Office for National Statistics

Statistical bulletin

UK natural capital accounts: 2022

Estimates of the financial and societal value of natural resources to people in the UK.

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Correction

15 March 2023 09:30

We have corrected an error in air pollution removal under the heading regulating services. The previous version read “Over the last decade, each tonne of PM2.5 pollution removed was valued at £99,881”. It should have read “Over the last decade, each tonne of PM2.5 pollution removed was valued at £108,111”. This happened because of an error in the data provided to the Office for National Statistics (ONS).

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1 . Main points

- In 2020, the assets of the natural capital services we are currently able to value were estimated to be worth £1.8 trillion.
- The inclusion of health benefits of recreation, a newly estimated cultural service, accounts for £600 billion of the total asset value.
- The total asset value is made up of three accounts: cultural (72%), provisioning (24%), and regulating (4%) services.
- Under the provisioning account, fossil fuels production has experienced the largest service reduction, with coal declining by 92%, oil by 21%, and gas by 28%, between 2011 and 2021.
- Renewable power generation was 82,302 gigawatt hours in 2021, which is the second highest amount since 2008.
- In 2020, air pollution removal services provided by nature led to an estimated 2,001 deaths being avoided and prevented 49,126 life years being lost.

2 . Understanding natural capital

Natural wealth is reflected in things like the productivity of soils and access to clean water. Any natural resource or process that supports human life, society, and the economy is an important part of our natural capital. Natural capital accounting estimates the current value of natural wealth and what it could provide for future generations. This is an important aspect of a wider move to better understand "inclusive wealth" as described in The Economics of Biodiversity: The Dasgupta Review on the GOV.UK website.

There are two important caveats to our work.

Our natural capital estimates do not cover all services that nature provides. We continue to work to encompass as much of the economic value of the natural world as possible, which is challenging given its scale and complexity.

For example, this year we have included health benefits from recreation in nature in the UK natural capital accounts for the first time. The asset valuation for this natural service is estimated to be £600 billion.

These natural capital asset values are not an absolute "value" of nature: a price accepted to sell the entire natural world. Given that the natural world supports all life on earth, including human life, this implies an infinite value, as described in David Pearce's 2010 report, Auditing the Earth: The Value of the World's Ecosystem Services and Natural Capital.

As a result of changing methods and an expanding portfolio of natural services measured, this latest account cannot be compared with previous years' accounts on a like-for-like basis. The latest methods developed have been applied retrospectively in the latest accounts, giving a consistent time series picture.

You can view and download the complete list of data sources used in this publication on our All data related to UK natural capital accounts: 2022 page.

3 . Provisioning services

Provisioning services are products from nature such as food, water, energy, and materials. These provisioning services include:

- agricultural biomass: the value of crops, fodder, and grazing – while farmed animals are not included as they are considered produced rather than natural assets, the food these animals eat, such as grass and feed, is included
- water abstraction: water removal for public water supplies
- fossil fuels extraction: production of crude oil, gas, and coal
- renewable energy generation: electricity generated from renewable sources – wind, hydroelectric, solar, wave, and tidal
- timber removals: wood production (also referred to as removals) is the harvesting of roundwood (trunks and branches) from coniferous (softwood) and broadleaved (hardwood) trees
- mineral extraction: largely consisting of construction mineral aggregates
- fish capture: the value of marine fish taken from mainland UK waters – aquaculture of farmed fish is excluded as these are viewed as produced rather than natural assets

Table 1: UK provisioning services included in UK natural capital accounts and their annual and asset values, 2020

Service	Annual value (flow) 2020 £ million, 2021 prices	Asset value (stock) 2020 £ million, 2021 prices
Agricultural biomass	7,307	153,459
Water abstraction	6,823	134,001
Fossil Fuels extraction	9,892	87,001
Renewable generation	1,988	30,043
Minerals	965	20,822
Timber extraction	373	12,610
Fish capiture	302	5,409
Total	27,651	443,346

