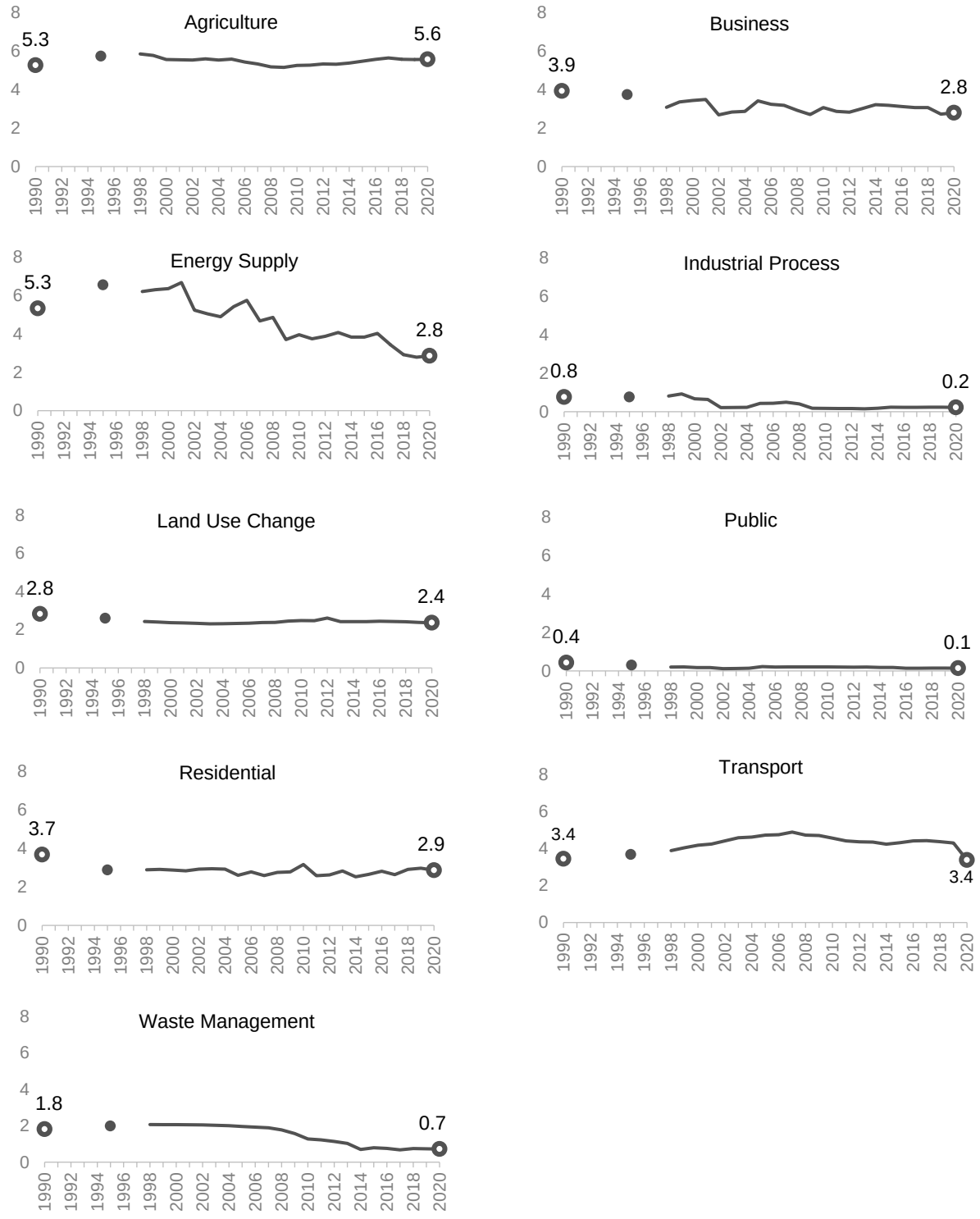
- Land use change sector emissions decreased by 16.3% over the time period (base year to 2020).

