ANALYSIS

The Impact of Tree Planting on the UK's Net Zero Pathway

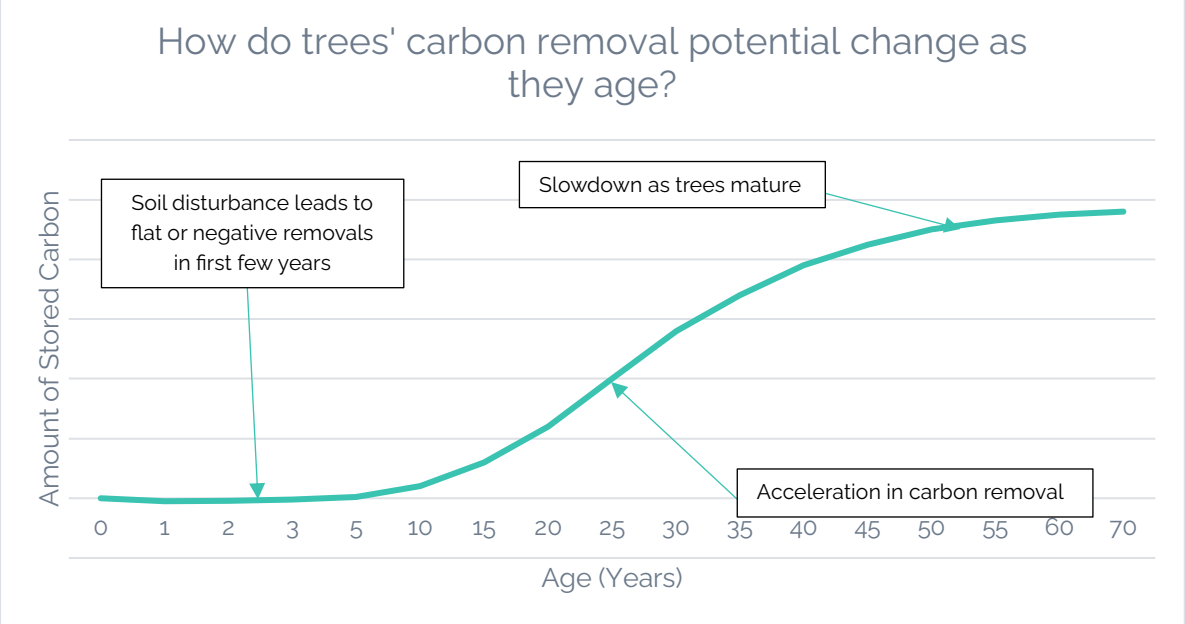
Summary

- This is the **tree planting parliament** – trees planted within this parliament have a disproportionate impact on the UK's net zero target.
- Trees planted in the next five years will contribute **over 70% of total carbon removal from planted trees to 2050**. This is due to the time lag between when a tree is planted, and when it peaks in its carbon removal potential. Higher planting in the future will be unable to make up for lost growth now.
- **Trees planted now will be the most effective at mitigating climate-induced flooding** in the future, due to flood risk prevention increasing with tree age. This in the context of a projected **1.7 million more homes at risk of flooding in England alone in 2050.**
- If current planting rates are maintained, the total area of missed planting will be an area **equivalent to three times the size of Greater London**, with **a third less carbon sequestered** than on the on the Climate Change Committee's (CCC's) Balanced Pathway, equivalent to **all residual industrial emissions in 2050**.
- The UK is **set to miss it's 2050 net zero target** if current tree planting rates are maintained without additional abatement or higher deployment of engineered removals.
- Missed woodland creation has **knock-on impacts** on nature recovery, reducing nutrient runoff, and benefits for our collective physical and mental health.
- Consistent, ambitious tree planting is required **into the foreseeable future**, to deliver for people and nature, and to ensure removals post 2050.