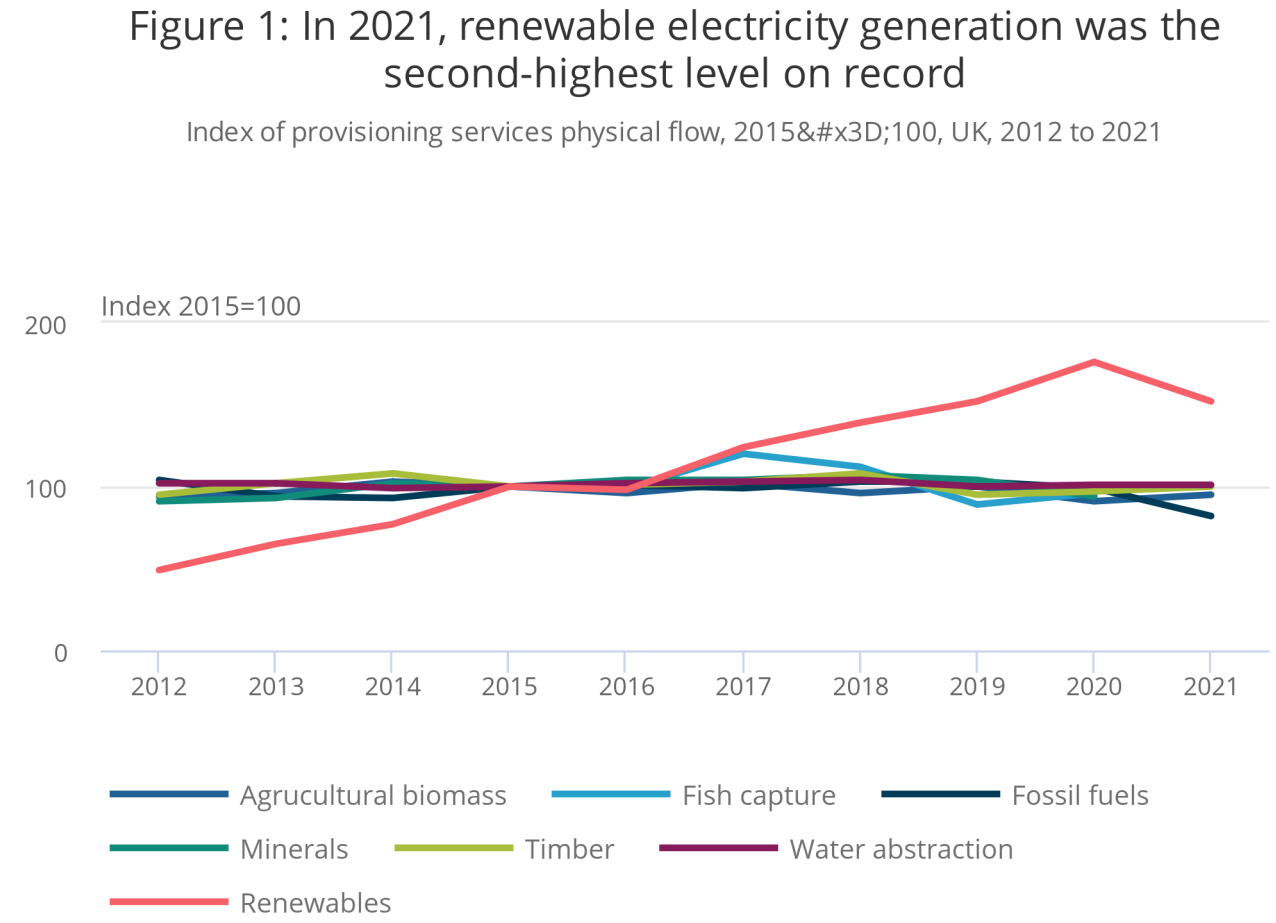
Source: Office for National Statistics – UK natural capital accounts

Fossil fuels production has seen the largest reduction, with coal declining by 92%, oil by 21%, and gas by 28%, since 2011.

In 2020, total electricity generation by renewables reached 95,394 gigawatt hours (GwH), which is a record high since 2008. Although total generation decreased by 14% in 2021 to 82,302, it was still the second highest amount since 2008.

Figure 1: In 2021, renewable electricity generation was the second-highest level on record

