

Statistical bulletin

Urban natural capital accounts, UK: 2023

Natural capital accounts estimate habitat extent, condition indicators, ecosystem services and asset value of urban areas in the UK.

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Notice

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Data included in this release contain an error affecting the service of air pollution removal. Some physical removals were incorrectly excluded due to errors in the aggregation of geographic areas. Monetary values split by habitat are also affected as physical flows are used to apportion annual monetary values across habitats. This error has been corrected in the UK Natural Capital Accounts: 2023 and subsequent releases, which also include the latest methodologies and data split by nation and habitat.

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1 . Main points

- The total UK urban land area was approximately 2 million hectares in 2021, which represents around 8% of the total UK land area.
- The total asset value of ecosystem services in UK urban areas was around £792 billion in 2020.
- Health benefits from recreation, valued at £324 billion in 2020, made the largest contribution (41%) to the total asset value of ecosystem services in UK urban areas in that year.
- The total annual value of ecosystem services in UK urban areas was around £15 billion in 2020, of which tourism and recreation accounted for £10 billion.
- There were over 2 billion tourism and recreation visits to nature in urban areas in 2020, an increase of 28% from 2011.
- The annual value of air pollution removal services by urban vegetation was around £800 million in 2021.
- Estimates of the urban bat population have increased 28% from 1999 to 2020, and there has been a 52% increase in the average total number of urban bee sightings between 2010 and 2021.

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

2 . Extent

There are many definitions of what constitutes an urban area in the UK. Within this cross-cutting habitat account we use a broader definition of urban extent than a narrower “urban habitat” definition that refers only to built-up areas. This meets our aim of capturing the valuable interactions between the built urban environment and the other broad habitats such as the woodland and grasslands present within urban green and blue spaces.

To estimate the area of the urban habitat in the UK , or “urban extent”, in 2021 (Table 1) we followed the methodology created by [Economics for the Environment Consultancy \(eftec\) and others \(2017\)](#). We applied this method of calculating urban extent to estimate the extent of the eight broad habitats within this area, from the UK Centre for Ecology and Hydrology Land Cover Map (LCM) 2021, including the narrower definition of “urban habitat” (Table 1), green and blue spaces (Table 2) and the allotments provisioning service. Beyond this definition of urban extent, we use a range of external data sources to estimate the ecosystem services and these have differing methods of defining the urban extent, so cannot be considered completely comparable. See [Section 8: Measuring the data](#) and [Section 9: Strengths and limitations](#) for more details.

For 2021, we estimated the total UK urban land area, including both built-up areas and all the other broad habitats within those urban areas, to be 2,037,116 hectares. This represents about 8% of the total UK land area.

Table 1: Extent of broad habitats within urban area, UK, 2021

Broad habitat	Area (hectares)	Percentage of total urban area
Enclosed farmland	351,034	17.2
Woodland	94,385	4.6
Semi-natural grassland	23,865	1.2
Freshwater, wetlands, floodplain	17,837	0.9
Coastal margins	6,560	0.3
Mountain, moorland, and heath	5,078	0.2
Marine	2,711	0.1
Total other habitats	501,470	24.6
Urban habitat	1,535,646	75.4
Total urban area	2,037,116	

Source: Office for National Statistics, UK Centre for Ecology and Hydrology, and Economics for the Environment (eftec) and others

Notes

1. The urban habitat type in the Land Cover Map is defined by two categories "urban" and "sub-urban". Urban includes dense urban such as town and city centres, where there is little, if any, vegetation. Urban also includes areas such as dock sides, car parks and industrial estates. Sub-urban includes areas where there is a mix of urban and vegetation.

The location of green and blue spaces, such as parks and lakes, are important for the provision of cultural ecosystem services such as recreation and well-being. For the public to enjoy green and blue spaces regularly, they need to be within a reasonable distance from their homes and accessible. We define green and blue space as:

- blue space – all inland water bodies, for example, rivers, lakes, ponds, canals
- functional green space – any green space that has a specific function in its use, for example, public parks and gardens, playing fields and bowling greens; these spaces contain natural land cover, and can also include some blue space, for example, a park with a lake in it
- publicly accessible green space – a subset of functional green space, taking out green spaces expected to have restriction to entry, for example, golf courses

There were 23,559 hectares of blue space and 121,566 hectares of functional green space in Great Britain's urban areas in 2021 (Table 2). Public parks and gardens accounted for 38% of functional green space in Great Britain. About 69% of this functional green space was publicly accessible.

Table 2: Extent of urban blue and green spaces in hectares, Great Britain, 2021

Extent (hectares)	England	Scotland	Wales	Great Britain
Blue space	20,471	1,656	1,432	23,559
Functional green space	106,510	11,335	3,721	121,566
Publicly accessible functional green space				
Public parks and gardens	41,198	4,387	1,080	46,665
Playing fields	22,292	2,212	1,174	25,678
Cemeteries	5,972	686	239	6,896
Religious grounds	3,433	492	205	4,130
Non-publicly accessible functional green space				
Golf courses	15,355	1,899	222	17,476
Allotments and community growing spaces	6,831	145	258	7,234
Bowling greens	258	217	22	497
Other sports facilities (e.g., cricket grounds)	11,171	1,297	520	12,988

Source: Office for National Statistics and Ordnance Survey

Notes

1. Ordnance Survey data cover Great Britain only.
2. Comparable data for Northern Ireland are unavailable.

Measured in a straight line, the nearest accessible public park or garden was an average distance of 867 metres from urban residential properties in England, 1,147 metres in Wales and 900 metres in Scotland in 2021 (Table 3).

Table 3: Average distance to nearest type of functional green space in metres, Great Britain, 2021

Mean distance (metres)	England	Scotland	Wales	Great Britain
Religious grounds	781	921	839	796
Golf courses	3,008	2,230	2,913	2,938
Playing fields	750	811	659	751
Public parks or gardens	867	900	1,147	881
Cemeteries	1,810	1,728	1,718	1,799
Other sports facilities (e.g., cricket grounds)	1,014	1,023	1,220	1,023
Bowling greens	1,510	1,257	1,635	1,493
Allotments or community growing spaces	1,035	3,493	1,387	1,258

Source: Office for National Statistics and Ordnance Survey

Notes

1. Ordnance Survey data cover Great Britain only.
2. Comparable data for Northern Ireland are unavailable.

3 . Urban condition indicators

Condition indicators in the natural capital accounts help us to understand the relationship between ecosystem condition and the ecosystem services they deliver. The UN [System of Environmental-Economic Accounting \(SEEA\) definition of ecosystem condition \(PDF, 605KB\)](#) is “the overall quality of an ecosystem asset in terms of its characteristics”.

