

Responding to the climate emergency with new trees and woodlands

A guide to help local authorities and landowning businesses achieve net zero



Contents



Focus of woodland creation	3
So why choose trees?	3
Using woodland creation to reach net zero emissions by 2050	4
Using woodland creation in development plans to contribute to net zero	7
Creating woodland through natural colonisation	7
Reduce the use of non-renewable resources with wood and timber products	8
Managing woodland is good for carbon too!	8
In summary...what can you do to help?	9
Sources of further information on grant funding	10
Woodland creation and plastic tree guards	11

Focus of woodland creation

The UK's climate is changing. Even with very ambitious actions to reduce greenhouse gas emissions globally, some further climate change is inevitable up to at least 2050. The Committee on Climate Change (CCC) has recommended that the UK Government adopt a net zero greenhouse gas (GHG) emissions target for 2050 and on the 27th June 2019, the UK Parliament amended the Climate Change Act (2008)¹ to include a commitment to net zero emissions by 2050. The UK Parliament and a growing number of local councils and some businesses have declared climate change emergencies and committed to achieving net zero targets over varying timeframes.

Trees, woodlands and forests play a key role in greenhouse gas removal. The CCC has recommended that we should be aiming to plant around 30,000 hectares of new woodland in the UK every year until 2050. That is nearly a million hectares over the next 30 years. Doing so could absorb approximately 10% of residual GHG emissions² alongside the substantial reductions to emissions across the whole economy required to meet net zero targets. In response to this the UK Government has committed to supporting woodland creation and peatland restoration with the £640m Nature for Climate Fund to plant more than 40 million trees and restore 35,000 hectares of peatland in England³ by 2025. This commitment builds on the ambition and aspirations of the 25 Year Environment Plan⁴.

So why choose trees?

Well-designed new woodlands not only capture carbon dioxide (CO₂) but deliver a wide range of other benefits too.

Sustainably managed woodlands perform a vital role as carbon sinks and reservoirs⁵ by capturing CO₂ from the atmosphere and storing it as a component of wood itself. Over time, the soil beneath them is enriched by adding carbon in the form of organic matter from leaf litter, branch fall and root death. In general, woodland soils have low and infrequent levels of disturbance and the total carbon content per unit area of woodland is higher than that for agricultural soils which are subject to more frequent and significant disturbance. The rate of CO₂ capture is closely related to tree growth rate (or yield class – YC) and wood density, and it differs between species.

Beyond carbon, all trees and woodlands – wherever they are in the landscape, including our towns and cities – can also provide a range of other benefits. They improve air quality, reduce the 'urban heat island', provide timber, wood and wood fibre products, provide opportunities for people to re-connect with nature and new spaces to improve health and well-being, help to reduce flood risk and can reduce the costs of water treatment too⁶.

1 The Climate Change Act 2008 (2050 Target Amendment) Order 2019 can be found at <http://www.legislation.gov.uk/ukxi/2019/1056/made>

2 'Net Zero – The UK's contribution to stopping global warming' Committee on Climate Change May 2019, the Further Ambition options sees forestry providing a net sink of CO₂ emissions of 22 MtCO₂e per year by 2050 of the total UK emissions (estimated at approximately 200MtCO₂e by 2050)

3 The announcement of £640M Climate for Nature Fund was made in the Budget Statement of 11th March 2020.

4 Details of the 25 Year Environment plan can be found at <https://www.gov.uk/government/publications/25-year-environment-plan>

5 Carbon sinks and sequestration <https://www.unec.org/forests/outlook/carbonsinks.html>

6 England's Tree Health and Resilience Strategy May 2018 provides information on the importance of trees, woodland and forest to our economy, provides good information on plant biosecurity and guidance on the sourcing of appropriate tree stock. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/710719/tree-health-resilience-strategy.pdf



Using woodland creation to reach net zero emissions by 2050

Placing woodland creation at the heart of any response to climate change will result in efficient and effective carbon capture. Achieving afforestation at the scale recommended by the CCC will require land use change up and down the country. Partnership-working and consultation is key to making the challenging choices involved and avoiding any negative social, economic or environmental impacts associated with woodland creation. Forestry regulations and the requirements of the UK Forestry Standard underpin woodland creation projects ensuring high quality design and sustainability.

