

Forests and climate change

The role of forests

Trees and forests play a crucial role in regulating our climate. Through photosynthesis, they remove CO₂ from the atmosphere, binding it and storing it as carbon. The carbon is held in the forest biomass – in the trunks, branches, foliage and roots, and in the soil as organic carbon. The process is constant, and is going on all around us.

In young forests, carbon is soaked up, or sequestered, quickly. In mature forests, sequestration eventually equals decomposition, and the carbon balance reaches a steady state. At this point the forest doesn't absorb any more carbon, but it's become a vast carbon reservoir. But if the trees are destroyed, they release carbon back into the atmosphere, thus becoming a source of greenhouse gas emissions.

The global picture

'Globally, forests store around 120 gigatonnes of carbon – more than the total amount of carbon in the form of carbon dioxide in the atmosphere'

Forests cover just under four billion hectares of the world's surface. That's almost one third of our total land area. They account for 90 per cent of the annual interchange of carbon between the atmosphere and the land. The amount of carbon stored in these ecosystems is the equivalent of around 4,500 gigatons of CO₂. That's more than the total carbon contained in the world's remaining oil stocks. More in fact than the amount of carbon in the atmosphere itself.

But globally, the forest area is decreasing. Global deforestation accounts for 13 million hectares every year. Tropical countries are most vulnerable. South America suffered the largest net loss of forests from 2000 to 2005 – about 4.3 million hectares every year. This was followed by Africa, which lost 4 million hectares a year.

Our own history here in the UK has been one of deforestation. This happened over thousands of years, and our forest area reached an all-time low at the beginning of the last century. At that point, woodland cover in the UK was just 5%.

We have rebuilt some of our forest resources. In the last 50 years, the UK's forest area has more than doubled. Similar patterns of deforestation followed by reforestation took place in many other industrialised nations, to the extent that forests in these countries are now reabsorbing CO₂ again. The forest area in Europe grew by 13 million hectares between 1990 and 2005. That's an area roughly equivalent to the size of Greece.

Since 1850, deforestation has released around 120 gigatons of carbon into the atmosphere. But, as we know from our own experience in the UK, the tide can be turned. Asia, which had a net loss of some 800,000 hectares a year in the 1990s, reported a net gain of 1 million hectares a year from 2000 – 2005, primarily as a result of large-scale reforestation by China.

Deforestation doesn't just exacerbate climate change. It affects everyone, particularly the world's poorest peoples. Loss of forests also means loss of biodiversity. Two out of three living species depend on our forests. Those forests provide, amongst many other things, flood protection, erosion control, timber and natural medicines.

'Deforestation is estimated to account for 18% of global anthropogenic carbon emissions – more than the whole of the transport sector'

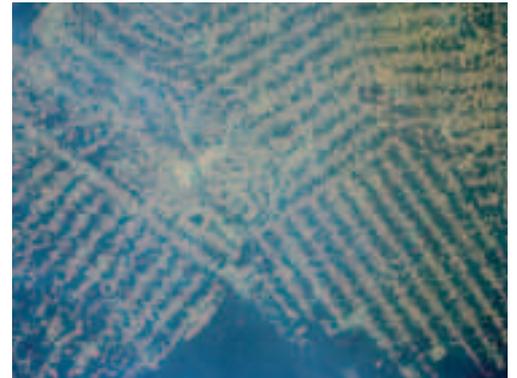
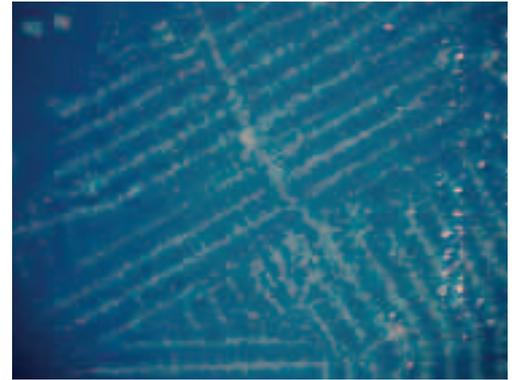


It's a grim statistic, but deforestation accounts for nearly one-fifth of the world's greenhouse gas emissions. That's more than from every car, every, boat, every plane in the world. More than the whole of the transport sector put together.

