

Article

# Greenhouse gas emissions and other environment measures, UK and European countries: 2020

How the UK ranks with EU14 countries on greenhouse gas emissions, specifically CO<sub>2</sub> and fossil fuel extraction and import, and environmental tax revenue collected in the UK compared with EU14 nations.

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# 1 . Main points

- The UK is the second highest overall emitter of both greenhouse gas (GHGs) and carbon dioxide (CO<sub>2</sub>), a key GHG, compared with EU14 countries, after Germany.
- Adjusted for population size, Luxembourg is the highest overall emitter of GHG and CO<sub>2</sub> among the EU14, with the UK emitting around the same as Italy, which is the tenth-highest emitter among the EU14.
- Over the last decade, carbon dioxide emissions have declined in both the UK and the five highest emitters among EU14 countries.
- Germany is the largest extractor of fossil fuels in the EU14, both in total and on a population-adjusted basis.
- The Netherlands imported the most fossil fuels in 2020 on a per head basis among the EU14, while the UK imported less than any EU14 country.
- Environmental tax revenue as a proportion of gross domestic product (GDP) was around 2.5% in the UK, Italy, France and the Netherlands in 2020.

## Comparability

The [UK Environmental Accounts](#) records flows of gaseous and particulate materials emitted into the atmosphere as a result of economic activity from the UK. This covers seven climate change-contributing greenhouse gases, including carbon dioxide (CO<sub>2</sub>), and seven air pollutants. Eurostat, the European statistical agency, records environment accounts for EU member states.

These air emissions accounts are part of the [Environmental-Economic Accounts](#). These provide detailed breakdowns for emitting industries as well as households, as defined in the [national accounts](#) of the UK and EU member states.

These are aligned with each country's economic statistics, such as gross domestic product (GDP). This makes them particularly useful for integrated environmental-economic analyses and modelling, for example measuring emissions by industry and climate-change modelling scenarios.

Eurostat collect the accounts from every EU member state as part of its regulations (see Annex I of [Regulation 691/2011](#)). Prior to the UK's exit from the EU, the UK regularly updated Eurostat with its environmental-economic accounts data. While the UK no longer provide such updates, the UK continues to adhere to standards that had been set by Eurostat, enabling comparison with EU countries.

[EU15](#) was a group of EU member states as of April 2004. Following the UK's departure from the EU, this article compares the UK with the EU14 countries.

All greenhouse gas (GHG) emissions figures in this article are on a [residence basis](#).

## 2 . Greenhouse gases

Greenhouse gas emissions (GHG) on a [residence basis](#) is provided up to the year 2020, covering the first part of the COVID-19 pandemic.

In 2020, total GHG emissions on a residence basis across the EU14 and UK combined were approximately 3,109 million tonnes of carbon dioxide equivalent (Mt Co2e). This is a 9% fall compared with 2019, the biggest single-year decrease since 1990, likely due to the coronavirus (COVID-19) pandemic and subsequent restrictions. However, this does continue a general downward trend of emissions from this group of countries since 1990, when these statistics began.

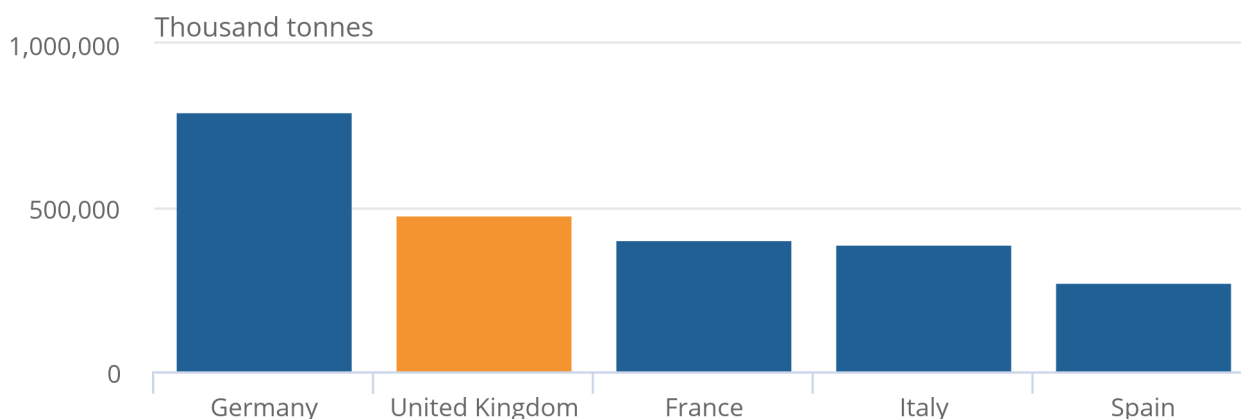
Germany is the largest emitter of GHGs in this group of countries, with almost 795 Mt CO2e. With 478 Mt Co2e total emissions, the UK emits more than each of the other EU14 countries, 317 Mt Co2e less than Germany.