    - The main contributors to this sector are emissions from wetlands (1.4 $MtCO_2e$), croplands (0.9 MtCO2e), and settlements (0.7 $MtCO_2e$);

    - These emissions were partly offset by removals which primarily consisted of removals by forest land (-0.6 $MtCO_2e$) (specifically forest land remaining forest land); and removals by grasslands (-0.4 $MtCO_2e$) (specifically cropland converted to grassland and settlements converted to grassland).

- In Northern Ireland the land use change sector acts as a net emitter of greenhouse gas emissions (+2.4 $MtCO_2e$) and similarly in England (+1.4 $MtCO_2e$) and Scotland (+0.5 $MtCO_2e$). Whereas in Wales the land use change sector can be classified as a ‘sink’ due to its net effect being one that absorbs carbon (-0.6 $MtCO_2e$).

Figure 4: Greenhouse gas emissions by sector
Northern Ireland, 1990, 1995, 1998-2020
$MtCO_2$



Emissions by Gas

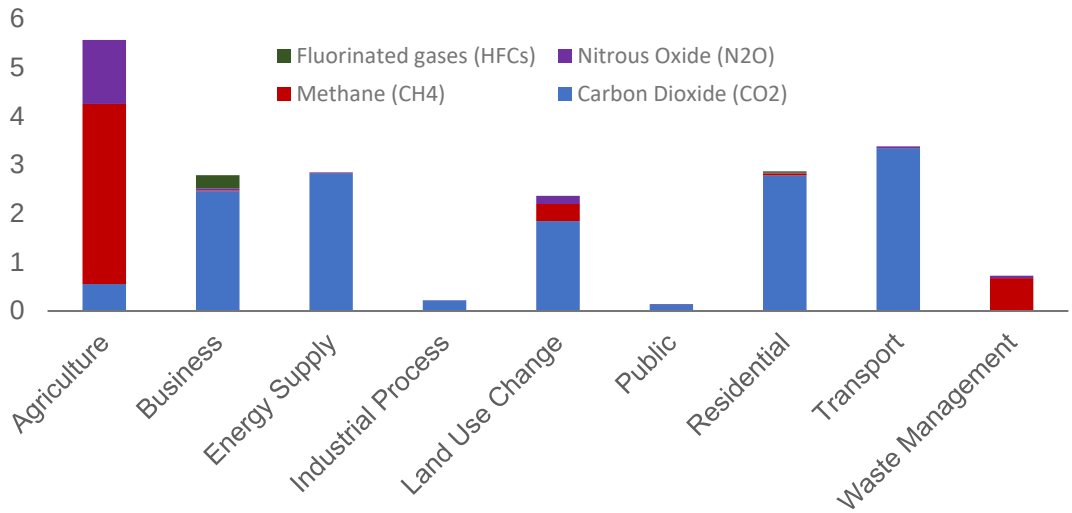
- Carbon dioxide was the most common gas emitted across all sectors except for agriculture and waste management. For the agriculture sector, methane from livestock and nitrous oxide from soils were more significant greenhouse gases than carbon dioxide. Methane from landfill was the main greenhouse gas from the waste management sector.

Table 2: Greenhouse gas emissions by gas within sector
Northern Ireland, 2020

$MtCO_2e$

Sector	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	All gases
Agriculture	0.6	3.7	1.3	0.0	0.0	0.0	0.0	5.6
Business	2.5	0.0	0.0	0.3	0.0	0.0	0.0	2.8
Energy Supply	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.8
Industrial Process	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Land Use Change	1.8	0.4	0.2	0.0	0.0	0.0	0.0	2.4
Public	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Residential	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.9
Transport	3.3	0.0	0.0	0.0	0.0	0.0	0.0	3.4
Waste Management	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.7
Total	**14.2**	**4.8**	**1.6**	**0.3**	**0.0**	**0.0**	**0.0**	**20.9**

Figure 5: Individual greenhouse gas emissions within sector[7]
Northern Ireland, 2020
$MtCO_2e$



[7] There are zero amounts of PFC and NF_3 as well as a minimal amount of SF_6 recorded in Northern Ireland and, as such, these gases are not included in the chart above.

Performance Towards targets

UK Climate Change Act

The UK Climate Change Act 2008 (hereafter referred to as 'The Act') introduced a legally binding target to reduce GHG emissions by at least 80% below the 1990 baseline by 2050. To meet these targets, the government has set five-yearly carbon budgets, which currently run until 2037.