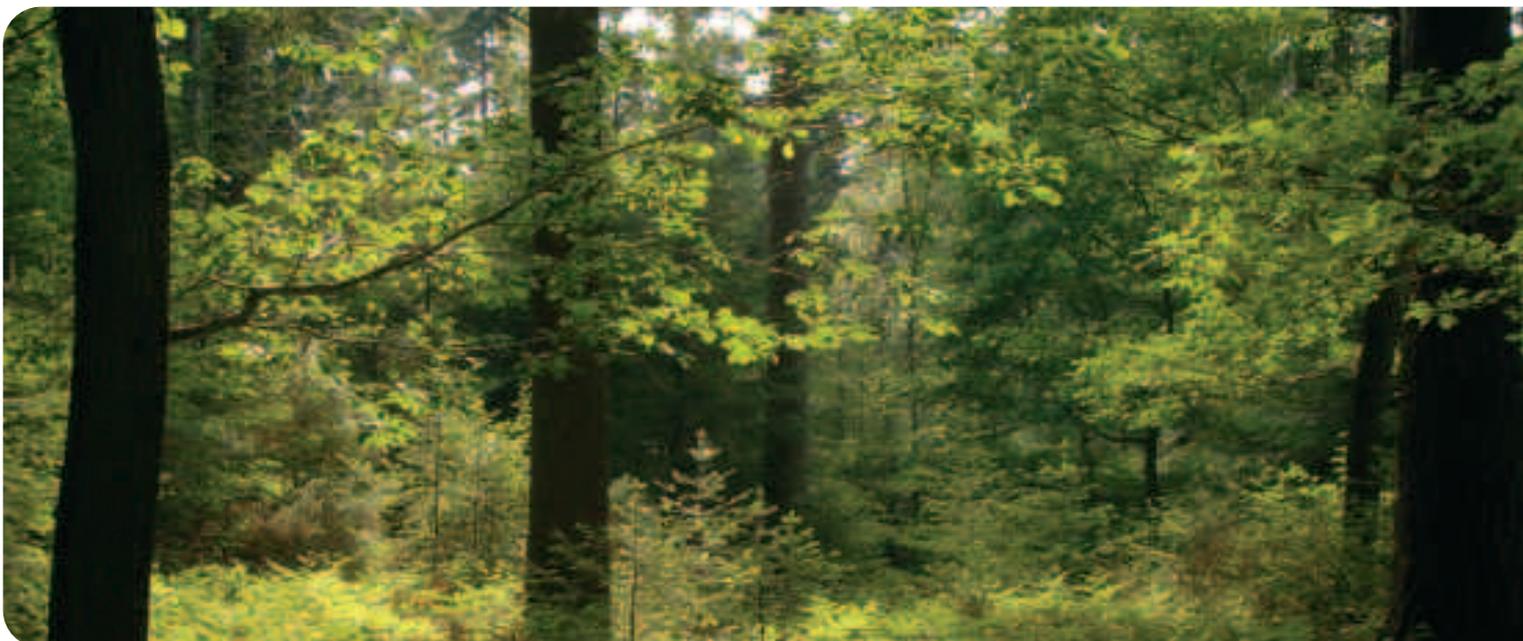
Reducing deforestation

The forest sector can make a big difference in helping to reverse this situation. Its contribution to climate change mitigation through forest management can come about in three main ways:

- By conserving and managing existing forests we can protect and maintain the carbon already locked up in them.
- By tackling the causes of deforestation we can reduce the rate and amount of loss of forest cover. Of course, this also protects the ecosystem services that forests provide.
- By planting new forests and re-establishing those we have lost we can restore the planet's forest cover. We know how to do this and are sharing our knowledge through the Global Partnership on Forest Landscape Restoration to help make a difference at global level.



Deforestation of tropical rainforest, South America. Images courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center.