**Figure 1: Germany, the largest emitter of greenhouse gases, emits almost double that of the UK**

Highest greenhouse gas emitters (residence basis), UK and EU14, 2020

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Highest greenhouse gas emitters (residence basis), UK and EU14, 2020



Source: Ricardo Energy and Environment, Office for National Statistics – UK Environmental Accounts, Eurostat

**Notes:**

1. Greenhouse gases under the Kyoto Protocol: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>).

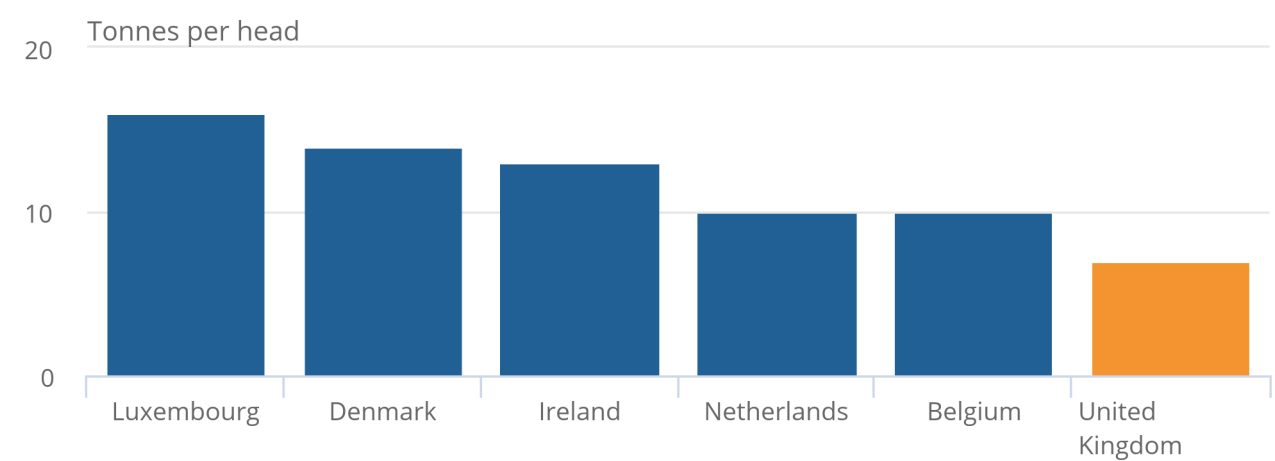
Adjusting for population size, the UK emits around the same level of GHG emissions (7.1 tonnes per head) as Italy, which is the 10th largest emitter among EU14 countries. Luxembourg has the highest GHG emissions per head at 15.8 tonnes per head. Germany, the largest single total GHG emitter, ranks sixth among the EU14 countries, with 9.5 tonnes per head. The other largest total emitters – France, Italy and Spain – emit less on a per head basis than most EU14 countries.

**Figure 2: Adjusted for population size, Luxembourg has the highest per head greenhouse gas emission, closely followed by Denmark and Ireland**

Top greenhouse gas emitters per head, UK and EU14, 2020

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### 3 . Carbon dioxide emissions

Total EU14 and UK carbon dioxide (CO<sub>2</sub>) emissions, on [a residence basis](#), for 2020 were estimated to be 2,540 million tonnes of carbon dioxide (Mt CO<sub>2</sub>e). This is a 11% fall compared with 2019, likely related to the coronavirus (COVID-19) pandemic and related restrictions. CO<sub>2</sub> accounts for around 80% of total greenhouse gas (GHG) emissions within the EU14 and UK, a share that has declined slightly since 2010.

