*EPA Headquarters*

PO Box 3000
Johnstown Castle Estate
County Wexford, Ireland

T +353 53 9160600
LoCall 1890 33 55 99
**www.epa.ie**

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# IRELAND'S FINAL GREENHOUSE GAS EMISSIONS IN 2014

## KEY HIGHLIGHTS

- The EPA has produced final estimates of greenhouse gas emissions for the time period 1990 - 2014.
- For 2014, total national greenhouse gas emissions are estimated to be 58.25 million tonnes carbon dioxide equivalent (Mt $CO_2$eq). This is 0.5% lower (0.29 Mt $CO_2$eq) than emissions in 2013.
- In 2014, emissions in the ETS sector increased by 1.7% or 0.27 Mt $CO_2$eq whereas non-ETS emissions decreased by 1.3% or 0.56 Mt $CO_2$eq.
- Emissions from *Energy* (principally electricity generation) decreased by 1.9% (0.22 Mt $CO_2$ eq) in 2014. This reflects a 2.9% decrease in coal used in conventional fossil fuel fired power stations for electricity generation, and also a decrease in natural gas use of 6.3% in 2014. Electricity generated from renewables increased by 12.6% between 2013 and 2014.
- *Industry and Commercial* emissions increased by 4.1% (0.36 Mt $CO_2$eq) in 2014. Industrial emissions from large combustion sources within the EU Emissions Trading Scheme comprise the largest source of emissions in this category – these grew by 1.4% in 2014. However, combustion emissions within the commercial services sector declined by 8.4% mainly due to a 16.2% reduction in oil use and an 11.7% increase in biomass use.
- *Agriculture* emissions are 1.1% lower (0.21 Mt $CO_2$eq) in 2014 compared with the 2013 levels. The most significant drivers for lower emissions in 2014 are reduced $CO_2$ emissions from liming on soils (-25.9%) and a reduction in nitrogenous fertiliser use (-6.0%) which is the main contributor to reduction of $N_2O$ emitted from agricultural soils (-1.5%). However, the small decrease in 2014 was somehow counterbalanced with higher animal numbers; dairy cows population was 4.8% higher in 2014 compared with 2013. 'Other cattle' livestock, which includes beef cattle, have decreased by 1.5% in 2014. In contrast, sheep numbers have increased by 2.3% and pig numbers increased by 1.3%.
- Greenhouse gas emissions from the *Transport* sector are 2.5% higher (0.28 Mt $CO_2$eq) in 2014 compared with 2013 levels. This is the second year of increases in *Transport* emissions since 2007. In 2014, gasoline use continued to decrease by 5.3% while diesel use increased by 6.1% and biofuels use increased by 13.6%.

- Greenhouse gas emissions from the *Residential* sector are 10.1% lower (0.65 Mt $CO_2$eq) in 2014 compared with 2013 levels mainly from decreased solid fuel consumption – coal, smokeless coal and lignite decreased by 23.2%, 11.2% and 26.8%, respectively and by 19.8% overall. There was also a decrease in the use of peat (-8.2%), oil (-6.5%) and natural gas (-11.6%) for space and hot water heating in homes in 2014. Renewable energy consumption increased by 1.2%. The weather in 2014 was considerably milder than 2013, with 10% fewer degree days[1].

- Emissions from *Waste* sector increased by 10.3% (0.15 Mt $CO_2$eq) in 2014 compared with 2013 levels. Methane generated at landfill sites decreased by 4.8% in 2014, however, overall methane emissions increased substantially by 13.7% due to a reduction of 16.5% in landfill gas utilised (+ 6.3%) or flared (-34.5%).

- *Agriculture* and *Transport* accounted for 72.4% of total non-ETS emissions in 2014.

- These figures indicate that Ireland will be in compliance with its 2014 annual limit set under the EU's Effort Sharing Decision (Decision 406/2009/EC)[2].

## Introduction

The EPA is responsible for compiling the inventories of greenhouse gas emissions for Ireland and for reporting the data to the relevant European and international institutions. As such, Ireland's legal reporting obligations require that we submit data for the period 1990-2014 in January, March and April 2016 to the European Commission and the UN. These estimates are the final estimates of Ireland's greenhouse gas figures for the years 1990-2014 and are an update of those previously published in December 2015.

These estimates are calculated using methodologies employed in the inventory in accordance with UNFCCC reporting guidelines and using latest available input data.

The 2014 estimates are given below, followed by an account of how these differ from the 2013 estimates. The longer-term trends in greenhouse gas emissions and their significance in relation to Ireland's target under the European Union's Decision 406/2009/EC (ESD) on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 are also assessed.

