Project Database of ICP Forests

PROJECT DESCRIPTION

PROJECT INFORMATION

Project title:	Potential of functional diversity for increasing the disturbance resiliency of forests and forest-based socio-ecological systems (FUNPOTENTIAL)
Project ID:	219
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PROJECT DESCRIPTION

Objectives

The overall aim of FUNPOTENTIAL is to develop disturbance-resilient forest management strategies and policies that balance the provision of timber and climate services and sustain biodiversity in a changing climate. To achieve this aim,

- Quantify the present disturbance regimes for the study regions by analysing the damage risk probabilities and losses due to damage, and factors that improve the forests' resilience. Future scenarios of potential disturbance pathways will be charted to support resilience and economic analyses.
- Evaluate how functional diversity impacts the forest resilience in boreal, temperate and Mediterranean parts of Europe, focusing on recovery after disturbances. More risk-resilient management principles, which draw from functional and structural diversity of forests will be developed.
- Study how the tree species and structural diversity influence the forest enterprises and climate services provided by forests, and how it may promote the resilience of economic and climate change mitigation under increasing disturbances.
- Examine optimal policies to reduce disturbance risk in forests by promoting species diversity. Examine how the outcomes of policies to promote carbon storage in forests are affected by the changing disturbance regimes.
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FUNPOTENTIAL will address the following related research questions related to ICP and other inventory data:

1. How are probabilities, severities and extents of forest disturbances and background mortality affected by functional traits of trees, landscape structure, and climate?
2. Which functional trait combinations promote forest recovery from disturbances under given climatic constraints?

Material and Methods

We will draw ecological diversity-resilience analyses based on a massive forest inventory dataset, which merges cross-European inventory datasets ICP I and II (crown condition + supporting datasets), FUNDIV (Kunstler et al., 2020), and country-specific inventory datasets that we are presently working with. We will study and quantify the occurrence probabilities of damage and mortality events, and factors driving damage using statistical modeling (e.g. Suvanto et al., 2020). We expect that this will provide information about variation of background mortality and damage processes by growing conditions and climate regions, which can be implemented to models. A central tool for the project, the forest model IPM (Kunstler et al. 2020), was recently developed in REFORCE/I-MAESTRO. Another model, PREBAS (Minunno et

al., 2019), was recently developed and calibrated for boreal conditions. We will extend an existing models with information about disturbance rates and impacts learnt from the data analyses, and evaluate with models how management could be altered to minimize the impacts of disturbances. Thereafter, the models will be used in simulation experiments and scenario analyses, where economic impacts and policies are evaluated.

References

Kunstler, G, Guyennon, A, Ratcliffe, S, et al. Demographic performance of European tree species at their hot and cold climatic edges. J Ecol. 2020; 00: 1– 14. https://doi.org/10.1111/1365-2745.13533

Minunno, Francesco, Peltoniemi, M., Härkönen, S., Kalliokoski, T., Makinen, H., & Mäkelä, A. (2019). Bayesian calibration of a carbon balance model PREBAS using data from permanent growth experiments and national forest inventory. Forest Ecology and Management, 440, 208–257. https://doi.org/10.1016/j.foreco.2019.02.041

Suvanto, S., Peltoniemi, M., Tuominen, S., Strandström, M., & Lehtonen, A. (2019). Highresolution mapping of forest vulnerability to wind for disturbance-aware forestry. Forest Ecology and Management, 453, 117619. https://doi.org/10.1016/j.foreco.2019.117619.