Figure 1 summarises the set of SEEA condition indicators and their long-term trends for a range of compositional and landscape condition indicators for urban areas from available data. We present condition data from a range of sources that have each used their own definition of “urban extent”, which may vary from our definition, used in Table 1.

Figure 1: Summary of long-term trend for urban condition indicators

Notes:

1. Trend categorised as no trend when only one year of data available.

Download the data

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Compositional species indicators

Species indicators can be used as a gauge of the wider ecological health of a habitat.

There has been a 52% increase in the average total number of bee sightings per kilometre walked during the [BeeWalk](#) surveys, in the urban environment between 2010 and 2021.

The number of moths found in urban areas has declined from the base year of 1990 to 2021, albeit with inter-annual variations.

The urban bird index has remained reasonably consistent between 1994 and 2021.

The urban bat population index has gradually increased from 2003, and by 2020 was 28% higher than the base year of 1999 (Figure 2). This smoothed trend uses weighted averages of observations and is quite robust against random variations between years. Across all habitats, including urban, populations of the greater horseshoe bat, lesser horseshoe bat, common pipistrelle, soprano pipistrelle and Natterer's bat have increased in Great Britain since 1999. For more information, see the [Bat Conservation Trust's National Bat Monitoring Programme, Annual Report 2022](#).

The combined index of the seven most commonly-recorded mammal species (hedgehogs, foxes, badgers, bats, grey squirrels, rabbits and brown rats) in Great Britain's urban areas showed little variation between 2004 and 2022 (Figure 2). However, the individual species (see [supplementary data tables](#)) of fox, badger, brown rats, grey squirrels and urban hedgehogs have increased from the start of the index. The longer-term decline of urban hedgehogs has stabilised, though rural hedgehogs continue to decline, according to [The State of Britain's Hedgehogs 2022 \(PDF, 2.81MB\)](#).

Figure 2: The smoothed bat population index rose by 28% for Great Britain urban areas between 1999 and 2020

Compositional species indicators for urban bats, bees, birds, moths and mammals, Great Britain or UK

Notes:

1. The arrow on each chart denotes the change over the time series, from the baseline year to the most recent year for which we have data. An upward pointing arrow indicates an increase and a downward pointing arrow shows a decrease.

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Landscape indicators

Urban trees

Many [trees grow outside of woodland habitats](#) in urban areas. These trees grow in small woods, in hedgerows and as individual trees and add to landscape diversity. They also contribute to ecosystem services such as carbon sequestration, temperature regulation and pollution removal.

In Great Britain's urban areas in 2017, there were 73,700 hectares of small woods, 90,300 hectares of groups of trees and 15,000 hectares of lone trees in open land (Table 4). See [supplementary data tables](#) for further geographic breakdowns. Data for Northern Ireland are not available.

Table 4: Area of urban trees by country, Great Britain, 2017

	Urban small woods (000 ha)	Urban groups of trees (000 ha)	Urban lone trees in open land (000 ha)
England	56.8	67.3	11.8
Scotland	5.2	6.7	0.8
Wales	11.7	16.3	2.4
Great Britain	73.7	90.3	15.0

Source: Forest Research

Notes

1. Small woods are wooded features exceeding 0.1 hectare and less than 0.5 hectare in extent or less than 20 metres in width.
2. Groups of trees are clusters less than 0.1 hectare.
3. Lone trees in open land are single trees 2 metres or more in height whose crowns have no contact with the crowns of any other tree crown and are not situated on a boundary.

Hedgerows

Hedgerows in urban areas provide vital habitats for wildlife while also contributing to ecosystem services such as temperature regulation and air pollution removal.

Forest Research estimated that there are [43,100 kilometres of hedgerows in urban areas in Great Britain](#) (Table 5).

Table 5: Area and length of hedgerows in Great Britain by land category, 2017

	Area (000 ha) Length (000 km)	
	Urban	Urban
England	8.5	31.0
Scotland	1.3	6.3
Wales	1.7	5.9
Great Britain	11.5	43.1

Source: Forest Research

Notes

1. Hedgerow estimates are based upon fieldwork and hand-mapping only; for further methodological details see [Forest Research](#).

Environmental pressure indicators

Some environmental pressure indicators, for example, wildfires and fly-tipping, provide a broad measure of potential effects on the condition of ecosystems. As they do not provide direct measures of condition, the System of Environmental-Economic Accounting classes these as ancillary or proxy indicators.

Wildfires

We consider wildfires to be a pressure indicator, as most wildfires are caused by humans, intentionally or not.

In England in 2021, there were a total of 6,508 urban wildfire incidents (deliberate and accidental), a decrease of 8% from 7,063 incidents in 2010.

The total number of wildfire incidents in urban areas in Wales has decreased by approximately 70%, from 221 in 2009 to 2010, to 67 in 2020 to 2021.

The total number of incidents in Scotland categorised in “other outdoor (including land)” areas, which includes urban areas among others, decreased from 200 in 2009 to 2010, to 115 in 2020 to 2021, a 43% decrease over the period. See [supplementary data tables](#) for full datasets for England, Wales and Scotland. Data by habitat for Northern Ireland are not available.

Fly-tipping

[Fly-tipping](#) is the illegal dumping of liquid or solid waste on land or in water.

There were 1,134,211 fly-tipping incidents recorded in England, and 41,071 in Wales in 2020 to 2021. See [supplementary data tables](#) for full data time series. Data for Scotland and Northern Ireland are not available split by habitat.

Protected sites

There are several formal protected area designations in the UK, including Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs). These are usually established because of rare fauna (animals) or flora (plants), or important geological or physiological features, which make them areas of interest to science. These sites are assessed and classified according to their condition: favourable, recovering, unfavourable or destroyed.

The area of designated protected urban sites classed as favourable in England decreased by 42%, from 39.3 hectares in 2018 to 22.9 hectares in 2022. There was no change in the sites classed as recovering or destroyed. No comparable data are available for Scotland, Wales and Northern Ireland.