## Ireland's Greenhouse Gas Emissions in 2014

For 2014, total national greenhouse gas emissions are estimated to be 58.25 million tonnes carbon dioxide equivalent (Mt $CO_2$ eq) which is 0.5 % lower (or 0.29 Mt $CO_2$ eq) than emissions in 2013 (58.55 Mt $CO_2$ eq). This follows the 0.2% decrease in emissions reported for 2013 and shows emission reductions in 8 of the last 9 years. The inter annual change in total greenhouse gas emissions is presented in Figure 1 and sectoral emissions in Figure 2. Detailed sectoral data are shown in Table 1.

*Agriculture* remains the single largest contributor to the overall emissions at 33.1% of the total. *Transport* and *Energy* are the second and third largest contributors at 19.5% and 19.1% respectively.

[1] SEAI, Energy in Ireland 1990-2014
[2] EU Effort Sharing Decision 406/2009/EC

The remainder is made up by the *Industry and Commercial* at 15.8%, *Residential* sector at 9.9% and *Waste* at 2.7%. Figure 2 shows the contributions from each of the sectors in 1990 and 2014.

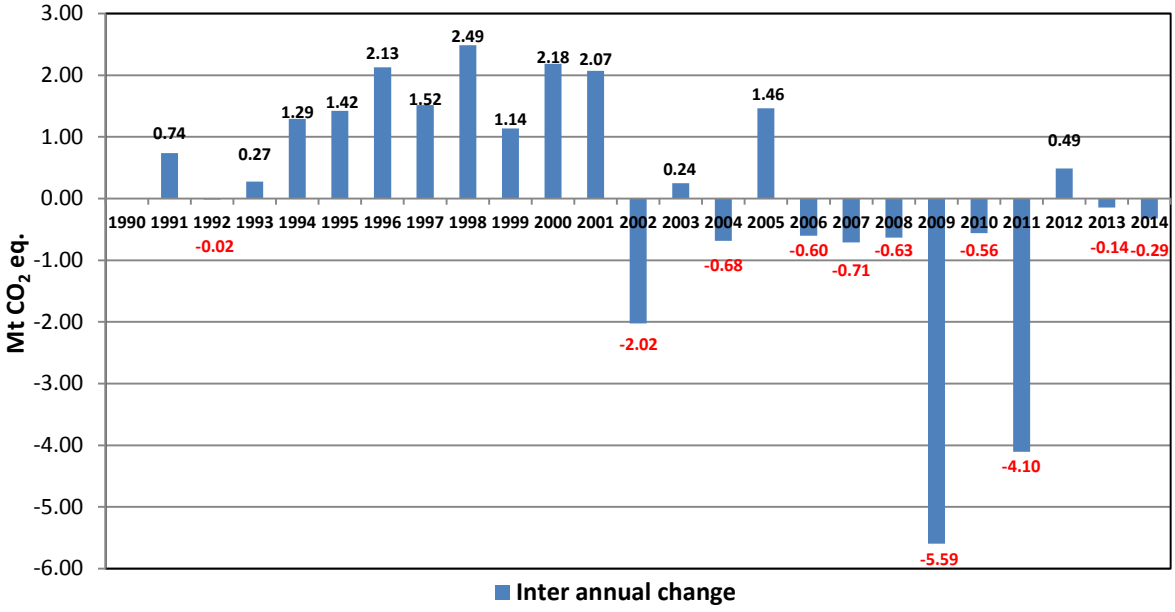


**Figure 1 Inter annual changes in GHG emissions 1990-2014**

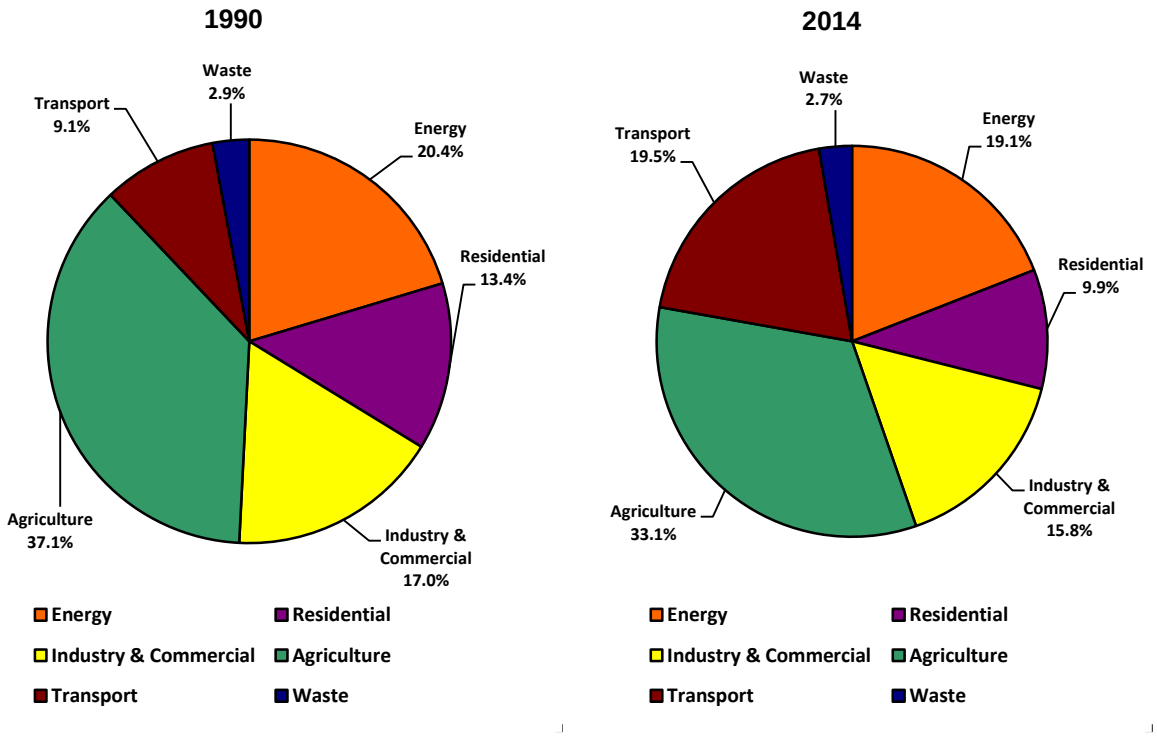


**Figure 2 Greenhouse Gas Emissions in 1990 and 2014 by Sector**

## Changes in Emissions from Sectors between 2013 and 2014

An overview of changes in emissions since the previous year is presented in Table 1.

**Table 1. Greenhouse gas emissions for 2013 and 2014 for Ireland**

| ***Mtonnes, $CO_2$ eq*** | **2013** | **2014** | **% Change** |
|---|---|---|---|
| Energy | 11.323 | 11.105 | -1.9% |
| Residential | 6.395 | 5.746 | -10.1% |
| Industry and Commercial | 8.822 | 9.181 | 4.1% |
| Agriculture | 19.502 | 19.290 | -1.1% |
| Transport | 11.068 | 11.347 | 2.5% |
| Waste | 1.436 | 1.584 | 10.3% |
| **Total** | **58.547** | **58.254** | **-0.5%** |