On total CO<sub>2</sub> emissions, the UK emits around twice the average of the EU14 countries combined. The UK's CO<sub>2</sub> emissions have declined steadily since 2010.

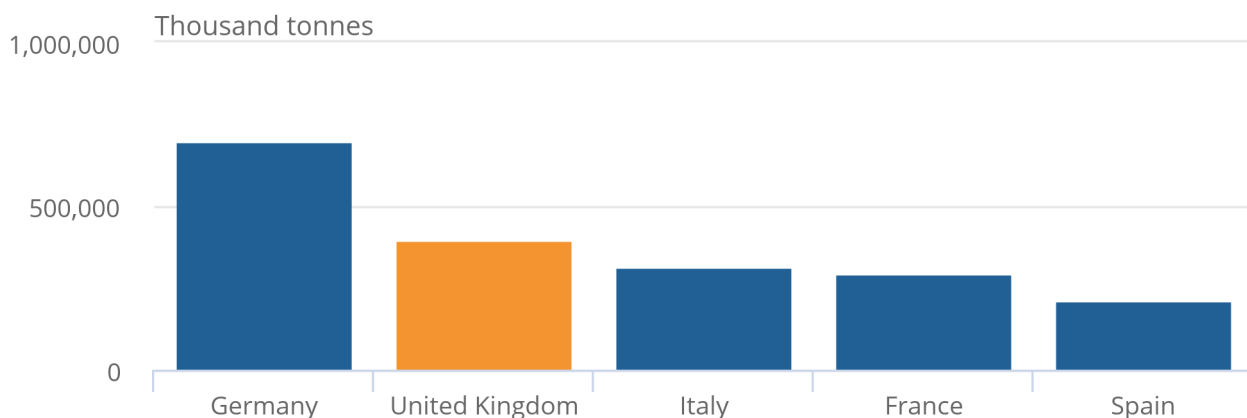
As well as being the largest single GHG emitters, Germany emits the most CO<sub>2</sub> in the EU14 in 2020, with around 700 MtCo<sub>2</sub>. The UK emits around 400Mt of CO<sub>2</sub>, more than each of the other EU14 countries, but 300 Mt CO<sub>2</sub> less than Germany.

**Figure 3: The UK emits around 400 megatonnes of CO<sub>2</sub>, more than each of the other EU14 countries, but 300 megatonnes of CO<sub>2</sub> less than Germany**

CO<sub>2</sub> emissions (residence basis), UK and EU14

Figure 3: The UK emits around 400 megatonnes of CO<sub>2</sub>, more than each of the other EU14 countries, but 300 megatonnes of CO<sub>2</sub> less than Germany

CO<sub>2</sub> emissions (residence basis), UK and EU14



Source: Ricardo Energy and Environment, Office for National Statistics – UK Environmental Accounts, Eurostat

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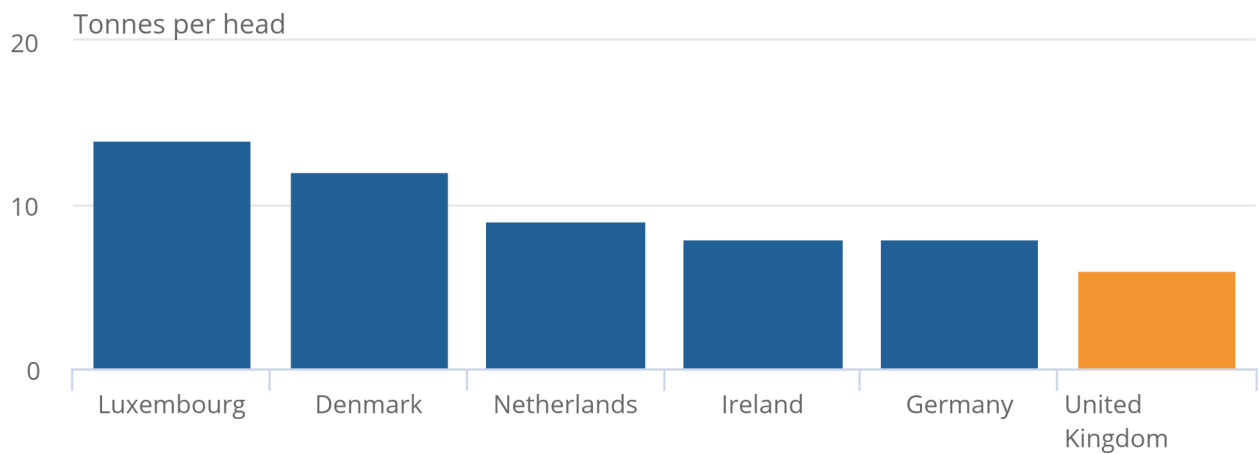
While the largest CO<sub>2</sub> emitter, on a per head basis Germany is the fifth-largest emitter among the EU14, with 8.4 tonnes of CO<sub>2</sub> per head. Luxembourg emits around 14.3 tonnes of CO<sub>2</sub> per head, more than any other EU14 nation. With per head CO<sub>2</sub> emissions of just under 6 tonnes in 2020, the UK emits less than Germany but more than Italy, France and Spain.