4 . Ecosystem services

Ecosystem services estimate the contribution of natural assets to the economy and society. We present physical (non-monetary) flows (Table 6) and estimates of the monetary value of these services in UK urban areas (Figures 3, 4, 5, 6). We present both annual flow values for the most recent year and asset values, which estimate the stream of services that are expected in the future.

The total annual value for UK urban ecosystem services we are currently able to measure was £15.5 billion in 2020 (2021 prices).

We continue to improve our estimates of the economic value of the natural world. This year we have included health benefits from recreation in the urban accounts for the first time, with the annual value estimated to be £2.5 billion in 2020.

Table 6: UK nations breakdown of urban annual physical flow by service, 2020

	England	Scotland	Wales	Northern Ireland	UK
Food production - allotments (thousand kilogrammes)	109,295.0	2,321.3	4,125.8	[x]	115,742.0
Provisioning					
Renewables - domestic solar PV, generation (gigawatt hours)	2,497.2	220.3	191.1	15.1	2,924.9
Carbon sequestration (million tonnes of CO2 equivalent)	-1.9	-1.6	-0.3	-0.9	-4.7
Regulating					
Air pollution removal (thousand tonnes)	28.5	3.5	1.6	[x]	33.5
Noise reduction (number of buildings benefitted)	142,000	7,000	12,000	6,000	167,000
Urban cooling (number of hot days)	44.4	0.2	4.9	[x]	49.6
Cultural					
Tourism and recreation (number of visits, millions)	1,962.8	279.3	83.7	76.9	2,407.1
Health benefits (number of people benefitted, millions)	6.2	0.9	0.2	0.2	7.5

Source: Office for National Statistics, Forest Research, Department for Energy Security and Net Zero (DESNZ), UK Centre for Ecology and Hydrology, Economics for the Environment Consultancy (eftec), Edmondson and others, Monitor of Engagement with the Natural Environment (MENE) Survey, Great Britain Day Visits Survey, Great Britain Tourism 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)

Notes

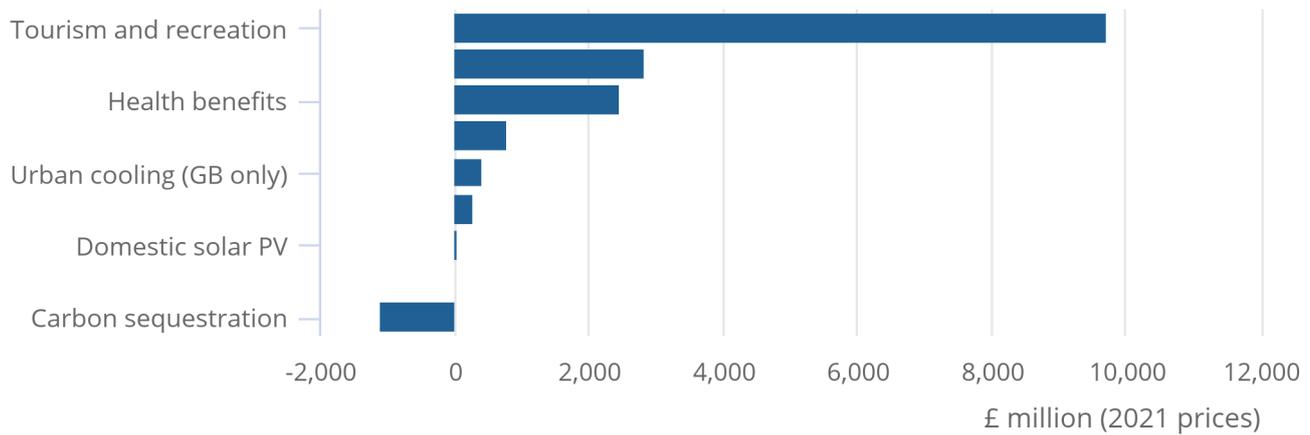
1. [x] indicates that data are not available.
2. Country-level data may not add up to the Great Britain or UK total because of rounding.
3. Tourism: country-level data may not add up to the overall UK total. This is because for the tourism surveys, some respondents do not specify which part of the UK they visited. Therefore, they are included in UK estimates but are missing from estimates for England, Scotland and Wales.
4. Country-level data for domestic solar PV may not add up to the overall UK total. This is because installations for which address data are unknown are not included.
5. Where 2020 data were not available for carbon sequestration, we used the 2019 values.
6. Where 2020 data were not available for food production, we used the 2021 values.
7. When we estimate the values of carbon sequestration in the urban environment, the emissions of greenhouse gases from soil disturbance are greater than the amount sequestered by urban trees, generating a net negative value.

Figure 3: Tourism and recreation was the largest contributor to total annual value for ecosystem services in UK urban areas in 2020

Ecosystem services for the UK, £ million (2021 prices), 2020

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Ecosystem services for the UK, £ million (2021 prices), 2020



Source: Office for National Statistics, Forest Research, Department for Energy Security and Net Zero (DESNZ), UK Centre for Ecology and Hydrology, Capital Growth, Monitor of Engagement with the Natural Environment (MENE) Survey, Great Britain Day Visits Survey, Great Britain Tourism Survey, and Economics for the Environment Consultancy (eftec)

Notes:

1. Where 2020 data were not available for carbon sequestration, and tourism and recreation, we used the 2019 values.
2. Where 2020 data were not available for food production, we used the 2021 value.
3. When we estimate the values of carbon sequestration in the urban environment, the emissions of greenhouse gases from soil disturbance are greater than the amount sequestered by urban trees, generating a net negative value.

Figure 4: The annual value of urban nature tourism and recreation in England was estimated to be £7,955 million in 2020

Ecosystem services in urban areas for England, Scotland, Wales and Northern Ireland, £ million (2021 prices), 2020

Notes:

1. Where 2020 data were not available for carbon sequestration, and tourism and recreation, we used the 2019 values.
2. Where 2020 data were not available for food production, we used the 2021 values.
3. When we estimate the values of carbon sequestration in the urban environment, the emissions of greenhouse gases from soil disturbance are greater than the amount sequestered by urban trees, generating a net negative value.

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Figure 5: The total annual value of urban ecosystem services in the UK in 2020 was an estimated £15.5 billion, of which health benefits from recreation accounted for £2.5 billion

Annual value of UK urban ecosystem services, £ million (2021 prices), 2010 to 2021

Notes:

1. Where 2020 data were not available for carbon sequestration, and tourism and recreation, we used the 2019 values.
2. Where 2020 data were not available for allotments, we used the 2021 value.

