Office for National Statistics

Woodland natural capital accounts methodology guide, UK: 2022

How the natural capital ecosystem service accounts are measured for the woodland habitat.

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1 . Overview

This methodology discusses the methods used to generate the data for the 2022 Woodlands Account. Similar to our Woodland natural capital accounts, UK: 2022 bulletin, this methodology first covers the extent of UK woodlands, secondly addresses the various condition indicators used, and finally covers the methods used in assessing woodland ecosystem services.

The Office for National Statistics (ONS) natural capital accounts are currently experimental. Therefore, ongoing efforts are made to find new and more accurate methodological approaches to improve the quality and reliability of the data. As a result, there are some changes which mean the data within the 2022 woodlands bulletin cannot be directly compared with data in the 2020 woodland report.

We have used a wide variety of sources for estimates of UK woodlands natural capital. These have been compiled in line with the guidelines recommended by the UN System of Environmental-Economic Accounting (SEEA) Central Framework and SEEA Experimental Ecosystem Accounting principles, which are part of the wider framework of the system of national accounts.

2 . Woodland extent

In developing our natural capital accounts, we use the broad habitat classifications as defined by the UK National Ecosystem Assessment (PDF, 2.04MB). According to this classification system, woodland includes both managed plantations and ancient, semi-natural woodlands. Both coniferous and deciduous (broadleaves) are included. To show the area of woodland, data are sourced from the Forestry Research Forestry Statistics 2022, which includes data from the Department of Agriculture, Environment and Rural Affairs (DAERA) for Northern Ireland.

3 . Woodland condition indicators

Ecosystem condition accounts provide a structured approach to recording and aggregating data describing the characteristics of ecosystem assets and how they have changed.

The United Nations System of Environmental-Economic Accounting — Ecosystem Accounting (SEEA EA) (PDF, 5.33MB) is a spatially based, integrated statistical framework.

The first step is to define and select ecosystem characteristics and associated variables. To assess condition, this means looking at characteristics that can show a directional change over consecutive accounting periods in a scientifically robust way. We also need to collect data on stable characteristics.

Ecosystem Condition Typology

The Ecosystem Condition Typology (ECT) is a hierarchical typology for organising data on the condition characteristics.

Abiotic (physical) ecosystem characteristics

- Physical state characteristics: including soil structure, water availability.
- Chemical state characteristics: including soil nutrient levels, water quality, air pollutant concentrations.

Biotic ecosystem characteristics

- Compositional state characteristics: including species-based indicators.
- Structural state characteristics: including vegetation, biomass, food chains.
- Functional state characteristics: including ecosystem processes, disturbance regimes.

Landscape-level characteristics

- Landscape and seascape characteristics: including landscape diversity, connectivity, fragmentation, embedded semi-natural elements in farmland.

Environmental pressure indicators

Some environmental pressure indicators, for example, wildfires and access, provide a broad measure of potential effects on the condition of ecosystems. However, as they do not provide direct measures of condition for individual ecosystem assets, they are used as a proxy measure where no other data are available.

Indicators of protection status (for example, Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SACs)) are classed as ancillary indicators as they can be used as proxy measures for condition in cases where no other information is available. Protected sites information could be thought of as a rough proxy for reduced environmental pressures, especially reduced overexploitation (for example, indicating lower management intensities).

Physical state indicators for woodland

Soil

Soil is important for providing many essential ecosystem services, such as food production, water purification and greenhouse gas regulation. Monitoring trends in specific soil indicators over time provides a suitable physical state condition indicator.

Soil data are taken from the Countryside Survey (PDF, 4.88MB) 1978, 1998 and 2007. Since then the UK Centre for Ecology and Hydrology (UKCEH) Countryside Survey has been monitoring soil samples in a rolling five-year survey to understand the state of topsoil (up to 15 centimetres depth). Interim data will be published during 2023.

Compositional indicators for woodland

Bats

Bats depend on a range of habitats, and in the UK are reliant on insect prey. They are sensitive to changes in land use, habitat fragmentation, climate and site management.

