



Department for  
Energy Security  
& Net Zero

# Annual Statement of Emissions for 2021

Reporting UK 2021 emissions to Parliament  
under the Climate Change Act 2008



**Department for Energy Security and Net Zero**

# **Annual Statement of Emissions for 2021**

Presented to Parliament pursuant to section 16 of the Climate Change Act  
2008



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# Introduction

1. The Climate Change Act 2008<sup>1</sup> requires that the Government reports greenhouse gas (GHG) emissions to Parliament annually. This is the fourteenth Annual Statement of Emissions required under section 16 of the Climate Change Act 2008. It confirms emissions for 2021 – the fourth year of the third carbon budget. The statement required by this section must be laid before Parliament not later than 31st March in the second year following that to which it relates.
2. The third carbon budget covers the period 2018-2022, with an emissions cap of 2,544 million tonnes of carbon dioxide equivalent (MtCO<sub>2e</sub>)<sup>2</sup>.
3. GHG emissions reported in Annual Statements of Emissions are based on the latest final UK GHG emissions National Statistics<sup>3</sup>. The National Statistics used to compile this statement show that net UK emissions for the fourth year of the third carbon budget period (2021) were 427 million tonnes of CO<sub>2</sub> equivalent (tCO<sub>2e</sub>), a 48% reduction in net GHG emissions from the base year<sup>4</sup>.
4. The 2021 net UK carbon account was 427 million tCO<sub>2e</sub>. Following the end to the UK's participation in the European Union Emissions Trading System, no units were debited from or credited to the net UK carbon account in 2021.
5. The net UK carbon account for 2021 will be revised and published in subsequent annual statements of emissions. Revisions are made in line with section 16(4) of the Climate Change Act 2008.

## Structure of the report

1. **Part one** of this statement shows the total amount of UK GHGs emitted to and removed from the atmosphere in the base year, 2020, and 2021; the methods used to calculate those figures; and whether there was an increase or a decrease in emissions and removals between 2020 and 2021.
2. **Part two** of this statement sets out the steps taken to calculate the “net UK carbon account” for 2021.

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<sup>1</sup> <http://www.legislation.gov.uk/ukpga/2008/27/contents>.

<sup>2</sup> This is the level of the third carbon budget, as legislated in 2009:

<https://www.legislation.gov.uk/ukxi/2009/1259/contents/made>. The level of the budget was raised to 2,631,930,284 tCO<sub>2e</sub>, through the decision to carry forward 87,930,284 tCO<sub>2e</sub> of over-achievement from the second carbon budget period, as set out at: <https://www.theccc.org.uk/publication/letter-carry-forward-of-surplus-emissions-lord-deben-to-chris-skidmore-mp/>.

<sup>3</sup> The final 2021 estimates of UK greenhouse gas emissions were published on 7 February 2023:

<https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2021>

<sup>4</sup> The base year varies by greenhouse gas (1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O; 1995 for Fluorinated gases):

<http://www.legislation.gov.uk/ukpga/2008/27/part/1/crossheading/targeted-greenhouse-gases>

## Explaining the net UK carbon account

1. Section 27 of the Climate Change Act defines the “net UK carbon account”. This is what we compare against carbon budgets to determine whether we are meeting them. The net UK carbon account for the relevant budgetary period must not exceed the level of the carbon budget at the end of each budgetary period. The process for determining the net UK carbon account in each year is summarised in Figure 1.
2. The starting point is UK emissions for the year, comprising emissions from all sources in the UK, excluding those from land use, land use change and forestry (LULUCF). These are then adjusted to take account of emissions and removals by sources and sinks associated with LULUCF activity. The new total is referred to as net UK emissions. Data are sourced from the annual National Statistics on territorial UK GHG emissions<sup>5</sup>.
3. Section 27 of the Climate Change Act 2008 makes provision for regulations to be made in relation to the crediting to or debiting from the net UK carbon account of specified carbon units. In previous years, when the UK was participating in the European Union Emissions Trading System (“EU ETS”), the net UK carbon account was adjusted to reflect net trading of emissions allowances. As of 2021, the UK was no longer participating in the EU ETS and no other adjustments were required for carbon unit trading. As such, the 2021 net UK carbon account reported in this Annual Statement of Emissions is equal to 2021 UK net territorial GHG emissions, pursuant to sections 29(2) and 89 of the Act.
4. The Climate Change (Targeted Greenhouse Gases) Order 2023<sup>6</sup>, made on 2<sup>nd</sup> February 2023, extends the scope of emissions captured and reported under the Climate Change Act 2008 by including nitrogen trifluoride (“NF3”) as a targeted greenhouse gas. This means that NF3 emissions are included within the scope of emissions in this Statement, and will be included in the full accounting period for the UK’s Third and for subsequent carbon budgets.

