Office for National Statistics

Compendium

Environmental accounts

Estimates of oil and gas reserves, energy consumption, atmospheric emissions and material flows.

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To be announced

Table of contents

1 . Environmental accounts

Environmental accounts are:

- “satellite accounts” to the main national accounts
- compiled in accordance with the System of Environmental-Economic Accounting (SEEA), which closely follows the United Nations System of National Accounts (SNA)

Environmental accounts measure:

- the impact the economy has on the environment
- how the environment contributes to the economy
- how society responds to environmental issues by using the accounting framework and concepts of the national accounts

Environmental accounts are used to:

- inform sustainable development policy
- model impacts of fiscal or monetary measures
- evaluate the environmental impacts of different sectors of the economy

Data are mostly provided in units of physical measurement (mass or volume) but can be provided in monetary units, where these are the most relevant or the only data available.

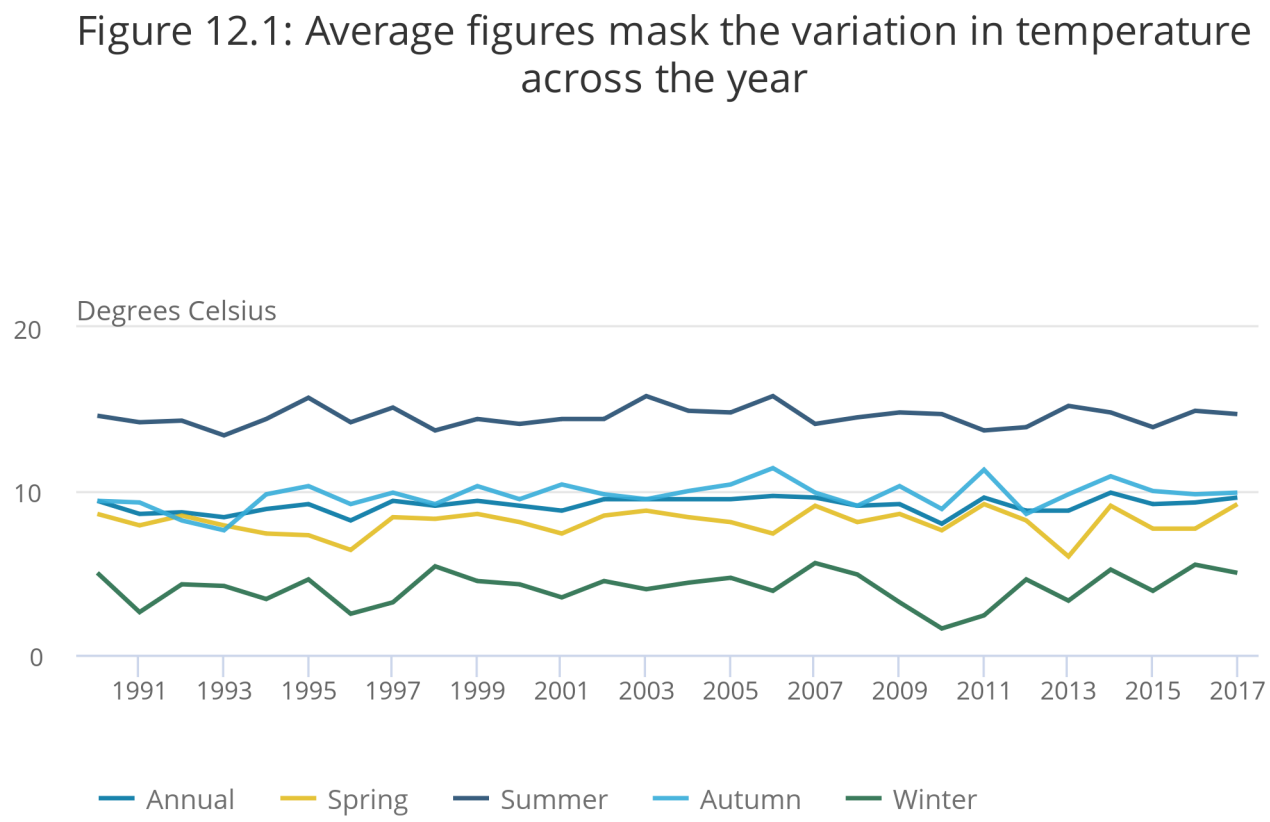
Tables 12.1 to 12.5 show estimates of oil and gas reserves, energy consumption, atmospheric emissions and material flows. More data, information and other environmental accounts, including natural capital accounts, can be found on the UK Environmental Accounts release page.