**Figure 4: While the largest CO2 emitter, on a per head basis, Germany is the fifth-largest emitter among the EU14, with 8.4 tonnes of CO2 per head**

Top CO2 contributors per head, 2020

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Top CO2 contributors per head, 2020



Source: Ricardo Energy and Environment, Office for National Statistics – UK Environmental Accounts, Eurostat

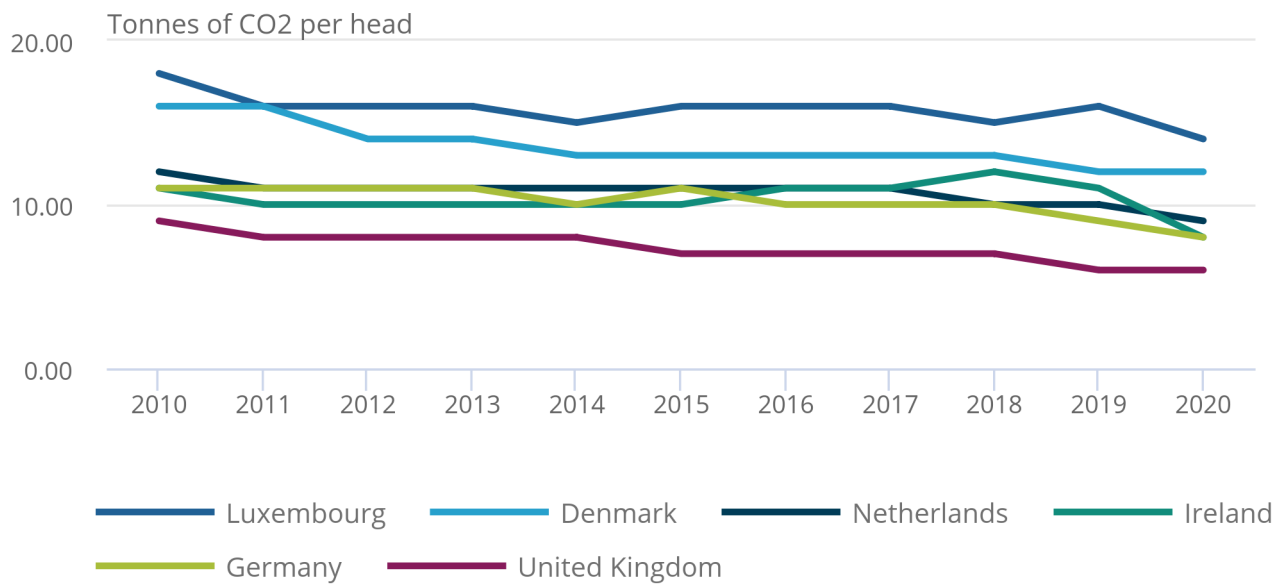
In the last decade, CO2 emission has declined across the top ranking EU14 countries and the UK. The dips seen between 2019 and 2020 are likely due to the COVID-19 pandemic and subsequent restrictions.

Figure 5: CO2 emissions have declined in the UK and across the top-emitting EU14 countries since 2010

CO2 emission per head since 2010

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CO2 emission per head since 2010



Source: Ricardo Energy and Environment, Office for National Statistics – UK Environmental Accounts, Eurostat

## 4 . Material flows

All materials extracted from nature and used in the UK are recorded in the material flow accounts. These show the physical exchange processes for a country between economy, society, and nature.