So how can we calculate the area of new woodland we are going to aim to create? The answer to that question will depend on the scale of current emissions and the actions already being taken to reduce those emissions to a minimum or residual value. The UK Government provides local authority and regional CO₂ emissions national statistics⁷ and more information about the greenhouse gas emissions in your local authority area is available from the National Atmospheric Emissions Inventory⁸.

The following worked examples use the Woodland Carbon Code's carbon calculator⁹ to provide estimates of CO₂ capture for four woodland types on the same area of land:

- Type 1:** 10 hectares (net area) of new broadleaved woodland growing at YC4 and under a non-intervention regime with tree shelters and fencing to protect the trees when young, will have captured approximately 2,700 tonnes of carbon dioxide (tCO₂) after 30 years, so 1 hectare will have captured 270 tCO₂.
- Type 2:** 10 hectares of new productive broadleaved woodland growing at YC8 under a thinning intervention with tree shelters and fencing will have captured approximately 3,100 tCO₂ after 30 years, so 1 hectare will have captured 310 tCO₂.
- Type 3:** 10 hectares of a new UKFS compliant mixed conifer woodland growing at YC20 and under a thinned continuous cover forestry regime, will have captured approximately 3,220 tCO₂ after 30 years, so 1 hectare will have captured 322 tCO₂. This woodland type yields some timber thinnings which will have a financial value in addition to any carbon value or could be used as a source of renewable energy (woodfuel), for fencing or as a raw material for panel board manufacture.
- Type 4:** 10 hectares of a new mixed woodland growing at YC20 and 12 for the conifers and YC6 for the broadleaves, and under a thinned continuous cover forestry regime, will have captured approximately 2,850 tCO₂ after 30 years after it is planted, so 1 hectare will have captured 285 tCO₂. This woodland type yields some timber thinnings which will have a financial value in addition to any carbon value.

⁷ UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2017 can be found at <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2017>

⁸ Go to <https://naei.beis.gov.uk/laco2app/> for more data on GHG emissions in your local area

⁹ Find the Woodland Carbon Code calculator under Carbon Prediction Tools at <https://www.woodlandcarboncode.org.uk/standard-and-guidance/3-carbon-sequestration/3-3-project-carbon-sequestration>



Local councils and businesses wishing to become 'Net Zero' contributors to Climate Change should first calculate their GHG emissions to account for their operations and provision of their services. Then they should set out an abatement strategy to reduce their emissions at source to a minimum. However, society cannot function without using some carbon and therefore emitting some CO₂. These emissions are known as unavoidable or residual CO₂ emissions. The local council or business abatement strategy will show what these residual emissions are estimated to be.

The final step in the process should be to calculate how to make good for these emissions. Here we are therefore looking at how much woodland is required to offset the residual emissions over the period of the 'net-zero strategy'. This can be done by dividing the residual emissions by the tonnes of CO₂ captured by the type of woodland to be created.

Calculating how much woodland you need to plant?

Anytown District Council has stated it will make its operations and provision of services have net zero emissions between now and 31st December 2050 and has committed to put into place all of its emissions reduction strategies and actions to make this happen. It has calculated its residual CO₂ emissions are an average of 3,000 tCO₂ per year for the next 30 years, declining from the current rate of 5,000 tCO₂/year to 1,000 tCO₂/year in 2050. That's approximately 90,000 tCO₂ over the 30 year period.

In order to provide its services and carry out its operations with net zero CO₂ emissions over the period between now and 2050, the Council has decided to create more woodland because, as well as capturing carbon, it realises that there are plenty of other benefits the town will enjoy from being set in a wooded landscape. As the Council is yet to decide the type of woodland it wishes to create it has a number of options. Using the woodland types and calculation mentioned earlier, to achieve 'net zero to 2050', they could plant:

For **Woodland Type 1** which captures 270 tCO₂ per hectare over the 30 years, they will need to create **333 ha** of mixed broadleaved woodland managed for its biodiversity benefits.

For **Woodland Type 2** which captures 310 tCO₂ per hectare over the 30 years, they will need to create **290 ha** of mixed productive broadleaved woodland that is managed for its timber products as well as the many other benefits woodland provides.

For **Woodland Type 3** which captures 322 tCO₂ per hectare over the 30 years, they will need to create **280 ha** of UKFS Compliant mixed coniferous woodland producing a timber resource as well as the other multitude of benefits provided by coniferous woodland.