2 . Temperature

Figure 12.1 shows the change in mean air temperature between 1990 and 2017. This measure provides a useful context for some of the changes observed across the environmental accounts. For example, a fall in temperature can contribute to an increase in energy consumption for heating (with an accompanying rise in associated emissions).

The average air temperature in 2017 was slightly higher than in 2016, up to 9.6 degrees Celsius (oC) from 9.3oC. This was still below the record high of 9.9oC in 2014. Annual figures mask the variation in temperature across the year, so the average temperatures for each season are also shown in Figure 12.1.

Figure 12.1: Average figures mask the variation in temperature across the year



Source: Met Office

3 . Oil and gas reserves

Table 12.1 presents non-monetary estimates of the oil and gas reserves and resources in the UK. “Resources” are minerals that are potentially valuable and could eventually be extracted, whereas “reserves” refer to discovered minerals that are recoverable and commercially viable.

Data are sourced from the Oil and Gas Authority (OGA) and the Department for Business, Energy and Industrial Strategy (BEIS).

Discovered reserves can be proven, probable or possible depending on the level of certainty that, based on the available evidence, they can be technically and commercially producible:

- proven reserves: better than 90% certainty
- probable reserves: between 50% and 90% certainty
- possible reserves: between 10% and 50% certainty

Contingent resources are also shown in Table 12.1. These are the quantities of oil and gas estimated to be potentially recoverable from known sites, but the plans are not yet mature enough for commercial development. Potentially recoverable in this case means a better than 50% chance of being technically producible.

OGA also produce estimates for prospective resources – those undiscovered or “yet to find”. Methodology for estimating this has changed over the years so it is not possible to show a consistent time series in Table 12.1.

Oil is defined as both oil and the liquids that can be obtained from gas fields. Shale oil is not included in the estimates.

Gas includes gas expected to be available for sale from dry gas fields, gas condensate fields, oil fields associated with gas, and a small amount from coal-bed methane projects. Shale gas is not included in these estimates. These reserves include onshore and offshore discoveries, but not flared gas or gas consumed in production operations.

4 . Energy consumption

Table 12.2 presents energy consumption by industry for the UK. Energy consumption is defined as the use of energy for power generation, heating and transport. This is essential to most economic activities, for example, as input for production processes. The term “direct use of energy” refers to the energy content of fuel for energy at the point of use, allocated to the original purchasers and consumers of fuels. On the other hand, “reallocated use of energy” means that the losses incurred during transformation[1] and distribution[2] are allocated to the final consumer of the energy rather than incorporating it all in the electricity generation sector.

Total energy consumption of primary fuels and equivalents (fossil fuels, nuclear, imports of electricity and renewable and waste sources) was 198.5 million tonnes of oil equivalent (Mtoe) in 2017, which was 2.1% lower than in 2016. Fossil fuels remained the dominant source of energy supply, although their use continued to fall. Energy consumption from fossil fuels in 2017 was at the lowest level since 1990 at 161.6 Mtoe. This represented 81.4% of total energy consumption.

Overall, direct use of energy from fossil fuels has dropped 21.6% since 1990, whereas total energy consumption has fallen 11.7% between 1990 and 2017. This fall in energy from fossil fuels is driven largely by the energy supply and manufacturing sectors.