There are four key flows of materials: biomass, metals, non-metal minerals and fossil fuels. The material flow accounts also include imports and exports of raw materials and the goods made from them.

In 2020, over 170,000 metric tonnes of fossil fuels were extracted in the EU14. In comparison, the UK extracted around 87,000 metric tonnes of fossil fuels. Only Germany extracted more than the UK in 2020, making it the largest overall fossil fuel extractor among EU14 countries.

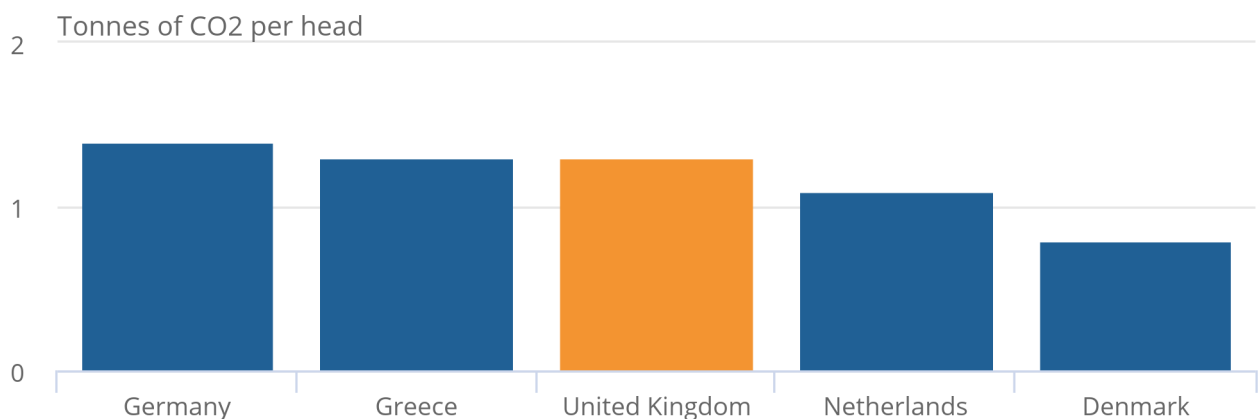
Adjusting for population size, the UK extracted 1.3 tonnes of carbon dioxide (CO2) equivalent per head in 2020. This is slightly lower than Greece (1.32) and higher than the Netherlands (1.13).

**Figure 6: The UK extracted 1.3 tonnes of CO2 equivalent per head in 2020 - slightly lower than Greece and higher than the Netherlands**

Per head fossil fuel extraction in the UK compared with top countries in EU14, 2020

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Per head fossil fuel extraction in the UK compared with top countries in EU14, 2020



Source: Ricardo Energy and Environment, Office for National Statistics – UK Environmental Accounts, Eurostat

Total and per head fossil fuel extraction across the UK and EU14 combined has declined since 2010. Greece, the largest per head fossil fuel extractor in the EU14, also has seen the steepest decline in this group on this measure since 2010, followed by the Netherlands.