The National Bat Monitoring Programme (NBMP), run by the Bat Conservation Trust (BCT), coordinates annual bat surveys. Volunteers monitor bats at survey points and along walks by listening for their vocalisations using specialised equipment. The monitoring sites and walks have been mapped against habitat maps to enable us to break it down by broad habitat.

The detection distance of bats means that the bats recorded may not be at the exact location of the recording point. A "buffer" is placed around each recording point based on the approximate maximum detection distance for each species. These are:

- Daubenton's bat - 10 metres (m)
- common pipistrelle and soprano pipistrelle - 25m
- noctule - 100m

Indices for each species are based on spots or walks where at least 50% of the buffer area was of the relevant habitat.

Generalised Additive Models (GAM) are used to fit a smoothed line to each bat dataset, with full details on the statistical methods used in NBMP's Annual Report.

Bees

Bees provide a range of ecosystem services as well as being useful indicators of wider ecological health. Bees are one of the main groups of insects responsible for pollination of wildflowers, berries, orchards, and crops. As a third of all UK crops are pollinator dependent, this is a particularly important service. Habitat loss and degradation is related to declines in bee populations, so is a useful indicator of long-term changes in the condition and health of the environment.

The Bumblebee Conservation Trust runs the BeeWalk Survey Scheme. This uses citizen volunteers to monitor the number of bumblebees on a monthly walk from March to October, along a set route of approximately one mile. This identifies worker bees (the most common), drones (fertile males), and queens (the sole fertile female in any colony). The number of bees per kilometre were counted and reported over time. The total number of bees per kilometre per BeeWalk is an indicator of the condition of woodland habitats.

Birds

Bird populations provide a useful indicator of the state of UK nature, as they occupy a wide range of habitats and respond to environmental pressures.

Many of the habitat-based bird population indices are official statistics and produced by the Royal Society for the Protection of Birds (RSPB) and British Trust for Ornithology (BTO).

Species are selected for the index if they have a population of at least 300 breeding pairs and are a native species. Find out how bird populations are counted on the Breeding Bird Survey, British Trust for Ornithology (BTO) website.

Butterflies

The UK Butterfly Monitoring Scheme states that butterflies are good indicators of environmental change as they have short life cycles and react quickly to weather and climate change.

Moths

Moths hold vital roles in the ecosystems with more than 2,500 moth species present in Britain in a range of habitats. Moths and caterpillars are important for feeding bird chicks, so declines could have major knock-on effects for bird species. They also have an important role in pollinating crops and wildflowers.

According to the Butterfly Conservation, more than 60 individual species became extinct in the 20th century. Data are supplied to the Office for National Statistics (ONS) from the Rothamsted Research Insect Survey for moth counts.

National Forest Inventory

Changes in land use practices, woodland management, and effects from climate change affect the ecological condition of woodlands.

The National Forest Inventory (NFI) survey is based on data collected between 2009 and 2015 in Great Britain. More than 15,000 one hectare squares were sampled, recording data for 15 woodland ecological condition indicators (PDF, 3.08MB) at each survey site. These are then classed as favourable, intermediate, or unfavourable. For full details, see Forest Research's NFI survey methods.

NFI indicators used in this publication include:

- tree health
- invasive species
- regeneration at component level
- number native trees and/or shrub species
- deadwood volume (metres cubed per hectare)
- vertical structure
- veteran trees
- age distribution trees
- proportion open space

A variety of ages of trees in woodlands benefits biodiversity, as they provide different ecological habitats. To be classified as favourable, woodlands need to have young, intermediate, and old trees present. The NFI defines a veteran tree as a tree that is of interest biologically, culturally, or aesthetically because of its age, size, or condition.

The vertical structure is defined as the number of "storeys" in the tree canopy. Woodlands with greater structural diversity (more storeys) provide a wider range of microhabitats and conditions.