Index of provisioning services physical flow, 2015=100, UK, 2012 to 2021



Source: Office for National Statistics – UK natural capital accounts

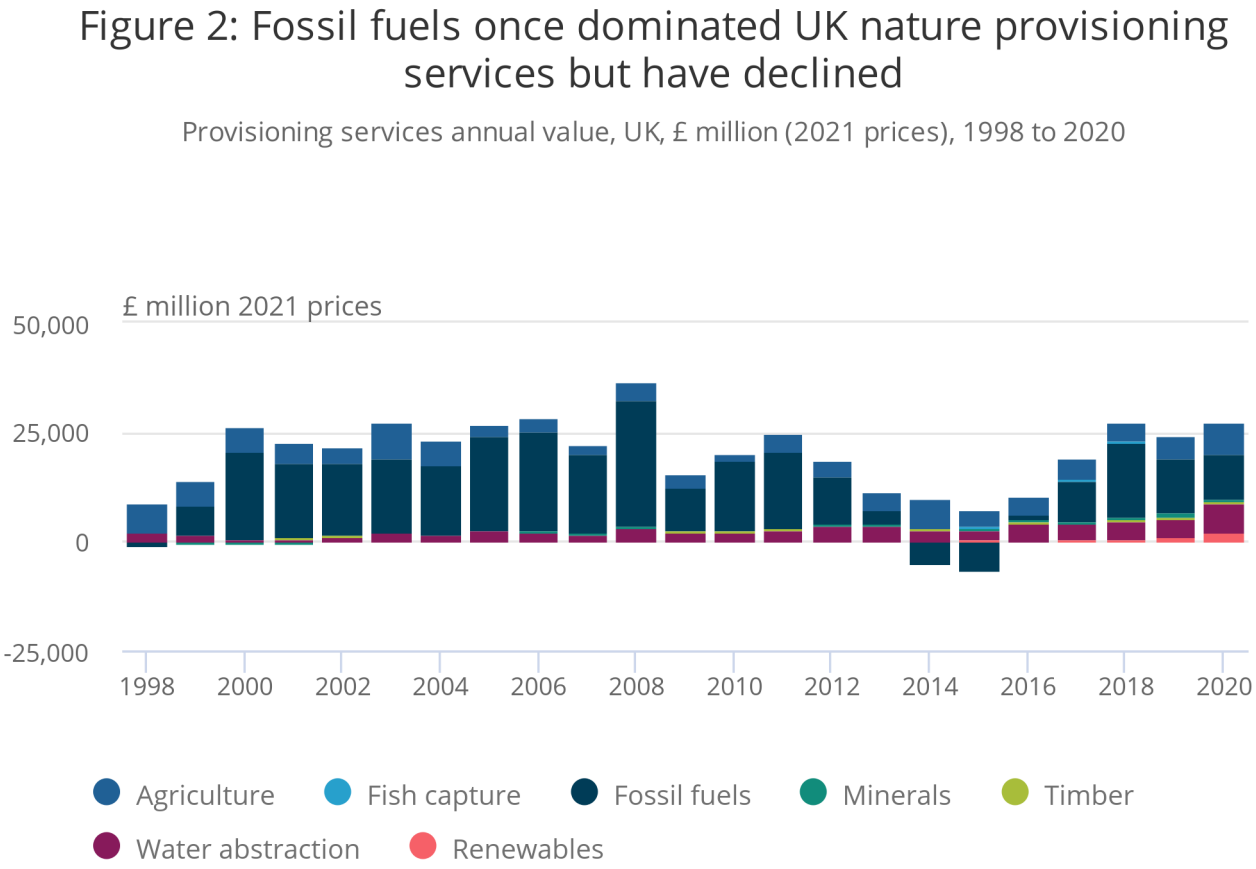
Notes:

1. Data for 2021 are not available for minerals and fish capture.

There was a 13% increase in the annual value of provisioning services between 2019 and 2020 (Figure 2), with water abstraction and renewables exhibiting the largest increase at 65% and 51%, respectively.

Figure 2: Fossil fuels once dominated UK nature provisioning services but have declined

Provisioning services annual value, UK, £ million (2021 prices), 1998 to 2020



Source: Office for National Statistics – UK natural capital accounts

Notes:

1. Annual valuations for renewables are only available between 2008 and 2020.
2. Fish capture data are only available for 2015 to 2020.

Fossil fuels accounted for 36% of the value of total provisioning services in 2020, down from 51% in 2019. This is because of a decrease in oil and gas prices of 23% and 33%, respectively, between 2019 and 2020. Annual fossil fuel values in 2014 and 2015 are negative because of lower values of the gross operating surplus (GOS).

All the renewable sectors experienced a decrease in generation in 2021 (Figure 3). This was a result of weather conditions, which saw a reduction in wind speeds (13%), sun hours (12%), and rainfall (30%) from 2020. This decrease was also reflected in generation efficiency, with load factors, a ratio of actual to potential total generation capacity, down for wind (18%), solar (8%), and hydro (20%).

Figure 3: Between 2020 to 2021, the average rainfall saw a decrease of 30%

Electricity generation and average wind speeds, sun hours and rainfall, UK, 2001 to 2021

Download the data

.xlsx

4 . Regulating services

Regulating services help to maintain the quality of the environment we rely upon.