Tree Growth and Carbon Removal

Trees capture carbon as they grow, storing it primarily in their trunks and roots. However, a tree's ability to capture carbon varies over its lifespan, with younger and older trees

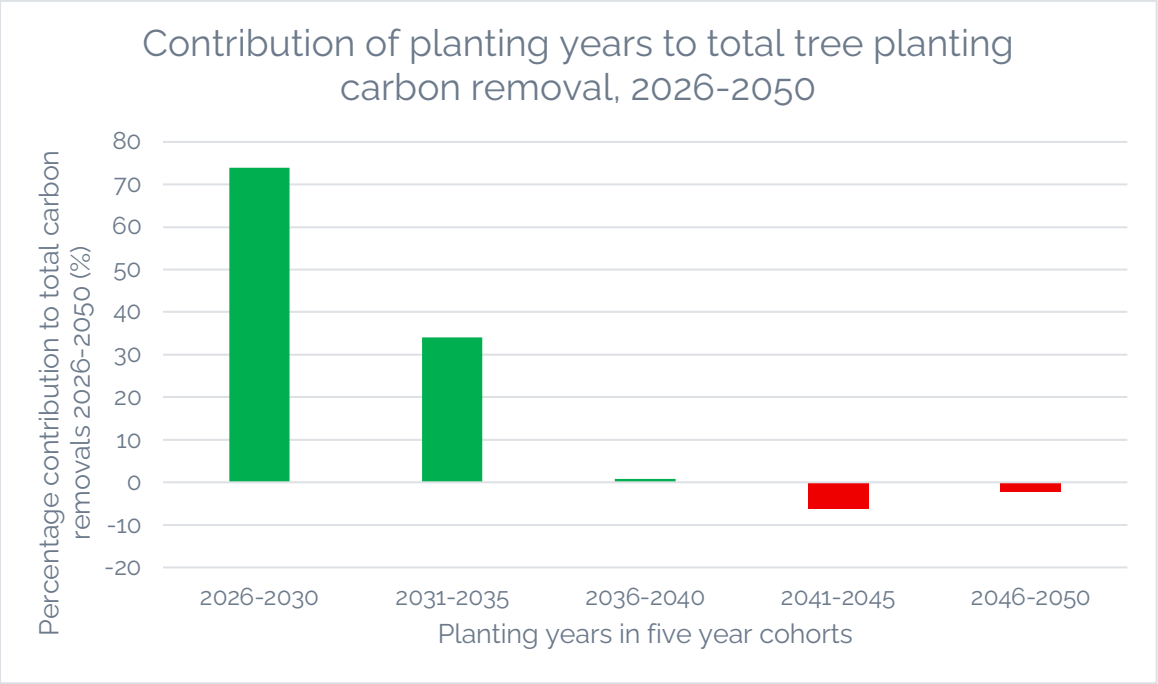
having more limited carbon removal potential. This gives trees' carbon removal potential an 's' shaped curve over their lifespan, as it starts slow, speeds up, and then slows down again as trees mature.