For **Woodland Type 4** which captures 285 tCO₂ per hectare over the 30 years, they will need to create **316 ha** of mixed broadleaved and conifer woodland which will provide multiple benefits for society including increased biodiversity, timber products and recreation.

Local authorities could also consider re-thinking their land portfolio. Selling valuable and developable land may enable them to buy other land for woodland creation and allow them to accommodate extra woodland creation. They could also work in partnership with other landowners in the area to create woodlands on their land.





The figures used in the fictional example are approximations. To be more accurate it would be advisable to use the Woodland Carbon Code (WCC) carbon calculator. More accurate estimates of future carbon capture will also require knowledge of the species you intend to plant and their growth rate. The Ecological Site Classification (ESC) on-line tool¹⁰ will help you to decide on appropriate species and their likely growth rate (yield class). ESC also allows you to consider the impacts of climate change on the species you plan to plant, which is an essential part of woodland design.

If your business or local council intends to report its efforts to offset its emissions, it is advisable to register, validate and verify the woodland that has been created with the WCC. You will need to have decided far more of the detail of the intended woodland creation to do this, so we recommend that you speak to your local Forestry Commission Woodland Officer¹¹.

Although seeking validation and verification of a planting project through the WCC involves some time and expense, it is free to register woodland creation projects initially. At present, verified Woodland Carbon Units are the only domestic carbon units that conform with Government's Environmental Reporting Guidelines¹². **The WCC is therefore the only available option that will ensure that any woodland planted will count towards any future emissions reduction targets or regulatory requirements.** It will also allow verifiable statements about the carbon capture that has been achieved through creating new woodland to be made.

For woodlands more than 10 ha in size, support for design is available through the Woodland Creation Planning Grant. This will help to ensure that the right trees are being planted in the right place. *Anyone planning, designing and creating new woodland should seek professional advice from a forestry agent, the Forestry Commission or a professional forestry organisation, to ensure that they comply with the UK Forestry Standard.*

10 Ecological Site Classification on-line tool <https://www.forestryresearch.gov.uk/tools-and-resources/ecological-site-classification-decision-support-system-esc-dss/>

11 <https://www.gov.uk/government/organisations/forestry-commission/about/access-and-opening>

12 Environmental Reporting Guidelines including streamlined energy and carbon reporting guidance https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/850130/Env-reporting-guidance_inc_SECR_31March.pdf



Using woodland creation in development plans to contribute to net zero

Sustainable economic growth and development are key to achieving a well-balanced future for the UK; however, growth will result in GHG emissions. Choosing low carbon sources of building material, insulation, heating and power will go a long way to minimising the amount of CO₂ that development produces. Encouraging the planting of trees and woodland as green infrastructure in housing and infrastructure development proposals could have a crucial role to play in mitigating for unavoidable CO₂ emissions.

Applying a similar approach to new developments to that employed earlier, it is possible to calculate the contribution new woodlands can make to mitigating unavoidable CO₂ emissions. Importantly, we should take into account not just the CO₂ emissions resulting directly from construction but also from the first decades of use.

So the calculation would be worked out by taking the residual emissions from the construction and use of each housing or retail unit over the first 30 years and dividing that by number of tonnes of CO₂ captured by the woodland type you want to create.

Such woodland will have a wide variety of purposes and uses, possibly as a contribution to achieving biodiversity or environmental net gain for development.

Creating woodland through natural colonisation

Given an adequate seed source, trees will probably establish naturally in the soils of most parts of Britain. In some places it is appropriate to let nature take control, creating woodland by allowing farmland, parkland or other open space to undergo natural colonisation or 're-wilding' to whatever ecological climax community develops. However, the presence of browsing mammals, particularly deer, and invasive weeds generally makes this a very long process and even impossible on some sites¹³. It follows that if woodland establishment is slower according to studies then the CO₂ captured on these sites will also be lower. In order to establish woodlands at the scale required that are climate resilient and species diverse, we cannot rely on this mechanism alone to do the job.

As well as achieving slower and lower carbon capture, with narrower species diversity, natural colonisation is generally a less reliable way to achieve woodland creation than planting well-designed UKFS compliant woodland. To create resilient long-term assets from our woodlands, we need a wide range of species and resilient genetic make-up within those species. This helps create woodland that is resilient to pests, diseases and climate change¹⁴.

¹³ See Section 6 page 92 of [Forestry Commission Handbook 11 Creating and Managing Woodlands Around Towns](#) which covers the reasoning behind the statements in this paragraph.