These regulating services include:

- sequestering and emissions of greenhouse gases (GHGs): the removal of GHGs, mostly carbon dioxide, from the atmosphere is provided by a range of habitats, particularly woodlands, and the capacity for habitats to sequester carbon from the air depends upon the habitat type and extent

- removing air pollutants: the removal of air pollutants by vegetation, the monetary value of which is measured in terms of the willingness to pay to avoid hospitalisation and mortality

- urban cooling: green (for example, parks) and blue (rivers, lakes, and canals) spaces can cool urban environments on hot days - benefits include limiting loss of labour productivity and reducing air conditioning use

- mitigating noise: vegetation acts as a buffer against noise pollution such as from road traffic

Table 2: UK regulating services included in UK natural capital accounts and their annual and asset values, 2020

Service	Annual value (flow) 2020 (£ million, 2021 prices)	Asset value (stock) (£ million, 2021 prices)
Carbon sequestration	-1,413	-81,020
Air pollution removal	2,394	124,515
Urban cooling	430	26,611
Noise mitigation	17	903
Total	1,428	71,009

Source: Office for National Statistics – UK natural capital accounts

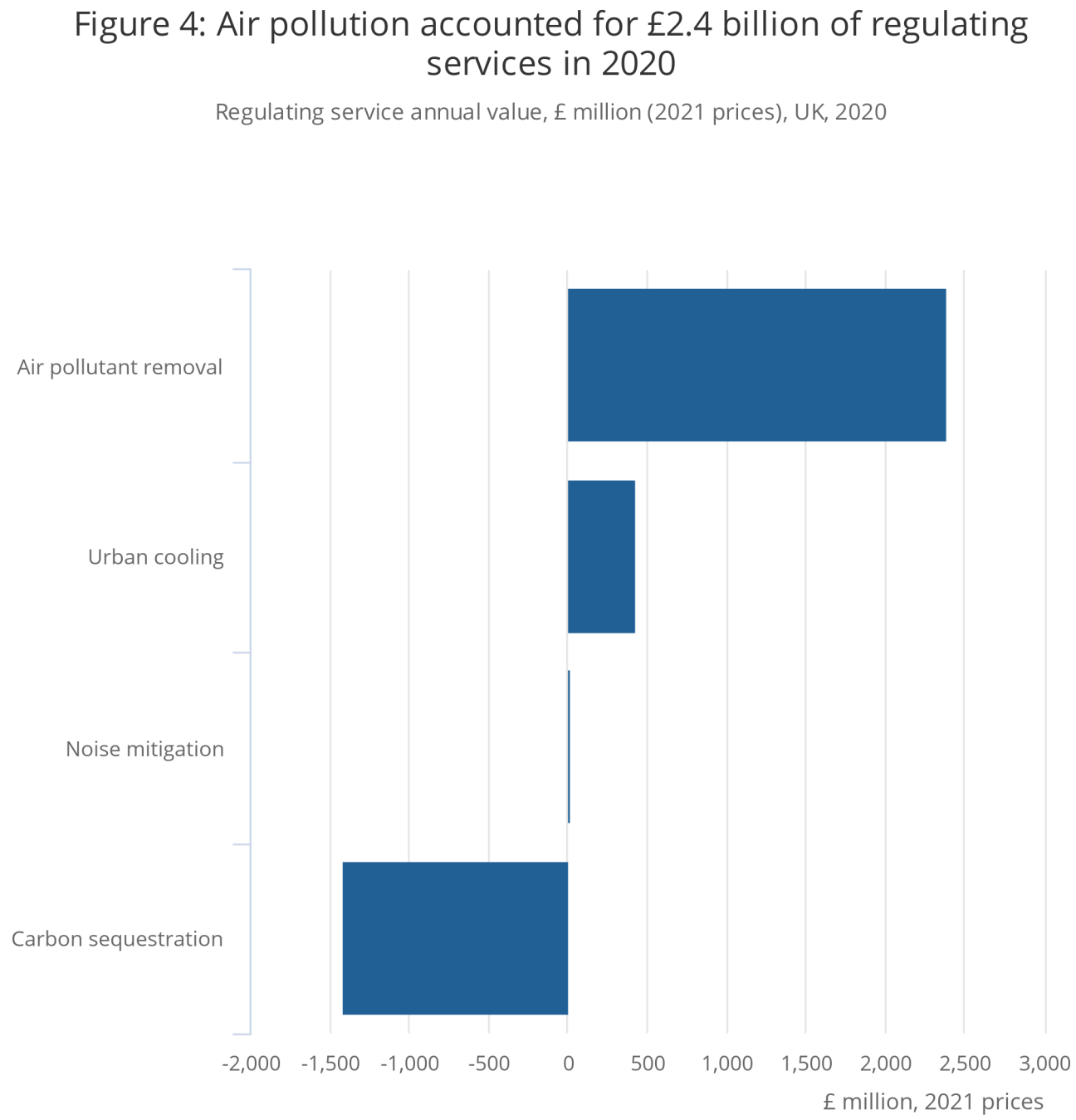
Notes

1. Data for carbon sequestration are for 2019

Over the last decade, each tonne of PM2.5 pollution removed was valued at £108,111; this is the greatest value of all pollutants because of its significant effects on health. A full breakdown of value by pollutant type can be found in our UK natural capital accounts: 2022 dataset.