Regeneration is an assessment of seedlings, saplings, and young trees. It is an important indicator of biodiversity for predicting the future health of woodlands. To be classed as favourable, the woodland needs to have trees with four to seven centimetres diameter, as well as having saplings and seedlings present.

Tree diseases and pests have a negative impact on woodland biodiversity. Dead and decaying wood enable light to reach the forest floor, which is an important micro-habitat. The rapid and widespread death of trees can harm ecological health.

Areas of open space within, and adjacent to, woodlands provide increased light for some shade-intolerant species, improving environmental and structural heterogeneity. The UK Forestry Standard required woodlands to have a minimum of 10% open ground.

Statutory Plant Health Notices

Statutory Plant Health Notices (SPHN) are instructions to take action, such as felling, when trees on a site are found to be infected with pests or disease. Different bodies are responsible for issuing these notices in each country. Forest Research (PDF, 368KB) publishes data on number of sites issued with SPHNs and number of fellings carried out as the result of a SPHN.

Landscape-level indicators for woodland

Habitat connectivity

Habitat connectivity measures the ease of different species' movement between landscape habitats. One definition is "the degree to which the landscape facilitates or impedes movement among resource patches", which we use here.

Connectivity can be structural — about the distribution of patches of habitat across a landscape, or functional — about the ability of species to move around different habitat patches. For example, birds might functionally move across a naturally structurally fragmented set of habitats many miles or even thousands of miles apart, while some terrestrial mammals may struggle if a single road crosses their habitat.

Forest Research and the UK Centre for Ecology and Hydrology (UKCEH) developed a connectivity indicator for England (PDF, 4.73KB) looking at bird and butterfly species and their ability to move between patches. This used Countryside Survey data for 1990, 1998, and 2007.

NatureScot has developed a method to assess functional habitat connectivity at a national and regional scale, applying this to calculate a habitat connectivity indicator for Scotland (PDF, 13.9KB).

The Equivalent Connected Area (Probability of Connectivity) (ECA(PC)) metric is defined as "the size that a single habitat patch would need to be, to produce the same probability of connectivity as the actual habitat pattern in the landscape under consideration."

The ECA(PC) has been created for 10 catchment areas, with higher values meaning greater connectivity. The ECA(PC) as a percentage of the total amount of habitat in the region was selected as the most meaningful way to present connectivity. This method can measure changes in connectivity at a local level over time. However, comparisons of national-scale connectivity over time are not currently possible because of inconsistent land cover data over time.

Woodland on farmland

Data are collected by the Department for Environment Food and Rural Affairs (DEFRA) on the size and structure of the agricultural industry (PDF, 9.43MB) in the UK, including the area of woodland on farmland.

Environmental pressure indicators

Pressure indicators are defined here as damage inflicted on the landscape by humans.

Wildfires

Wildfires can be a pressure indicator. Most are anthropogenic in origin, with or without intent.

There are two main sources of wildfires data: reports and satellite data. Reported fires include wildfires of all sizes attended by Fire and Rescue Services but may miss remote fires that are addressed by land managers. Satellite data capture fires in both built-up and remote places but can miss smaller fires under 30 hectares.

England

The England wildfire statistics were collected from the Home Office's Incident Recording System.

Scotland

Wildfire data for Scotland are from Scottish Government using data from the Incident Recording System and only represent wildfires responded to by the Scottish Fire and Rescue Service. These exclude wildfires extinguished by landowners alone.

Wales

The Welsh Government reports annually on wildfires with data from the three Fire and Rescue Services in Wales.

Protected sites

There are several formal designations, including Special Areas of Conservation (SACs) in the UK, a Site of Special Scientific Interest (SSSIs) in Scotland, Wales and England, or Areas of Special Scientific Interest (ASSIs) in Northern Ireland. The rare fauna or flora present, or important geological or physiological features, make it an area of interest to science.

The England and Wales data were recorded by habitat. The Scottish data were recorded by feature category and therefore sites were only included if they had the habitat as the feature. For example, if the site had been recorded as a feature for birds, invertebrates or earth sciences, we were not able to assign it to a habitat.