¹⁴ See [Protecting Plant Health A Plant Biosecurity Strategy for Great Britain](#) for more information on biosecurity





Reduce the use of non-renewable resources with wood and timber products

In designing and establishing diverse woodlands, rich in wildlife, well-matched to the soil and appropriate to the landscape, the role those woodlands can play beyond the 2050 Net Zero target date should be considered. In 2018, 11.6 million green tonnes of softwood and hardwood were delivered to wood processors for conversion to other wood products¹⁵. This resulted in the production of 6.8 million cubic metres of sawn-wood and wood-based panels, a good proportion of which is used in the construction industry. As carbon comprises about 50% of the dry weight of wood and timber products, it is clear that encouraging the use of wood and timber in new buildings will ensure that it is stored away for many years and also avoids the high energy consumption and GHG emissions associated with alternative construction materials such as concrete and steel.

Managing woodland is good for carbon too!

There is still uncertainty about how trees, woods and forests in England will respond to climate change; however this should not be used as a reason for inactivity. While mature woodland represents a large carbon store and bringing it into management (i.e. felling a proportion of the trees) is likely to result in net carbon emissions over the short term, there are longer term benefits through such action – beyond the financial benefits to the woodland owner, local employment opportunities and community engagement. Management is required to bring light to the woodland floor to allow high quality habitat to develop, while it also promotes natural regeneration and evolutionary adaptation to the changing climate. In woodland of limited species diversity, management also provides the opportunity to introduce species appropriate to the woodland that will enhance its resilience to climate change and pest and disease outbreaks. So as well as a wide range of species and resilient genetic make-up within those species in our planted woodland, we need to create a tree stock in our managed woodland that is also resilient to the climate of the future. Making choices about how we manage our woodland with a view to a climate that will be very different to the one we currently have is essential for their future resilience¹⁶.

Local Authorities and landowning businesses are encouraged to consider the management of their existing woodland holding as well as planting new woodlands.

However, relying on managing existing woodland to capture more CO₂ will not be enough to combat the effects of climate change; the extra capacity provided by new woodlands will bolster what existing woodlands are already doing, wherever they are.

¹⁵ Source: www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2019/uk-grown-timber/

¹⁶ Further information on Managing England's Woodlands in a Climate Emergency is available at <https://www.gov.uk/government/publications/managing-englands-woodlands-in-a-climate-emergency>



In summary...what can you do to help?

It is important to remember all these benefits your existing trees and woodlands are already providing for your local area – well-designed woodlands and correctly situated urban trees will deliver more than carbon reduction, they will contribute to a wide range of other local agendas including improving air quality, reducing the risks of flooding and improving water quality, as well as other public health, wellbeing and biodiversity benefits. If you want to consider creating more woodland in response to climate change you might want to:

- Consider measuring the multiple benefits existing woodlands and street trees already provide, including the amount of carbon they already store and capture so their value is recognised. You can find out more about how to do this by using i-Tree Eco¹⁷.
- Encourage the appropriate protection of ancient woodlands and trees through the planning system¹⁸, so there is no net loss of these woodlands and their carbon rich soils.
- Encourage the sustainable management of existing trees and woodlands so that they are more resilient to the long-term effects of climate change, continuing to act as a carbon sink and store and, if possible, consider extending or joining these woodlands together to create larger woodlands.
- Encourage the use of timber in construction¹⁹ and sustainable heating ²⁰projects to help avoid emissions associated with alternative materials.
- Support the retention of trees and the creation of new woodland in any new development proposals²¹.
- Encourage woodland creation and tree planting to be identified in local plans as an appropriate response to climate change and sustainable development.
- Promote the development of a tree and woodland strategy²², if one does not already exist to place trees and woodland firmly within the council's planning framework.
- Encourage decision makers to re-think the land portfolio their council owns – by selling valuable and developable land they may be able to buy cheaper farm or other land for woodland creation and be able to accommodate extra woodland creation.
- Help to evaluate the land owned by the local authority that may already be available for tree and woodland planting including vacant land, farmland, public spaces, highways, parks, gardens.
- Persuade local authorities to seek professional advice from either a forestry agent, the Forestry Commission or other professional organisations, to ensure that they comply with the UK Forestry Standard and co-design any new amenity woodland with their communities.
- Promote the benefits associated with offering public access and consider various options for wider community engagement and management.
- Remember that the Woodland Carbon Code provides reassurance that planting initiatives will count towards any future emissions reduction targets or regulatory requirements and this monitoring should be part of any emissions mitigation action plan.