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Figure 6: Health benefits of recreation in urban areas was estimated to be £291 million for Scotland in 2020

Annual value of urban ecosystem services, England, Scotland, Wales and Northern Ireland, £ million (2021 prices), 2010 to 2021

Notes:

1. Where 2020 data were not available for carbon sequestration, and tourism and recreation, we used the 2019 values.
2. Where 2020 data were not available for allotments, we used the 2021 values.
3. Comparable data are not available for Northern Ireland for allotments, air pollution and urban cooling.
4. The values on the y axis vary for each UK nation.

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Provisioning services

Provisioning services are products from nature such as food, water, energy and materials.

Food production – allotments and community gardens

Allotments and community growing spaces enable small scale food production in urban areas. In 2021, they yielded an estimated 116 million kilogrammes of produce in Great Britain. Data for Northern Ireland are not available.

The annual value of food production in allotments and community growing spaces in 2021 was £274.1 million in England, £5.8 million in Scotland and £10.3 million in Wales. The total asset value for food production across Great Britain is estimated to be £8.7 billion.

Renewable energy – domestic solar photovoltaics (PV)

Renewable energy generation refers to electricity generated from renewable sources, dependent on the natural services of wind, sunshine, tides and rainfall. While this requires human investment, natural capital enables this renewable energy to be generated.

In 2021, solar PV accounted for about 10% of the UK's electricity generated from [renewable sources](#). Domestic solar PV is a scheme installed in a residential property and will generally be of small scale, 0 to 4 kilowatts in capacity. The majority of residential domestic properties are in urban areas, although some are rural and we are unable to separate them out. Domestic solar PV systems contributed an estimated 23% of the amount of electricity generated by solar PV in the UK in 2021.

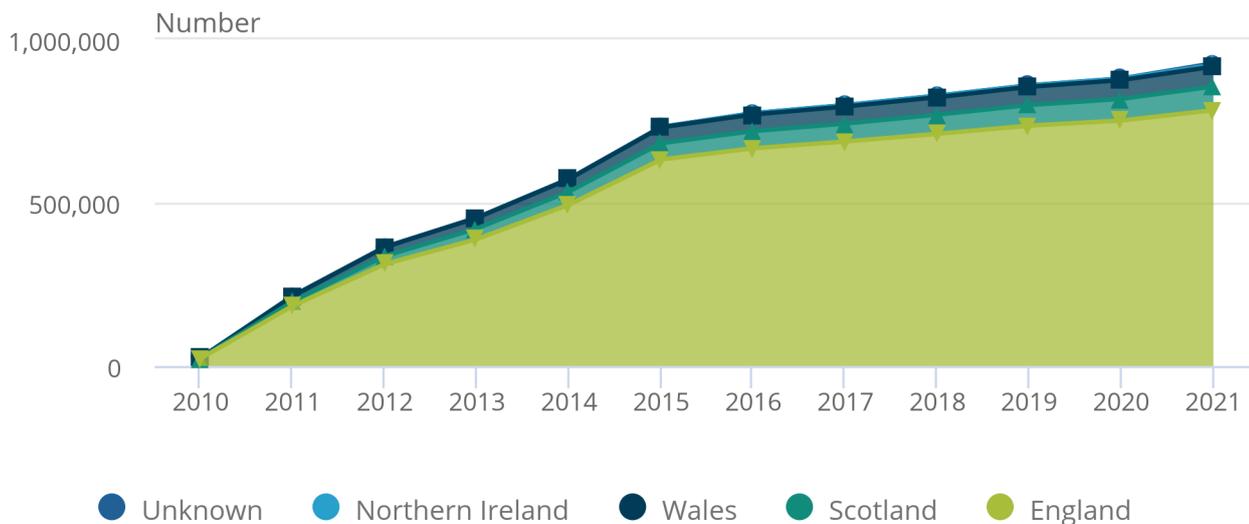
Installed capacity for UK domestic solar PV schemes was at its highest ever level in 2021 at 3,229 megawatts. Feed-in Tariff (FiT) is a financial support scheme promoting installation of small-scale solar PV systems. Since the introduction of the FiT scheme in April 2010, domestic solar installations increased rapidly, with an increase in the number of sites from 24,854 in 2010 to 926,879 in 2021 (Figure 7). While the scheme closed to new applicants in 2019, installations have continued to increase.

Figure 7: Domestic solar PV installations in the UK have risen rapidly since 2010

Cumulative number of domestic solar PV installations, by UK country, 2010 to 2021

Figure 7: Domestic solar PV installations in the UK have risen rapidly since 2010

Cumulative number of domestic solar PV installations, by UK country, 2010 to 2021



Source: Department for Energy Security and Net Zero (DESNZ)

Notes:

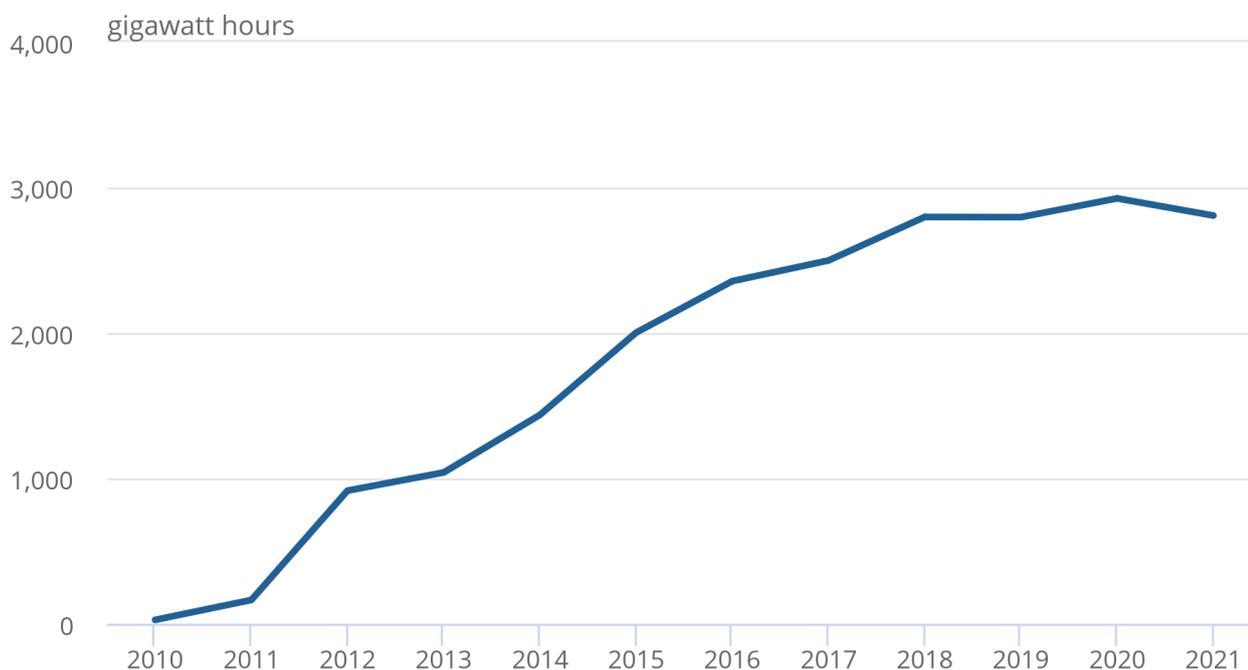
1. "Unknown" are installations for which address data could not be matched currently, including newly introduced postcodes for late 2022.
2. Not all domestic solar PV installations will be in urban residential areas, some will be in rural residential areas.