Certified woodland area

Certified woodland in the UK has been independently audited against the UK Woodland Assurance Standard, which promotes good forest practice. They offer product labels that demonstrate that wood or wood products come from well-managed forests.

Access to woodland

This was recorded by Woodland Trust in their State of the UK's Woods and Trees 2021 report (PDF, 28.1MB). The report analysis uses accessible woodland data, along with data on overall woodland cover and population census data.

4 . Ecosystem services

Timber and woodfuel

The method used to value the provisioning services related to timber supply requires two inputs: the stumpage price and the physical amount of timber removed. We generate annual flow values by multiplying the two factors together.

Timber provisioning service asset valuations used Forestry Commission forecasts of timber availability to estimate the pattern of expected future flows of the service over the asset lifetime. Only partial forecast information is available for Northern Ireland, so asset value estimates have been included, by subtracting the yearly total of England, Scotland, and Wales from the UK asset value amount.

Removals estimates are taken from Forestry Commission timber statistics and converted from green tonnes to cubic metres (m3) overbark standing, using a conversion factor of 1.222 for softwood and 1.111 for hardwood.

The stumpage price is the price paid per standing tree, including the bark and before felling, from a given land area. Stumpage prices are sourced from the Forestry Commission Coniferous Standing Sales Price Index in the Timber Price Indices publication. The Coniferous Standing Sales Price Index monitors changes in the average price received per cubic metre (overbark) for timber that the Forestry Commission or Natural Resources Wales sold standing, where the purchaser is responsible for harvesting.

The same data from Forest Research or the Forestry Commission also informs our woodfuel figures. It does not, however, give a country level breakdown of woodfuel. Country level woodfuel data are estimates that have been calculated by apportioning out according to country level timber removal proportions.

Air pollution

Air quality regulation estimates have been supplied in consultation with the UK Centre for Ecology and Hydrology (UKCEH). A brief overview of the methodology will be explained here. A more detailed explanation can be found in the full air pollution methodology published in July 2017.

Calculation of the physical flow account uses the European Monitoring and Evaluation Program Unified Model for the UK (EMEP4UK) atmospheric chemistry and transport model. The model generates pollutant concentrations directly from emissions and dynamically calculates pollutant transport and deposition, considering meteorology and pollutant interactions.

Air pollution data removal by UK vegetation has been modelled for the years 2007, 2015, 2019. We have then scaled this based on previous modelling to create values for 2030. For years where government concentration data are available through the UK's Automatic Urban and Rural Network (AURN), figures are fed into the model to generate estimates for changes in air pollutant concentrations because of vegetation. Linear interpolation then occurs for future years where no government concentration data are available.

The health benefits were calculated from the change in pollutant exposure from the EMEP4UK scenario comparisons, that is, the change in pollutant concentration to which people are exposed. Damage costs per unit exposure were then applied to the benefiting population at the local authority level for a range of avoided health outcomes:

- respiratory hospital admissions
- cardiovascular hospital admissions
- loss of life years (long-term exposure effects from particulate matter where particles are less than 2.5 micrometres in diameter (PM2.5) and nitrogen dioxide (NO2))
- deaths (short-term exposure effects from ozone (O3))

The damage costs were updated in February 2019. For a method of how the damage costs are calculated, see Defra's Air Quality damage cost update 2019 (PDF, 1.13MB).

The primary chemical atmospheric modelling occurs on a kilometre grid square basis, with outputs aggregated up to habitat type and local authority levels of geography. Population weighting the results then enables the calculation of the resulting health benefits from vegetation induced pollution removal.

Carbon sequestration

Estimates relate to the removal of carbon dioxide equivalent (CO_2e) from the atmosphere by habitats in the UK.

The carbon sequestration data come from the UK National Atmospheric Emission Inventory (NAEI) Greenhouse Gas Inventory. This contains data relating to carbon change in the Land Use, Land Use Change and Forestry (LULUCF) sector. The account includes data which pertains to both the "forest land" and "harvested woodland products" land categories.