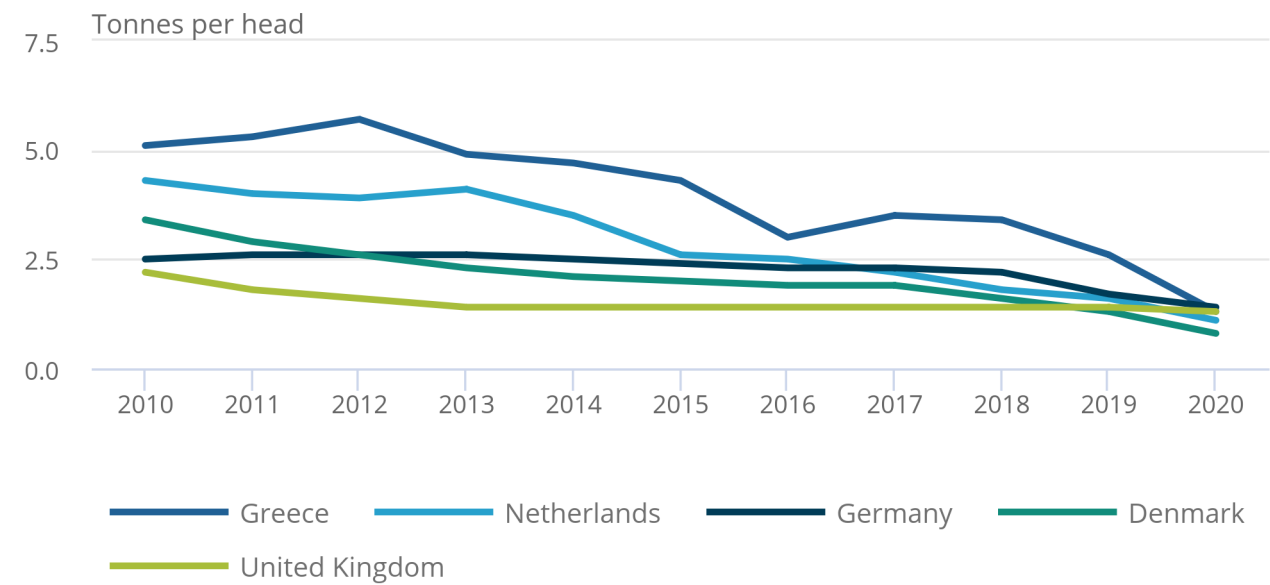


Figure 7: Fossil fuel extraction per head, UK and top countries in EU14, 2010 to 2020

Top five countries for domestic extraction – UK and EU14, 2020

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Top five countries for domestic extraction – UK and EU14, 2020



Source: Ricardo Energy and Environment, Office for National Statistics – UK Environmental Accounts, Eurostat

In addition to domestic extraction, countries also import fossil fuels.

The UK imported a total of 120,000 metric tonnes of fossil fuel in 2020, similar to Italy and France.

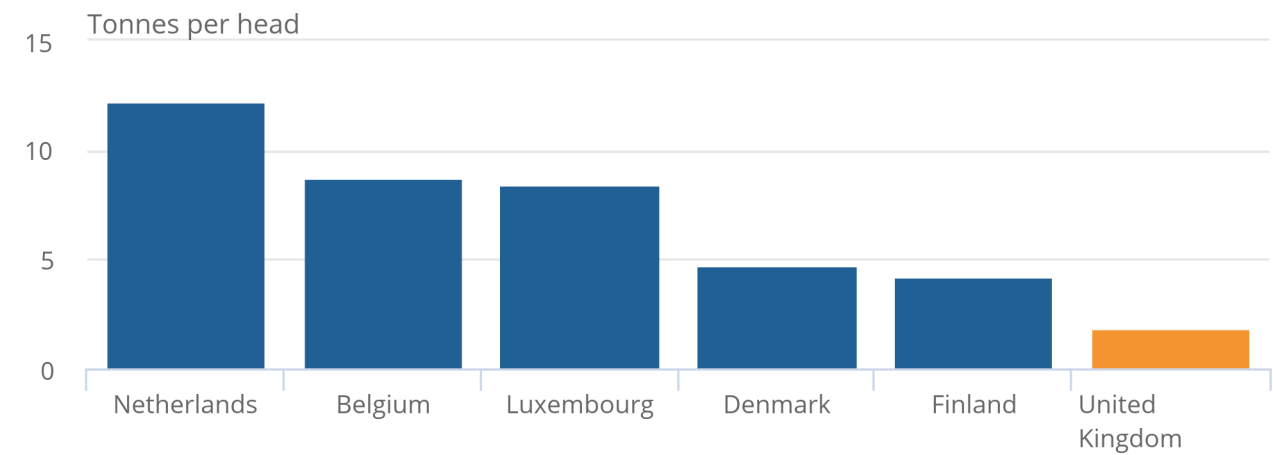
Adjusting for population size, the UK had the lowest imports of fossil fuels per head. The Netherlands, Belgium, Luxembourg, Denmark and Finland were the five highest importers of fossil fuels among EU14 countries in 2020.

**Figure 8: Adjusting for population size, the UK had the lowest imports of fossil fuels per head**

Top fossil fuel importers in EU14, 2020

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Top fossil fuel importers in EU14, 2020



Source: Ricardo Energy and Environment, Office for National Statistics – UK Environmental Accounts, Eurostat

## 5 . Environmental tax revenues

An environmental tax is one that has a proven negative impact on the environment, with a physical unit, for example, a litre of petrol or a passenger flight. Such taxes can help promote reduce environmental impacts. This definition is from the UN [System of Environmental-Economic Accounting \(SEEA\)](#). The Organisation for Economic Co-operation and Development (OECD) and Eurostat also use this definition.