Although fossil fuels are the main source of energy for consumption, other sources (including nuclear, net imports, and renewable and waste sources[3]) are becoming increasingly important.

Total energy consumption from sources other than fossil fuels was 36.9 Mtoe in 2017.

Energy consumption from renewable and waste sources was 10% of total energy consumption in 2017 (20.5 Mtoe), energy consumption from nuclear sources made up 8% (15.1 Mtoe).

Data are provided by Ricardo Energy and Environment.

Notes for: Energy consumption

1. Transformation losses are the differences between the energy content of the input and output product, arising from the transformation of one energy product to another.

2. Distribution losses are losses of energy product during transmission (for example, losses of electricity in the grid) between the supplier and the user of the energy.

3. Renewable sources include: solar photovoltaic, geothermal and energy from wind, wave and tide, hydroelectricity, wood, charcoal, straw, liquid biofuels, biogas from anaerobic digestion and sewage gas. Landfill gas, poultry litter and municipal solid waste combustion have also been included within this definition.

5 . Atmospheric emissions

Tables 12.3 and 12.4 show emissions of greenhouse gases, acid rain precursors (ARP) and other pollutants by industry for the UK.

Atmospheric emissions of greenhouse gases are widely believed to contribute to global warming and climate change.

In 2017, emissions of greenhouse gases were estimated to be 566.4 million tonnes of carbon dioxide equivalent (Mt CO2e), the lowest level since 1990. Across the time series, the largest annual fall in emissions of greenhouse gases occurred in 2009, following the onset of the economic downturn in 2008, when emissions decreased by 8.1%. Between 2016 and 2017, emissions decreased by 13.6 Mt CO2e (2.3%). This was primarily because of reductions in carbon dioxide emissions from the energy supply[1], transport and manufacturing sectors.

Carbon dioxide (CO2) was the dominant greenhouse gas, accounting for 84.8% of the UK's total greenhouse gas emissions in 2017. The remainder of greenhouse gas emissions comprised methane (CH4, 9.1%), nitrous oxide (N2O, 3.5%) and fluorinated gases[2] (2.6%). For comparability, all figures are presented as carbon dioxide equivalents (CO2e).

Other important atmospheric emissions include acid rain precursors (ARPs). Acid rain is caused primarily by emissions of sulphur dioxide (SO2), nitrogen oxides (NOX) and ammonia (NH3), and can have harmful effects on the environment. For comparability, all figures are weighted according to their acidifying potential and presented as sulphur dioxide equivalents (SO2e).

Since 1990, total ARP emissions have decreased sharply, falling by 77.8%, from 7.1 million tonnes of sulphur dioxide equivalent (Mt SO2e) to 1.6 Mt SO2e in 2017. The reduction in ARPs was driven largely by a reduction in SO2 emissions, which fell by 94% between 1990 and 2017. ARP emissions from the energy supply sector fell 96.9% between 1990 and 2017 as electricity generation has moved away from the use of coal towards greater use of gas and renewable energy sources.

NOX have also seen a large decline (67.2%) between 1990 and 2017.

Data are provided by Ricardo Energy and Environment.

Notes for: Atmospheric emissions

1. The "energy supply" sector comprises electricity, gas, steam and air conditioning supply industries.

2. Hydrofluorocarbons (HFC), perfluorocarbons (PFC), nitrogen trifluoride (NF3) and sulphur hexafluoride (SF6).

6 . Material flows

Table 12.5 presents economy-wide material flow accounts, which estimate the physical flow of materials through the UK economy.

The quantity of materials extracted in the UK has been declining gradually from over 700 million tonnes between 1994 and 2000, to 444 million tonnes in 2017.

Domestic extraction is divided into four categories: biomass, non-metallic minerals, fossil energy materials and carriers, and metal ores.

Biomass includes material of biological origin that is not from fossil, such as crops, wood and wild fish catch. Extraction of biomass has remained fairly constant since 1992. In 2017, there were 141 million tonnes of biomass extracted. Of this, crop residues, fodder crops and grazed biomass accounted for 63% (89 million tonnes).

