Climate change and ecosystem services
How can our trees and woodlands help?
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Climate change will have wide-ranging effects on ecosystem services (Box 1).

At the same time, trees and woodlands provide ecosystem services which could help us mitigate and adapt to the climate emergency. The provision of these services will also depend on partnerships of managers, scientists and other stakeholders who learn and adapt together.

Regulating and maintenance services

○ As they grow, trees capture and store carbon, reducing the concentration of CO_2 in the atmosphere and regulating the climate. Even where trees are harvested, the smaller branches and leaf-litter left behind can help to increase carbon storage in the soil.

○ Extreme heatwaves are expected to increase under climate change. Trees can protect, or moderate, the effects of extreme temperature, e.g. providing shelter for people and livestock, and shading of streams for fish.

○ Woodlands have an important role in regulating water cycling. Woodland soils act like sponges, absorbing water and reducing the amount of runoff during rainfall. Trees and woodland vegetation also slow down runoff.

○ Climate change is expected to increase the risk of high rainfall events leading to flooding. Woodlands and debris dams in the right place can moderate flood events by delaying and reducing peak flows.

○ Trees and woodlands are home to many different species. As climate changes these species may need to move to places that suit them better. Connected networks of trees and woodlands can help species move and survive.

○ The risk of invasive pests and diseases is expected to be higher under climate change. Diverse woodlands with high biodiversity can reduce the damaging effects of some pests and diseases.

Box 1

The ecosystem services concept helps to describe the benefits that humans receive from nature and natural processes.

They are often grouped into three categories: regulation and maintenance, provisioning and cultural.

Provisioning services

○ Forest and woodlands are important sources of timber. The effects of climate change on timber supply will vary depending on location and over time. In some areas and for some species, warmer temperatures and higher CO_2 concentrations could increase tree growth. However, an increased likelihood of drought and other extreme climate events may reduce growth and/or damage the timber quality of some tree species.

- Timber can be used for construction, furniture and flooring. If more wood is used for these purposes, long-term carbon storage would be increased, thus contributing to climate-change mitigation.

- Wood can also provide renewable fuels, helping society to phase out fossil-fuel use.

- When planting new woodlands, selecting tree species that are genetically suited to cope with future climates (e.g. those with adaptive potential and/or which grow well in warmer or more variable climates) may increase woodland resilience.

Cultural services

- Woodlands and forests provide important recreational spaces for people and can contribute to valued landscapes and urban greenspaces.

- Living in a period of climate emergency can have adverse effects on mental health. Spending time in woodlands can provide mental restoration, relaxation, escape and distance from sources of anxiety.

Exploring future scenarios

- Decision-makers need to understand how ecosystem service provision may change under climate-change projections.

- Exploring alternative possible futures, by simulating different climate-change scenarios and management responses, can help us to understand which measures may help most.

- Choosing tree species that can cope with future climates is essential in order to develop new woodlands which can continue to provide a diverse range of ecosystem services.

- Existing trees and woodlands also need to be managed carefully to ensure they are and remain healthy and resilient.

Methods and tools to support decisions

Forest Research has developed a wide range of tools to support forest managers and decision-makers:

- The Ecological Site Classification (ESC) tool predicts tree species suitability and yield class (timber production) under future climate predictions.

- The Ecosystem Services Model simulates forest development through time for different climate scenarios to produce annual ecosystem services and other resilience indicators.

- LANDPREF is an interactive tool which allows users to 'design' their perfect landscape and consider the ecosystem services that it might provide.

- The CRAFTY modelling framework represents diverse land managers and their objectives. It provides a method to explore future scenarios and what they may mean for land-use change and ecosystem-service provision.

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