Figure 4: Air pollution accounted for £2.4 billion of regulating services in 2020

Regulating service annual value, £ million (2021 prices), UK, 2020



Source: Office for National Statistics – UK natural capital accounts

Since last year's estimates, changes in how the Department for Business, Energy and Industrial Strategy (BEIS) models carbon sequestration by nature (PDF, 4.25MB), primarily in capturing the emissions from degraded peatland across all habitats, indicate that the UK emits more greenhouse gases than it removes from land use, land use change and forestry (LULUCF). The net carbon sequestration values presented align with the UK 2019 Greenhouse Gas Inventory figures for the LULUCF sector.

5 . Cultural services

Cultural services are the non-material benefits we obtain from natural capital, such as tourism, recreation, and aesthetic experience. This year, for the first-time, health benefits from recreation in nature have been included in the UK natural capital accounts. The impact and methodology of this new service are discussed within our Health benefits from recreation, natural capital, UK: 2022 bulletin.

Cultural services include:

- tourism and recreation: spending on travel to the natural environment and some aspects of expenditure incurred during visits (parking fees, transport costs, vehicle running costs, and admissions)
- health benefits from recreation: the value associated with improved health and well-being resulting from regular visits to nature
- house prices (recreation and aesthetic): recreation house prices include the additional expenditure on houses that are near to green (land) and blue (water) spaces, enabling people to make free trips to the natural environment, while aesthetic house prices estimate the value added to a property by a view of a green or blue space

Table 3: UK cultural services included in UK natural capital accounts and their annual and asset values, 2020

Service	Annual value (flow) 2020 (£ million, 2021 prices)	Asset value (stock) (£ million, 2021 prices)
Tourism and recreation	15,584	623,482
Health benefits	6,831	598,645
House prices (recreation and aesthetic)	2,819	83,849
Total	25,234	1,305,975

