Project Database of ICP Forests
PROJECT DESCRIPTION

PROJECT INFORMATION

Project title: Alterations in the lifetime of forest stands: Economic consequences of climate change for forestry enterprises. Management options for optimizing risk-return ratios under a changing climate.

Project ID: 98

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PROJECT DESCRIPTION

The project consortium consists of the Technical University of Munich, the Bavarian State Institute of Forestry, the Forestry Research Institute of Baden-Württemberg, the Thünen Institute of Forest Ecosystems and the Research Institute for Forest Ecology and Forestry Rheinland-Pfalz.

Aims

Climate change does not only lead to changes in species distribution and productivity, but also causes additional risks, e.g. an increase in droughts or in the frequency of storms (Hanewinkel et al. 2010). To secure a sustainable wood production and the provision of ecosystem services it is essential that these risks are taken into account in decision-making (Kölling et al. 2013). The effects of risks on forest stands can be captured by looking at the survival times or the mortality rates of trees.

Therefore, the project aims at developing models describing the entire range of survival times and risks for mortality and the factors that influence them based on a European data set. The focus is on the most important tree species in Germany (Picea abies, Pinus sylvestris, Abies alba, Fagus sylvatica, Quercus robur, Quercus petraea, Pseudotsuga menziesii). Climate scenarios predict a warmer and drier climate for Germany in the future. Consequently, in order to predict future risks for German forests data of regions that experience these climatic conditions today are required for model fitting. The respective models will be validated using experimental plots and, subsequently, applied to real and idealized forest estates. Potential management options to optimize the risk-return ratio under a changing climate will be investigated and assessed in terms of their economic outcomes.

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Methods

- An approach to model survival times (Neuner et al. 2015, Nothdurft 2013) for forest stands based on a European database (Level I and Level II) will be developed. Important site factors and management factors influencing survival times will be identified.
- The relationships found will be applied and validated using a network of experimental plots to provide data for yield science in two German federal states.
- These improved functions will then be applied to the data from the National Forest Inventory in Germany. Using this dataset, management options in the form of different scenarios will be analyzed and assessed. This step will allow for optimizing short-term forest management decisions (i.e. harvest schedules) and long-term production planning options (i.e. tree species selection and stand structures) for idealized forest enterprises (Neuner et al. 2013, Roessiger et al. 2013).
- These findings will be put into practice by analyzing the returns and risk for different real world forest enterprises of different forest ownership types.

Data requirements

- Crown Condition (Level I and Level II) in order to derive mortality rates
- BioDiv and Growth and Yield data in order to check Crown Condition data (i.e. age estimation) and mortality rates for plausibility
- European climate data (WorldClim, Hijmans et al. 2005) as explanatory variables in the models
- European soil data (BioSoil) as explanatory variables in the models
- Foliage data in order to test the effect of nutrient supply on tree survival
- Meteorological data of Level II plots in order to investigate more closely the cause and effect relationships between site variables and mortality (i.e. wind)

Expected Results

- The knowledge of mortality dynamics of the most important German tree species will be improved.
- The study should provide a generalizable quantification and economic assessment of changes in mortality and growth rates in European forest stands under increasing temperatures and decreasing precipitation.
- The research results and data sets produced will be made available for future research and application as part of the German National Forest Inventory dataset.

References

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