The most significant change in sectoral emissions is in the *Residential* sector with a 10.1% decrease in emissions (0.65 Mtonnes of $CO_2$eq) mainly from decreased solid fuel consumption – coal, smokeless coal and lignite decreased by 23.2%, 11.2% and 26.8%, respectively and by 19.8% overall. There was also a decrease in the use of peat (-8.2%), oil (-6.5%) and natural gas (-11.6%) for space and hot water heating in homes in 2014. Renewable energy consumption increased by 1.2%. The weather in 2014 was considerably milder than 2013, with 10% fewer degree days.

Emissions in the *Energy* sector (i.e power generation) show a decrease of 1.9%. The decrease in emissions is attributable to a reduction in electricity generation from coal (-2.9%) and natural gas (-6.3%), although peat use increased by 8.9%. There was a significant increase in electricity generated from renewables (+ 12.6%) with wind increasing by 13.2%, biomass by 16.6% and a 1.3% decrease in hydro. There was a 2.5% decrease in the $CO_2$/kWh generated in 2014 (435 g $CO_2$/kWh) compared with 2013 (446 g $CO_2$/kWh). Renewables now account for 23% of electricity generated in 2014.

*Industry and Commercial* services emissions show an increase of 4.1% in 2014. Total combustion emissions within the industrial sector increased by 2.1% in 2014 whereas combustion emissions within the commercial services sector decreased by 8.4% mainly due to a 16.2% reduction in oil use and an 11.7% increase in biomass use. Total emissions from the cement sector (process and combustion) increased by 31.4% in 2014 showing a recovery of economy in the construction industry sector and emissions from industrial gases (F-gases) increased by 7.9% mainly due to increased uses of HFCs in refrigeration and air conditioning systems.