Source: Office for National Statistics – UK natural capital accounts

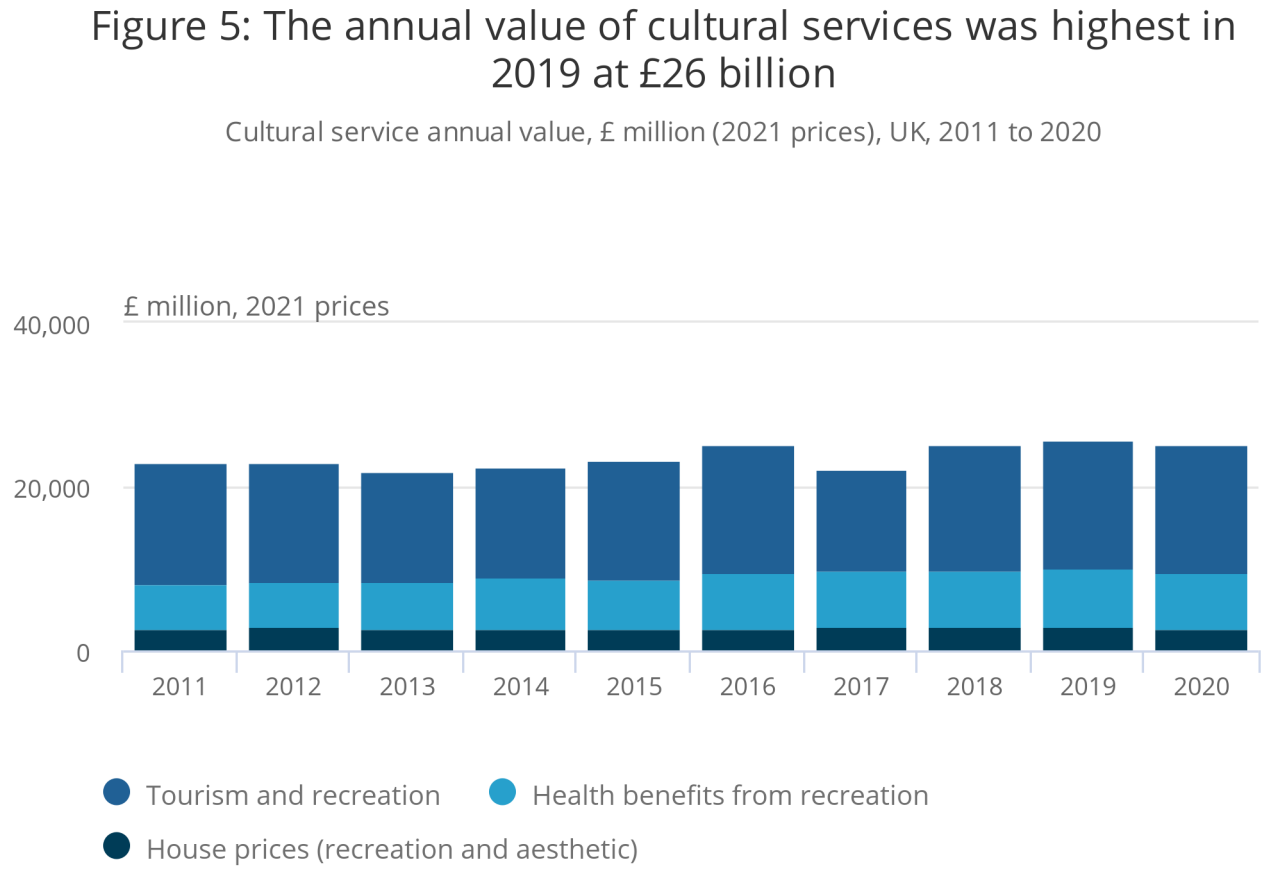
Notes

1. Data for tourism and recreation are from 2019.

In the 10 years since 2011, tourism and recreation has contributed an average of 61% to the annual value of cultural services, health benefits from recreation has contributed 27%, and house prices has contributed 12%.

Figure 5: The annual value of cultural services was highest in 2019 at £26 billion

