



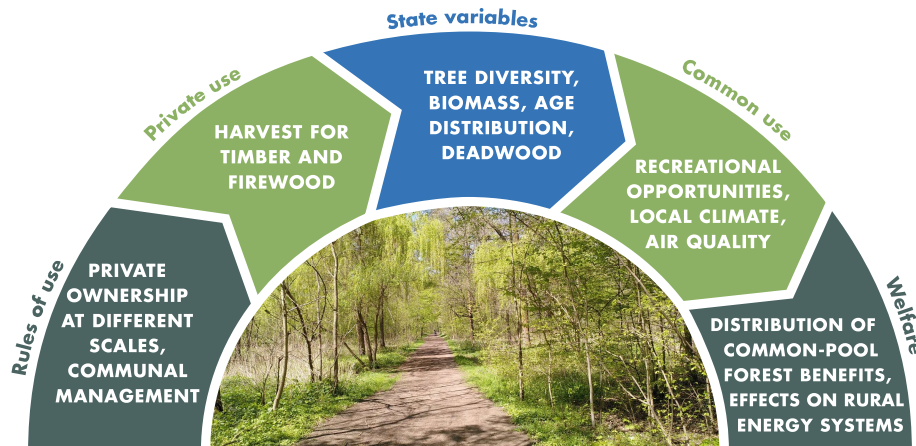
ELEMENTS OF OPTIMAL FOREST MANAGEMENT FOR THE PROVISION OF PRIVATE AND COMMON-POOL SERVICES

MARTIN QUAAS
RESOURCE ECONOMICS

NADJA RÜGER
FOREST MODELLING

DANIELA THRÄN
BIOENERGY SYSTEMS

CHRISTIAN WIRTH
FOREST BIODIVERSITY



FOREST MODELLING

Nadja Rüger, Martin Quaas

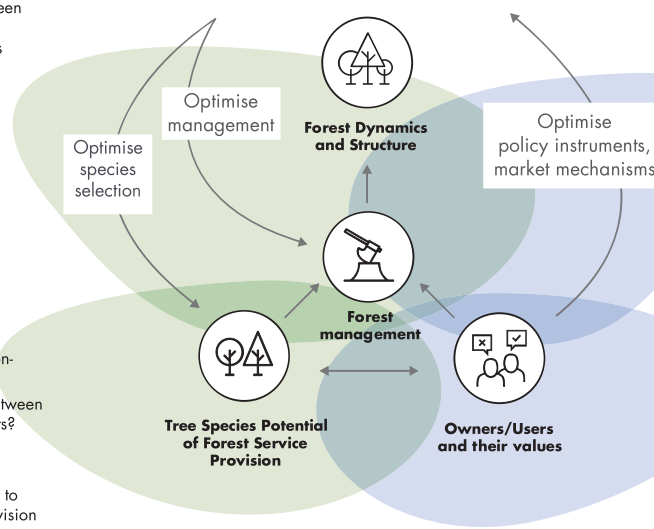
What are trade-offs and synergies between timber and bioenergy provision versus provision of common-pool forest services (especially biodiversity, carbon storage, recreational value/aesthetics) in
 — Privately-owned rural forests?
 — Communally-owned urban forests?
 Second cohort: Model effects of climate extremes on forest dynamics

FOREST BIODIVERSITY

Christian Wirth, Daniela Thrän

Quantify potential to provide 13 common-pool services of >100 tree species
 — What are synergies and trade-offs between species-specific service provision traits?
 — How can services be predicted from functional traits?
 Second cohort: From tree identity effects to tree interactions; sensitivity of forest provision traits to climate extremes

Provision of common-pool and private forest goods and services



FOREST RESOURCE ECONOMICS

Martin Quaas, Christian Wirth

Communal forests
 — How do values of forest services differ between the general public and different forest owners?
 — Which of these values are reflected in actual management?
 — How does optimal forest management change with objectives?
 Second cohort: Analyse effect of uncertainty and risk aversion

BIOENERGY SYSTEMS

Daniela Thrän, Nadja Rüger

Privately-owned rural forests
 — How does ownership type affect bioenergy use?
 — How does bioenergy use affect forest management, forest composition and the potential to provide common-pool services?
 Second cohort: adaptation of forest owners to climate risks

SHARED METHODOLOGY:

Dynamic modelling and optimisation; discrete choice modelling; multivariate and explanatory statistics