Illustrative example

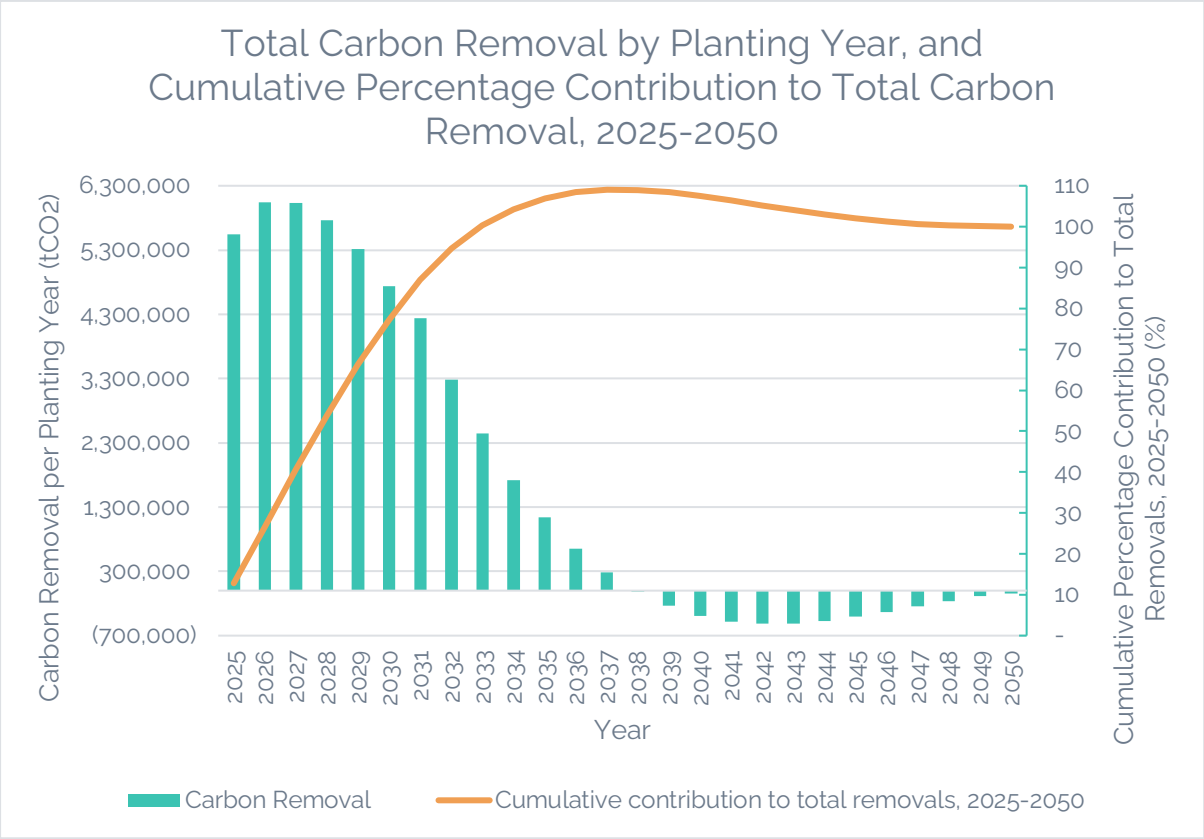
When scaled to the size of a new forest, the s-curve of trees' carbon removal becomes even more pronounced, as carbon trapped in soils is released during a tree's planting, meaning for a time new forest is a carbon source, before the trees mature enough to begin to counterbalance the carbon released in their planting.

Analysing the modelling of tree planting's contribution to land-use removals underpinning the CCC's Carbon Budget 7 report, the period of 2026-2030 is, by a significant margin, the most important from a tree-planting perspective when meeting the net zero 2050 target.



The planting that the CCC advise should occur within this Parliament contributes over 70% of total carbon removal to 2050 from new trees. Indeed, the planting from 2038 onwards negatively contributes to the total carbon removal of new planting, due to the soil disturbances discussed above. This planting however is important both for the co-benefits it brings, and to act as an insurance policy against emissions post-2050.

The below chart shows the total carbon removal by planting year, 2025-2050, alongside the cumulative percentage contribution to total carbon removal, 2025-2050. Note that the contribution of planting years from 2038 onwards is negative, due to these planting years being an emissions source within this timeframe.



The implications of this analysis underscore the critical planting window that exists from now to 2030. Delayed or underplanting will have serious implications for the UK's ability to meet its net-zero target, and higher rates of planting in later years will not be able to compensate due to the reduced ability of younger trees to remove carbon.

Tree Growth and Flood Mitigation

Trees are an important tool in flood risk prevention, providing over £400m per year in flood mitigation benefits to the UK, compared with bare ground or grassland[1]. A meta-analysis of factors that affect trees' ability to slow water flow strongly indicated that tree maturity was one of the most important factors to influence flood mitigation[2]. Like carbon removal, the ability of trees to mitigate flood risk does not increase linearly with age, with some studies suggesting that younger trees are worse than grassland at slowing water flow rates, due to soil disturbance caused in planting, and lower complexity of root systems in younger forests[3]. The research suggests it could take at least fifteen years for new forest to begin to demonstrably contribute to flood risk prevention.

[1] https://www.forestresearch.gov.uk/publications/revised-valuation-of-flood-regulation-services-of-existing-forest-cover/

