

Sector Perspective

- Forest and woodland cover 13% of the UK's total land area, having increased from 5% over the past 90 years. 41,000 people are employed in the forestry and primary wood-processing industries.¹ Most responsibility for forestry is held by the individual countries of the UK.
- The sector is influenced by many pressures and drivers that may be of equal or greater importance compared with climate change. They include fluctuating global markets for timber/ timber-processing, population growth, land-use changes, rising demand for renewable energy, the Common Agricultural Policy and rural development policy.
- Climate affects the growth of vegetation both directly (e.g. through sunlight, temperature and rainfall) and indirectly (e.g. by influencing the occurrence and impact of pests and diseases).

Change in climate may affect timber productivity, forest/ woodland habitat and biodiversity, as well as businesses, jobs, public access and communities, both positively and negatively.

- Climate change is already affecting UK forests, native woodlands and their management. Adaptation will need to happen sooner where the largest changes in climate are projected to occur most rapidly (e.g. southern and eastern England).
- The long-term timescales usually involved in forestry mean that this sector is already well-advanced in planning necessary adaptations for a changing climate.
- The impact of climate change on forestry may be influenced by and/or affect other sectors (e.g. agriculture, energy and water).

¹ 2008 figure.



Forestry

Climate change is projected to result in changes in temperature and rainfall patterns, as detailed in the UK Climate Projections 2009 (UKCP09) analysis. These changes may lead to some benefits, but may also present serious threats to the forestry sector.

The Climate Change Risk Assessment (CCRA) has completed an assessment of a range of impacts for which this sector may need to prepare. Some of the key points from this assessment are summarised here. The results presented are restricted to existing crops grown on the public forest estate (apart from the risk of wildfires which covers multiple habitat types).

The results presented here do not take account of changes in society (e.g. population growth, economic growth and developments in new technologies); nor do they take account of responses to climate risks (e.g. future or planned Government policies or private adaptation investment plans).

Focus on... Forest Productivity

Warmer temperatures may lead to an increase in tree growth rates and timber productivity, whilst sustaining the quality of timber currently produced. However, this will only occur where other conditions needed for tree growth, particularly water supply, are not limiting. By the 2050s, most conifers and broadleaved tree species currently grown in England may experience a decline in productivity; for some species in some regions, this could be substantial. But there might be significant increases in productivity in Scotland, especially among conifers.²

Increasing concentrations of atmospheric carbon dioxide (CO₂) may also boost timber productivity. Over the past 100 years, these concentrations have increased by nearly 100 ppm (i.e. 33%) and they may rise further, possibly doubling pre-industrial levels by 2050. This may have a positive impact on tree growth, but the size of the effect would depend on factors such as the availability of water and nutrients.

Confidence

M Change in yield class³ for Sitka spruce: by the 2080s, productivity in south-west England is projected to decline by around 10 m³/ha/year (current productivity: 18 m³/ha/year), while in the Grampian region productivity is projected to increase by more than 3 m³/ha/year (current productivity: 13 m³/ha/year).

M Change in yield class for beech: by the 2080s, productivity in south-east England is projected to decline by around 5 m³/ha/year (current productivity: 7 m³/ha/year).

Focus on... Pests and Diseases

Warmer temperatures may increase the threat from insect pests and from fungal and other pathogens.⁴ While evidence suggests international trade has been the main factor influencing their spread in the UK to date, changing climatic conditions (e.g. temperature and humidity) can help new pests and diseases become established and then spread. Changing conditions may also affect the severity and frequency of outbreaks of existing pests and diseases. Extreme weather can exacerbate the harm these organisms cause and make trees more susceptible to damage.

Particular threats include: red band needle blight, a fungal disease which has already had a serious impact on Corsican pine plantations in England, Scotland and Wales; and green spruce aphid, a pest that may affect an increasing area of spruce forest by the end of the century, although it is unlikely to pose a major threat in the short to medium term. Increased incidence of pests and diseases such as these may lead to significantly lower timber yields.

Confidence

M Threat from red band needle blight: over 50% of pine forests in Britain, including native Scots pine, could be affected by the 2050s and all pine forests (totalling over 400,000 ha) could be affected by the 2080s (current figure: around 10% affected; potential increase in economic cost up to £12 million/year by the 2080s).

M Threat from green spruce aphid: by the 2080s, the area of British spruce forest affected could more than double from the present day figure of around 80,000 ha (potential increase in economic cost up to £17 million/year by the 2080s).



Focus on... Drought

An increase in drought conditions will affect tree growth, timber productivity and woodland ecology, especially in southern and eastern England where projections indicate the decline in soil moisture will be most severe. Very dry summers can have serious effects on tree health, although mild drought can have a positive impact on some fast-growing species. Drought can also exacerbate the susceptibility of some tree species to pests and diseases and contributes to increasing the risk and severity of wildfire.

