



Climate Change

Impact on Environment and Society

Forestry

The Impact of Climate Change on Timber Production in Austria

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The COIN project evaluates the economic impact of climate change on the productivity of the Austrian forest sector.

Main findings

- Assuming a moderate climate change scenario, already during the period of 2014 to 2039 higher temperatures and summer dryness lead to a decrease in the productivity of forests and to increased cultivation costs owing to bark beetle infestation and investments necessary to restore the forests' protective functions.
- Thus, additional average annual costs of approx. € 150 million (mn) (€ 230 mn) are expected to arise over the 2014–2039 (2044–2069) period.
- Losses in productivity would especially affect forests in the eastern and north-eastern lowlands as well as in inner-alpine basins; however, many mountain forests could profit from extended growing periods.
- As a result of economic interrelations with other sectors, these developments would result in the gross national product (GNP) decreasing by an annual average of € 463 mn between 2036 and 2065, which corresponds to double the costs which directly arise for the forestry sector itself.

Forestry is very sensitive to climatic changes. Rising temperatures, for instance, affect tree growth and may lead to increased pest pressure within forests (e.g., due to spruce bark beetles). Under changed climatic conditions, forests can no longer perform some of their ecosystem services – such as carbon sequestration or providing protection against gravitational natural hazards (e.g. rockfall, erosion, snow avalanches) – to the full extent, or additional efforts have to be made, respectively, for forests to further provide these services.

The interdisciplinary COIN (Cost of Inaction – Assessing Costs of Climate Change for Austria) project evaluates economic impacts of climate change on Austria. For this purpose, a scenario-based analysis of and across twelve key sectors is conducted, which assesses the possible impact of climatic change in combination with socio-economic developments. The main scenario assumes a temperature rise within the two degrees Celsius margin for the period up to 2050. This assumption presupposes stronger climate policies than the ones currently in place. The analyses presented here only show that part of all potential impacts which has already been quantified and takes into consideration individual adjustments made.

Project info box

What has been analysed?

The current study has investigated individual impact chains caused by rising temperatures and decreased precipitation sums during the growing period. Additionally, the study estimates possible damages caused by the spruce bark beetle.

Damages due to storms, wet snow, and late frost have not been considered in the analysis, as information concerning future developments of these extreme weather events is highly unreliable. However, it has to be taken into account that extreme weather events can cause extensive damages to the Austrian forestry sector. Between 1990 and 2012, storms caused annual damages of 1 to 11 million m³ (damaged) timber, which corresponds to 4 to 50 % of the annual timber production. The number of forest fires in Austria could also increase in the future, yet, compared to extreme weather events, they only play a minor role.

What impacts are to be expected?

Under the assumption of a moderate climate change scenario¹ and moderate socio-economic developments², the forestry sector will already suffer productivity losses due to temperature increase and changes in precipitation sums (less rain during the growing season) as of the 2014–2039 period. These productivity losses result in average annual financial losses of approx. € 0.4 mn during the first period of analysis (2014–2039); over the second period (2044–2069) they amount to approx. € 0.6 mn, and toward the end of the century (2074–2100) the annual financial losses are estimated at approx. € 2.4 mn. This corresponds to an average annual loss of approx. one million m³ of timber between 2074 and 2100.

However, climate-driven bark beetle outbreaks could cause much more extensive damage to the forestry sector. In this context, the study assumes that after a massive infestation, forest stands will be salvaged and reforested; that partially damaged forests will yield less profit; and that running costs will increase due to unscheduled forest tending measures necessary. As a result, the annual financial losses will amount to approx. € 64 mn/€ 98 mn/€ 141 mn over the first (2014–2039)/second (2044–2069)/third (2074–2100) period of analysis.

Finally, investments have to be undertaken to compensate for losses in protective services of mountain forests due to pest infestations and subsequent enforced salvage harvests of infested timber: the study assumes an expenditure of € 220,000 per ha damaged protective forest. Hence, the additional average annual costs are estimated at approx. € 85 mn during the period of 2014 to 2039, at € 134 mn by mid-century (2044–2069), and at € 189 mn by the end of the century (2074–2100). When interpreting these findings, it has to be considered that actually both future climate change and socio-economic developments may differ from the model assumptions. Thus, the current findings represent a first estimation, which can be refined by analysing additional climate and socio-economic scenarios.

¹ The calculations were carried out for a scenario based on monthly climate data on a regionally disaggregated (NUTS-3) level. The moderate climate change scenario assumes a mean temperature rise of +1.0 °C (+2.0 °C), comparing the reference period (1981–2010) to the first (second) scenario period 2016–2045 (2036–2065).

² Moderate socio-economic developments (medium sensitivity) assume spruce timber prices that were determined on basis of the past five-year (2009–2013) average, corresponding to Austrian total felling's proportional amounts of saw logs, industrial timber, and fuel wood. The assumed timber prices and costs for reforestation of mixed mountain forests are also in accordance with the present conditions.

³ The result is based on comparing the respective climate scenarios to a baseline scenario (which interprets socio-economic development without climate change at a medium sensitivity level of the production and trade sector).

Are there regional variations throughout Austria?

Regional variations can be observed especially with respect to the impact of climate change on the forestry sector's productivity. While the climate will effectuate extended growing seasons in mountain forests, dry periods will cause productivity losses for forests at lower altitudes, particularly in the eastern and north-eastern parts of Austria and in inner-alpine basins. Thus, climate change will affect individual regions in Austria to much varying degrees; some will experience positive economic effects (i.e., rather the western regions of Austria), while for the larger part of Austria the effects will be negative.

What impacts on the Austrian national economy can be expected?

The current findings do not yet take into consideration the forestry sector's interrelations with other sectors. When taking into account respective feedback effects, the gross national product (GNP) is estimated to decrease³ by an annual average of approx. € 272 mn (€ 463 mn) over the 2016–2045 (2036–2065) period under a moderate climate change scenario and moderate socio-economic developments. This corresponds to double the costs which directly arise for the agricultural sector itself. These aggregate net losses take into account that sectors such as construction industry will profit from the necessary investments, as will the forestry sector itself in terms of turnover (since new investments in protective measures are to be accredited to the sector). Among others, the trade and retail sectors as well as the real estate sector will suffer losses due to changes in relative prices.

References:

Lexer MJ, Jandl R, Nabernegg S, Bednar-Friedl B. 2015. Forestry, Chapter 9 in: Steining K, et al. (eds.), Economic Evaluation of Climate Change Impacts: Development of a Cross-Sectoral Framework and Results for Austria. Vienna, Springer.



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