*Agriculture* emissions decreased by 1.1% in 2014 (0.21 Mtonnes of $CO_2$eq). The most significant drivers for lower emissions in 2014 are reduced $CO_2$ emissions from liming on soils (-25.9%) and a reduction in nitrogenous fertiliser use (-6.0%) which is the main contributor to reduction of $N_2O$ emitted from agricultural soils (-1.5%). However, the small decrease in 2014 was somehow counterbalanced with higher animal numbers; dairy cows population was 4.8% higher in 2014 compared with 2013. This reflects national plans to expand milk production under Food Wise 2025 and following removal of milk quota in 2015. 'Other cattle' livestock, which includes beef cattle, have decreased by 1.5% in 2014. In contrast, sheep numbers have increased by 2.3% which is the fourth year that this animal category has shown an increase and is consistent with favourable sheep market conditions in recent years. Additionally, pig numbers increased by 1.3%.

*Transport* emissions increased by 2.5% in 2014 (0.28 Mtonnes of $CO_2$eq). This is the second year of increases in transport emissions following 5 consecutive years of decreases since 2007. In road transport in 2014, gasoline use continued to decrease by 5.3% while diesel use increased by 6.1% and biofuels use increased by 13.6%. Looking at the underlying drivers, the number of passenger diesel cars increased by 11.4% in 2014 while the number of passenger petrol cars decreased by 3.6% and commercial vehicle numbers increased by 2.8% in 2014.

Emissions from the *Waste* sector account for 2.7% of total national emissions with a 10.3% increase in emissions in 2014. Methane generated at landfill sites decreased by 4.8% in 2014, however, overall

methane emissions increased substantially by 13.7% due to a reduction of 16.5% in landfill gas utilised (+ 6.3%) or flared (-34.5%).

**Long-term Changes in Sectoral Emissions 1990 – 2014**

The trend in emissions from 1990 to 2014 is shown in Figure 3, Figure 4 and Table 3. The share of $CO_2$ in total greenhouse gas emissions has increased to 62.9% of total greenhouse gas emissions in 2014 compared to 58.5% in 1990. In contrast, $CH_4$ and $N_2O$ emissions, primarily from the agriculture sector, have fallen from 41.5% of total greenhouse gas emissions in 1990 to 35.1% in 2014. Emissions from F-gases account for 2.1% of the total in 2014.

Between 1990 and 2014, *Transport* shows the greatest overall increase at 120.9%. Emissions increased by 2.5% in 2014, the second year of increases in *Transport* emissions following 5 consecutive years of decreases since 2007. However, *Transport* emissions have decreased by 21.1% below peak levels in 2007 primarily due to the economic downturn, improving vehicle standards due to the changes in vehicle registration tax and the increase use in biofuels. The increase up to 2007 can be attributed to general economic prosperity, increasing population with a high reliance on private car travel as well as rapidly increasing road freight transport.

*Energy* (mainly electricity generation) shows a decrease (-2.9%) in emissions over the period 1990 – 2014. Over the time series, $CO_2$ emissions from electricity generation have decreased by 2.2% whereas electricity consumption has increased by 109%. Emissions from electricity generation increased from 1990 to 2001 by 54.2% and have decreased by 36.2% between 2001 and 2014. This decrease reflects the improvement in efficiency of modern gas fired power plants replacing older peat and oil fired plants and the increased share of renewables, primarily, wind power.

Emissions from *Agriculture* reached a peak in 1998 and have decreased to below their 1990 level since 2002, reflecting long-term decline in livestock populations and in fertiliser use due to the Common Agricultural Policy. Emissions from *Agriculture* in 2014 are now 7.5% below their 1990 levels but have increased for 2 years in 2012 and 2013 followed by a decrease in 2014. The fluctuations in *Agriculture* emissions are underpinned by higher animal numbers; dairy cows population was 4.8% higher in 2014 compared with 2013. This reflects national plans to expand milk production under Food Wise 2025 and following removal of milk quota in 2015. 'Other cattle' livestock, which includes beef cattle, have decreased by 1.5% in 2014. In contrast, sheep numbers have increased by 2.3% which is the fourth year that this animal category has shown an increase and is consistent with favourable sheep market conditions in recent years. Additionally, pig numbers increased by 1.3%. The most significant drivers for lower emissions in 2014 are reduced $CO_2$ emissions from liming on soils (-25.9%) and a reduction in nitrogenous fertiliser use (-6.0%) which is the main contributor to reduction of $N_2O$ emitted from agricultural soils (-1.5%).

Increased housing stock drove the gradual upward trend in the emissions from the *Residential* sector after 1998 following a sharp reduction in the early 1990s that resulted from fuel switching to reach a peak in 2010. The 2014 emissions in this sector show 10.1% decrease on 2013 levels and are 23.6% lower than their 1990 level. Winter heating demand is the most important variable determining emissions from this sector.