The UK is currently in the third carbon budget period (2018 to 2022) which has a target to reduce emissions by 37% by 2020 (on 1990 levels). The fourth, fifth and sixth carbon budgets have targets of 51% by 2025, 57% by 2030 and 78% by 2035[8]. In 2019, The Act[9] was amended to require the UK to have a 100% reduction in greenhouse gas emissions by 2050 from 1990 levels, commonly referred to as the 'net zero 2050' target[10] .

The UK greenhouse gas inventory reports emissions on a 'by source basis' and it is these estimates that are used to assess the UK's progress against emissions reductions targets. All administrations, including Norther Ireland, contribute to the UK carbon budgets. These legally binding carbon budgets act as stepping-stones towards the 2050 target and provide a pathway to meet the overall UK climate change target.

Northern Ireland Climate Change Bill

Until this year, Northern Ireland was the only devolved administration without its own specific climate change legislation to complement the requirements of the UK Climate Change Act. However, on the 9th March 2022, a bill committing Northern Ireland to net-zero greenhouse gas emissions by 2050 passed its final stage in the Northern Ireland assembly[11] and Royal Assent assent was granted on the 6th June 2022.

The Bill once enacted, clarifies that the Northern Ireland net zero by 2050 ambition will not require a level of methane emissions reduction of more than 46% by 2050 against baseline levels. The new legislation also states that interim targets for the years 2030 and 2040 must be set. Whilst yet to be finalised, the bill requires these to be in line with the overall 2050 target and, the target for the year 2030 must be at least 48% lower than the baseline.

In addition, the bill requires that the emission targets for 2030 and 2040 be laid before the Northern Ireland Assembly within 24 months of the legislation receiving Royal Assent.

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[8] The CCC - Carbon budgets and targets
[9] The Climate Change Act 2008
[10] Net Zero – The UK's contribution to stopping global warming
[11] Northern Ireland Climate Change Bill

Previous Programme for Government Indicator

Monitoring of the 2016-21 Draft Programme for Government (PfG) Indicators ceased in May 2021. Departments have now proposed Indicators for a new Draft Framework, which was consulted on in 2021. Monitoring of these Indicators will commence when the incoming Executive have agreed the Draft Framework. Previously, Greenhouse gas emissions was included as an Indicator under outcome 2: we live and work sustainably – protecting the environment.

- In 2020, Northern Ireland's greenhouse gas emissions were estimated to be 20.9 $MtCO_2e$. This is a decrease of 7.7% since the baseline year for PfG reporting (2014) available in Table 3 of the data tables that accompany this report[12].

[12] Northern Ireland GHG statistics 1990-2020 statistical bulletin data and charts

UK Comparisons

- The trends in greenhouse gas emissions vary across the different parts of the UK between the base year and 2020. It should be noted that the regional estimates are less certain than the overall UK estimate. Estimates for the UK are available in Tables 4 and 5 of the data tables that accompany this report.

    - UK has reduced emissions by 49.9%
    - Scotland has reduced emissions by 51.0%
    - England has reduced emissions by 52.6%
    - Wales has reduced emissions by 40.0%
    - Northern Ireland has reduced emissions by 23.9%

- Note that the UK greenhouse gas emissions publication uses a 1990 base year for all gases (including fluorinated gases) which results in a reduction of 49.7% by 2020. Note also that for consistency in the above list, the figure for Scotland, derived as part of the UK estimate, does not include international aviation and shipping. However the Scottish Government do include international aviation and shipping in greenhouse gas statistics produced in Scotland.

End user emissions

- The end user inventory reallocates the emissions by source depending on where the end user activity occurred. For example, when reporting on a by source basis, all of the carbon dioxide produced by a power station is allocated to the energy supply sector. On an end user basis, these emissions are reallocated to the users of the electricity, such as domestic homes and industry.

- In 2020, total greenhouse gas emissions for Northern Ireland in the end user inventory were 20.7 $MtCO_2e$. Agriculture accounted for over a quarter (27.3%) of these end user emissions. The transport, residential and business sectors were the next biggest contributors to end user emissions, at 18.9%, 18.0% and 17.4%, respectively.

