Project Database of ICP Forests

PROJECT DESCRIPTION

PROJECT INFORMATION

Project title: **New Insurance Solutions for planted forests**

Project ID: 288

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PROJECT DESCRIPTION

Global climate change and associated drought are posing stress and increasing mortality rates of entire forests, such as artificial spruce monocultures. Between 2018-2020, 245,000 ha of forest died in Germany alone with many coniferous stands becoming increasingly stressed. To increase the resilience of forest ecosystems under climate change, knowledge on tree species adapted to future climate conditions is needed at the regional scale. This project aims to provide insurance solutions to newly planted forests, by providing forest owners with financial security that accounts for the risks of drought. To accomplish this, tree species models will be developed that simulate species responses under changing climate conditions at the regional scale. The objective of this project is: 1) to determine areas at risk of forest stress at the regional scale and 2) identify those tree species that are most resilient to climate extremes.

The project will employ the process-based model 3-PG (Physiological Processes Predicting Growth, https://3pg.forestry.ubc.ca/) to determine the spatial and temporal patterns of tree stress and associated impacts on species distributions across Europe. The model is parameterized with high resolution climate data obtained from Chelsa (https://chelsa-climate.org/), based on temperature extremes, solar radiation, the frequency of frost and soil properties. The environmental mechanisms of tree stress obtained from 3-PG will then be combined with ICP Forests inventory data on tree species occurrences using machine-learning algorithms. This will allow to predict how the distribution of different tree species is shifting under climate change based on limitations imposed by temperature extremes, frost, vapor pressure deficit and soil water. The ICP Forests data of interest for the study, includes information on tree species occurrences (presence/absence) as well as plot coordinates.

Results from this study will provide novel insights into the physiological mechanisms influencing tree stress in response to climate change across Europe. The models will provide a basis to identify risks imposed on different tree species under drought. This will allow to develop insurance solutions for foresters by providing a realistic assessment of insurance needs and by calculating the financial risks of forest plantations.