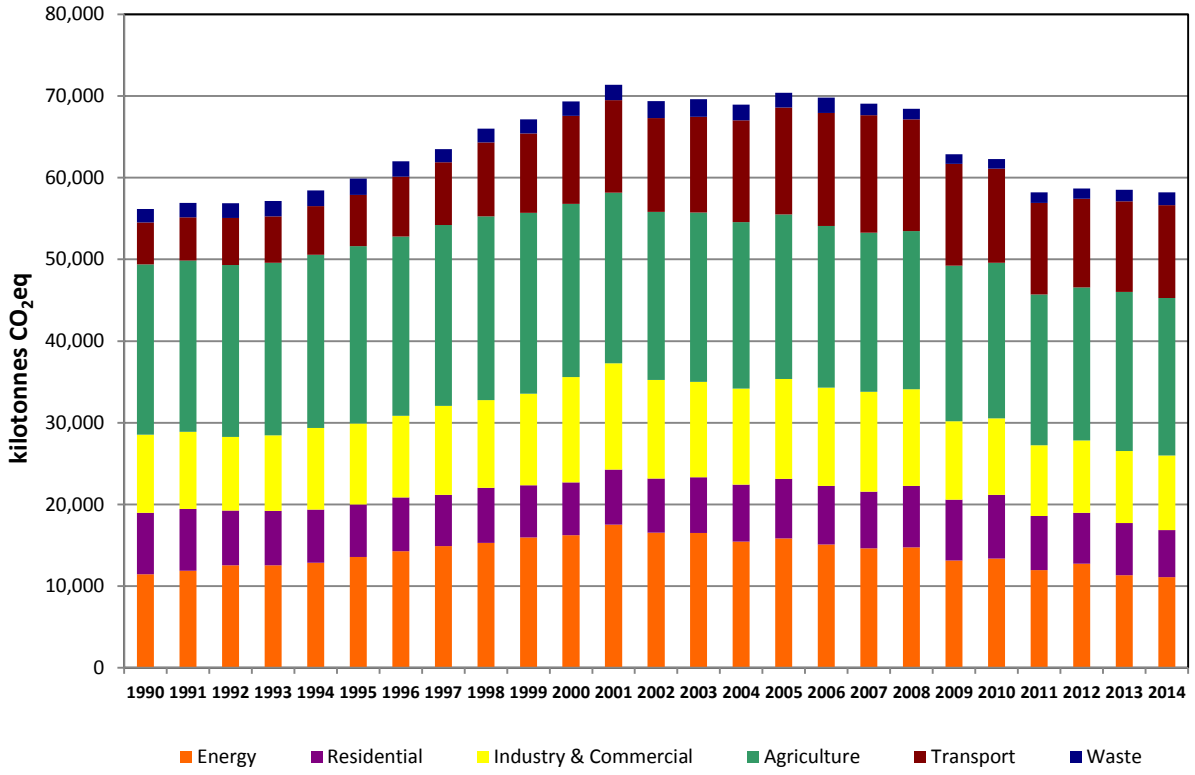


**Figure 3 NCCS GHG emissions 1990-2014**

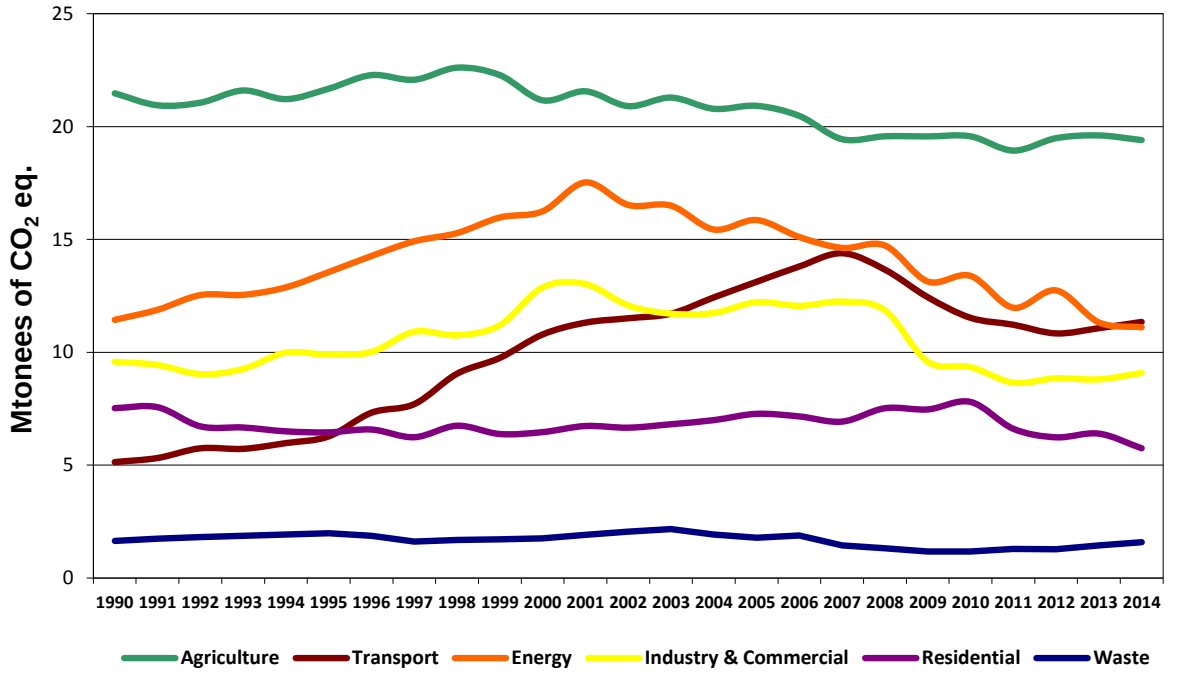


**Figure 4 Trends in Greenhouse Gas Emissions 1990-2014**

## Compliance with EU and international commitments

The greenhouse gas emission inventory for 2014 is the second year that compliance under the European Union's Effort Sharing Decision (Decision 406/2009/EC) will be assessed. This Decision sets 2020 targets for sectors outside of the Emissions Trading Scheme (known as non-ETS sector emissions) and annual binding limits for the period 2013-2020. Ireland's target is to reduce non-ETS emissions by 20% by 2020 compared with 2005 levels.

Ireland's 2014 greenhouse gas emissions for non-ETS sectors are 42.291 Mt $CO_2$ eq. This value is the national total emissions less emissions covered by the EU's emissions trading scheme for stationary and aviation operators. *Agriculture* and *Transport* accounted for 72.4% of total non-ETS emissions in 2014.

Ireland's annual target for 2014 is 45.761 Mt $CO_2$ eq which is 3.470 Mt $CO_2$ eq higher than the 2014 final estimates. See Table 2 and Figure 5 for detail. This indicates that Ireland will be in compliance with its 2014 Effort