- End user emissions do not take account of emissions “embedded” within manufactured goods and services which the UK imports and exports. Embedded emissions capture what is sometimes referred to as the “carbon footprint”. Such a calculation would be on a “consumption” basis, reporting on emissions embedded in goods and services across international borders, and is considerably more challenging.

- Statistics on the UK’s Carbon Footprint are available from the Department for Environment, Food and Rural Affairs UK's carbon footprint.

Upcoming change to Global Warming Potentials

The emissions estimates in this report cover seven greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). Depending on their molecular weights, radiative properties and residence times in the atmosphere, each greenhouse gas has a different capacity to cause global warming.

Global warming potentials (GWPs) are used to estimate the climate change impacts of various GHG emissions and express them in a single unit – carbon dioxide equivalents (CO_2e). As such the GWP for each gas is defined as its warming influence relative to that of CO_2 over a given time period, typically 100 years.

The GWPs commonly used in GHG reporting are defined by the Intergovernmental Panel on Climate Change (IPCC), a primary authority on climate change science. The values for GWPs have been revised on a number of occasions, with each update incorporating the results of advances in scientific knowledge. The GWPs used in the UK/NI GHG inventory (1990 to 2020) are principally from the IPCC's Fourth Assessment Report (AR4) and are consistent with international reporting up to 2020.

In November 2021 during COP26, the international community agreed that GHG emissions reporting, under the Paris Agreement transparency framework, should use the 100-year GWPs (without climate feedback[13]) that are set out in the IPCC's Fifth Assessment report (AR5). For that reason, estimates of GHG emissions will be based principally on AR5 $GWPs_{100}$ in next year's edition of this publication.

Table 6 shows the total estimated emissions of each greenhouse gas based on AR4 and AR5 $GWPs_{100}$ for the base year and 2020.

[13] The AR5 report presents two sets of GWP values, one that takes into account climate feedbacks, which measures the indirect effects of changes in carbon storage due to changes in climate, and one that does not. (IPCC, 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group 1 to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Technical Summary)

Table 6: Greenhouse gas emissions by gas[14], using global warming potentials (without feedback) from the Intergovernmental Panel on Climate Change's Fourth and Fifth Assessment Reports (AR)
Northern Ireland; Base year and 2020

$KtCO_2e$

Greenhouse Gas	Base year AR4	Base year AR5	% difference	2020 AR4	2020 AR5	% difference
CO_2	19,683	19,683	0.0%	14,178	14,178	0.0%
CH_4	5,647	6,325	12.0%	4,790	5,365	12.0%
N_2O	2,100	1,867	-11.1%	1,636	1,455	-11.1%
SF_6	3	3	3.1%	3	3	3.1%
PFCs	1	1	-8.8%	0	0	0.0%
HFCs	24	22	-8.4%	295	279	-5.5%
NF_3	0	0	0.0%	0	0	0.0%
Total	**27,458**	**27,902**	**1.6%**	**20,903**	**21,280**	**1.8%**

CO_2 was selected by the IPCC as the reference gas that other GHG emissions were to be weighted against and therefore its GWP is by definition always going to be one. As a result, there is no change to the CO_2 emission estimates shown in Table 6 using AR4 and AR5 GWPs. Given CO_2 makes up the majority of the GHG emissions accounted for in the Northern Ireland GHG inventory (67.8% in 2020 using AR4 GWPs), the difference in total emissions when reported using AR5 GWPs compared with AR4 GWPs is small; a 1.6% increase in 1990 and a 1.8% increase in 2020.

The extent of the difference in emissions reported using AR4 and AR5 GWPs for CH_4, N_2O, SF_6, and NF_3 is the same in 1990 as it is in 2020, and for all other years. This is because these are individual greenhouse gases having only one GWP each, and it is applied consistently to emissions estimates across the 1990 to 2020 time series.

The HFCs and PFCs are collections of gases and in both these cases, they have a number of associated GWPs. As a result, the extent of the difference from using AR4 GWPs to AR5 GWPs can vary from year to year as the amount of emissions these individual gases contribute to the total amount of HFCs and PFCs emissions can change between years (Table 6).