17 I-Tree Eco can be found here <https://www.forestresearch.gov.uk/research/i-tree-eco/>

18 How Ancient woodland is treated within the planning system can be found at <https://www.gov.uk/guidance/planning-applications-affecting-trees-and-woodland#ancient-woodland-and-the-planning-system>

19 <https://www.forestresearch.gov.uk/research/sustainable-construction-timber/>

20 <https://www.forestresearch.gov.uk/tools-and-resources/biomass-energy-resources/reference-biomass/documents-downloads/biomass-and-sustainability/>

21 <https://www.gov.uk/government/publications/planning-guidance-and-green-infrastructure>

22 <https://www.london.gov.uk/what-we-do/environment/parks-green-spaces-and-biodiversity/trees-and-woodlands>



Sources of further information on grant funding

The government offers grants to make woodland creation a cost-effective part of the solution to reaching net zero carbon emissions. Detailed information on these grants for woodland creation can be found at: www.gov.uk/guidance/create-woodland-overview.

Woodland larger than 10 hectares can receive funding for its design through the **Woodland Creation Planning Grant (WCPG)**. This grant provides funding to prepare a Woodland Creation Design Plan that complies with the UK Forestry Standard which can subsequently be used to support further woodland creation grant applications.

The **Woodland Carbon Fund (WCF)** supports the planting of productive, multi-purpose woodlands to store carbon that are larger than 10 hectares. The scheme offers capital funding for the creation of new woodland, including the costs of tree planting and protection items including tree guards, fencing and gates. Funding is also available to install forest roads and recreational infrastructure.

Landowners may wish to earn further income by selling carbon credits – known as Woodland Carbon Units (WCUs) – from their project. They will need to register their woodland with the Woodland Carbon Code before they start planting, so that the potential opportunities for future revenues from the developing UK carbon market are not missed.

The **Woodland Carbon Guarantee (WCaG)** is an incentive scheme which will provide long-term (up to 35 years) payments for carbon sequestration to landowners in England who plant new woodlands. The WCaG offers successful participants the option to sell woodland carbon units to government, in the future, at a guaranteed price set by auction, which may be above current market rates. The guarantee holder will also have the option to sell the WCUs on the open market. Registration is open year-round and participation in the scheme will be through periodic auctions which will be advertised online.



The **Urban Tree Challenge Fund (UTCf)** is a two year challenge fund finishing in March 2021 to support the planting and establishment of large and small trees in urban and peri-urban areas in England. The fund is competitive and targeted at projects that can provide the greatest environmental, social and economic benefits in our towns and cities. The fund offers up to 50% of published standard costs and applicants are required to provide at least 50% match funding from other sources, which can be in the form of money or labour.

The **Countryside Stewardship Woodland Creation Grant** is a capital grant, through which applicants can apply for one-off payments for the trees which will be planted and any associated protection items and support towards infrastructure to help the establishment of new woodland. Once the woodland is planted and the final capital claim is paid, eligible applicants can apply for a separate multi-year grant to maintain the newly created woodland for 10 years.

Woodland creation and plastic tree guards

There is currently some debate over the use of plastic tubes for tree protection during woodland establishment. The benefits of using guards to create better conditions for growth for most tree species are clear. It is often also necessary to fence woodland planting sites and implement comprehensive weed and browsing mammal management programmes to create thriving woodlands. Evidence suggests that the current design specifications for tree guards remain the most effective for achieving thriving woodland in the UK and consequently the most effective for CO₂ sequestration. While no alternative, proven, viable and long-term tree protection mechanisms exist we recommend that, in most situations, plastic tubes will continue to be the best form of protection for young trees. The Countryside Stewardship Scheme woodland creation maintenance grants include funding for recovering used tree guards; all tubes should be recovered and recycled after use. We recommend that anybody funding or facilitating woodland creation projects should include a requirement for all tubes to be recovered as part of their contracts.





There are a range of grant and incentive schemes available for woodland creation, maintenance, management and tree health. Visit the Forestry Commission homepage at gov.uk/government/organisations/forestry-commission to find out more.

Alternatively, you can speak to your local Forestry Commission Woodland Officer.

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