



## Social and environmental benefits of forestry



Loch Garten, Cairngorms, Scotland.

Forests and woodlands provide wide-ranging and diverse benefits to people in Britain. These benefits include important economic outputs, such as the income and employment that is generated by forest industries, and the wider contribution that forests indirectly make to other sectors such as tourism. Well-managed forests and woodlands also deliver a range of 'social and environmental' goods and services. These include:

- providing opportunities for open-access outdoor recreation;
- supporting and enhancing biodiversity;
- contributing to the visual quality of the landscape;
- taking up carbon from the atmosphere;
- other benefits such as improving air quality, regulating water supply and water quality, and providing protection for archaeological sites.

These social and environmental benefits are often not traded in markets, and so no price is directly paid by individuals to receive them. However, understanding the value that people place on these benefits provides useful information for the management of forest resources.

According to a major study published in 2003 on *The social and environmental benefits of forestry in Britain*, the total value of these benefits to people in Britain is around £1 billion per year. This factsheet summarises the methods used in the study and reports the main findings.

The study used existing data sources and information on woodland resources, and commissioned new surveys on public preferences for forestry. Conservative assumptions were used throughout in estimating values. The total *annual* and *capitalised* values placed by individuals on the social and environmental benefits of forestry, according to the study, are shown in the table below.

### What is the difference between 'annual' and 'capitalised' values?

The **annual** value is the total value of the benefit received each year. The **capitalised** value is the sum of annual benefits that are received, assuming that the annual benefit will arise every year in the future. Values that arise in the future are discounted (at a rate of 3.5%) to reflect the fact that people prefer to receive benefits sooner rather than later. See the HM Treasury Green Book: *Appraisal and evaluation in central government* for further information.

### What are marginal benefits?

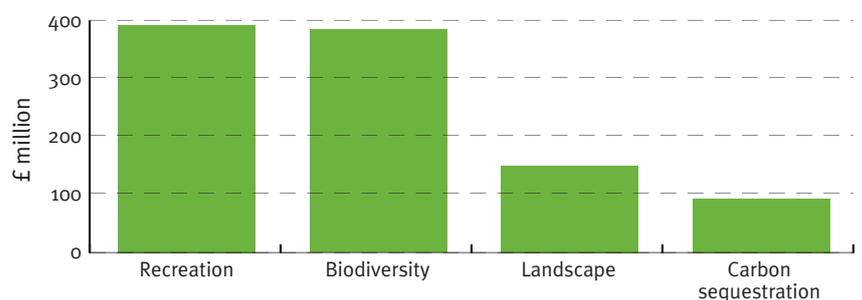
A marginal benefit is the additional benefit from a unit increase in the consumption of a good or service. For example, the value assigned by an extra visitor to recreation in a forest is a marginal value. The value assigned by all visitors to a forest is the total value of recreation to that forest.

### Annual and capitalised values of the social and environmental benefits of forests and woodland in Britain (£ millions, 2002 prices).

Benefit	Annual value	Capitalised value
Recreation	393	11 218
Biodiversity	386	11 029
Landscape	150	4 292
Carbon sequestration	94	2 676
<b>Total*</b>	<b>1 023</b>	<b>29 226</b>

\*This total includes the benefits of forests and woodlands improving air quality.

### Annual values of the social and environmental benefits of forests in Britain



The study also estimated *marginal* values for the social and environmental benefits of forests and woodlands; these are shown in the table below.

### Estimated marginal benefits of forests and woodland

Benefit	Marginal value
Recreation	£1.66 for each recreational visit (£0.90 for local visits; £1.80 for visits from a greater distance).
Biodiversity	£0.35 per household per year for enhanced biodiversity in each 12 000 ha (1%) of commercial Sitka spruce forest; £0.84 per household per year for a 12 000 ha increase in lowland new broadleaved native forest, and £1.13 per household per year for a 12 000 ha increase in ancient semi-natural woodland.
Landscape	£269 per annum per household, for those households on the urban fringe with a woodland landscape view.
Carbon sequestration	£6.67 per tonne of carbon sequestered.



Mountain biking is an increasingly popular recreational activity in forests.

## Providing outdoor recreation

Forests and woodlands provide a setting for recreational activities such as walking, viewing wildlife, mountain biking, and other pursuits. Household surveys indicate that there are more than 350 million recreational visits per year to forests and woodlands in Britain.

The value that people place on these visits was estimated by a survey of visitors to a number of forest sites, to ask people the amount that they would be willing to pay for access to woodlands for recreational purposes. This value varies with the characteristics of the forest, and recreational opportunities within it, as well as the availability of alternative recreational opportunities in the surrounding area and the income and preferences of the local population.

At the sites where the survey was carried out, it was estimated that individuals value a day visit at an average of £1.66. This value ranged between £0.90 and £1.80 depending on the distance that a visitor had to travel to get to a forest. From the value per visit and the number of visits to forests and woodlands, the total value of woodland recreation is estimated to be around £400 million per year.