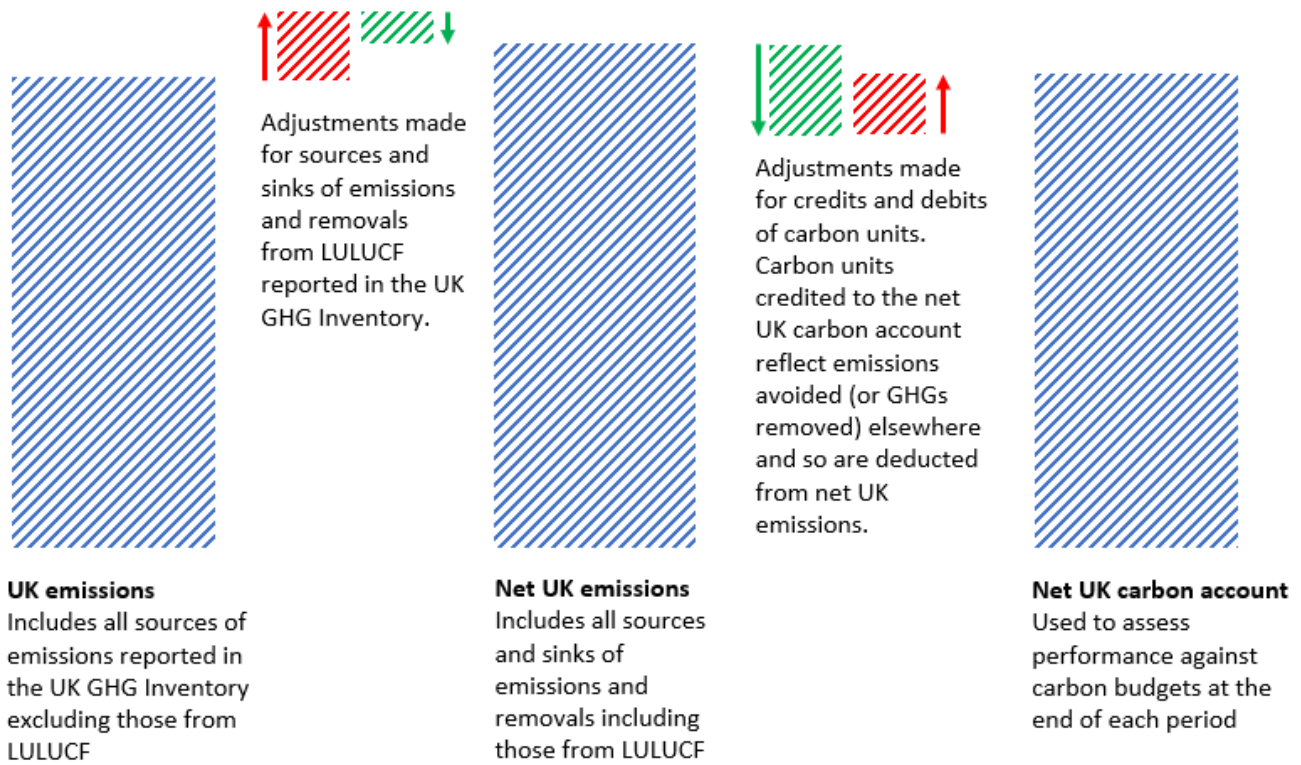
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<sup>5</sup> The final 2021 estimates of UK greenhouse gas emissions were published on 7 February 2023: <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2021>

<sup>6</sup> The Climate Change (Targeted Greenhouse Gases) Order 2023, <https://www.legislation.gov.uk/ukSI/2023/118/contents/made>



**Figure 1: The net UK carbon account (illustrative only)**



Note – LULUCF includes both emissions and removals and so can be a net source or sink of GHGs, depending on a variety of factors, including the age profile of UK forests. A negative value means the net effect is the removal of GHGs from the atmosphere, whereas a positive value means the net effect is the addition of GHGs to the atmosphere. Since 2021, the UK GHG Inventory has included updated estimates for peatlands emissions in accordance with international guidelines. This resulted in LULUCF becoming a net source of emissions across the time series (from 1990 to latest estimates) where it was previously reported as a net sink.