A presentation of natural capital accounts based on the impacts from nature acting naturally would include sequestration from ancient woodland but might exclude that from plantation forests. Emissions from damaged green spaces would not be included, as this can be viewed as a form of human-driven pollution, but emissions from a volcano would.

Another view of natural capital would state that all natural habitats are somewhat modified. Usually, human intervention is required to capture value and so the possibility of valuing many natural services (notably renewable energy) as if they were separate from human action is impossible.

We will consider this area of research further as our accounts develop. The net carbon sequestration values presented align with the 2019 Greenhouse Gas Inventory for the Land Use, Land-Use Change and Forestry sector. We also aim to estimate the gross carbon sequestration benefits of nature, but this is currently not possible with inventory data.

To estimate the annual value, we multiply the physical flow by the carbon price. The carbon price used in calculations is based on the projected non-traded price of carbon schedule. This is contained within data table 3 of the Green Book supplementary guidance. Carbon prices are available from 2020 to 2050. Prices before 2020 and beyond 2050 are deflated or inflated respectively by 1.5% annually, following guidance from the Department for Business, Energy and Industrial Strategy (BEIS).

Flood mitigation

To capture the flood regulating service for woodland in Great Britain, Forest Research examined how much it would cost to have flood water storage (reservoirs) in an area where there was no woodland. They looked at the substitution costs of having no woodland.

Urban cooling

A brief overview of the methodology of urban cooling will be provided here. For a more detailed description, see the Economics for the Environment Consultancy (EFTEC) and others' 2018 report, Scoping UK Urban Natural Capital Accounts: Extension to develop temperature regulation estimates (PDF, 834KB). To calculate the physical flow of local climate regulation services for urban woodland, EFTEC and others calculated the proportional impact on city-level temperatures caused by the urban cooling effect of woodland and their buffers using the cooling values from various sources.

EFTEC and others estimated the cooling benefit provided by woodland in urban environments for 11 city regions in the UK. EFTEC and others created a set of regions that comprised the main 11 city regions in Great Britain. Some city regions encompass large urban conglomerations (for example, Greater Manchester City Region), while others include considerable rural areas as well (for example, North-East City Region). All spatial calculations were made within these boundaries. For a map of the city regions, see page 21 in the scoping study. They calculated the overall benefit by applying cooling effects discovered in academic literature (Table 1) to the urban area within the cooled areas beside green or blue spaces.

Table 1: Width of buffers and temperature differentials applied for urban blue and green space

	Width of buffer to apply (m)	**Temperature differential (degree Celsius)**	
Asset		**Green or blue infrastructure**	**Buffer**
Urban green space			
Woodland (200 < x < 30,000m^2)	0	-3.5	n/a
Woodland (> 30,000 m^2)	100	-3.5	-0.52

Source: Economics for the Environment Consultancy (Eftec) and others (2018)

The monetary account measures the value of the cooling effect in pounds. The cooling effect is monetised through the estimated cost savings from air conditioning and the benefit from improved labour productivity. The benefit from improved labour productivity makes up most of the value, with avoided air conditioning energy costs only accounting for a small fraction.

This is assessed by non-financial business sectors, based on averaging temperature mitigation across urban areas and applying temperature–output loss functions to estimate the gross value added (GVA) that would have been lost owing to heat in the absence of the cooling effect, accounting for adaptation behaviours. These estimates represent exchange values as they are directly based on avoided losses in economic output and expenditure. Welfare values would be included if the valuation covered the non-market benefits to the general public of urban cooling (for example, the value of tree shading). In principle, some of these non-market benefits may be captured within the recreational account, to the extent that the cooling and shading features of green and blue space generate more recreational visits to such sites on hot days.

These adaptation behaviours consider the averted loss of labour productivity from air conditioning and behaviour change. For the purposes of this analysis, a 40% reduction is applied to the estimated additional avoided productivity loss from urban cooling to more labour-intensive or non-office-based sectors for averted losses owing to behavioural change (that is, mining and utilities and manufacturing). An 85% reduction is also applied for less labour-intensive or office-based sectors for averted losses owing to air conditioning (that is, information and communication and real estate activities).

