

Temperate Continental Region

Potential impacts of climate change on forest goods and services

Climate characteristics

The region is characterized by hot summers, cold winters and low rainfall. The difference between the mean temperature of the warmest and coldest month is greater than 21°C. Average annual temperatures range from 6°C to 12°C; compared to the temperate oceanic zone rainfall is lower and decreases eastwards.

Key climate change trends

Annual mean temperature will increase around 3–4°C. Mean annual rainfall will increase, mainly in winter, while reductions are expected in summer rainfall in several areas.

Sensitivity to climate change

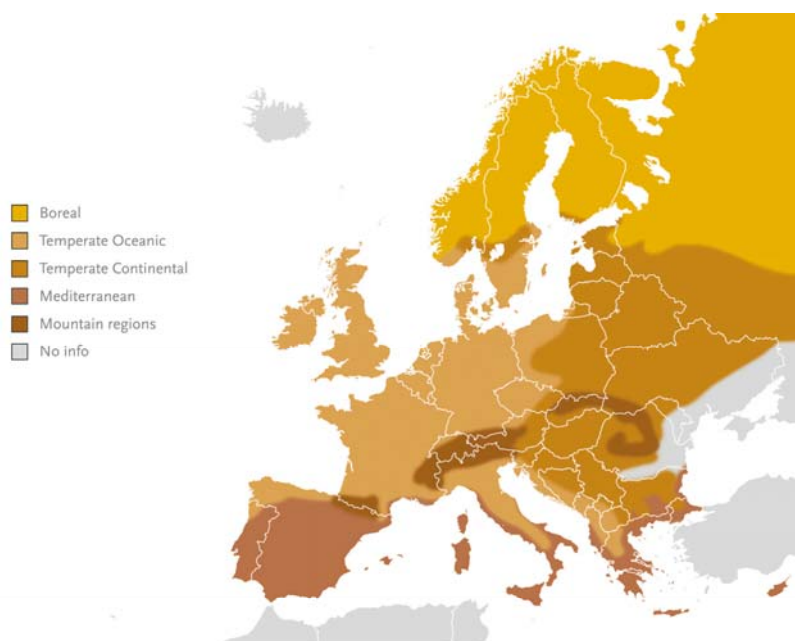
Higher air temperature There will be a negative impact on productivity where the rise in temperature leads to increased demand for water. On the other hand, milder winters may reduce winter hardening in trees, increasing their vulnerability to frost.

Precipitation (rainfall). Currently, the demand for water during the growing season is normally larger than the amount of rainfall. Production therefore decreases at sites vulnerable to water stress. However, it increases at sites where the elevated temperature is balanced by an increase in precipitation.



Typical forest in the temperate continental region. Photo: A. Bolbot, Fotolia

Changes in temperature and precipitation will lead to changes in **species distribution** especially if the number of years with water stress increases. Beech is projected to face severe problems when temperatures increase and could be replaced by oak, due to its lower sensitivity to water stress.



Projected climate change impacts vary in different bioclimatic regions.

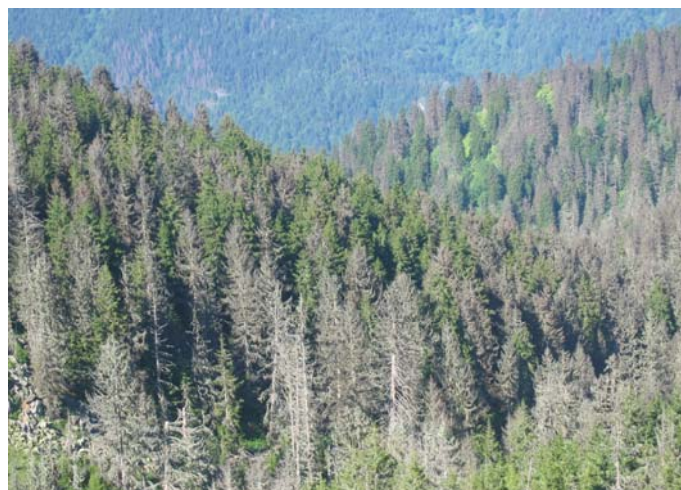
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Sensitivity to climate change

Abiotic risks (non-living factors which affect ecosystems, like wind patterns, precipitation, temperature). Fire danger is likely to increase in temperate forests.

Biotic disturbances (changes in living organisms). Pest species may occur, due to an increase in areas suitable for outbreaks. At the same time, climate change may induce a shift from the main host species, oaks, to alternative tree species, such as beech. Rising average temperatures and increases in disturbance events, such as windthrow (trees uprooted or broken by wind) or extreme weather conditions will bring forward outbreaks of spruce bark beetles. Drought-stress of forests will predispose host trees to root diseases. Given an increase in precipitation in spring, the future risk of severe outbreaks of fungal pathogens that reproduce best during warm and moist periods might be high.



The European spruce bark beetle has benefited from warm and dry summers as well as from storm events in recent decades in large parts of Europe. Photo: T. Gokturk, Bugwood.org

Potential impacts on forest goods and services

Wood production. Wood production could decline by around 10%. In Austria, impacts may become widespread and severe beyond a temperature increase of approximately 1°C (with no changes in precipitation).

Biodiversity. Climate change and the likely increase in disturbance frequency and intensity will benefit species that are adapted to disturbed and open forest ecosystems. However, species depending on mature and closed forests may be negatively affected. Another effect is that beech could be replaced by oaks.

Adaptation options

- Improve fire risk management and adjust afforestation techniques. Afforestation is the establishment of a forest or stand of trees in an area where there was no forest before.
- Select well-adapted tree species or new plants that are genetically similar to those that might have grown in the area previously, and favour them at the tending and thinning stages.
- Keep forests in good condition, so they can better recover from biotic or abiotic damage.
- Maintain the biodiversity of forests; it will improve the ability of forests to adapt to changes in climate.

The project MOdels for AdapTIVE forest management (MOTIVE) is a large-scale integrated project (project number 226544) in the 7th Framework Programme of the EU that develops tools to support decision-making in forestry in response to climate and land use change. It encompasses 20 partners from 14 European countries. It has an overall budget of almost 9 million euros, from which 7 million will be paid as EU contribution. The project is coordinated by the Forest Research Institute of Baden-Württemberg with duration of 4 years.