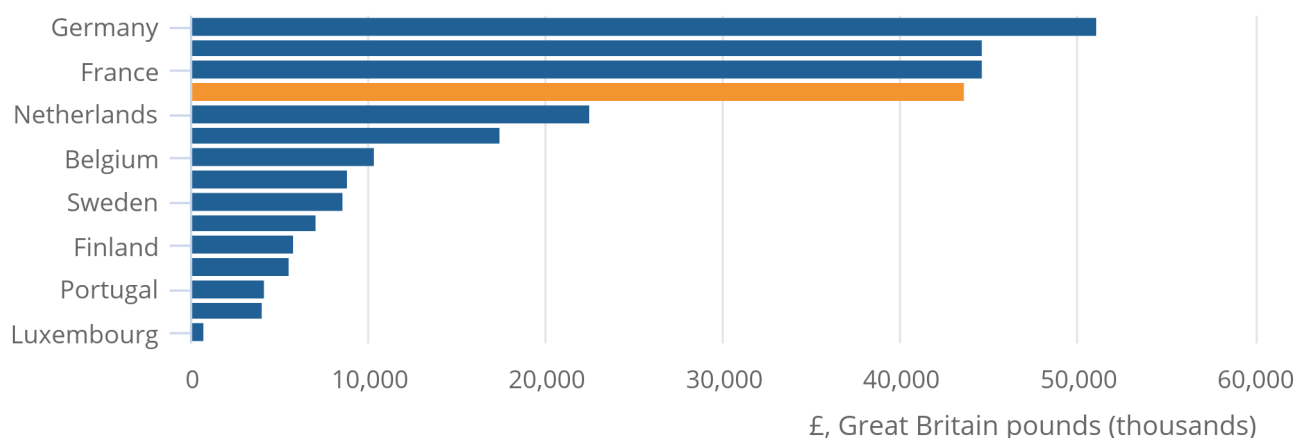
The UK raised over £43 billion of revenue from environmental taxes in 2020. This was similar to the total revenue raised by France (£44.64 billion) and Italy (£44.65 billion), less than Germany (£51 billion), but considerably more than the others EU14 countries.

**Figure 9: The UK raised over £43 billion of revenue from environmental taxes in 2020 - similar to the total revenue raised by France and Italy**

Environmental tax revenue, UK and EU14, 2020

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Environmental tax revenue, UK and EU14, 2020



Source: Office for National Statistics – UK Environmental Accounts, Eurostat

Adjusting for respective gross domestic product (GDP), the UK, Italy, France and the Netherlands all have similar total environmental tax revenue of around 2.5% of GDP.

The revenue raised by France and the UK has been stable since 2002. Germany, which collected the most total revenue from environmental taxes among these countries, has seen this decline as a proportion of GDP to around 1.7% by 2020.