Non-metallic minerals are mainly construction and industrial minerals, including limestone and gypsum, sand and gravel, and clays. Extraction of non-metallic minerals fell following the recent economic downturn. In 2017, around 211 million tonnes were extracted, 60% of which related to sand and gravel (126 million tonnes). Fossil energy materials and carriers include coal, crude oil and natural gas. The extraction of these has decreased since 1999.

Data are compiled from multiple sources including the Department for Environment, Food and Rural Affairs (Defra), the United Nations Food and Agriculture Organisation (FAO), the British Geological Survey (BGS), Eurostat and the Kentish Cobnuts Association. Data on imports and exports are primarily from HM Revenue and Customs.

Physical trade balance

Physical imports increased by 27.5% between 2000 and 2017, rising from 221 million tonnes to 282 million tonnes. Contrary to this, physical exports have gradually decreased, falling to 162 million tonnes in 2017. The rise in imports for particular materials can offset the decline in domestic extraction.

The physical trade balance (PTB) shows the relationship between imports and exports, and is calculated by subtracting the weight of exports from the weight of imports [1]. The UK has a positive PTB, meaning that more materials and products are imported than are exported.

In 2000, the PTB was relatively small at 21 million tonnes. It generally increased until 2007, before falling between 2008 and 2010 during the economic downturn. From 2010, the PTB increased, peaking at 151 million tonnes in 2013. The PTB has since decreased to 120 million tonnes in 2017, when the amount of materials and products imported (282 million tonnes) exceeded the amount of materials and products exported (162 million tonnes).

Material consumption

Direct material input (DMI) (domestic extraction plus imports) measures the total amount of materials available for use in the economy.

Domestic material consumption (DMC) (domestic extraction plus imports minus exports) measures the amount of materials used in the economy and is calculated by subtracting exports from DMI.

Between 2000 and 2017, DMI and DMC have gradually declined but with a noticeable fall around the time of the 2008 economic downturn. This indicates that fewer material resources were being used and consumed in the UK economy.

Notes for: Material flows

1. The physical trade balance (imports minus exports) is defined in reverse to the monetary trade balance (exports minus imports). Physical estimates can differ quite significantly from monetary estimates.

7 . More information

There is more information about environmental accounts on the UK Environmental Accounts release page, in particular see the Quality and Methodology Information reports for:

- Air
- Energy
- Material Flows

8 . Natural capital

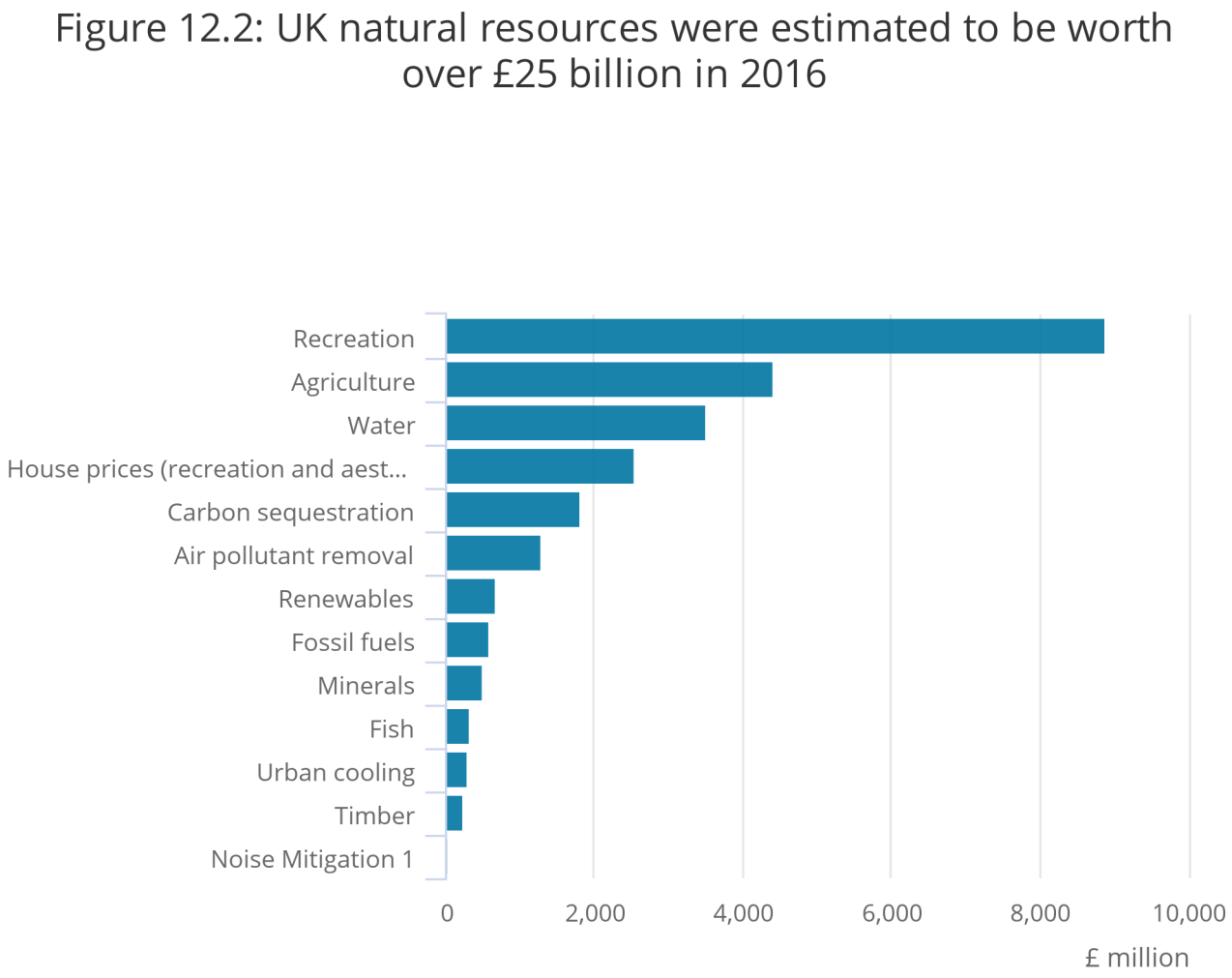
In collaboration with the Department for Environment, Food and Rural Affairs (Defra) we have been developing natural capital accounts to estimate the wealth of the UK's environment. These are currently Experimental Statistics which will become part of the Environmental Accounts in 2020. Here we present the headline results from this year's work in anticipation of formal inclusion next year.

The UK's natural wealth is reflected in the productivity of its soils, its access to clean water, and the splendour of its mountains. Any natural resource or process that supports human life forms an important part of our natural capital. Natural capital is one part of a wider move to better understand wealth. In that respect we are not only estimating what wealth the UK inherited in its islands and seas but what it might provide to future generations.

Figure 12.2 presents the most recent experimental natural goods and service flow estimates for the UK (2016). We are presenting these rather than the assets as they relate more directly to the flow values in the wider environmental accounts.

These figures are partial in terms of the number of services. We will continue to work to include as much of the economic value of the natural world as possible but may never complete that work, given the complexity and scale of the natural world. Our asset values are also narrowly market driven and not an absolute "value" of the natural world since nature supports all life on earth. Nature's wholesale collapse would be our own. For more detail please see UK Natural Capital Accounts: 2019.

Figure 12.2: UK natural resources were estimated to be worth over £25 billion in 2016



Source: Office for National Statistics - UK Environmental Accounts

Notes:

1. Data obtained from Economics for the Environment Consultancy (EFTEC) and Centre for Ecology and Hydrology (CEH), extrapolated from 2017.