Compendium

Environmental accounts

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

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Correction

7 November 2023 15:18

We have corrected an inconsistency with Table 12.8. Unlike the rest of the timeseries, the 2022 value for Timber provisioning (FV5G) did not include woodfuel. We have removed the 2022 row to correct this and make the table consistent with the other UK Natural Capital Account tables (12.6 and 12.7).

31 January 2024 09:30

We have corrected an error in Table 12.8. The values for timber provisioning (FV5G) had been aggregated incorrectly so woodfuel was double counted. Table 12.6 has also been revised due to changes to the data provided by Forest Research for timber provisioning (FU2R).

We have corrected an error in the physical value of air pollution regulating (FV5K) in table 12.8. The previous version incorrectly excluded some physical removals due to errors in the aggregation of geographic areas. Total monetary values (annual and asset) are unaffected.

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1 . Environmental accounts

- Environmental accounts are "satellite accounts" to the main UK National Accounts.

- They are compiled in accordance with the System of Environmental-Economic Accounting (SEEA), which closely follows the United Nations System of National Accounts (SNA).

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

- They are used to inform sustainable development policy, model impacts of fiscal or monetary measures, and evaluate the environmental impacts of different sectors of the economy.

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

In the accompanying dataset (XLSX, 3.3MB):

- Worksheets 12.1 to 12.5 show estimates of oil and gas reserves, energy consumption, atmospheric emissions and material flows

- Worksheets 12.6 to 12.8 show natural capital accounts

- Worksheets 12.9 to 12.12 show data on environmental taxes

More data, information and other environmental accounts (including fuel use, environmental goods and services sector and environmental protection expenditure) can be found on the UK Environmental Accounts release page.

2 . Oil and gas reserves

Worksheet 12.1 in the accompanying dataset (XLSX, 3.3MB) presents non-monetary estimates of the oil and gas reserves and resources in the UK.

In this dataset, "resources" are minerals that are potentially valuable and could eventually be extracted, whereas "reserves" refer to discovered minerals that are recoverable and commercially viable.

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 have better than a 90% chance

- probable reserves have between a 50% and 90% chance

- possible reserves have between a 10% and 50% chance

Contingent resources are also shown in Worksheet 12.1. These are the quantities of oil and gas estimated to be potentially recoverable from known sites, but where 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.

The North Sea Transition Authority (NSTA) also produce estimates for prospective resources – those undiscovered or "yet to find". Methodology for estimating this has changed over time so it is not possible to show a consistent data time series in Worksheet 12.1.

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

Gas includes that 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.

Data are sourced from the NSTA and the Department for Energy Security and Net Zero (DESNZ).

3 . Energy consumption

Worksheet 12.2 in the accompanying dataset (XLSX, 3.3MB) 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 [note 1] and distribution [note 2] are allocated to the final consumer of the energy rather than incorporating it all in the electricity generation sector.

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

Short-term fluctuations in energy consumption are often attributable to changes in temperature or gross domestic product (GDP). Longer term, the decline in energy consumption for these purposes has largely been driven by the switch away from coal by the energy supply and manufacturing industries to other, more efficient fuels, such as natural gas and, more recently, renewable sources.

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.

4 . Atmospheric emissions

Worksheets 12.3 and 12.4 in the accompanying dataset (XLSX, 3.3MB) show emissions of greenhouse gases, acid rain precursors (ARPs) and other pollutants by industry for the UK.

Greenhouse gases (GHG) are covered by the Kyoto Protocol. These gases contribute directly to global warming and climate change because of their positive radiative forcing effect. The potential of each GHG to cause global warming is assessed in relation to a given weight of CO2, so all GHG emissions are measured as carbon dioxide equivalents (CO2e).

The greenhouse gases included in the worksheets are:

- carbon dioxide (CO2)

- methane (CH4)

- nitrous oxide (N2O)

- hydro-fluorocarbons (HFC)

- perfluorocarbons (PFC)

- nitrogen trifluoride (NF3)

- sulphur hexafluoride (SF6)

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).

Emissions levels are influenced by factors such as gross domestic product (GDP) and UK temperatures. They are also influenced by policy initiatives, for example, those encouraging adoption of cleaner technologies or emissions standards on motor vehicles. Changes in energy consumption, particularly energy from fossil fuels, directly influence air emissions.

Data are provided by Ricardo Energy and Environment.

5 . Material flows

Worksheet 12.5 in the accompanying dataset (XLSX, 3.3MB) presents economy-wide material flow accounts, which estimate the physical flow of materials through the UK economy.