Sharing annual limit. Final compliance for 2013 and 2014 will be determined following an official review of this data by the European Commission under Article 19 of Regulation (EU) No. 525/2013. The compliance transactions will subsequently be carried out on the Registry in late 2016.

**Table 2. Compliance with EU ESD Targets 2013-2020**

| | | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | Total greenhouse gas emissions without LULUCF | 58,546.7 | 58,253.7 | | | | | | | kt $CO_2$eq |
| B | $NF_3$ emissions | 0.9 | 1.0 | | | | | | | kt $CO_2$eq |
| C | Total greenhouse gas emissions without LULUCF and without $NF_3$ emissions | 58,545.8 | 58,252.7 | | | | | | | kt $CO_2$eq |
| D | Total verified emissions from stationary installations under Directive 2003/87/EC | 15,685.7 | 15,952.7 | | | | | | | kt $CO_2$eq |
| E | $CO_2$ emissions from 1.A.3.a civil aviation | 10.0 | 9.4 | | | | | | | kt $CO_2$eq |
| F | **Total ESD emissions (=C-D-E)** | 42,850.1 | 42,290.7 | | | | | | | kt $CO_2$eq |
| G | **EU ESD Targets** | 46,891.9 | 45,760.9 | 44,629.9 | 43,498.9 | 42,367.9 | 41,236.9 | 40,105.9 | 38,974.9 | kt $CO_2$eq |
| | **Distance to target (=F-G)** | **-4,041.8** | **-3,470.3** | | | | | | | |