## Supporting and enhancing biodiversity

Biodiversity refers to the variety of plants, animals, and habitats, and to the interconnections between these. Forests and woodlands provide natural habitats that can enhance and support biodiversity.

Biodiversity is a concept that is difficult to fully understand. It is an issue about which people tend to have very different views; previous studies have shown that the values that different people attach to biodiversity vary considerably.

Information about individuals' preferences for biodiversity – and the value that is put on the role of forests and woodland in supporting biodiversity – was obtained through discussions held in structured focus groups across Great Britain. In each group, participants had a chance to learn about biodiversity in forests, before being asked to express their preferences.

The study estimated values for biodiversity for forests where suitable data were available on either the type of woodland or on forest management changes to increase biodiversity. Data were available for just over 0.5 million hectares of woodland. Biodiversity values were, therefore, not calculated for the remaining 2.2 million hectares in Great Britain. The approach also excluded values that exist in one country for woodlands in another country, for example the values that people in England put on woodlands in Scotland. Although the estimate should be viewed as conservative, it amounts to more than £380 million a year, or around £11 billion as a capitalised value.

The biodiversity value estimated in the study is the 'non-use value'. The non-use value includes the value to individuals of knowing that the



Forests and woodlands provide a variety of habitats for wildlife in Britain.

resource exists (the ‘existence value’), the desire to protect biodiversity for future generations (the ‘bequest value’) and the value of maintaining the option to use the resource (the ‘option value’). In this study, the use value of forests for wildlife – such as bird watching and viewing other wildlife – was captured in the recreational value of forests.

## Enhancing the appearance of the landscape

Forests and woodland can enhance the visual quality and appearance of the landscape. They can, for example, enhance views from people’s homes, or on journeys to and from work.

Household interviews were conducted to investigate individuals’ preferences for different types of landscape. Of the preferences investigated, the strongest were for wooded landscapes with mixed tree species and open space, and where trees were growing in a random rather than regular pattern.

The value of the visual contribution of forests and woodland to landscapes viewed from people’s homes, on the urban fringe, ranged between £200 and £500 per household per year. For views while travelling to and from work, the value was in the range of £155 to £330 per household per year. Analysis was restricted to the urban fringe as this was the context in which statistically reliable results could be obtained.

The total value of woodland landscapes was estimated in the following way: the value per individual was multiplied by an estimation of (a) the number of households on the urban fringe that have a woodland view; and (b) the number of journeys made by individuals to and from work during which a woodland landscape could be viewed.

The capitalised value of views of wooded landscapes from home is estimated at an average of £7680 per household. This is consistent with other studies that have found that the presence of trees can add 4–7% to house prices\* if the woodland is appropriately planned and managed.

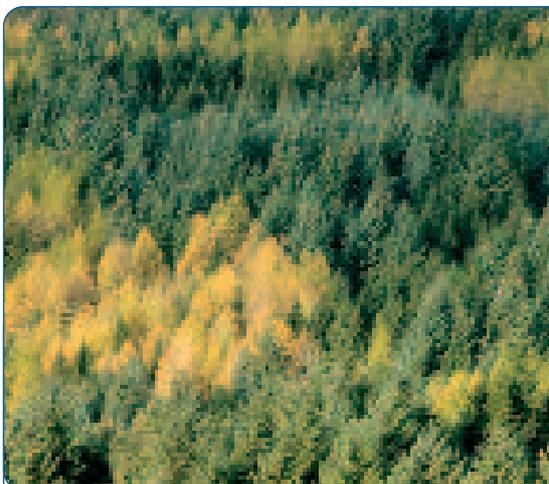
## Sequestering carbon

Scientific evidence has suggested that the global climate is gradually warming. This has been attributed in many cases to increased emissions of greenhouse gases such as carbon dioxide (CO<sub>2</sub>). The UK government is committed, along with many other governments worldwide, to stabilising the concentration of greenhouse gases in the atmosphere – principally by reducing emissions – but also by protecting and increasing ‘carbon sinks’ such as forests and woodlands. Forests provide one of the most important global sinks as they lock up or *sequester* carbon in the form of wood while they are growing.

The value of the role of forests in storing carbon is based on two factors. The first is an estimate of the amount, in tonnes, of carbon from the atmosphere that is absorbed by trees. The second is the value of each



Views of well-managed forests and woodlands add value to people’s homes.



Trees lock up CO<sub>2</sub> by accumulating carbon while they are growing; carbon makes up about half of their dry weight.

\*Anderson and Cordell (1988), Morales (1980), Garrod and Willis (1992).

tonne of carbon that is absorbed, in terms of the reduction in future levels of damage induced by climate change. In this study a value of £6.67 was used for each tonne of carbon that is stored, based on the results of previous studies. The capitalised value of forest and woodlands across Great Britain as a carbon sink was estimated at approximately £2.7 billion. The value of the role of forests in storing carbon varies between regions, largely depending upon the amount of forest in the region, the proportion of different tree species, and the rate at which they grow.