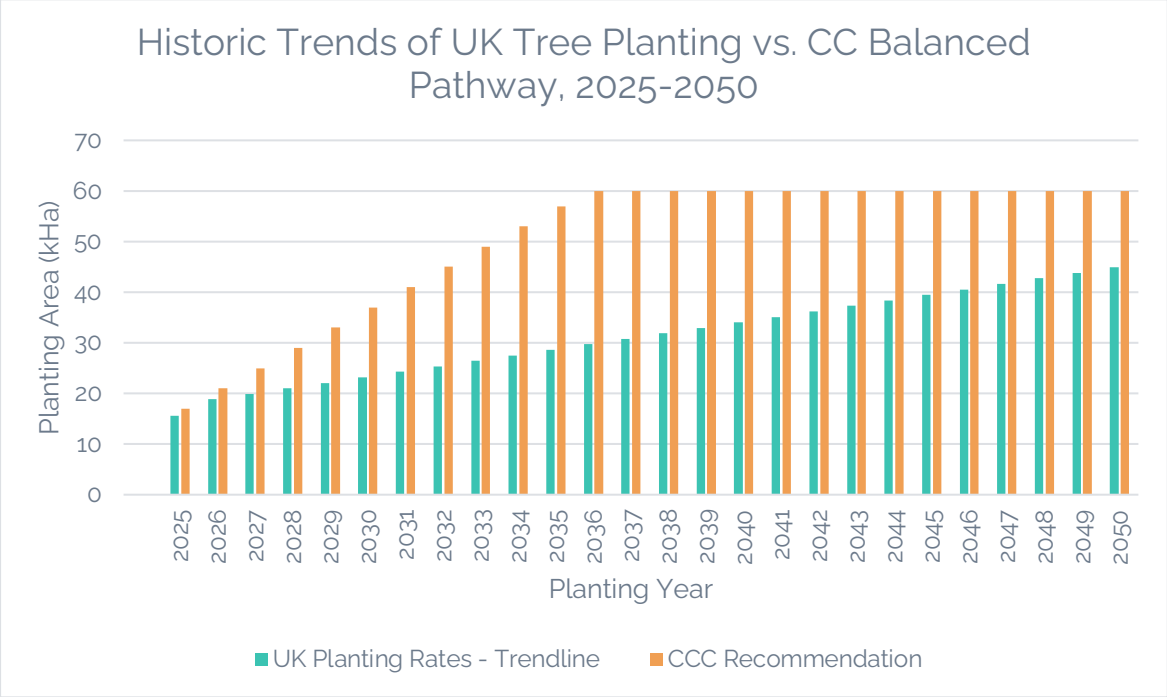
[2] Herath et al. (2025). A Systematic Review of Forest Cover for Catchment-Scale Flood Mitigation: A Nature-Based Solution

[3] Archer et a. (2022). Rainfall infiltration and soil hydrological characteristics below ancient forest, planted forest, and grassland in a temperate northern climate

In the context of the analysis above, it is the planting years 2026-2030 that will be the most effective at reducing flood risk to 2050, as they will have reached the requisite maturity to effectively slow water flow. A recent Aviva study indicates that homes across the UK will be at increased flood risk in 2050 due to climate change, with an increase in the number of at-risk homes of 27% in England, and over 80% in Scotland and Wales[4]. This underscores the imperative for ambitious planting rates in the short-term, to reap the benefits in the long term.

Historic and Projected Tree Planting Rates

The CCC's Balanced Pathway envisages current planting rates rising from 15.58 kHa in 2025[5] to 37 kHa in 2035, and 60 kHa from 2040 onwards[6]. Plotting a trendline of historical planting rates 2015 – 2025 out to 2050, the UK is currently off-off track to achieve the planting necessary to achieve its net zero ambitions, as well as the wider benefits these woods and trees can provide.



The cumulative impact of this divergence is 494 kHa, an area equivalent to three times the size of Greater London (157.2 kHa).

[4] https://www.aviva.com/newsroom/news-releases/2025/10/uks-iconic-landmarks-at-risk-from-climate-change-by-2050-according-to-new-report/

[5] https://www.forestresearch.gov.uk/tools-and-resources/statistics/publications/forestry-statistics/forestry-statistics-2025/

[6] https://www.theccc.org.uk/publication/the-seventh-carbon-budget/#post-49721-_Toc187753762

The carbon removal impact of this underplanting, based on CB7 modelling, means planted trees would remove 33% less carbon than is required from tree planting in 2050, or 3.64MtCO2. This is equivalent to the residual industrial emissions projected in 2050, under the CCC's balanced pathway (3.6MtCO2e).

Without contingency measures being deployed under this scenario, the UK would miss its 2050 net zero target. Contingency measures could include greater absolute emissions reductions in the UK economy, or greater deployment of novel carbon removal technologies, such as Bioenergy Carbon Capture and Storage (BECCS) or Direct Air Carbon Capture and Storage (DACCS). See ECIU's recent explainer on carbon dioxide removal for more discussion of these technologies.