Domestic extraction is divided into four categories:

- biomass, which includes material of biological origin that is not from fossil, such as crops, wood and wild fish catch

- non-metallic minerals, which are mainly construction and industrial minerals, including limestone and gypsum, sand and gravel, and clays

- fossil energy materials and carriers, which include coal, peat [note 1], crude oil and natural gas

- metal ores, which include precious metals such as gold

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.

Physical trade balance

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 [note 2]. The UK has a positive PTB, meaning that more materials and products are imported than are exported suggesting that the UK may be becoming more reliant on the production of materials in other countries.

Material consumption

Direct material input (DMI) (domestic extraction plus imports) measures the total amount of materials that are 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.

Notes for: Material flows

1. For fossil energy materials and carriers (which include coal, crude oil, natural gas and peat) peat estimates were not available from 2016.

2. 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.

6 . Natural capital

The natural capital accounts estimate the wealth of the UK's environment. These remain in development so are currently classed as Experimental Statistics.

The UK's natural wealth is reflected in the productivity of its soils, its access to clean water, and 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.

Natural capital monetary estimates should be interpreted as partial or minimal value of the services provided by the natural environment, as a number of services are not currently measured. Services provided by the natural environment that we can measure include timber provisioning, agricultural biomass provisioning, fish provisioning, water provisioning, coal, oil and gas provisioning, renewable electricity generation, air pollution regulating, greenhouse gas regulating, noise regulating, urban heat regulating and recreation. We will continue to work to include as much of the economic value of the natural world as possible. Our asset values are narrowly market driven and not an absolute "value" of the natural world. For more details please see the UK Natural Capital Accounts: 2022.

These estimates have been developed using updated methodologies, which means they are not comparable with those published previously. Full details of these updated methodologies will be published alongside our UK Natural Capital Accounts: 2023.

This is particularly important for our recreation and aesthetic (house prices) service where data from the Valuation Office Agency, HM Land Registry and Ordnance Survey are used to estimate the effect of proximity to public green space on house prices. A unique house-level dataset is produced by linking data, and machine learning techniques are then applied to flexibly model house prices. To obtain an estimate of the average effect of green and blue spaces on house price, we estimate the difference between the predicted price based on the real data and the predicted price if there were no green and blue spaces within 1,000 metres. This value is extended to cover all houses, not just those that have sold, to produce an asset value. Estimates relate to urban properties only, defined as built-up areas with a population of 5,000 or greater.

7 . Environmental taxes

Environmental taxes are those whose base is a physical unit, for example, a litre of petrol or a passenger flight, that has a proven negative impact on the environment. These taxes should reduce the activity, and therefore reduce negative environmental impacts. Increases in tax revenue can occur from either rising tax rates, increased activity, or both.

Other initiatives may promote environmentally-positive behaviour but are not considered an environmental tax under this definition. For example, charges on single-use plastic bags by retailers are not classified as a tax.

An environmental tax needs to be defined as a tax (and not another type of payment) in the System of National Accounts (SNA 2008). The National Tax List is published by the Office for National Statistics (ONS) using the European System of National and Regional Accounts (ESA 2010), which is consistent with the SNA. This definition is also explained in the Central Framework for the System of Environmental-Economic Accounting from the United Nations, which uses concepts, definitions and classifications consistent with the SNA.

Source data on aggregate revenue for each type of tax is provided to the ONS from HM Treasury, to enable compilation of public sector accounts. We then produce a breakdown of the aggregate by industry, including allocation to households and the rest of the world. To do so, we use a number of sources, including supply and use tables.

More information on this environmental taxes measure can be found in our Environmental accounts on environmental taxes QMI.

8 . More information

There is more information about environmental accounts on the [UK Environmental Accounts release page](#).The residence adjustment is included, as the UK Environmental Accounts are based on a UK residence basis (as opposed to a territory basis). This is in line with national accounting principles, allowing environmental impacts to be compared on a consistent basis with economic indicators such as gross domestic product (GDP).UK figures for energy and air emissions on a territory basis are published by the Department for Energy Security and Net Zero (DESNZ). Energy and air emissions bridging tables are available, which show the difference between these estimates.

Further explanation of the differences can be found in [our article on energy consumption](#) and [our article on net zero and the different official measures of the UK's greenhouse gas emissions](#).

Data rounded to thousand tonnes can be found on the [UK Environmental Accounts release page](#).

9 . Cite this chapter

Office for National Statistics (ONS), released 31 October 2023, ONS website, compendium chapter, [Environmental accounts, UK National Accounts, The Blue Book: 2023](#)