[14] 1990 is used for base year reporting for CO_2, CH_4 and N_2O, whilst 1995 is used for SF_6, PFCs, HFCs and NF_3.

Table 7: Greenhouse gas emissions by sector, using global warming potentials (without feedback) from the Intergovernmental Panel on Climate Change's Fourth and Fifth Assessment Reports (AR)
Northern Ireland; Base year and 2020

$MtCO_2e$

Sector	Base year AR4	Base year AR5	% difference	2020 AR4	2020 AR5	% difference
Agriculture	5.3	5.5	4.5%	5.6	5.9	5.4%
Business	3.9	3.9	-0.1%	2.8	2.8	-0.6%
Energy Supply	5.3	5.3	0.0%	2.8	2.8	0.0%
Industrial Process	0.8	0.7	-5.0%	0.2	0.2	-0.1%
Land Use Change	2.8	2.8	0.6%	2.4	2.4	1.0%
Public	0.4	0.4	0.0%	0.1	0.1	0.0%
Residential	3.7	3.7	0.5%	2.9	2.9	0.1%
Transport	3.4	3.4	0.0%	3.4	3.4	-0.1%
Waste Management	1.8	2.0	11.6%	0.7	0.8	10.4%
Total	**27.5**	**27.9**	**1.6%**	**20.9**	**21.3**	**1.8%**

Table 7 shows the effect of the upcoming change to GWPs at sectoral level. For the year 2020, the two sectors most affected by this change are waste management and agriculture (10.4% and 5.4% increase in emissions from AR4 to AR5, respectively). The primary gas produced by these sectors is methane; its 100-year GWP is set to change to 28 as per the AR5[15], in comparison to 25 in AR4. The effect of moving to AR5 GWPs is available for the full time series in the tables[16] published alongside this release.

[15] Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment
[16] Northern Ireland GHG statistics 1990-2020 statistical bulletin data and charts

Revisions to the Northern Ireland Greenhouse Gas Inventory

In line with the UK Greenhouse Gas Inventory revision process, estimates of emissions for Northern Ireland are reviewed each year and the whole historical data series is revised, where necessary, to incorporate methodological improvements, changes to international reporting guidelines or new data.

Full details of the methods used to produce the latest greenhouse gas emissions estimates are published in the UK's National Inventory Report[17] (NIR).

Changes are applied back through the time series to 1990 in order to ensure that the trend in emissions from 1990 to the latest year is based on a consistent method. Therefore, it is not appropriate to compare the emissions time series from one year with that from another. However, the latest inventory represents a single consistent data series going back to 1990, and this therefore allows year-on-year comparisons to be made.

Table 8: Revisions in the 2020 Greenhouse Gas Inventory, by sector

Northern Ireland, Base year and 2019

$MtCO_2e$

	Base Year (1990-2019 inventory)	Base Year (1990-2020 inventory)	Base year Change	2019 (1990-2019 inventory)	2019 (1990-2020 inventory)	2019 change
Agriculture	5.2	5.3	0.1	5.6	5.6	0.0
Business	3.0	3.9	0.9	2.3	2.7	0.4
Energy Supply	5.3	5.3	0.0	2.8	2.8	0.0
Industrial Process	0.8	0.8	0.0	0.2	0.2	0.0
Land Use Change	2.3	2.8	0.5	2.5	2.4	-0.1
Public	0.5	0.4	-0.1	0.1	0.1	0.0
Residential	3.7	3.7	0.0	2.9	3.0	0.1
Transport	3.5	3.4	0.0	4.2	4.3	0.1
Waste Management	1.8	1.8	0.0	0.7	0.7	0.0
Total	**26.1**	**27.5**	**1.4**	**21.4**	**21.8**	**0.4**

[17] Previous UK NIRs can be found here: National Atmospheric Emissions Inventory Reports**.** The latest NIR covering 1990-2020 emissions were submitted to the UNFCCC on 15th April 2022.

Reasons for revisions to the Northern Ireland data include the following:

- Agriculture
  - Changes to forage diet composition, concentrate composition and feed rates for dairy animals.
  - Revisions to dairy cattle ages and cow breakdown under different management regimes.
  - Changes in emissions factors relating to sheep and goats.
  - Updates to the methodology concerning the use of fertilisers.