Figure 8: Domestic solar photovoltaic electricity generation has grown since 2010 to 2,925 GWh in 2020

Domestic solar PV electricity generation, gigawatt hours, UK, 2010 to 2021

Figure 8: Domestic solar photovoltaic electricity generation has grown since 2010 to 2,925 GWh in 2020

Domestic solar PV electricity generation, gigawatt hours, UK, 2010 to 2021



Source: Department for Energy Security and Net Zero (DESNZ), Office for National Statistics

Notes:

1. Physical flow estimates are based on the assumption that commercial and domestic systems have similar efficiency levels.

Electricity generation from domestic solar PV in the UK has largely increased over time, in line with a cumulative increase in domestic installations (Figure 8). However, despite a 5% increase in the number of installations, domestic electricity generation fell by 4% in 2021. This is because the [average number of sun hours](#) decreased by 12% in 2021 compared with 2020. In 2020, the annual value for UK domestic solar PV was estimated to be £61 million, while the asset value was £921 million (2021 prices).

Regulating services

Regulating services help to maintain the quality of the environment we rely upon. They include the regulation of natural processes such as air quality regulation, climate regulation and noise reduction.

Carbon sequestration

The UK is estimated to emit more greenhouse gases than it removes from [land use, land use change and forestry \(PDF, 4.36MB\)](#) (LULUCF). There are many ways in which greenhouse gases move between the atmosphere and the land, including by being released or removed directly by a habitat as it functions, or when a habitat is changed from one habitat to another. Notably for urban environments, soil disturbance during construction results in more climate change-causing gasses being emitted. When we consider all the exchanges of greenhouse gases in the urban environment, the emissions from soil disturbance dominate, generating a negative flows and asset value for the service. For more information, see our [quality and methodology information](#).

The net annual value of carbon removed by urban areas in the UK was estimated to be negative £1.1 billion in 2019, and therefore urban areas represent a net source of carbon. The reporting of negative values in accounts such as these is a live area of debate amongst statisticians – for more information note our recent [Principles paper](#)

Air pollution removal

Globally, the World Health Organization estimates that [91% of people in urban areas breathe polluted air](#). In the UK, estimates of between [28,000 and 36,000 deaths each year are attributed to human-made air pollution \(PDF, 6.10MB\)](#). Vegetation in urban green and blue spaces can remove airborne pollutants from the environment, therefore reducing harmful impacts on human health. These impacts include fewer deaths and life years lost, fewer respiratory hospital admissions and fewer cardiovascular hospital admissions.

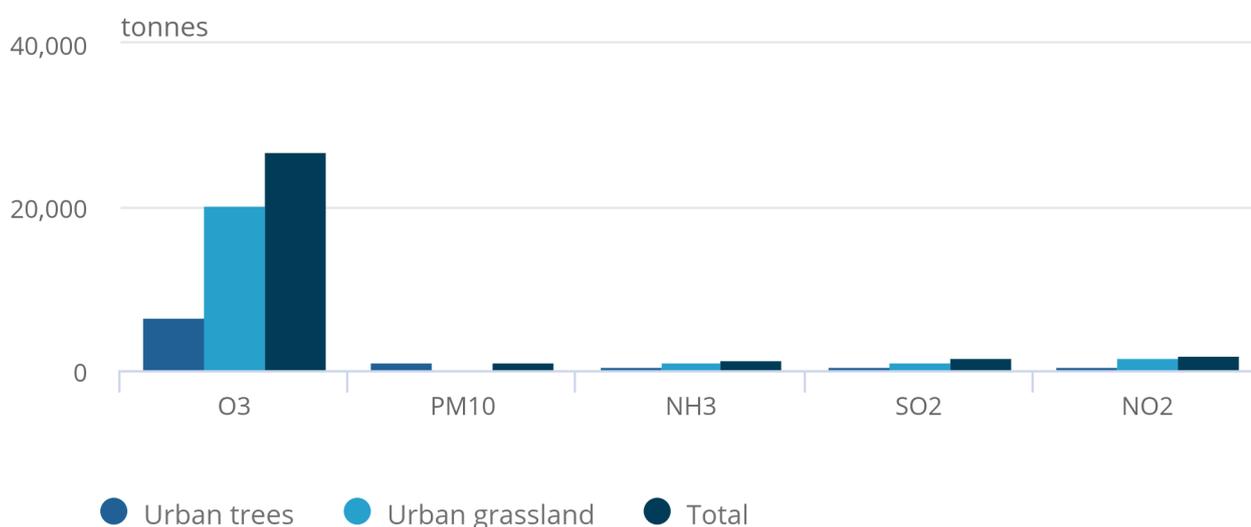
It is estimated that the removal of harmful pollutants by urban vegetation generated £800.5 million in avoided negative health impacts in Great Britain in 2021.