If climate change increases the frequency of drought conditions in the UK, in some locations it will be necessary to plant more drought-tolerant tree species (e.g. Scots pine, Douglas-fir and ash) rather than existing choices (e.g. Sitka spruce, Norway spruce, larch and beech). Managed introduction of new tree species, to increase resilience through diversification and maintain timber production, may subtly change the character and ecology of existing forests and woodland.

Confidence

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Losses in timber yield due to drought: currently 14% in south-east England and 10% in Wales and northern Scotland, rising to 12-26% in south-east England, 11-29% in Wales and 10-23% in northern Scotland by the 2080s.⁵

Focus on... Forest Fires and Wind Throw

Climate change is projected to increase the risk of large-scale wildfires throughout the UK, especially in southern England. Although such fires are usually caused by humans (accidentally or deliberately), their magnitude is exacerbated by drought, high air temperatures and wind.

The UK has one of the windiest climates in Europe and so its forests and woodland are particularly vulnerable to high winds. Wind throw (where trees are uprooted or damaged by wind) is the biggest cause of damage to UK woodland and forests. The risk may increase if the UK experiences more storms or if tree-root depth becomes restricted by increased rainfall and waterlogging. However, at present it is unclear how climate change might affect wind and storm regimes.

Confidence

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Increased risk of wildfires in British National Parks: between 30% and 50% by the 2080s.



² Based on UK Climate Impacts Programme 2002 (UKCIPO2) projections.

³ Yield class is defined as annual timber volume production per hectare (assuming conventional forest management, for example).

⁴ Disease-causing microbes.

⁵ In northern Scotland the impact of drought on timber yield may be more than compensated for by increases in yield as a result of rising temperatures and CO₂ levels.

The Challenge of Adaptation

Although trees and forest ecosystems have a natural ability to adapt to a changing climate, the rate and magnitude of changes projected to occur over the coming century mean that intervention may be needed to maintain timber productivity and protect the ecosystem services provided by forests. This is more of a challenge in semi-natural woodland where the level of management is generally less than in forests planted for timber production.

The forestry sector has been considering the impacts of climate change for over two decades. Currently, understanding of climate-related risks is strong up to 2050, with some issues being explored into the 2080s.

Awareness of climate change issues is at a particularly high level in the Forestry Commission, among decision-makers in large organisations active in the sector and among relevant charities and non-governmental organisations. Across the public forest estates, the adoption of adaptive forest management is under active consideration, e.g. in England through implementation of a Climate Change Action Plan. Adaptive management measures include:

- Selection of more drought-tolerant species when replanting.
- Selection of seeds from native species that currently grow in the south of the UK, for use in more northerly locations in the future as the climate changes.
- Managing biodiversity to reduce future impacts (e.g. by tree species selection, diversification of forest management strategies).
- Encouraging changes in the recreational use of woodland.
- Increasing species diversity and employing alternative management systems to maintain tree cover.

- Extending existing woodlands and creating new woodlands that connect with each other to aid species movement.⁶

The long timescales involved in tree growth mean some adaptation decisions (e.g. planting drought-resistant species, planting in lower fire-risk areas) might need to be taken soon, especially where the climate may change most quickly (e.g. in southern and eastern England).

Specific areas where there are still gaps in the available evidence about climate impacts include:

- The impact of warmer, drier conditions (particularly drought) on forest and woodland.
- The effect of climate change on forest biodiversity and ecosystem services (e.g. how rising temperatures might affect the balance between species, or water quality and supply).
- The area of forest and woodland that might potentially be damaged by pests and diseases.
- Changes in wildfire risk.

Where to Get Further Information

For copies of the CCRA Forestry Sector Report, the CCRA Evidence Report and Devolved Administration Reports, please visit www.defra.gov.uk/environment/climate/government/.

⁶ Connectivity can be made using 'corridors' or by creating new habitat close enough to current patches to allow species to move between them.

How the CCRA was conducted

The CCRA reviewed the evidence for more than 700 potential climate impacts on the UK economy, society and environment. Over 100 of these impacts across 11 sectors were taken forward for more detailed analysis, having been selected on the basis of likelihood, potential consequences and how urgently adaptation action may be needed to address them.

A plausible range of climate change scenarios was used in the analysis. Some aspects of socio-economic change (e.g. population growth) were also taken into consideration. Adaptation policies that are planned for the future were not considered, so that the underlying level of risk could first be compared across sectors.

The results presented here are based on the UKCP09 Medium emissions scenario for the 2020s (2010-2039) and the Low, Medium and High emissions scenarios for the 2050s (2040-2069) and the

2080s (2070-2099). A range of climate projections representing lower, central and upper estimates were considered within each emissions scenario. Where indicated, some analyses were based on the earlier UKCIP02 climate scenarios.

Risks are categorised as low, medium or high based on their economic, social and environmental consequences.

The CCRA findings are also categorised as having low, medium or high confidence. The level of confidence is the degree to which the findings are considered valid, based on the type, amount, quality and consistency of the evidence studied.

Further information on how the CCRA results should be interpreted is presented in the CCRA Evidence Report. www.defra.gov.uk/environment/climate/government/