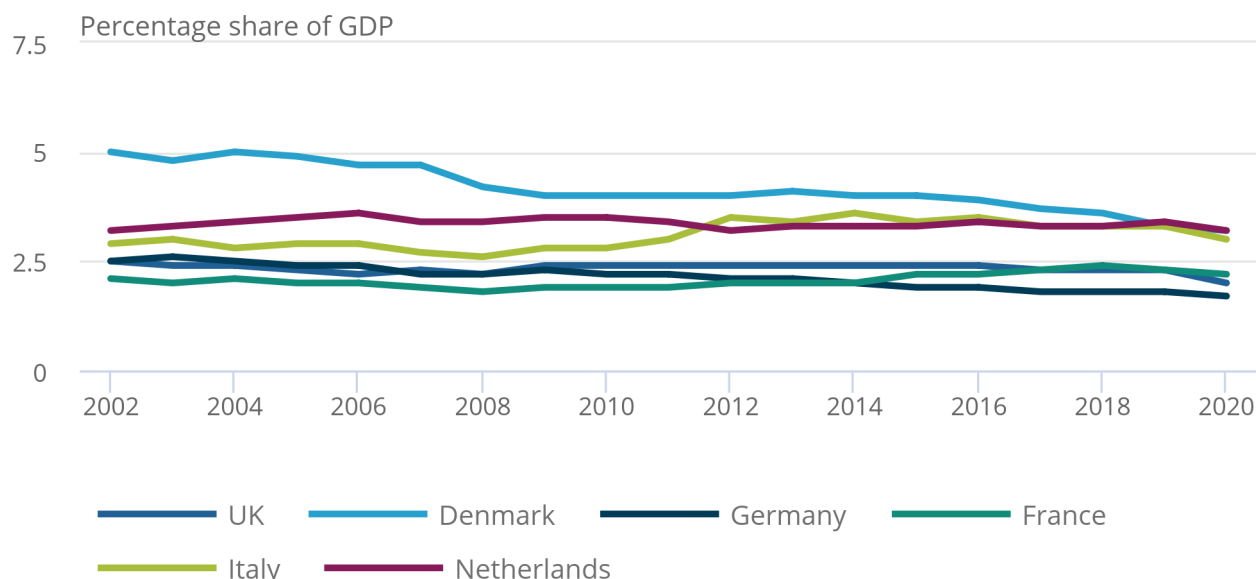
Italy's environmental tax revenue as a proportion of GDP increased since 2002, reaching 3.6% in 2014. Denmark and the Netherlands has the highest environmental tax revenue as share of GDP on average between 2002 to 2020, while Denmark's has decreased by 1.8 percentage points over this period.

**Figure 10: Adjusting for respective gross domestic product (GDP), the UK, Italy, France and the Netherlands all have similar total environmental tax revenue of around 2.5% of GDP**

Environmental tax revenue as a percentage of gross domestic product, UK and EU14, 2002 to 2020

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Environmental tax revenue as a percentage of gross domestic product, UK and EU14, 2002 to 2020



Source: Office for National Statistics – UK Environmental Accounts, Eurostat

## 6 . Data sources and quality

The UK Environmental Accounts are satellite accounts to the UK National Accounts, this means they are linked to economy not part of the core UK National Accounts. They are compiled in accordance with the [System of Environmental Economic Accounting \(SEEA\)](#), as detailed on the [United Nations website](#). This closely follows the UN System of National Accounts (SNA).

### Air emissions and energy use

The air and energy accounts in the UK Environmental Accounts are compiled by Ricardo Energy and Environment on behalf of the Office for National Statistics (ONS).

The main source of information for this reporting is the UK's National Atmospheric Emissions Inventory. This provides air emissions data, calculated from activity data and emission factors, for all relevant sources in the UK as a starting point for generating the air emissions accounts. The [residence principle](#) is then applied to these datasets, which assigns the emissions to an industrial classification based on [Standard Industrial Classification: SIC 2007](#).

More information on quality and methodology – strengths, limitations, appropriate uses, and how the data were created – is available in our [Environmental accounts on air emissions Quality and Methodology Information \(QMI\)](#).

## Material flows

Material flows show domestic extraction, imports and exports, and provide an indicator called domestic material consumption (extraction plus imports minus exports). The materials are grouped into biomass, metal ores, non-metallic minerals, and fossil fuels. As above, more information on quality and methodology – strengths, limitations, appropriate uses, and how the data were created – is available in our [Environmental accounts on material flows QMI](#).

## Taxes

Most taxes in the UK are collected by HM Revenue and Customs (HMRC). HMRC provides monthly data to the Office for National Statistics (ONS), detailing each individual tax collected and the amount of revenue associated with that tax.

The ONS then uses supply and use data, and several other minor sources, to apportion tax revenue to different industries. As above, more information on quality and methodology – strengths, limitations, appropriate uses, and how the data were created – is available in our [Environmental accounts on environmental taxes QMI](#).

## 7 . Related links

[UK Environmental Accounts: 2022](#)

Bulletin | Released 9 June 2022

Measuring the contribution of the environment to the economy, impact of economic activity on the environment, and response to environmental issues.

[Greenhouse gas emissions. UK: provisional estimates: 2021](#)

Bulletin | Released 1 November 2022

Measuring the contribution of the environment to the economy, the impact of economic activity on the environment, and society's response to environmental issues.

## 8 . Cite this article

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