Cultural service annual value, £ million (2021 prices), UK, 2011 to 2020

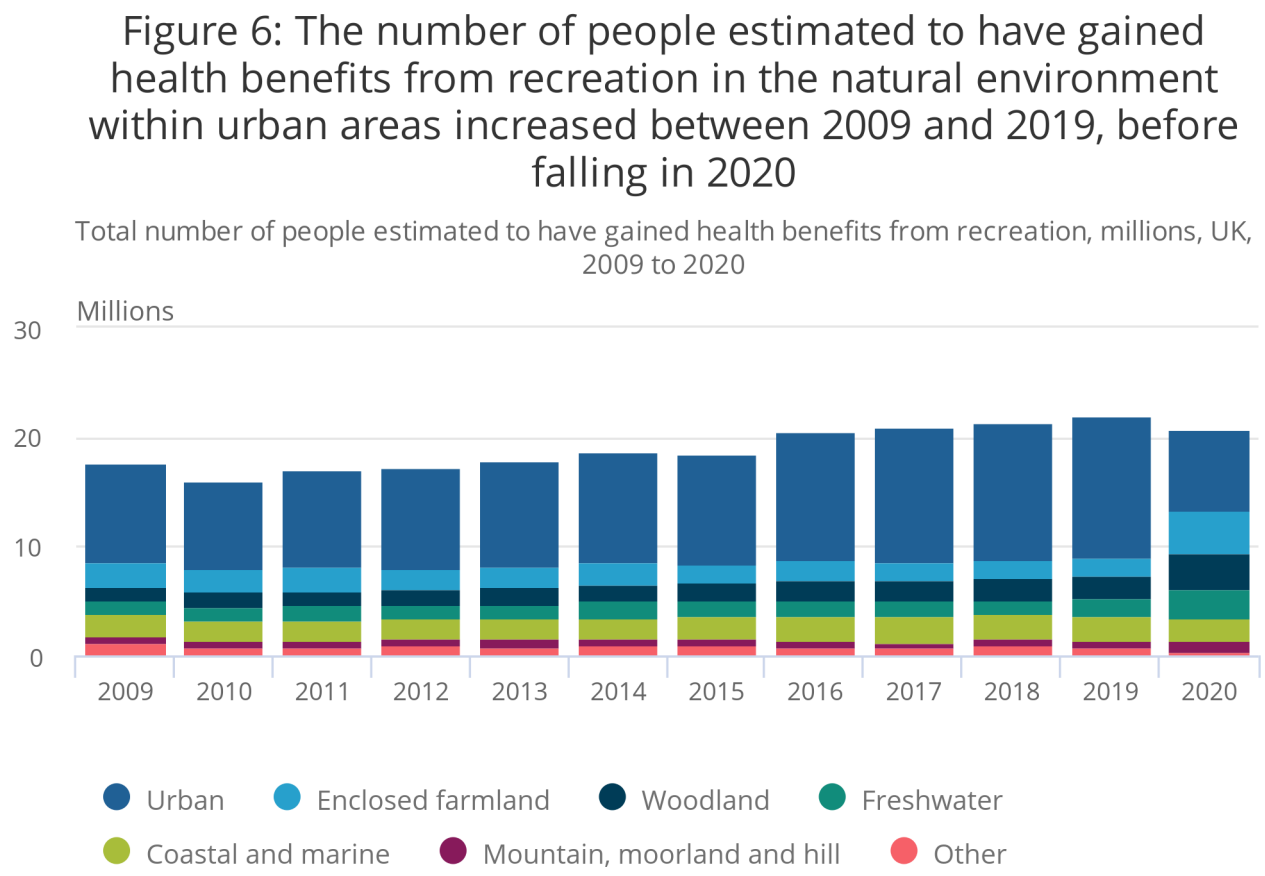


Source: Office for National Statistics, Monitor of Engagement with the Natural Environment (MENE) Survey, Great Britain Day Visits Survey, and Great Britain Tourism Survey

The number of people estimated to have gained health benefits from recreation fell from 22 million in 2019, to 21 million in 2020 (Figure 6). This was driven by a decline in the average duration of trips taken within nature. As a result, fewer people met the definition of spending 120 minutes or more a week in nature to receive health benefits.

Figure 6: The number of people estimated to have gained health benefits from recreation in the natural environment within urban areas increased between 2009 and 2019, before falling in 2020

Total number of people estimated to have gained health benefits from recreation, millions, UK, 2009 to 2020



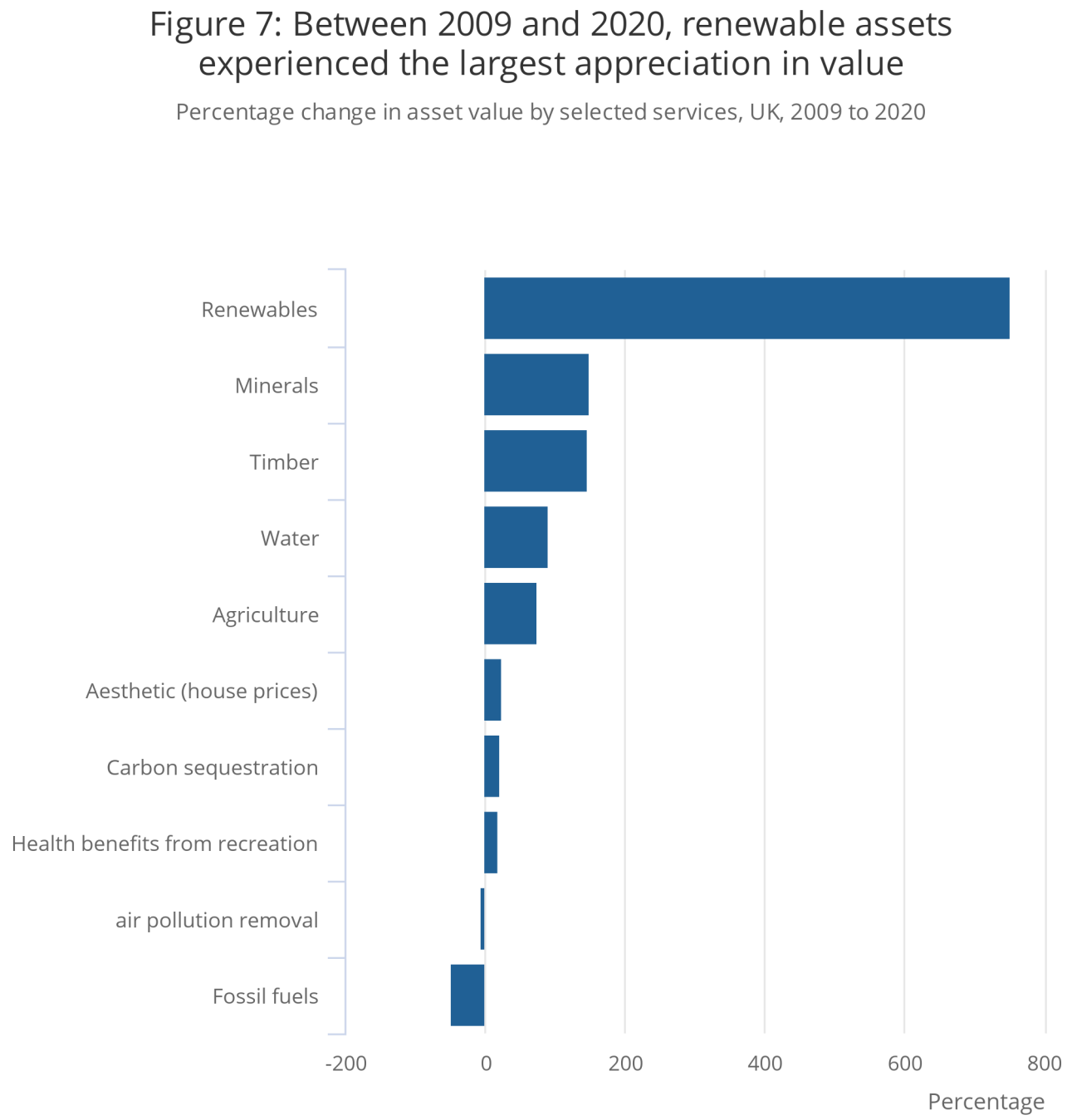
Source: Office for National Statistics, England's Monitor of Engagement with the Natural Environment (MENE) Survey, England's People and Nature Survey (PANS), Scotland's People and Nature Survey (SPANS), National Survey for Wales (NSW), and People in the Outdoors Monitor for Northern Ireland (POMNI)