Figure 9: Urban vegetation removed 26,913 tonnes of ground-level ozone in 2021

Tonnes of pollutants removed by vegetation in the urban habitat, Great Britain, 2021

Figure 9: Urban vegetation removed 26,913 tonnes of ground-level ozone in 2021

Tonnes of pollutants removed by vegetation in the urban habitat, Great Britain, 2021



Source: UK Centre for Ecology and Hydrology and Office for National Statistics

Notes:

1. PM10 data include PM2.5.

Ground-level ozone (O3) represented 81% of all pollutants removed in 2021 (Figure 9); this accounted for 2% of the overall value of the service (Figure 10). Urban trees removed the majority (81%) of particulate matter (PM).

While PM2.5 (742 tonnes) accounted for only 2% of total pollution removed, it resulted in nearly 85% of total avoided negative health impacts in 2021 (£677 million). This is because PM2.5 (fine particulate matter with a diameter of less than 2.5 micrometres, 3% of the diameter of a human hair) poses the greatest risk to health. [PM2.5 is emitted from multiple sources](#) including wood burning, and wear of tyres and brakes from vehicles.

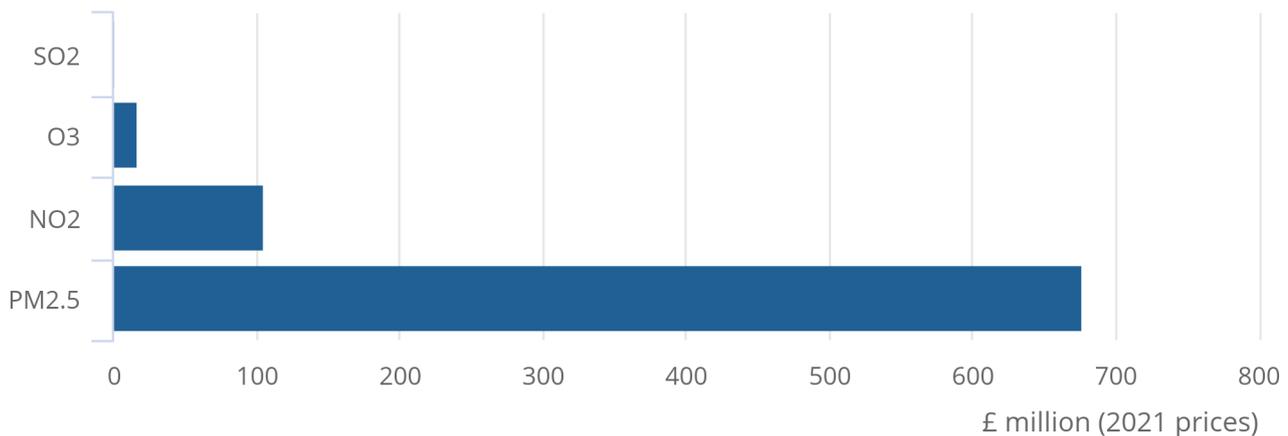
The long-term asset value of air pollution removal services by urban vegetation was an estimated £41.6 billion in 2021.

Figure 10: Removal of PM2.5 by urban vegetation accounted for nearly 85% of total avoided negative health impacts in urban areas in 2021

Annual value of urban vegetation pollution removal services by pollutant, Great Britain, £ million (2021 prices), 2021

Figure 10: Removal of PM2.5 by urban vegetation accounted for nearly 85% of total avoided negative health impacts in urban areas in 2021

Annual value of urban vegetation pollution removal services by pollutant, Great Britain, £ million (2021 prices), 2021



Source: UK Centre for Ecology and Hydrology and Office for National Statistics

Urban cooling

The [urban heat island effect](#) causes the air temperature in built-up areas, such as cities and towns, to be greater than that in surrounding rural areas, because of buildings and other solid surfaces absorbing and retaining heat. In 2018, Economics for the Environment Consultancy (eftec) and others estimated the cooling effect provided by green and blue spaces in urban environments for 11 city regions across Great Britain in [Scoping UK Urban Natural Capital Accounts: Extension to develop temperature regulation estimates \(PDF, 834KB\)](#).

Following the eftec method, we value the cooling effect through estimating the benefit from improved labour productivity and cost savings from air conditioning. The benefit from improved labour productivity accounts for most of the value, with avoided air conditioning energy costs representing only a small proportion.

The value of urban cooling is influenced by the size of the effect that needs to be reduced, that is, the number of hot days, which fluctuate. “Hot days” are those over 28 degrees Celsius. In 2021, 42.1 hot days were recorded for 11 Great Britain city regions (see [supplementary data tables](#) for full dataset). The annual value of avoided costs from urban cooling was an estimated £233 million in 2021.

The asset value of urban cooling, which takes future projections into consideration, was £27.4 billion in 2021.

Noise reduction

Trees can act as a buffer against noise pollution, in particular road traffic noise. Noise pollution causes adverse health outcomes through annoyance and lack of sleep.

The occupants of around 167,000 buildings benefitted from noise mitigation by urban vegetation in the UK. A large majority of these buildings were in England (142,000), with 12,000, 7,000 and 6,000 in Wales, Scotland and Northern Ireland, respectively.

The total UK annual value of noise reduction in 2020 was £16.6 million in avoided loss of quality adjusted life years (QALY) from sleep disturbance and annoyance. The total UK asset value for noise reduction was £903 million.

Cultural services

Cultural services are the non-material benefits we obtain from ecosystems through recreation, tourism, and the associated health benefits.

House prices (recreation and aesthetic)

Recreation house prices estimate the additional value included within house prices associated with proximity 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.

The annual value from house prices that can be attributed to living near to nature in the UK was £2.8 billion in 2020. This measures the value of free trips to spaces within 500 metres.

Tourism, recreation and health

There were an estimated 2.4 billion recreation and tourism visits to UK urban areas in 2020, an increase of 28% from 2011 (1.9 billion). These include visits to places such as urban parks and gardens. This represents 41% of all outdoor recreation and tourism visits in the UK in 2020, making it the most popular habitat to visit (Figure 11).

The number of visits to urban areas in 2020 was 20% lower than in 2019 (3 billion), in part because of the effect of the coronavirus (COVID-19) pandemic and lockdown restrictions, which changed how people interacted with nature. In 2019, the annual value of tourism and recreation in urban areas was £9.7 billion (2021 prices).

