

Forestry Statistics 2023

Sources: Carbon

Release date:

28 September 2023

Coverage:

United Kingdom

Geographical breakdown:

Country

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The Research Agency of the
Forestry Commission

Forest Research is the Research Agency of the Forestry Commission and is the leading UK organisation engaged in forestry and tree related research.

The Agency aims to support and enhance forestry and its role in sustainable development by providing innovative, high quality scientific research, data, technical support and consultancy services.

11.4 Sources: Carbon

Introduction

Forests can help mitigate climate change by reducing the amount of greenhouse gases in the atmosphere. They do this by absorbing carbon dioxide, using the carbon to produce sugars for tree growth and releasing the oxygen back into the air. As trees grow, they store carbon in their leaves, twigs and trunk, and in the soil around them.

Globally, deforestation caused by the unsustainable harvesting of timber and the conversion of forests to other land uses accounts for almost 20 per cent of global carbon dioxide emissions. The amount of carbon stored can be increased by actions to reduce the amount of deforestation and to convert non-forested areas to forest. Forests can be managed as a sustainable source of wood – an alternative energy source to fossil fuels, and a low-energy construction material.

Woodlands can also help society adapt to a changing climate, by reducing the risk of flooding, providing shade for wildlife, reducing soil erosion and helping to cool down towns and cities.

Data sources and methodology

Forest carbon stock

Table 4.1a is adapted from Table 2d in the final UK report submitted in January 2019 to FAO for the [Global Forest Resources Assessment](#) (FRA) 2020. Table 4.1b has been compiled using the same approach to produce estimates by country within the UK.

Units

These tables are shown in million tonnes carbon dioxide equivalent (MtCO_{2e}) rather than million tonnes carbon (MtC). To convert from CO_{2e} to C multiply by 12/44.

Timescales

Carbon stock is estimated for 1990, 2000, 2010, 2015 and 2020.

Living biomass

Carbon in living biomass is based on data from NFI report [Carbon in live woodland trees in Britain](#) (Forestry Commission, May 2014), uprated from GB to UK estimates based on estimated volumes of growing stock. A "root to shoot ratio" (below ground biomass = 0.36 x above ground biomass) is used to estimate the breakdown between above- and below-ground biomass (Levy et al., 2004). Updated estimates of growing stock over time (making use of data from the National Forest Inventory) have been used.

Deadwood

Estimates of deadwood volume per hectare are taken from National Forest Inventory estimates. These are rated up by woodland area estimates for FRA 2020, assuming a density of 0.45 ODT/m³, and an average carbon content of 50% is applied.

Litter

Estimates of the carbon content of the litter layer are available from Morison et al. (2012). These are rated up by woodland area estimates for FRA 2020 to provide a consistent time series.

Soil carbon

Estimates of the carbon content of soil 0 to 100 cm for England, Wales and Scotland are available from Morison et al. (2012). An estimate of the carbon content of soil for Northern Ireland is taken from Bradley et al. (2005) and rated downward to reflect the generally lower carbon content found in Morison et al. (2012). The soil carbon estimates are then rated up by woodland area estimates for FRA 2020 to provide a consistent time series. This soil estimate does not take account of soil carbon accumulation. It also assumes that the soil carbon content of

afforested (and previously unwooded) land has the same soil carbon content as woodland soils, whereas in practice this may vary.

Comparison with other data sources

Figures in this updated table are broadly similar to the estimates made in Morison et al. (2012).

Future updates

This table will be updated once further information is available from the National Forest Inventory.

Carbon sequestration

The information in Table 4.2 is taken from inventory and projections of UK emissions by sources and removal by sinks due to land use, land use change and forestry, produced by CEH for the [National Atmospheric Emissions Inventory](#) (NAEI) which incorporates all air pollutants including greenhouse gases.

Figure 4.1 shows annual estimates of carbon accumulation by country, taken from the same source but shows carbon in living forest biomass only; it excludes carbon in litter, soils and forest products. Future predictions of carbon uptake assume that commercial conifer plantations will be replanted when felled, and that planting of new woodland will follow a central projection whereby planting up to 2020 is determined by the available grants for woodland creation (i.e., policy and funding in place), and after that planting rates drop to 10% of the baseline projection, reflecting the lack of funding beyond the current Rural Development Plan.

For more information, please refer to the [National Atmospheric Emissions Inventory](#) (NAEI).

Emissions and sequestration can be presented as tonnes of carbon or tonnes of carbon dioxide (CO₂). To convert from tonnes of CO₂ to tonnes of carbon multiply by 12/44.

Woodland Carbon Code

The Woodland Carbon Code is a voluntary standard, initiated in July 2011, for woodland creation projects that make claims about the carbon they sequester (take out of the atmosphere). All projects must be placed on the UK Woodland Carbon Registry. Their claims about potential carbon sequestration are validated by an independent certification body. Validated projects are then verified on a regular basis to confirm the progress of carbon sequestration.

Information about Woodland Carbon Code projects comes from the UK Woodland Carbon Registry, housed on the [Markit Environmental Registry](#). The register is a live database and summary data are extracted annually.

Further information on the Woodland Carbon Code is available at the [UK Woodland Carbon Code website](#).

Public opinion on climate change

[Public Opinion of Forestry surveys](#) have been run every 2 years by Forest Research on behalf of the Forestry Commission/Forestry England/Defra, Scottish Forestry, Welsh Government/Natural Resources Wales and every 4 years on behalf of the Forest Service of Northern Ireland. The surveys cover public attitudes to forestry and forestry-related issues. In the UK/England survey, respondents are asked two questions on climate change: one asking about ways in which forests and woodlands can impact on climate change and one asking about how UK forests should be managed in response to the threat of climate change (Table 4.4). Further information on the Public Opinion of Forestry surveys, including methodology and quality statement, can be found in the Annex section in each report.

References

Bradley, R.I., Milne, R., Bell, J., Lilly, A., Jordan, C., Higgins, A. (2005) "[A soil carbon and land use database for the UK](#)", *Soil Use and Management* 21 (363-369), DOI: 10.1079/SUM2005351.

Broadmeadow, M., Matthews, R. (2003) "[Forests, Carbon and Climate Change: the UK Contribution](#)", Forestry Commission, Edinburgh.

Department for Business, Energy and Industrial Strategy (2022) "[Final UK greenhouse gas emissions national statistics: 1990 to 2020](#)".

Levy, P.E., Hale, S.E., Nicoll, B.C. (2004) "[Biomass expansion factors and root: shoot ratios for coniferous tree species in Great Britain](#)", Forestry, Vol 77, No 5, DOI: 10.1093/forestry/77.5.421.

Morison, J. et al (2012) "[Understanding the Carbon and GHG balance of UK Forests](#)", Forest Research.

Quality

All of the statistics in this chapter are outside the scope of National Statistics, but are included here to give a broad indication of the role of UK forests in climate change.

Revisions

Most of the statistics in this chapter have been previously released. Data have not been revised from previous releases.

Our revisions policy sets out how revisions and errors to these statistics are dealt with, and is available on our [Quality of Official Statistics web page](#).

Release schedule

Woodland Carbon Code Statistics for the year ending March 2024 will be released in Provisional Woodland Statistics 2024 on 20 June 2024.

Forestry Statistics 2024 and Forestry Facts & Figures 2024 will be released on 26 September 2024.

The next Public Opinion of Forestry Survey is expected to run in early 2025, with results available in summer 2025.

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