

Forests and forestry can be an important and attractive part of the solution



## 6 Mitigation: Planting more trees

Trees store carbon. One of the practical ways to combat climate change is to lock up or sequester more carbon from the atmosphere through planting more trees - as long as the right trees are planted in the right place.

**Definition:** The term mitigation refers to activities aimed at reducing greenhouse gas emissions and/or removal of carbon dioxide from the atmosphere.

A headline statistic is that the carbon sequestered (or stored) by half a hectare of conifer woodland over one rotation can compensate for the carbon dioxide emissions associated with car fuel consumption during one average driver's lifetime.

However, with 30 million registered drivers in the UK, three quarters of the land area of the nation would have to be covered in forest to make car use alone carbon-neutral. Therefore planting more trees is an attractive part of mitigating climate change, but can clearly never be the whole solution.

### Just how much carbon does one tree store?

A recent study carried out at Kielder Forest has calculated that the Forest's 150 million trees lock up 82,000 tonnes of carbon\* annually. This means that as a rough estimate each tree at Kielder is locking up 0.546 kg of carbon per year – equivalent to 2 kg of carbon dioxide.

Although this example does answer the apparently simple question 'how much carbon does one tree store,' in reality the answer is far from straightforward; it is dependent on species, growing conditions and how a tree is managed. For example, 2500 trees might be planted per hectare in a commercial plantation (broadleaf or conifer) but only 50–500 remain when the final crop is harvested as a result of natural mortality and thinning.

\*One tonne of carbon is equivalent to 3.7 tonnes of carbon dioxide.

### Facts and figures

- UK forests and woodlands contain around 150 million tonnes of carbon in the biomass and 640 million tonnes of carbon in the soil.
- UK forests and woodlands are a carbon sink, as they remove about 10 million tonnes of carbon from the atmosphere every year.
- Current (2008) UK emissions of carbon dioxide are about 530 million tonnes per year.
- Other greenhouse gas emissions equate to an additional 100 million tonnes of carbon dioxide per year.

In addition, young trees absorb carbon dioxide quickly while they are growing, but as a tree ages a steady state is eventually reached. At this point the amount of carbon absorbed through photosynthesis is equal to that lost through respiration and decay.

It is, therefore, a much simpler concept to talk about how much carbon an area of woodland can sequester or store.

In the UK, forest soils contain around four times as much carbon as the trees. Maintaining the forest area will help ensure these stocks of carbon are protected. Soils can release carbon dioxide when they become aerated as a result of disturbance (such as planting and felling) or drainage. This effect is most marked in organic or peat soils. On most soils, long-term carbon gains through new woodland establishment will outweigh initial carbon losses due to soil disturbance. The continual input of organic materials from leaf litter and decomposing roots will gradually increase the soil carbon content.

Over a full rotation, including planting to felling, a conifer forest can sequester around 14 tonnes of carbon dioxide per

hectare per year. When UK woodlands are looked at as a whole, the average is around 5.4 tonnes of carbon dioxide per hectare per year (or 1.4 tonnes of carbon per hectare per year), including broadleaved and unproductive woodlands. In terms of total carbon

storage, a commercial conifer plantation grown over 50 years might sequester 50–100 tonnes of carbon per hectare. In contrast, an old growth forest may store up to 250 tonnes carbon per hectare but over a much longer period (300 years or more).



## Carbon offsetting

Trees and forests have a clear role to play in helping to mitigate climate change, and tree planting projects have been proposed as valid ways to help 'offset' unavoidable carbon emissions – carbon offsetting. However, there has been resistance to such projects for a number of reasons, including the following:

- Is the activity 'additional' or would the tree planting have occurred anyway?
- Will the woodland be permanent, or will the carbon be re-emitted in the future?
- Will the carbon be counted only once – or by a number of individuals/organisations?
- Are the emissions reductions real?

The most important point is that offsetting – whether through tree planting or not – should not be the first

thought; reducing emissions should always be the main objective.

Secondly, offsetting requires certainty in the emissions reductions taking place. This is a very difficult issue for tree planting projects, which generally provide funding for carbon uptake in the future.

However, it is undeniable that planting new woodlands in appropriate locations removes carbon dioxide from the atmosphere, and also provides a number of other environmental and social benefits that many other offsetting options do not provide.

For these reasons the Forestry Commission has developed a 'Code of good practice for forest carbon projects' which will be published in 2010. This will provide answers to these questions and provide a 'standard' which tree planting projects can sign up to and be assessed against.

## Definitions:

### Sequestration

This is the act of removing (literally seizing) carbon dioxide from the atmosphere and storing it in biological material.

### Sink

A forest is termed a carbon 'sink' if there is a net transfer of carbon from the atmosphere to the forest. A forest only remains a sink while its carbon stock continues to increase.

### Store

Wood products are a store of carbon, as they themselves do not capture carbon dioxide from the atmosphere, but keep it locked up throughout their lifetime.

## Summary

- As long as the right trees are planted in the right place, planting more trees can be an attractive way of removing carbon dioxide from the atmosphere
- However overall, tree planting can only ever play a very small part in climate change mitigation