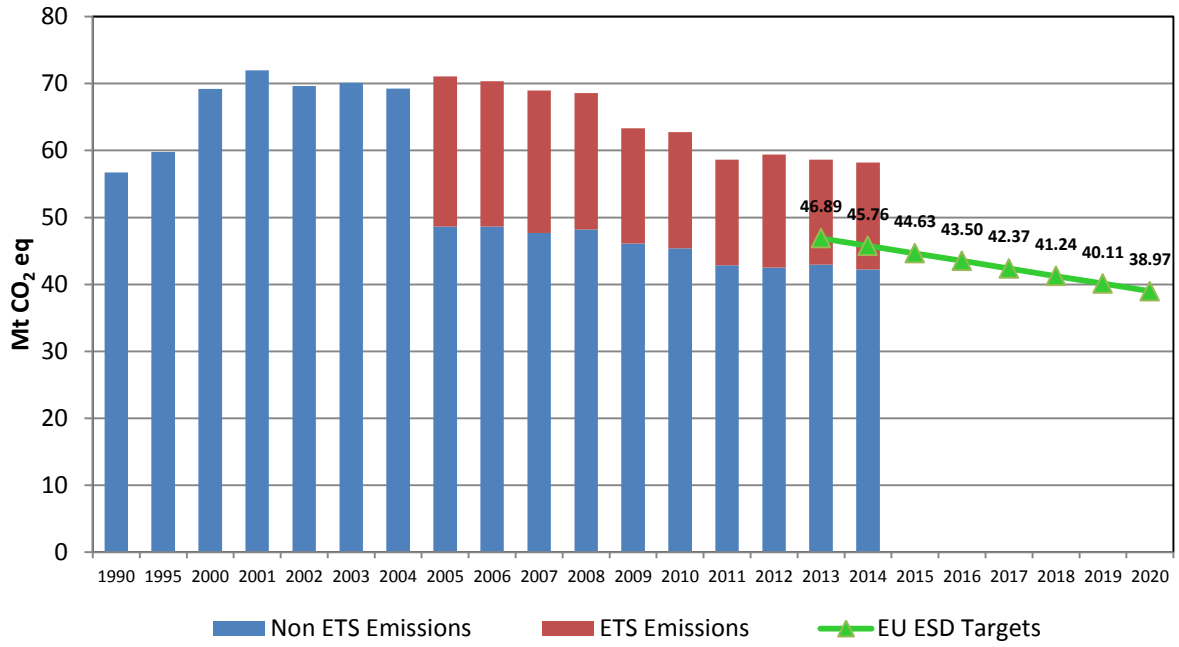


**Figure 5 ESD Targets 2013-2020**

In relation to international commitments, 2014 is also the second year of the second commitment period (CP2) under the UNFCCC Kyoto Protocol, the Doha Amendment. The EU and its Member States along with Iceland have decided to jointly fulfil its commitments (QELRC) under the Doha Amendment as allowed by Article 4 of the Kyoto Protocol. Ireland's compliance with the Doha amendment will be assessed based on the GHG inventory submission in 2022 for 1990-2020 data.

**Notes:**

**Units:** 1 Mt = 1,000 kilotonnes

**$CO_2$ Equivalent:** greenhouse gases other than $CO_2$ (i.e. methane, nitrous oxide and so-called F-gases) may be converted to $CO_2$ equivalent using their global warming potentials.

**F-gases:** These gases comprise HFCs (Hydroflurocarbons), PFCs (Perfluorcarbons), $SF_6$ (Sulphur Hexafluoride) and $NF_3$ (Nitrogen Trifluoride). They are much more potent than the naturally occurring greenhouse gas emissions (carbon dioxide, methane and nitrous oxide).

**National Climate Change Strategy Sectors:** The Government Strategy to combat Climate Change uses the following six sectors for analysis:

1. Energy (electricity generation, oil refining, briquetting manufacture)
2. Residential (combustion for domestic heating)
3. Industry and Commercial (combustion emissions from industrial and commercial activities, industrial process emissions, fluorinated gas emissions, solvent emissions),
4. Agriculture (ruminant digestion, agricultural soils, manure management, gasoil used on farms)
5. Transport (road, rail, navigation, domestic aviation, pipeline gas transport)
6. Waste (solid waste disposal on land, solid waste treatment (composting), wastewater treatment, waste incineration & open burning)