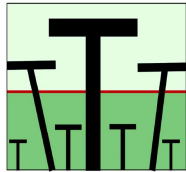


ICP FORESTS

MARTIN QUAAS, NADJA RÜGER, DANIELA THRÄN, CHRISTIAN WIRTH

FOREST MODELLING

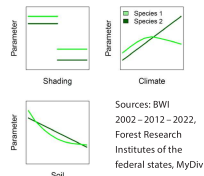
PPA MODEL



PARAMETERS

- Growth in canopy
- Mortality in canopy
- Growth in understory
- Mortality in understory
- Recruitment rate

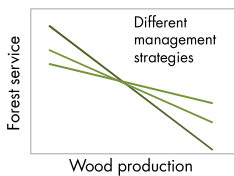
PARAMETERISATION



VALIDATION

- **Natural forests:** potential natural vegetation, maximum diameter
- **Harvested forests:** size distribution under different management regimes, productivity

SIMULATIONS

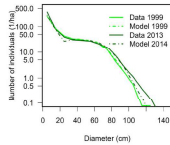


TREE SPECIES

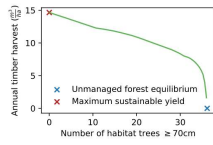
- A. alba,
- A. pseudoplatanus,
- A. campestre,
- C. betulus,
- F. sylvatica,
- F. excelsior,
- L. decidua,
- P. abies,
- P. sylvestris,
- Q. robur

PRELIMINARY WORK – BEECH FOREST IN THE HAINICH NATIONAL PARK

	Growth	Mortality
Canopy	2.5 mm / y	0.5 %
Understory	0.8 mm / y	1.6 %



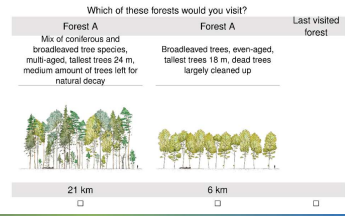
Observed and simulated diameter distribution



Trade-off between timber harvest and biodiversity habitat value

FOREST RESOURCE ECONOMICS

Assess how values of forest services differ between forest owners and general public



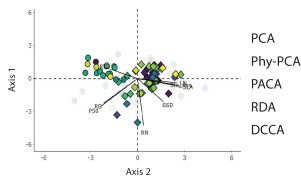
Discrete choice experiment

Estimate from forest inventory data which values are reflected in communal vs. private forest management



Explore trade-offs between private and common-pool benefits in an optimisation model using the PPA forest demographic model and indices of non-market forest services derived from forest biodiversity project

FOREST BIODIVERSITY – ES PROVISION TRAITS



- PCA
- Phy-PCA
- PACA
- RDA
- DCCA

Generalisation



FF TRAITS

Fundamental Functional Traits Physiology, Morphology, Anatomy (available)



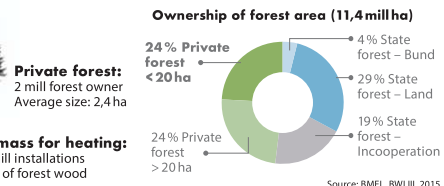
Synergies, trade-offs

CICES	ESP Traits	Approach
Provisioning	Growth Wood quality Bioenergy	ARBOfun available / NFI Coop. Forest Modeling Sales statistics, wood technology literature Coop. Forest Bioenergy
Regulating	Drought resistance Cooling / Shading Noise reduction Habitat VOC Matter recycling	ARBOfun available ARBOfun available ARBOfun, acoustic measurements Scientific Literature Coop. Urban Air Quality ARBOfun, litter and wood decomposition
Cultural	Aesthetics Inspiration Heritage Science	Nursery catalogues, tourist brochures COULBI literary text analysis, available Database of monumental trees WOS results, Flora Incognita searches

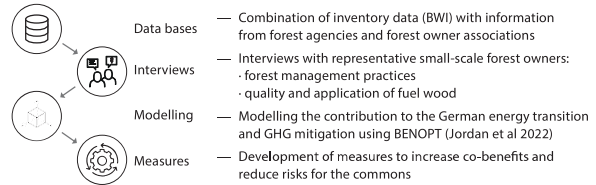


FOR 100 TREE SPECIES

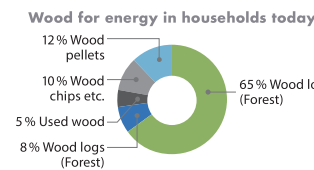
BIOENERGY SYSTEMS



Source: BMEL, BWI III, 2015



PRELIMINARY WORK – OPTIMISED WOOD USE IN ENERGY TRANSITION



The use of own sourced wood logs in private households has been shown as a robust element in future energy systems (a human-made commons)