# Part 1 – UK greenhouse gas emissions

1. The information contained in this part of the statement is derived from the UK 1990-2021 GHG emissions statistics<sup>7</sup>, which were published on 7<sup>th</sup> February 2023. Emissions coverage under the Climate Change Act 2008 comprises UK territory only (i.e. England, Wales, Scotland and Northern Ireland)<sup>8</sup>. Unless otherwise stated, all figures in this section are stated in tonnes of carbon dioxide equivalent (tCO<sub>2e</sub>)<sup>9</sup>.

## 1.1 Base year, 2020, and 2021 GHG emissions by gas

*Section 16(2)(a), 16(2)(c), 16(3) and 16(8) of the Climate Change Act*

2. Table 1 below sets out the base year<sup>10</sup> emissions – the emissions in the year against which progress is measured – for each GHG covered by the Climate Change Act. The table also sets out the total UK emissions for 2021, and whether any of those amounts represent an increase or decrease compared to the equivalent amount for the previous year. Emissions are grouped into:
  - a) emissions (excluding LULUCF)
  - b) net LULUCF emissions/removals
  - c) net emissions/removals (including net LULUCF)

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<sup>7</sup> The final 2021 estimates of UK greenhouse gas emissions were published on 7 February 2023: <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2021>

<sup>8</sup> Section 89 of the Climate Change Act specifies that this includes UK coastal waters and the UK sector of the continental shelf. <http://www.legislation.gov.uk/ukpga/2008/27/section/89>

<sup>9</sup> This is the usual way of reporting greenhouse gases to account for the different global warming potentials of each gas. The global warming potential (GWP) of a gas is a measure of its impact on global warming relative to carbon dioxide. The GWPs used for each gas in the UK inventory in this publication are based on those published in the Intergovernmental Panel on Climate Change's (IPCC's) 5<sup>th</sup> Assessment report: <https://www.ipcc.ch/assessment-report/ar5/>

<sup>10</sup> The base year varies by greenhouse gas (1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O; 1995 for Fluorinated gases) <http://www.legislation.gov.uk/ukpga/2008/27/part/1/crossheading/targeted-greenhouse-gases>

<b>Table 1: UK GHG emissions/removals by gas (tCO<sub>2</sub>e)</b>					
<b>Emissions</b>	<b>Greenhouse gas</b>	<b>Base year</b>	<b>2020</b>	<b>2021</b>	<b>2020 to 2021 change</b>
Emissions (excluding net LULUCF emissions/removals)	Carbon dioxide (CO <sub>2</sub> )	600,426,353	324,354,998	345,432,847	21,077,849
	Methane (CH <sub>4</sub> )	144,748,280	51,843,265	51,307,139	-536,126
	Nitrous oxide (N <sub>2</sub> O)	42,343,366	17,313,450	17,774,495	461,045
	Hydrofluorocarbons (HFC)	15,614,310	11,031,307	10,297,337	-733,970
	Perfluorocarbons (PFC)	533,270	151,135	192,878	41,742
	Sulphur hexafluoride (SF <sub>6</sub> )	1,290,867	420,267	421,818	1,551
	Nitrogen trifluoride (NF <sub>3</sub> )	256	338	338	0
	<b>Total</b>		<b>804,956,703</b>	<b>405,114,759</b>	<b>425,426,851</b>
Net LULUCF emissions/removals	Carbon dioxide (CO <sub>2</sub> )	3,607,499	-5,808,482	-5,892,815	-84,332
	Methane (CH <sub>4</sub> )	5,569,087	5,691,370	5,692,033	664
	Nitrous oxide (N <sub>2</sub> O)	1,906,895	1,294,527	1,283,927	-10,600
	Hydrofluorocarbons (HFC)	0	0	0	0
	Perfluorocarbons (PFC)	0	0	0	0
	Sulphur hexafluoride (SF <sub>6</sub> )	0	0	0	0
	Nitrogen trifluoride (NF <sub>3</sub> )	0	0	0	0
	<b>Total</b>		<b>11,083,481</b>	<b>1,177,414</b>	<b>1,083,146</b>
Net emissions (including net LULUCF emissions/removals)	Carbon dioxide (CO <sub>2</sub> )	604,033,852	318,546,516	339,540,032	20,993,517
	Methane (CH <sub>4</sub> )	150,317,368	57,534,635	56,999,172	-535,462
	Nitrous oxide (N <sub>2</sub> O)	44,250,260	18,607,976	19,058,422	450,446
	Hydrofluorocarbons (HFC)	15,614,310	11,031,307	10,297,337	-733,970
	Perfluorocarbons (PFC)	533,270	151,135	192,878	41,742
	Sulphur hexafluoride (SF <sub>6</sub> )	1,290,867	420,267	421,818	1,551
	Nitrogen trifluoride (NF <sub>3</sub> )	256	338	338	0
	<b>Total</b>		<b>816,040,183</b>	<b>406,292,173</b>	<b>426,509,996</b>