Schemes that encourage individuals, businesses and others to offset their emissions by planting trees can be valuable but mustn't act just as a salve to our environmental conscience. Where offsetting can be valuable is when emissions can't be avoided. People and companies need to know that their money will bring real benefits, real cuts in emissions, actually make a difference. So, we need agreed standards to provide that reassurance.

Use for wood energy

Another thing we can do is to use more wood in our everyday lives. Wood used for energy is bioenergy – something that can replace fossil fuels and the emissions they produce. The potential is enormous and we must capitalise on that. Of course, forests that supply wood need to be managed sustainably.

In developing countries, wood – usually in the form of fuelwood or charcoal – is the most important source of energy for two billion people. These are mostly poor people who have no access to modern energy services. Understandably, there is great interest in developing biofuels in developing countries, but if this means destroying pristine rain forest then it does more harm than good. With governments committing to fossil fuel alternatives, use of biomass for electricity generation is forecast to triple between now and 2030. There are also great opportunities for smaller scale wood-fuelled heating schemes in areas currently dependent on fossil fuel heating such as oil and coal.

Replace other materials with wood

Wood is also a raw material. When it comes to constructing homes and buildings, it has the lowest energy consumption and CO₂ emission of any commonly used building material.

Wood products are unique. They come from a natural, renewable, sustainable resource. The carbon they contain remains stored for the duration of the product's lifetime, until it decays, or is burnt. The longer the wood product is used, the longer the period of time the carbon is stored within it. A global increase in the use of industrial wood products would help reduce the amount of CO₂ in the atmosphere.

Research into the environmental impacts of building construction suggests that increasing the use of wood in place of other materials could cut greenhouse gas emissions by between 40% and 80% per building.

Replacing one cubic metre of concrete or red brick with the same volume of timber can save around 1 tonne of CO₂. Designing future buildings to use more wood instead of concrete, plastic and steel could result in a significant drop in greenhouse gas emissions.

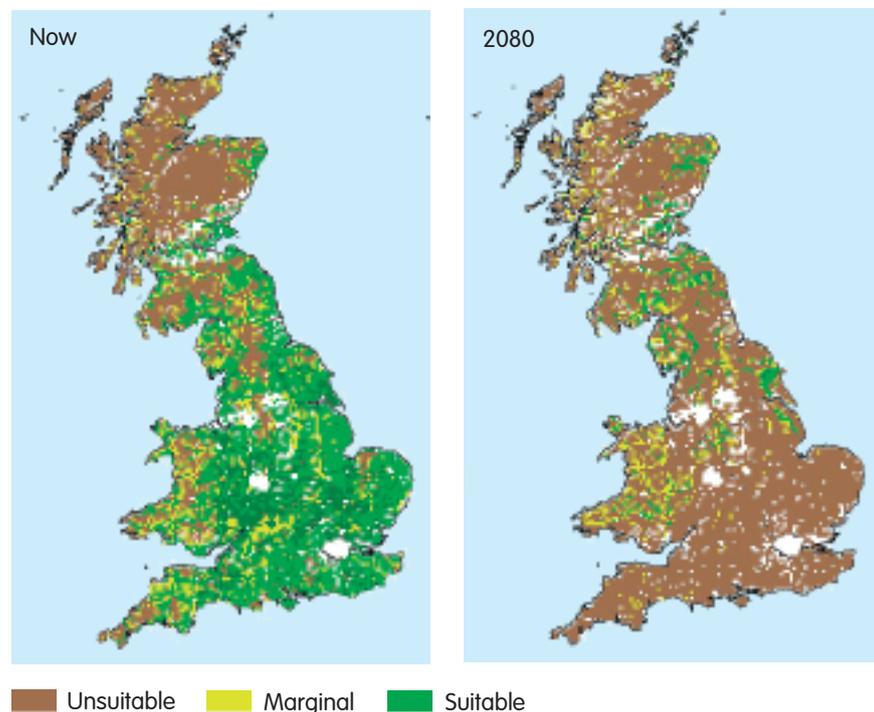
Plan to adapt to our changing climate

While we can take measures now to curb greenhouse gas emissions, the benefits won't be apparent for some time. Changes to our climate over the next 30 to 40 years caused by past emissions are largely inevitable.