Additionally, avoided air conditioning energy costs are based on estimates in London and extrapolated to other city regions. To extrapolate to other city regions, data on the relative air-conditioned office space and percentage green space in other regions are used. This figure is more tentative. The value of the service will fluctuate year to year reflecting the number of hot days (defined as over 28 degrees Celsius) experienced.

The monetary account of the future provision of the ecosystem service, or future benefit stream, accounts for the benefits received over a specified time period, in this case 100 years. The account incorporates a projection for an annual increase in working day productivity losses owing to climate change, which increases the value of urban cooling over time. The assessment of future climate impact relies on a broad estimation of the number and degree of hot days in the future across Great Britain. As well as including climate change impacts, an annual uplift is applied to the monetary values to account for year on year increases in GVA over the 100-year assessment period. For the first 30 years, this uplift is 2% annually, decreasing to 1.5% for years 31 to 75 and 1% for years 76 to 100.

Further work is needed to measure these ecosystem services more accurately (for example, adoption of a more granular, bottom-up approach to physical account modelling). For a full list of all the recommendations to update this service, see the Scoping UK Urban Natural Capital Accounts: Extension to develop temperature regulation estimates (PDF, 834KB).

Tourism and recreation

The recreation estimates are adapted from the "simple travel cost" method developed by Ricardo-AEA in the methodology Reviewing cultural services valuation methodology for inclusion in aggregate UK natural capital estimate. This method was originally created for use on the Monitor of Engagement with the Natural Environment (MENE) Survey, which covers recreational visits by respondents in England.

The method looks at the expenditure incurred to travel to the natural environment and during the visit. It considers the market goods consumed as part of making the recreational visit (that is, fuel, public transport costs, admission charges and parking fees). This expenditure is currently assumed as a proxy for the value of accessing the site.

Estimates for the cultural service of outdoor recreation in this publication use survey data across seven surveys covering England, Wales, Scotland and Northern Ireland. The questions used from these surveys can be summarised as:

- How many visits to the outdoors for leisure and recreation have you made in the last four weeks?
- On the last visit to the outdoors, what type of habitat did you go to?
- What was the main means of transport used on this last visit?
- How far did you travel to get to and from the main destination of this visit?
- How long was the visit, in terms of time (including travel time)?
- How much did you spend on [spending category]?

For estimates of outdoor recreation in England, the Monitor of Engagement with the Natural Environment (MENE) Survey is used. The survey collects detailed information on people's use and enjoyment of the natural environment during visits. This report relates to the full ten years of surveying from March 2009 to February 2019. MENE samples around 47,000 respondents, 20,000 of whom make visits annually.

In Scotland, data from two surveys are used to produce estimates of outdoor recreation. From 2003 to 2012, data from the Scottish Recreation Survey (ScRS) was used. The ScRS was undertaken through the inclusion of a series of questions in every monthly wave of the TNS Omnibus survey, the Scottish Opinion Survey (SOS). In every month of the SOS around 1,000 face-to-face interviews are undertaken with adults in Scotland aged 16 years and over.

Replacing the ScRS, Scottish Natural Heritage commissioned the Scotland's People and Nature Survey (SPANS) for the first time in 2013 to 2014, then again in 2017 to 2018. Unlike ScRS, SPANS excludes questions relating to respondent expenditure during their last outdoor recreation visit. To produce estimates of Scottish outdoor recreation expenditure beyond 2012, we created a statistical model. Using comparable MENE and ScRS data, this model examined the relationship between English and Scottish per visit expenditure on a habitat basis. Linear interpolation was used to produce estimates of Scottish recreation from 2014 to 2016.

Previously we used the Welsh Outdoor Recreation Survey (WORS 2014) in combination with England's MENE survey to produce outdoor recreation estimates for Wales. However, since obtaining 2016 and 2018 data from the National Survey for Wales (NSW), all Welsh estimates are calculated using NSW only, as NSW provides improved quality of the sampling approach, therefore comparability between WORS and NSW is not advisable.