6 . Asset valuation

Asset values of natural resources refer to the long-term potential (stock) of that resource to provide goods and services to humans. This contrasts with annual valuations (flows).

Figure 7: Between 2009 and 2020, renewable assets experienced the largest appreciation in value

Percentage change in asset value by selected services, UK, 2009 to 2020



Source: Office for National Statistics – UK natural capital accounts

Notes:

1. Excludes comparison of asset values for fish capture, urban cooling, and noise mitigation because of data limitations.

Between 2009 to 2020, the asset value of renewable services saw an eight-fold increase while fossil fuels declined by 48%.

7 . UK natural capital accounts data

UK natural capital accounts 2022 - Summary - Final
Dataset | Released 10 November 2022 Estimates of the financial and societal value of natural resources to people in the UK.

UK natural capital accounts: 2022 – detailed summary
Dataset | Released 10 November 2022
Detailed data breakdowns of the financial and societal value of natural resources to people in the UK.

8 . Glossary

Asset

A natural asset is a resource that can generate goods or services to humans into the future. Asset valuation estimates the stream of services that are expected to be produced by the natural resource over a reasonably predictable time horizon.

Ecosystem services

Ecosystem services are the living (biotic) components of the Earth that provide services to humans, such as woodland.

Physical flow

The physical flow of a natural asset is the measure of its output in units appropriate to the good or service. This differs from the annual value and asset value, which measure the monetary value of a natural resource.

9 . Measuring the data

We have used a wide variety of sources for estimates of UK natural capital.

The Office for National Statistics (ONS) and the Department for Environment, Food and Rural Affairs (Defra) have published a summary of the principles underlying the natural capital accounts.

These accounts have been compiled in line with the guidelines recommended by the United Nations (UN) System of Environmental-Economic Accounting (SEEA) Central Framework and the UN SEEA Experimental Ecosystem Accounting principles. These are, in turn, part of the wider framework of the system of national accounts. UN guidance is under development.

We welcome feedback on this output or any of the approaches in it to natural.capital.team@ons.gov.uk.

More detailed quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in the accompanying UK natural capital accounts methodology guide: 2022.

10 . Strengths and limitations

These experimental accounts are being continually revised to produce the best statistics with the available data and methods.

We have identified limitations of the data as well as ideas for future development. More detailed quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in the accompanying UK natural capital accounts methodology guide: 2022.

11 . Related links

Health benefits from recreation, natural capital, UK: 2022
Bulletin | Released 27 May 2022
Further development of the UK recreation natural capital ecosystem service accounts, including specific methods used to estimate the health benefits gained from nature-based recreational activities.

Habitat extent and condition, natural capital, UK: 2022
Bulletin | Released 3 May 2022
The size of area and condition indicators for eight natural UK habitats, including woodland, enclosed farmland, semi-natural grasslands, and coastal margins. Uses the System of Environmental-Economic Accounting framework for Ecosystem Accounting. Experimental estimates.

Woodland natural capital accounts: ecosystem services for England, Scotland, Wales and Northern Ireland, 2020
Bulletin | Released 11 May 2021
Additional information splitting down UK data in the Woodland natural capital accounts, UK: 2020 publication for England, Scotland, Wales and Northern Ireland. Extra data on summary ecosystem services and asset value.

12 . Cite this bulletin

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