Note - A negative value in 2020 and 2021 means the net effect is the removal of GHGs from the atmosphere, whereas a positive value means the net effect is the addition of GHGs to the atmosphere.

## 1.2 Method used to calculate GHG emissions and removals

### *Section 16(2)(b) and 16(4) of the Climate Change Act*

- The UK GHG inventory is compiled in line with international guidance from the Intergovernmental Panel on Climate Change<sup>11</sup> (IPCC). Each year the inventory is updated to include the latest data available. Methodological changes are made to take account of new data sources, or new guidance from the IPCC, and new research, sponsored by BEIS or otherwise. Improvements to the methodology are backdated as required under the Climate Change Act. The United Kingdom's National Inventory

<sup>11</sup> Further detail on IPCC guidance is available from: <https://www.ipcc-nggip.iges.or.jp>

Report<sup>12</sup> (NIR), which is submitted each year to the United Nations Framework Convention on Climate Change (UNFCCC), provides details of the methods used to estimate emissions.

2. Emission inventories will always have some uncertainty. It is not possible to measure directly all the emissions from a country, so inventories are largely based on statistical activity data as well as on emission factors<sup>13</sup>, both of which are subject to uncertainty. The UK Greenhouse Gas Inventory assesses uncertainties according to internationally agreed good practice guidance<sup>14</sup>, and this uncertainty information helps prioritise efforts to improve the accuracy of inventories in the future and guide decisions on methodological choice. The uncertainty analysis provides us with a high confidence that UK emissions of GHGs have declined since 1990. The uncertainty associated with estimates of emissions is small at approximately 3% based on 2020 emissions data published in 2022.
3. To ensure transparency and credibility in carbon budgets reporting, it is important that any changes to GHG reporting – made in accordance with international practice – are clearly stated. Section 16(4) of the Climate Change Act requires that, where adjustments in the emissions figures for an earlier year in the same budgetary period are required as a result of changes to international carbon reporting practice, the Annual Statement of Emissions must specify the adjustment required and state the adjusted amount.
4. Greenhouse gas emissions reported in this publication are expressed in terms of carbon dioxide equivalent (CO<sub>2</sub>e), recognising the different global warming potentials (GWP) of each gas. GWPs are set out by the IPCC in Assessment Reports (AR) and are updated on a regular basis. Figures contained within this Annual Statement of Emissions use 100-year GWPs (without climate-carbon feedback) as set out in the fifth assessment report of the IPCC (AR5), consistent with the agreement reached in November 2021 at COP26 on Paris Agreement transparency framework reporting. Emissions data in this publication, both historic and the most recent year, use 100-year AR5 GWPs.
5. Detailed information on the impact of methodology changes on GHG emissions estimates is published annually with the latest covering the 1990-2021 UK GHG Inventory<sup>15</sup>. A summary of total adjustments made to emissions figures reported in the Annual Statement of Emissions 2020 can be found in Annex A.