Estimates of outdoor recreation in Wales for 2017 and before 2015 are based on an index of MENE outputs. Because of this, we multiply estimates of total expenditure by the proportion spent on each expenditure type in the most recent year we have data available. This allows the different expenditure types to sum to total expenditure, despite some years being based on an index of MENE outputs.

The absence of a question relating to the transport method within NSW affects our ability to estimate overall running costs and travel time, given that we do not know how respondents travel to their visit destination. We address this by calculating the proportion of total distance travelled to mountains, moorlands, and heath (MMH) habitats by different methods of transport in the MENE survey for the years of 2016 and 2017. These are used as proxy variables for NSW and the years of 2016 and 2018 respectively. We multiply the proxy variables by the total distance travelled in NSW to produce estimates for distance travelled by different methods of transport, which are used in our running costs calculations.

The NSW does not include a breakdown of expenditure type, for instance, how much money a respondent spends on food and drink, fuel or admissions. Instead, an overall amount is collected in the "VisitMoney" variable of the NSW (PDF, 3,977KB). This affects our ability to calculate annual expenditure values as we replace reported fuel costs with our calculated running costs, while also subtracting money spent on food and drink.

We address this by calculating the proportions of expenditure on each type of service from MENE in 2016 to 2017. This proxy variable is then multiplied by the total expenditure in NSW to produce a service expenditure breakdown, with food and drink removed and fuel costs replaced with calculated running costs.

Finally, we use the People in the Outdoors Monitor for Northern Ireland (POMNI) in combination with England's MENE survey to produce outdoor recreation estimates for Northern Ireland. Data from POMNI are only available for 2021. The survey samples around 6,000 respondents, 67% of whom take visits annually. Northern Ireland data before 2021 are based on an index of MENE outputs.

These surveys focus on short day trips from home and miss out potentially large amounts of spending on outdoor activity from domestic tourism. A combined recreation and tourism account has been created to capture this additional spending.

Habitat disaggregated estimations may not sum to equal overall totals. This is because the habitat-visited question may be asked less frequently compared with other questions, resulting in smaller sample sizes. Estimations can differ depending on sample sizes.

For broad habitat classifications by country, please see the Habitats section of our Health benefits from recreation methodology.

For the asset valuation of outdoor recreation, projected population growth calculated from ONS population statistics and an income uplift assumption, were implemented into the estimation. The income uplift assumptions are 1%, declining to 0.75% after 30 years and 0.5% after a further 45 years. These assumptions project the annual value to increase over the 100 years.

It is acknowledged that the expenditure-based method provides an underestimation of the value provided by visits to the natural environment. Primarily, this is because there are several benefits that are not accounted for including scientific and educational interactions, health benefits and aesthetic interactions. Currently, there is no method in use that incorporates these considerations. Additionally, the time spent by people in the natural environment is not itself directly valued because of the accounting and methodological challenges involved.

A significant number of outdoor recreation visits have no expenditure as people make local visits, such as walking to a local park. The value of local recreation and the aesthetic benefit from living near green and blue spaces is estimated through house prices.

Health benefits from recreation

The UK natural capital accounts: 2022 include a new recreation account for the first time. The recreation-based surveys discussed in this section have been further used to generate the number of people gaining health benefits from regular recreation, and the monetary value associated with this. The monetary value of health benefits from recreation have been derived from the work of Claxon and others (2015). This cost saving approach concluded that £13,000 of NHS resources adds one Quality Adjusted Life Year (QALY) to the lives of NHS patients (2008 values).

The methodology underpinning the health benefits gained from recreation can be found under Exposure to nature in Section 2 of our Health benefits from recreation methodology. Since this report, further work has been undertaken to implement the "exposure to nature" approach. This includes integrating data from the People in the Outdoors Monitor for Northern Ireland survey to improve estimates for Northern Ireland.

5 . Cite this methodology

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