This removals gap would particularly impact agriculture, as under the Balanced Pathway. agricultural emissions are balanced by land-based removals. If this logic were applied in an underplanting scenario, then agricultural emissions would have to decline more steeply to compensate.

Knock-on Impacts of Underplanting

Planting the right trees in the right places has many of benefits beyond carbon removal. A recent estimate by the UK Centre for Ecology and Hydrology estimates that the uplift in net benefits (both private and social) from land-use change, including tree planting, to be £500-1,500/hectare, compared with a baseline scenario[7].

For tree planting and woodland creation specifically, benefits include:

- Increased flood resilience, with trees estimated to provide over £400m/year in flood risk mitigation compared with bare ground or grassland[8];
- Improved water quality by reducing nutrient run-off, in some cases by up to 100%[9]
- Additional income for farmers and land managers, at a time when farm incomes are under pressure
- Significant physical and mental health benefits via access to nature and recreation
- Nature recovery, with the expansion of new native woods and trees creating new, bigger and joined habitats for British wildlife

[7] https://www.theccc.org.uk/wp-content/uploads/2025/05/UK-Rural-Land-Use-Archetypes---Part-2.pdf

[8] https://www.forestresearch.gov.uk/publications/revised-valuation-of-flood-regulation-services-of-existing-forest-cover/

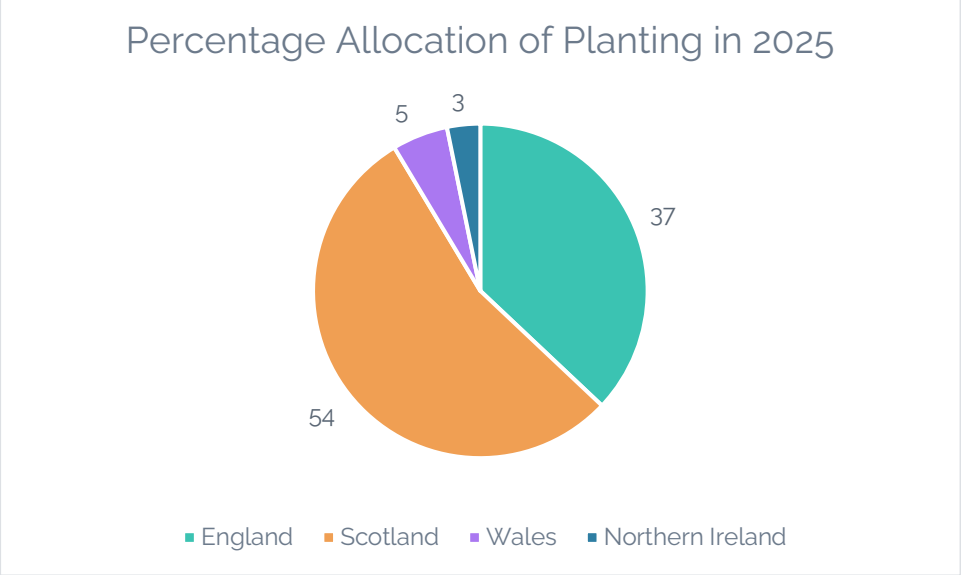
[9] https://www.sciencedirect.com/science/article/abs/pii/S0269749104000594

The need for tree planting into the future

Consistent, ambitious tree planting and woodland creation is needed into the future for several reasons. First, to ensure the UK's net zero ambitions are realised. In a situation where the UK underperforms in its decarbonisation efforts, trees planted in the 2030s and 2040s will be needed to balance emissions in a situation where net zero is not reached until after 2050, and trees planted in the near-term have peaked in their carbon removal potential. Without consistent planting, current and projected woodland will reach 'sink saturation' in the 2060s and be unable to act as a carbon removal option, necessitating the continued creation of new forest to balance any ongoing residual emissions beyond 2050[10].