Let's look at predictions for the UK. Mean annual temperatures are expected to rise by between 3 and 6 degrees by the 2080s. Winters will see substantially fewer frosts. Summer rainfall could fall by 50%, winter rainfall could rise by up to 40%. Summer droughts and winter flooding may become more common. More deep depressions could be crossing the country in winter. Cloud cover in summer, particularly in the south, could reduce, leading to increased amounts of sunshine.

These predictions are subject to many uncertainties, but it's already clear there will be a significant impact on our trees and forests.

These maps show the predicted change in suitable sites for oak woodland under a high emission scenario.



'Mean annual temperatures in the UK are expected to rise by between 3° and 6° by the 2080s. It is already clear that there will be a significant impact on our trees and woodlands'

'Curbing deforestation is a highly cost-effective way of reducing greenhouse gas emissions and has the potential to offer significant reductions fairly quickly.'

'Action to preserve the remaining areas of natural forest is urgent.'

Stern Review, 2006.

Changes will vary though from one region to another. Scotland, northern England and much of Wales could see increased tree growth because of rising CO₂ levels, a longer growing season, and a generally warmer climate. Whereas in other areas of England, more summer droughts could lead to a decrease in the growth rates of many tree species. We will have to look again at the types of trees we grow.

The character of our native woods is also likely to change. Careful consideration will need to be given to species choice, particularly where timber production is important. In some parts of southern England, some native species will simply no longer be commercially viable.

Trees under stress are more susceptible to harmful insects and diseases. The majority of insect pests that currently affect UK forestry are likely to benefit from climate change, through increased summer activity and reduced winter mortality.

We need to adapt and plan ahead for these changes. We need to design and manage forests and woodlands to cope, and help us cope, with the new climate, ensuring they contribute to flood prevention, develop habitat networks and create wildlife corridors.

Protect what we already have

Looking globally again, action to protect forests can be complemented by action to increase the uptake of CO₂ in trees and soils. Forests need to be managed using sustainable forestry practices.

Achieving the transition from deforestation to forest conservation and management is a huge challenge.

How do we know that our forests are being managed sustainably? Well, we have tools to hand. There are credible forest certification schemes that work. The UK is a world leader in forest certification. We were the first country in the world to have all of our public forests – those managed by the Forestry Commission – independently certified as sustainably managed. Wood from these forests carries a label showing just that.



There's no doubt that protecting, conserving and managing forests sustainably comes at a cost. It also requires the commitment of resources. On the other hand, The Stern review showed that it can be cost-effective. The pressure for deforestation is greatest in a small number of developing countries, but every country in the world gains from maintaining forest resources that provide public goods to the rest of the world. Finding ways to compensate the countries that provide a global service in this way will encourage conservation.

What we need to do

Implementing practical proposals for the sustainable management of the world's forests is essential. However, we should be optimistic. We know what needs to be done:

- **Protect** what we already have
- **Reduce** deforestation
- **Restore** the world's forest cover
- **Use** wood for energy
- **Replace** other materials with wood
- **Plan** to adapt to our changing climate

By these six simple measures, the world's forest sector can help to solve this global problem.

Morally, we have always had an obligation to protect and manage our forests for future generations. We now have the power and the strongest possible imperative to do something. Mankind understands its predicament, has the knowledge to see what needs to be done, and has the skills and the technology to do it.





Contacts and further information

More information about forestry and climate change can be found on our website at: www.forestry.gov.uk/climatechange

Publications covering various aspects of climate change can be found in our online publications catalogue at: www.forestry.gov.uk/publications

Other useful websites:

Forest Research	www.forestresearch.gov.uk
Biomass Energy Centre	www.biomassenergycentre.org.uk
Woodfuel Resource in GB	www.eforestry.gov.uk/woodfuel
FAO Forestry pages	www.fao.org/forestry
The Stern Review	www.hm-treasury.gov.uk
Intergovernmental Panel on Climate Change	www.ipcc.ch



Silvan House
231 Corstorphine Road
Edinburgh EH12 7AT

www.forestry.gov.uk