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<sup>12</sup> The NIR is accessible from the UNFCCC website: <https://unfccc.int/ghg-inventories-annex-i-parties/2022>. The NIR covering methodologies used to estimate 1990-2021 GHG emissions will be published in April 2023. Alternatively, further details on how the UK's greenhouse gas inventory is compiled can be accessed from: <https://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics>.

<sup>13</sup> The emissions factor is the emissions per unit of activity. Emission factors are typically derived from measurements of a number of representative sources and the resulting factor applied to all similar sources in the UK.

<sup>14</sup> Intergovernmental Panel on Climate Change guidelines, as adopted by the UNFCCC.

<sup>15</sup> The final 2021 estimates of UK greenhouse gas emissions were published on 7 February 2023: <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2021>

## 1.3 International aviation and international shipping

### Section 16(5) of the Climate Change Act

1. Emissions from international aviation and international shipping are not included in the UK's emissions as reported under section 16(2) of the Climate Change Act 2008.
2. In June 2021, the UK government set the Sixth Carbon Budget (covering 2033-37) to include the UK's share of international aviation and shipping emissions, as recommended by the Climate Change Committee. This will be the first-time emissions from international aviation and shipping will be included in the UK's domestic carbon budget targets.
3. Until then, international aviation and international shipping emissions are reported under section 16(5) of the Climate Change Act 2008 and appear as memo items in the UK GHG inventory.
4. Emissions from international aviation and international shipping can be estimated from refuelling from bunkers at UK airports and ports, whether by UK or non-UK operators. Table 2 below shows GHG emissions from these sources in the base year, 2020 and 2021.
5. Table 2 shows GHG emissions from international aviation and international shipping totalled 20 million tCO<sub>2</sub>e in 2021.

<b>Emissions</b>	<b>Greenhouse gas</b>	<b>Base year</b>	<b>2020</b>	<b>2021</b>	<b>2020 to 2021 change</b>
International aviation	Carbon dioxide (CO <sub>2</sub> )	15,375,091	14,689,720	13,192,882	-1,496,838
	Methane (CH <sub>4</sub> )	9,290	1,214	1,086	-127
	Nitrous oxide (N <sub>2</sub> O)	129,343	123,577	110,983	-12,594
	<b>Total</b>	<b>15,513,724</b>	<b>14,814,511</b>	<b>13,304,952</b>	<b>-1,509,559</b>
International shipping	Carbon dioxide (CO <sub>2</sub> )	8,029,513	5,970,473	6,146,508	176,035
	Methane (CH <sub>4</sub> )	3,297	2,086	2,174	89
	Nitrous oxide (N <sub>2</sub> O)	100,422	72,393	74,564	2,171
	<b>Total</b>	<b>8,133,233</b>	<b>6,044,952</b>	<b>6,223,246</b>	<b>178,294</b>
International aviation and shipping	Carbon dioxide (CO <sub>2</sub> )	23,404,604	20,660,193	19,339,390	-1,320,803
	Methane (CH <sub>4</sub> )	12,587	3,299	3,260	-39
	Nitrous oxide (N <sub>2</sub> O)	229,765	195,970	185,547	-10,423
	<b>Total</b>	<b>23,646,956</b>	<b>20,859,463</b>	<b>19,528,198</b>	<b>-1,331,265</b>

## Part 2 – the net UK carbon account

1. Section 27 of the Climate Change Act 2008 makes provision for regulations to be made in relation to the crediting to or debiting from the net UK carbon account of specified carbon units. Prior to 2021, when the UK was participating in the European Union Emissions Trading System (“EU ETS”), the net UK carbon account was adjusted to reflect net trading of emissions allowances. As of 2021, the UK is no longer participating in the EU ETS and no other adjustments were required for carbon unit trading. As such, the 2021 net UK carbon account reported in this Annual Statement of Emissions is equal to 2021 UK net territorial GHG emissions, pursuant to sections 29(2) and 89 of the Act.

### 2.1 Total amount of units credited to and debited from the net UK carbon account

#### *Section 16(6) of the Climate Change Act*

1. In respect of 2021, no carbon units were credited to or debited from the net UK carbon account. Emissions are reported on a territorial basis without adjustments for trading, pursuant to Climate Change Act 2008 sections 29(2) and 89.