**Table 3. Emissions by National Climate Change Strategy Sectors 1990-2014 (kt $CO_2$ eq)**

| | Energy (A) | Residential (B) | Industry & Commercial (C) | Agriculture (D) | Transport (E) | Waste (F) | Total (A-F) | Carbon Sinks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Article 3.3 (ARD) | Article 3.4 (FM) | |
| 1990 | 11,434.95 | 7,523.67 | 9,574.48 | 20,854.27 | 5,135.48 | 1,645.71 | **56,168.55** | | | |
| 1991 | 11,881.00 | 7,565.94 | 9,437.24 | 20,967.28 | 5,314.71 | 1,739.79 | **56,905.95** | | | |
| 1992 | 12,532.81 | 6,717.81 | 9,030.63 | 21,048.71 | 5,744.79 | 1,814.67 | **56,889.42** | | | |
| 1993 | 12,544.31 | 6,667.04 | 9,255.92 | 21,101.02 | 5,721.60 | 1,874.19 | **57,164.08** | | | |
| 1994 | 12,874.89 | 6,496.58 | 9,975.56 | 21,199.15 | 5,974.94 | 1,929.49 | **58,450.60** | | | |
| 1995 | 13,553.14 | 6,452.05 | 9,888.98 | 21,730.87 | 6,271.71 | 1,975.99 | **59,872.75** | | | |
| 1996 | 14,266.46 | 6,576.67 | 10,008.64 | 21,962.07 | 7,321.99 | 1,866.33 | **62,002.15** | | | |
| 1997 | 14,917.09 | 6,235.93 | 10,905.88 | 22,147.94 | 7,702.13 | 1,608.33 | **63,517.30** | | | |
| 1998 | 15,280.48 | 6,744.75 | 10,749.11 | 22,501.87 | 9,048.16 | 1,678.87 | **66,003.25** | | | |
| 1999 | 15,972.95 | 6,377.88 | 11,191.92 | 22,141.72 | 9,749.22 | 1,708.06 | **67,141.75** | | | |
| 2000 | 16,244.96 | 6,462.60 | 12,866.62 | 21,210.18 | 10,788.98 | 1,751.62 | **69,324.96** | | | |
| 2001 | 17,526.01 | 6,732.30 | 13,017.76 | 20,901.01 | 11,311.99 | 1,904.84 | **71,393.92** | | | |
| 2002 | 16,528.22 | 6,658.64 | 12,071.05 | 20,553.53 | 11,506.56 | 2,053.23 | **69,371.23** | | | |
| 2003 | 16,496.69 | 6,812.59 | 11,700.11 | 20,734.52 | 11,709.93 | 2,159.96 | **69,613.80** | | | |
| 2004 | 15,438.43 | 6,992.51 | 11,733.93 | 20,417.89 | 12,430.28 | 1,919.62 | **68,932.67** | | | |
| 2005 | 15,858.00 | 7,271.95 | 12,213.02 | 20,145.82 | 13,121.30 | 1,786.23 | **70,396.33** | | | |
| 2006 | 15,103.60 | 7,157.48 | 12,051.83 | 19,797.79 | 13,801.50 | 1,882.96 | **69,795.17** | | | |
| 2007 | 14,624.53 | 6,928.50 | 12,238.60 | 19,467.13 | 14,388.11 | 1,436.34 | **69,083.20** | | | |
| 2008 | 14,730.19 | 7,521.57 | 11,855.05 | 19,367.84 | 13,660.86 | 1,315.50 | **68,451.00** | -2,311.59 | | **Kyoto Protocol Commitment Period 1 (CP1)** |
| 2009 | 13,135.50 | 7,467.05 | 9,580.09 | 19,065.74 | 12,440.87 | 1,170.14 | **62,859.38** | -2,733.26 | | |
| 2010 | 13,385.77 | 7,800.97 | 9,341.52 | 19,068.76 | 11,527.32 | 1,174.67 | **62,299.01** | -3,101.00 | | |
| 2011 | 11,972.26 | 6,609.75 | 8,658.41 | 18,451.45 | 11,219.54 | 1,283.25 | **58,194.67** | -3,121.29 | | |
| 2012 | 12,740.01 | 6,232.40 | 8,858.88 | 18,748.04 | 10,836.05 | 1,269.83 | **58,685.21** | -3,207.19 | | |
| 2013 | 11,323.44 | 6,395.37 | 8,822.05 | 19,502.03 | 11,067.51 | 1,436.32 | **58,546.73** | -3,519.11 | -435.55 | **Kyoto Protocol Commitment Period 2 (CP2) and ESD** |
| 2014 | 11,105.21 | 5,746.34 | 9,181.41 | 19,289.62 | 11,346.65 | 1,584.43 | **58,253.67** | -3,480.89 | -256.60 | |
| 2015 | | | | | | | | | | |
| 2016 | | | | | | | | | | |
| 2017 | | | | | | | | | | |
| 2018 | | | | | | | | | | |
| 2019 | | | | | | | | | | |
| 2020 | | | | | | | | | | |

*Article 3.3 activities include emissions/removals from; Afforestation, Reforestation and Deforestation (ARD).*
*Article 3.4 mandatory activities include emissions/removals from; Forest Management (FM).*
*The FM value reported here will be subject to net-net accounting using an agreed Forest Management Reference Level (FMRL) and a technical correction in accordance with Decision 2/CMP.7 at the end of the 2nd Commitment Period in 2022. The likely result of net-net accounting and technical correction is that the FM accounted value at the end of CP2 would be a marginal emission or removal.*