Figure 11: Urban areas are consistently the most popular habitat to visit in the UK across the time series, despite a 20% fall in number of visits in 2020

Number of outdoor recreation and tourism visits to UK habitats, millions, 2011 to 2020

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Number of outdoor recreation and tourism visits to UK habitats, millions, 2011 to 2020



Source: Monitor of Engagement with the Natural Environment Survey, The Welsh Outdoor Recreation Survey, Scottish Recreation Survey, Scotland's People and Nature Survey

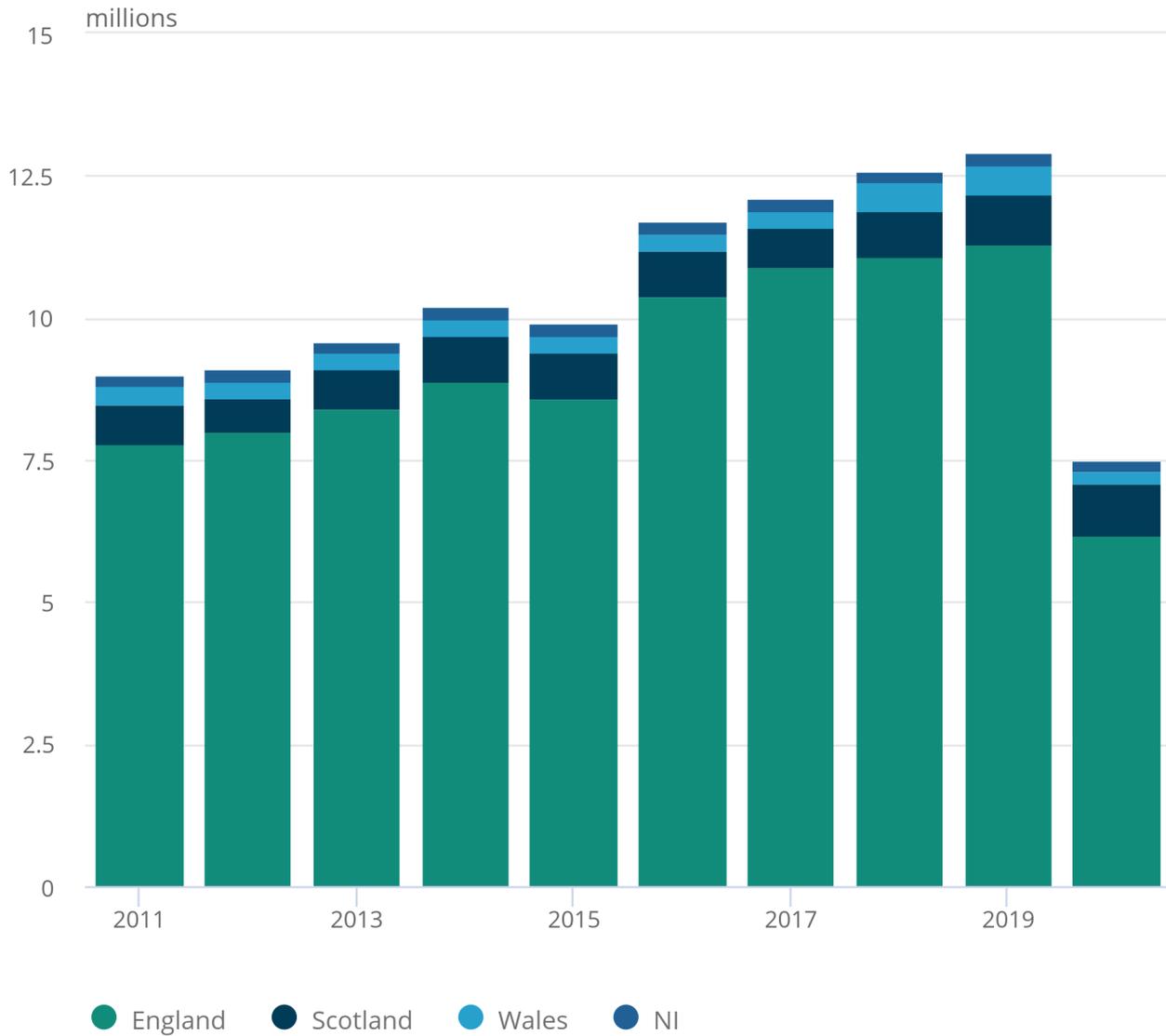
Research shows that [spending at least 120 minutes a week in nature is associated with good health and well-being](#). Between 2009 and 2019, recreational [visits to nature in urban areas accounted for more than 50% of total health benefits](#) associated with UK recreation (Figure 12).

Figure 12: The number of people who gained health benefits from exposure to nature in urban areas peaked at 12.9 million in 2019

Number of people gaining health benefits from recreation in UK urban areas, millions, 2011 to 2020

Figure 12: The number of people who gained health benefits from exposure to nature in urban areas peaked at 12.9 million in 2019

Number of people gaining health benefits from recreation in UK urban areas, millions, 2011 to 2020



Source: Office for National Statistics, Monitor of Engagement with the Natural Environment Survey, The Welsh Outdoor Recreation Survey, Scottish Recreation Survey, Scotland's People and Nature Survey

The number of people gaining health benefits from recreation in urban areas rose from 8.9 million in 2011 to a peak of 12.9 million in 2019, declining to 7.5 million in 2020 (Figure 12), when pandemic restrictions were in place.

Between 2019 and 2020, values remained relatively stable for Scotland and Northern Ireland, but the number of people obtaining health benefits from recreation in urban spaces declined in England (45%) and Wales (55%). This decline was driven by a 22% decrease in the average time spent per visit from 2019 to 2020. As a result, fewer people met the definition of spending 120 minutes or more a week in nature to receive health benefits. A change to the survey data in England in 2020 may partially account for shifts. For detailed methodological information, please see our [Health benefits from recreation, natural capital, UK: 2022 bulletin](#).

Correspondingly, the annual value of obtaining health benefits from spending time outdoors in UK urban areas fell from £4.2 billion in 2019 to £2.5 billion in 2020. The asset value was £324 billion in 2020.

The total asset value of urban tourism, recreation and health combined was estimated to be £676 billion in 2019.

5 . Asset value of urban areas

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

The UK asset value of urban ecosystem services was estimated to be £792 billion in 2020 (Table 7).