- Business
  - Several new mapping grids for the use of fuels at industrial sites have been integrated into the emissions calculations from this sector.
  - Revision to Digest of UK Energy Statistics (DUKES) activity data in later years of the time series.

- LULUCF
  - Methodological updates have taken place concerning cropland including updates to activity data used in both soil and non-forest biomass models.
  - The assumed activity for organic soils has been revised, as has that of wildfires.
  - Bioenergy crop data has also been included in the calculations of emissions from this sector for the first time.
  - A methodological change regarding activity data affecting soil and biomass carbon stock changes has resulted in some revisions of the deforestation activity data.

- Residential
  - Revisions to the mapping grid analysis of fuel used in domestic and public combustion, particularly solid fuel use affects the early part of the time-series.

- Transport
  - Emission estimates have been revised across the entire time series due to road transport calculation improvements.

- Waste Management
  - Analysis of installation-level data from the early 1990s has resulted in the addition of methane estimates for a number of chemical waste facilities.
  - Improved emissions factors has resulted in a minor revision to estimates for clinical waste incinerators.

Further information

1. This is the thirteenth release of the Northern Ireland greenhouse gas inventory statistical bulletin. It will continue to be updated annually. The data were produced by a consortium led by Ricardo Energy and Environment, on behalf of the Department for Business, Energy & Industrial Strategy, the Scottish Government, the Welsh Assembly Government and the Northern Ireland Department of Agriculture, Environment and Rural Affairs.

2. Emissions in this bulletin are reported according to the National Communication sectors. This is in accordance with international reporting guidelines from the United Nations Framework Convention on Climate Change (UNFCCC). Descriptions of each sector are available on page 23.

3. The Kyoto Protocol, a 1997 addition to the UNFCCC treaty, requires countries to monitor emissions and report on an emission reduction target. The UK's reduction in emissions are set against a base line of emissions in 1990 (for carbon dioxide, methane and nitrous oxide) and 1995 (for the F-gases, i.e hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride). The sum of these emissions in 1990 and 1995 is called the base year emissions.

4. The greenhouse gas emission estimates are based on a wide range of data sources and sources of uncertainty include statistical differences, assumptions, proxy datasets and expert judgement. In addition, the natural variability in the processes that are being modelled introduce uncertainty. For example, carbon content of fuels and farming practices under different climatic conditions and soil types. Therefore when using the statistics in this bulletin, users should be mindful of the uncertainty around the published estimates. These uncertainties are presented as confidence intervals and the width of the interval provides a measure of the accuracy of the estimate.

5. Uncertainty estimates for Northern Ireland emissions are available for the base year, the latest year (2020) and for the percentage change between the two years. For the base year, a close approximation of the 95% confidence interval is ±8%, and for 2020 it is ±6%. For the percentage reduction between the base year and 2020, the 95% confidence interval ranges from 16% to 34%. There remains greater uncertainty around emissions in Northern Ireland compared to other parts of the United Kingdom due to the relative importance of methane and nitrous oxide emissions in the agriculture sector. Emissions of these gases are more difficult to estimate than carbon dioxide, and the agriculture sector makes up a larger share of Northern Ireland's emissions than in other parts of the UK. In addition, the fuel activity data for Northern Ireland is more uncertain than other devolved administrations, due to the greater use of solid fuels and oils.

6. Official Statistics are produced to a high professional standard. They undergo regular quality assurance reviews to ensure that they meet customer needs. They are produced free from any political interference. As we want to engage

with users of our statistics, we invite you to feedback your comments on this publication. Contact details are available on page 3.

7. The UK greenhouse gas inventory National Statistics user guide provides a simple guide to the origins and use of data in the compilation of the UK Greenhouse Gas Inventory. This guide can be accessed through the Department for Business, Energy & Industrial Strategy website An introduction to the UK's greenhouse gas inventory.

Overview of National Communication sectors

Sector	Description
Energy supply	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.
Transport	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.
Residential	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.
Business	Includes emissions from stationary combustion in the industrial and commercial sectors, industrial off-road machinery, and refrigeration and air conditioning.
Public	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.
Industrial process	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.
Agriculture	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.
Land use change	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.
Waste management	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.