## Other benefits

The study also carried out exploratory work to examine other social and environmental benefits of forestry.

### Improving air quality

Forests and woodland ‘clean’ the air as trees trap harmful dust particles and absorb gases such as sulphur dioxide and ozone. Scientific evidence has shown that air pollution ‘absorbed’ by trees in this way is considerable.

The benefits of trees in improving air quality were valued indirectly through the resulting improvements to human health. The impact on health was estimated using information, adopted by the Department of Health, on the link between air pollution and deaths and hospital admissions for respiratory diseases. The value of the associated reduction in pollution-related deaths and hospital admissions was calculated using values for preventable fatalities and hospital admissions that have also been adopted by the Department of Health.

Net pollution absorption by forests and woodland was calculated to have reduced the number of pollution-related deaths by between 59–88 per year, and to have reduced the number of hospital admissions by between 40–62 per year in Britain. The net reduction in costs (or increase in benefits) attributable to this benefit of improved air quality by forests and woodland was estimated to be around £11 million.

It is likely that the true value is higher than this as the study only investigated the benefits of forests with areas greater than 2 hectares. The air quality benefits of smaller areas of trees in towns and cities may be even more significant. The study also made a number of simplifying assumptions, perhaps the most notable being that people only benefit from improved air quality when they live in the same one-kilometre square as the forest. The impact of woodland on pollution levels over longer distances is as yet unclear and there is a need for further research on this particular issue.

### Regulating water supply and water quality

Forests and woodland can reduce soil erosion, stabilise riverbanks and reduce pollution in run-off. However, these and other possible benefits (such as flood alleviation) require fuller understanding before they can be quantified and valued.



Forests and woodlands ‘clean’ the air by trapping harmful dust particles and absorbing pollutant gases.



Water quality is important for users such as commercial and recreational fisheries.



Well-managed forests can protect valuable archaeological sites such as this broch in northwest Scotland.

#### Web addresses

The full report *Social and environmental benefits of forestry in Britain* can be accessed and downloaded from our website at:

[www.forestry.gov.uk/economics](http://www.forestry.gov.uk/economics)

Other useful websites:

[www.defra.gov.uk/environment/economics](http://www.defra.gov.uk/environment/economics)

[www.odpm.gov.uk](http://www.odpm.gov.uk)

[search for 'economic valuation']

[www.evri.ca](http://www.evri.ca)

[a database of valuation studies]

This is one of several factsheets published by the Forestry Commission on various aspects of sustainable forest management. For other titles, go to **In Brief** at:

[www.forestry.gov.uk/sustainableforestry](http://www.forestry.gov.uk/sustainableforestry)

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## Protecting archaeology

British forests and woodlands contain a diverse and rich collection of archaeology including burial mounds, fortifications, earthworks, field systems, and standing stones. Well-managed forests can play a valuable role in protecting these sites.

Based on the results of earlier studies, this value was estimated at up to £247 per hectare per year, but this varies according to the landscape setting. The earlier studies were based on archaeological sites in 'attractive' landscape settings. However, where settings are more ordinary, or are perceived to be less attractive, the values may be expected to be lower.

## Summary and conclusions

Information on the values placed on social and environmental benefits is vital in understanding the total economic value of forests and woodlands. Such information also informs policy-makers and forest managers on how to maximise the economic value of forestry to society.

The total value of the social and environmental benefits of forestry in Britain, examined by the study, is estimated at around £1 billion per year. The total capitalised value is over £29 billion. This demonstrates the high level of importance of forests and woodlands to people in Britain. Recreation and biodiversity dominate the total value. Landscape and carbon sequestration also contribute significantly.

A number of social and environmental outputs of forestry were not included within the study. These include further aspects of the contribution of forests to health and well-being, and the role of forestry in supporting local communities. These outputs require further research before they can be fully understood and valued.

## References and useful sources of information

- Influence of trees on residential property values in Athens, Georgia (USA): a survey based on actual sales prices. L.M. Anderson and H.K. Cordell (1988). *Landscape and Urban Planning* 15, 153–164.
- Valuing goods' characteristics: an application of the hedonic price method to environmental attributes. G.D. Garrod and K.G. Willis (1992). *Journal of Environmental Management* 34, 59–76.
- *The green book: appraisal and evaluation in central government*. HM Treasury (2003). TSO, London.
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- The social and environmental benefits of forestry in Britain. K.G. Willis, G. Garrod, R. Scarpa, N. Powe, A. Lovett, I.J. Bateman, N. Hanley and D.C. MacMillan (2003). Report to Forestry Commission from Centre for Research. In: *Environmental Appraisal and Management*. University of Newcastle, Newcastle.