Table 7: Asset values urban ecosystem services UK, £ million (2021 prices), 2020

	England	Scotland	Wales	Northern Ireland	UK
Food production - allotments (GB only)	8,184	174	309	[x]	8,667
Renewables - domestic solar PV	786	69	60	5	921
Carbon sequestration	-16,979	-8,419	-1,279	-5,713	-32,389
Urban cooling (GB only)	25,960	201	450	[x]	26,611
Noise reduction	772	36	65	30	903
Air pollution removal (GB only)	40,397	845	408	[x]	41,650
Tourism and recreation	266,884	25,279	17,682	10,207	337,782
Health benefits	287,788	20,646	9,690	6,341	324,465
House prices	74,188	9,506	2,698	1,552	83,849
Total	687,980	48,339	30,083	12,422	792,459

Source: Urban natural capital accounts from the Office for National Statistics

Notes

1. Tourism: country-level data may not add up to the overall UK total. This is because for the tourism surveys some respondents do not specify which part of the UK they visited. Therefore, they are included in UK estimates but are missing from estimates for England, Scotland and Wales.
2. [x] indicates that data are not available.
3. House prices: country-level data may not add up to the UK total because Scotland uses a different model to estimate values.
4. Renewables: country-level data may not add up to the UK total because installations for which address data is currently unknown are not included here.
5. Where 2020 data were not available for carbon sequestration and tourism and recreation, we used the 2019 values to calculate annual and asset values.
6. Where 2020 data were not available for food production, we used the 2021 values.
7. When we estimate the values of carbon sequestration in the urban environment, the emissions of greenhouse gases from soil disturbance are greater than the amount sequestered by urban trees, generating a net negative value.

6 . Urban natural capital accounts, UK ecosystem services data

[Urban natural capital accounts, UK: supplementary information](#)

Dataset | Released 7 September 2023

A detailed data breakdown of financial and societal value of urban natural resources in the UK.

7 . 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 estimate the contribution of natural assets in UK urban areas to the economy and society. This includes provisioning services such as food and water, regulating services such as flood protection and pollution removal, and cultural services such as recreation and heritage.

Natural capital

Natural capital is a way of measuring and valuing the benefits that the natural world provides society. These benefits from natural resources include food, cleaning the air of pollution, sequestering carbon and cleaning fresh water.

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.

8 . Measuring the data

We present the urban natural capital accounts in four sections:

- size of the urban area (extent account)
- indicators of the quality of the urban ecosystem and ability to continue supplying services (condition account)
- quantity and value of services supplied by the urban ecosystem (physical and monetary ecosystem service flow accounts)
- value of urban habitat as an asset, which represents the stream of services expected to be provided over the lifetime of the asset (monetary asset account)

The data underpinning urban natural capital come from a wide range of sources, each with different timeliness and coverage.

The data sources used in this article:

- Bat Conservation Trust
- British Trust for Ornithology
- Bumblebee Conservation Trust
- Capital Growth
- Department for Energy Security and Net Zero
- Department for Environment, Food and Rural Affairs
- Economics for the Environment Consultancy
- Edmondson and others
- Forest Research
- Home Office
- Land Registry
- Met Office
- Natural England
- Natural Resources Wales
- NatureScot
- Outdoor Recreation Northern Ireland
- People's Trust for Endangered Species
- Rothamsted Insect Survey
- Royal Society for the Protection of Birds
- Scottish Fire and Rescue Service
- StatsWales
- UK Centre for Ecology and Hydrology
- UK National Atmospheric Emissions Inventory
- Visit Britain
- Welsh Government

Detailed methodology on the estimation of ecosystem services can be found in our [Urban natural capital accounts methodology guide, UK: 2023](#).

The Office for National Statistics produces the natural capital accounts in partnership with the Department for Environment, Food and Rural Affairs (Defra).

Methodology

Details of our methodologies for the urban accounts can be found in [Urban natural capital accounts methodology guide, UK: 2023](#).

Further details on the concepts and methodologies underlying the UK natural capital accounts can be found in our [Principles of UK natural capital accounting: 2023](#).

9 . Strengths and limitations

Data quality

The ecosystems services are classed as [experimental statistics](#). This means that they are in the testing phase, are not yet fully developed and have not been submitted for assessment to the UK Statistics Authority.

Ecosystems provide a diverse range of services and not all are included in our UK urban natural capital accounts, either because of availability of data or the need for robust valuation methods. We will continue to expand our reporting on such services.

We use a range of external data sources to calculate the ecosystem services and these use different definitions of urban areas.

Renewable energy

The Department for Energy Security and Net Zero supplied data for the number of small scale solar photovoltaic installations and capacity at residential properties. The assumption is that the majority of residential properties will be in urban areas, but this will not always be the case.

Air pollution removal

UK Centre of Ecology and Hydrology modelling includes the air pollution removal of urban trees and urban grassland.

Noise reduction

This ecosystem service estimate is based on the project [Scoping UK Urban Natural Capital Account – Extending noise regulation estimates – NR0170](#) published by the Department for Environment, Food and Rural Affairs (Defra). The urban “extent” in this study uses the urban area boundary based on the Office for National Statistics (ONS) (2011) Built-Up-Area dataset and focuses on trees and woodland areas in the Ordnance Survey Master Map for Great Britain. Northern Ireland data for location of woodland used the UKCEH Land Cover Map 2007.

Urban cooling

This ecosystem service estimate is based on the project [Scoping UK Urban Natural Capital Accounts – Extension to develop temperature regulation estimates – NR0172](#) by effec and others (2018). The urban “extent” in this study is based on the ONS (2011) Built-Up-Area dataset.

Carbon sequestration

Forest land data from the UK National Atmospheric Emission Inventory (NAEI) [Greenhouse Gas Inventory](#) are apportioned for urban areas using data from [Forest Research](#).

Recreation, tourism, and health benefits

Informed from a variety of survey data that contain habitat data.

House prices (amenity value)

This ecosystem service estimate uses data on house prices and the proximity of green spaces.

10 . Related links

[UK natural capital accounts: 2022](#)

Bulletin | Released 10 November 2022

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

[UK natural capital roadmap: 2022](#)

Article | Released 31 August 2022

This article assesses achievements since the publication of the natural capital roadmap, outlines various challenges, and sets out priorities for the next phase.

[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, urban and coastal margins. Uses the System of Environmental-Economic Accounting framework for Ecosystem Accounting. Experimental estimates.

[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.

11 . Cite this bulletin

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