Appendix A: Revision of peatland emissions consistent with the 2013 IPCC Wetlands Supplement

In the 2019 GHG inventory, there was a major methodological change to improve estimates of emissions and removals from drainage and rewetting of inland organic soils (peatlands). The major emissions changes to the 1990-2019 LULUCF time series were compiled following guidance for estimating emissions from inland organic soils set out in chapters 2 and 3 of the 2013 Wetlands Supplement to the 2006 IPCC Guidelines for National GHG Inventories.

The net effect of these changes relates to the recording of additional emissions that had not been included prior to the 2019 GHG inventory. The GHG time series from 1990-2019 was fully revised to take account of this new methodology and these revisions continue going forward.

The calculations have employed a Tier 2 methodological approach for implementation described in the BEIS-funded wetlands report (Evans, et al., 2017[18]), and a continued Tier 3 approach using the Forest Research CARBINE model for direct CO_2 from organic soils under forest.

Emissions factors presented in that report have since been updated following a literature review of new GHG flux studies in 2019, and updates to the reported peatland restoration activity data.

Incorporating improved data on peat extent, condition and UK specific emission factors for drained and rewetted organic soils affected GHG emissions estimates across all land use categories. In addition, to avoid double-counting, the Land-Use Change (LUC) model to estimate carbon stock changes in soils was adjusted to calculate for mineral soils only instead of for all soils combined, as LUC on organic soil are now estimated separately.

More detail on these changes are available in Annex A of Northern Ireland greenhouse gas inventory 1990 – 2019 statistical bulletin | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)

[18] Evans, et al., 2017: Implementation of an Emissions Inventory for UK Peatlands

Figure A1: Impact of the implementation of the 2013 IPCC Wetlands Supplement on Northern Ireland greenhouse gas emissions for 2018, 2019 and 2020 inventories