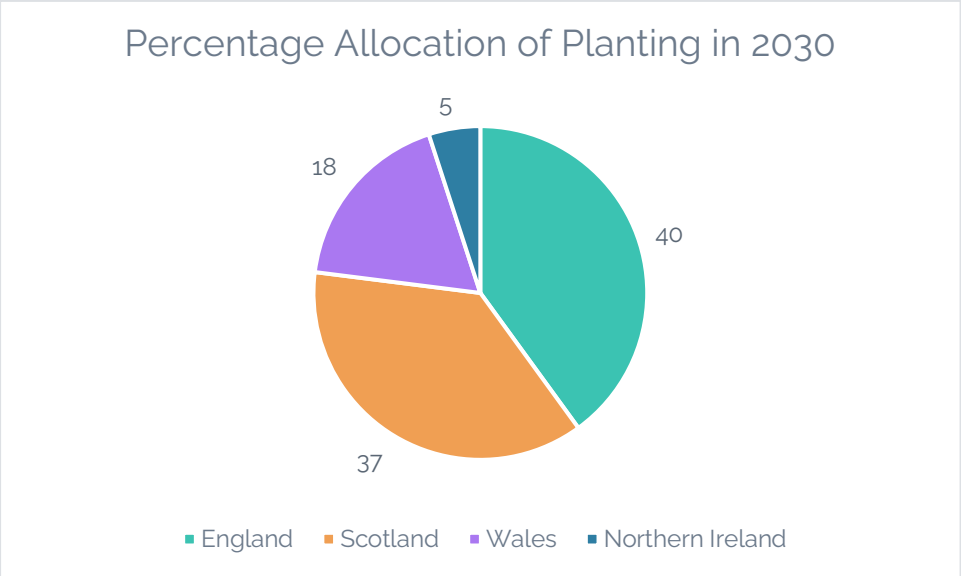
Tree Planting in the Devolved Nations

Forestry is a devolved issue, meaning that the UK's afforestation target will be realised, or not, based on the sum of the individual contributions from England, Scotland, Wales and Northern Ireland. Of note in the CCC's Balanced Pathway is the shifting role that the devolved nations will play over time. Currently, Scotland is responsible for over half of new planting, with England responsible for just over a third.



However, under the CCC's Balanced Pathway, this allocation is set to change significantly from 2030 onwards, driven mostly by a reduction in Scottish planting, and an increase in planting in Wales.

[10] https://www.sciencedirect.com/science/article/pii/S259033222300444X



Future analysis will examine the status of tree planting in the devolved nations' net-zero targets, and the degree to which the ambitions and action of the devolved nations tally with what is required for the UK as a whole. The recently published Carbon Budget and Growth Delivery Plan assumes that the devolved administrations all have plans in place to reduce or remove emissions for agriculture and land use in line with net zero targets.

Methodology

Analysis based on modelled tree planting carbon removal data supplied by the UK Centre for Ecology and Hydrology, and CCC data underpinning their CB7 report. Modelling assumed an increased in woodland cover to 18% in 2050, with an additional 1.3m hectares planted between 2025-2050. A combination of tree species is modelled for the Balanced Pathway of both broadleaf and conifer varieties. The modelling assumes the balance of tree species will be 55% broadleaf, 45% conifer by 2050, from 48% and 52% respectively in 2025.

Planting rates vary between the nations over time. England has 32% of the UK total in 2024, rising to 40% in 2037-2050; Scotland has 58% in 2024 falling to 37% in 2036-2050; Wales has 6% in 2024, rising to 18% for 2029-2050; and Northern Ireland has a stable allocation of 5% of total UK woodland creation in all years.

For more information on the assumptions underpinning the modelling, see Chapter 17 of the CCC's Methodology Report, published in May 2025.

Data provided was presented as an annualised hectarage table, representing the total carbon removal for each planting year across time. This allows for analysing both the contribution of an individual planting year over time, and comparison of the contribution of different cohorts.

Percentage contribution chart was created by summing the total contribution of planting years in five-year increments (2026-2030, 203-2035, etc.) and determining the contribution of each of these cohorts to total carbon removals 2026-2050.

Total removals and cumulative percentage contribution chart was derived by summing the total removals of each planting year 2025-2050, alongside the cumulative percentage contribution of each planting year. Negative contributions represent emissions sources via soil carbon disturbances in the planting of new trees.

Historic versus CCC planting rates chart derived via extrapolating a linear trendline of historical UK planting rates 2015-2025 out to 2050.

Emissions gap calculated by applying a reduction to modelling carbon removals by planting year based on the percentage difference in area planted between the CCC's Balanced Pathway, and the trendline in historic planting.