## 2.2 Net UK carbon account for the year

### *Section 16(7) of the Climate Change Act*

- The net UK carbon account is calculated by taking net UK emissions and adjusting them to account for units debited from and credited to the net UK carbon account. Table 3 shows the net UK carbon account in 2021 is 427 million tCO<sub>2e</sub>.

<b>Table 3: Calculating the Net UK Carbon Account (tCO<sub>2e</sub>)</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Net emission (including net LULUCF emissions)	464,807,552	450,435,177	406,292,173	426,509,996
Amount of units to be credited/debited from EU ETS stationary installations	24,310,361	-14,088,081	-1,074,996	N/A
Amount of units to be credited/debited from EU ETS domestic aviation accounting	417,568	490,529.0	1,300,592	N/A
<b>Net UK Carbon Account</b>	<b>489,535,481</b>	<b>436,837,625</b>	<b>406,517,769</b>	<b>426,509,996</b>

Note: Prior to 2021, the net UK carbon account for a given year was calculated by taking net UK emissions for that year, with an adjustment made to reflect net trading of EU ETS emissions allowances (i.e. the number of units to be credited to, and debited from, the net UK carbon account for that year). Carbon units that were counted as credits reduced the level of the net UK carbon account, while carbon units that were counted as debits increased the level of the net UK carbon account. See Annual Statement of Emissions 2020 for more details on the methodology.

# Annex A

Summary of total adjustments made to 2018, 2019 and 2020 emissions estimates and net UK carbon account figures reported in the Annual Statement of Emissions (ASE) 2020.

Table 4: adjustments to 2018, 2019 and 2020 emissions estimates and net UK carbon account calculations published in Annual Statement of Emissions 2020		2018	2019	2020
ASE 2020	Emissions (excluding net LULUCF emissions)	459,820,871	443,856,749	401,853,912
	Net LULUCF emissions	3,642,004	4,020,327	3,659,297
	Net emissions (including net LULUCF emissions)	463,462,875	447,877,076	405,513,209
	Units to be credited/debited from EU ETS stationary installations	24,310,361	-14,088,081	-1,074,996
	Units to be credited/debited from EU ETS domestic aviation accounting	439,210	509,999	1,335,988
	<b>Net UK Carbon Account</b>	<b>488,212,446</b>	<b>434,298,994</b>	<b>405,774,201</b>
ASE 2021	Emissions (excluding net LULUCF emissions)	463,381,745	448,686,464	405,114,759
	Net LULUCF emissions	1,425,807	1,748,713	1,177,414
	Net emissions (including net LULUCF emissions)	464,807,552	450,435,177	406,292,173
	Units to be credited/debited from EU ETS stationary installations	24,310,361	-14,088,081	-1,074,996
	Units to be credited/debited from EU ETS domestic aviation accounting	417,568	490,529	1,300,592
	<b>Net UK Carbon Account</b>	<b>489,535,481</b>	<b>436,837,625</b>	<b>406,517,769</b>
Difference	Emissions (excluding net LULUCF emissions)	3,560,874	4,829,715	3,260,848
	Net LULUCF emissions	-2,216,197	-2,271,614	-2,481,883
	Net emissions (including net LULUCF emissions)	1,344,677	2,558,102	778,964
	Units to be credited/debited from EU ETS stationary installations	0	0	0
	Units to be credited/debited from EU ETS domestic aviation accounting	-21,642	-19,470	-35,396
	<b>Net UK Carbon Account</b>	<b>1,323,035</b>	<b>2,538,631</b>	<b>743,568</b>

Note – in accordance with carbon accounting regulations relevant to 2018, 2019 and 2020<sup>16</sup>, there have been some minor revisions to the units credited/debited from EU ETS domestic aviation due to updated data

<sup>16</sup> requirements set out in the Carbon Accounting Regulations 2009, the Carbon Accounting (Provision for 2018) Regulations 2020, the Carbon Accounting (Provision for 2019) Regulations 2021, and the Carbon Accounting (Provision for 2020) Regulations 2022 when calculating the net UK carbon account from 2018-2020.



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