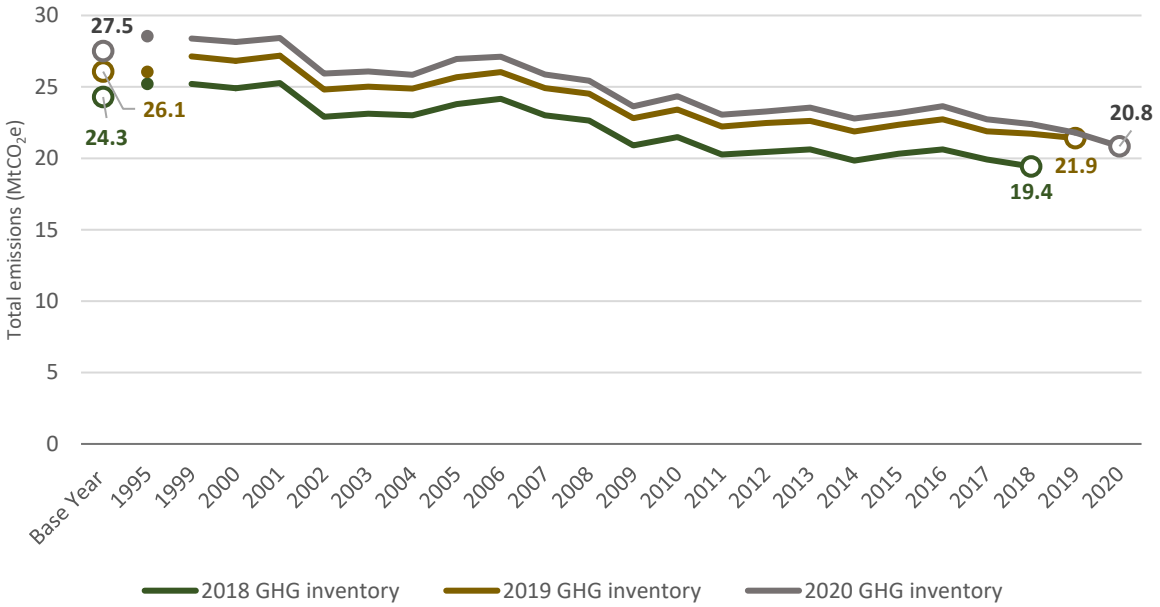


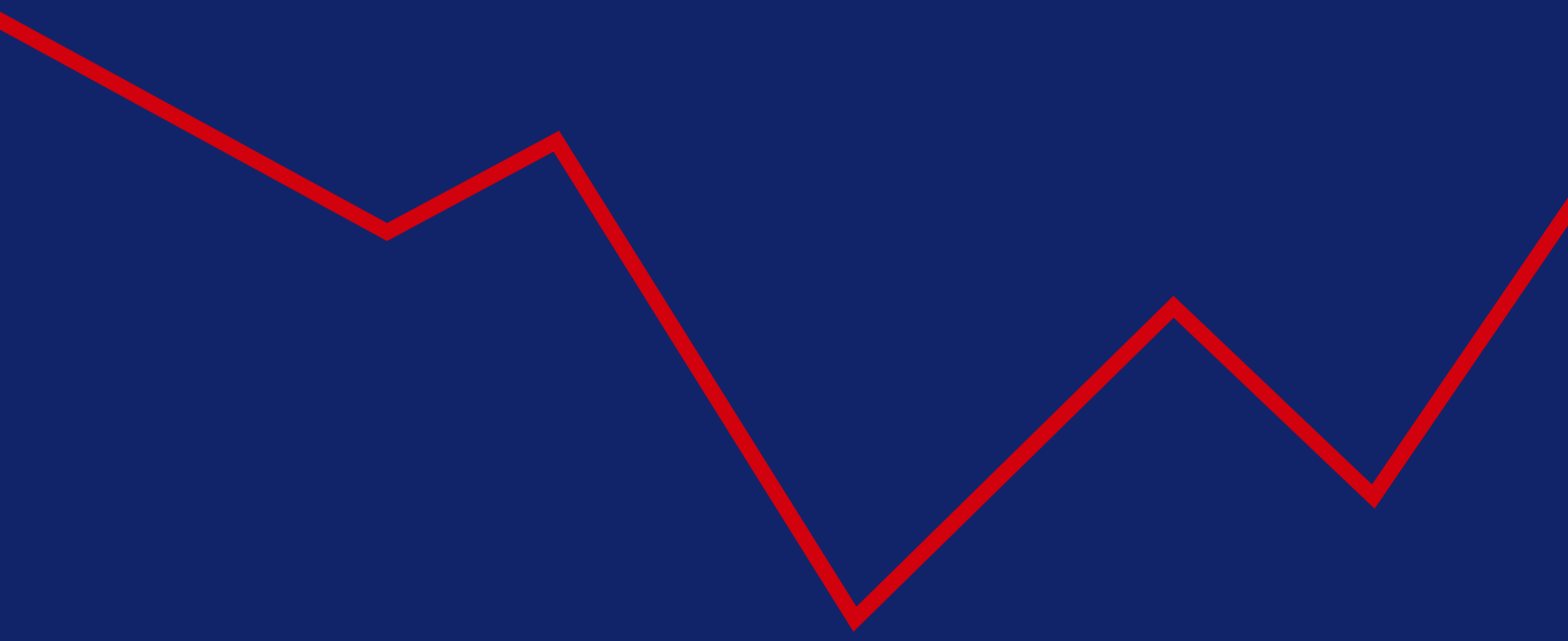
Figure A1, above, shows the overall change in greenhouse gas emissions, revised over the time series, for Northern Ireland.

- In the 2018 inventory, published in June 2020, total emissions, for the base year, stood at 24.3 $MtCO_2e$. This was revised upwards to 26.1 $MtCO_2e$ in the 2019 inventory.

- The figure for total emissions in 2018, before the implementation of the recommendations of the wetland supplement, stood at 19.4 $MtCO_2e$. The 2019 inventory revised this 2018 figure up to 21.7 $MtCO_2e$. In the 2020 inventory, total emissions were revised to 20.8

- The latest estimate of total GHG emissions for Northern Ireland now stands at 20.8 $MtCO_2e$ for 2020. This represents and annual decrease of five per cent from 2019; and a decrease of 24 per cent from the base year.

Policy, Economics and Statistics Division
Department of Agriculture, Environment and Rural Affairs
Dundonald House
Upper Newtownards Road
Ballymiscaw
BELFAST BT4 3SB



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