



A Forest Sector Model for the Region Baden- Wuerttemberg in Germany BW-GLOBAL-FOR

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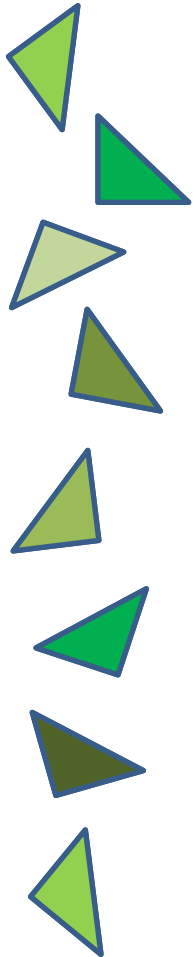
Bioenergy from Forest 2014

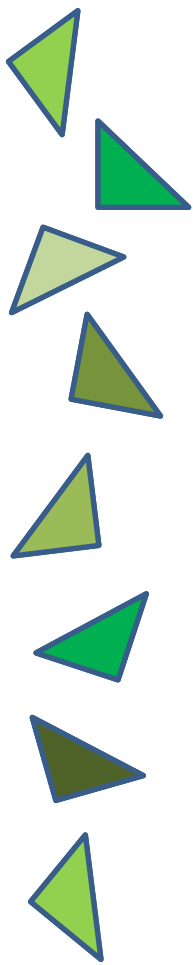
Helsinki, Finland

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Forst & Holz Baden Wuerttemberg

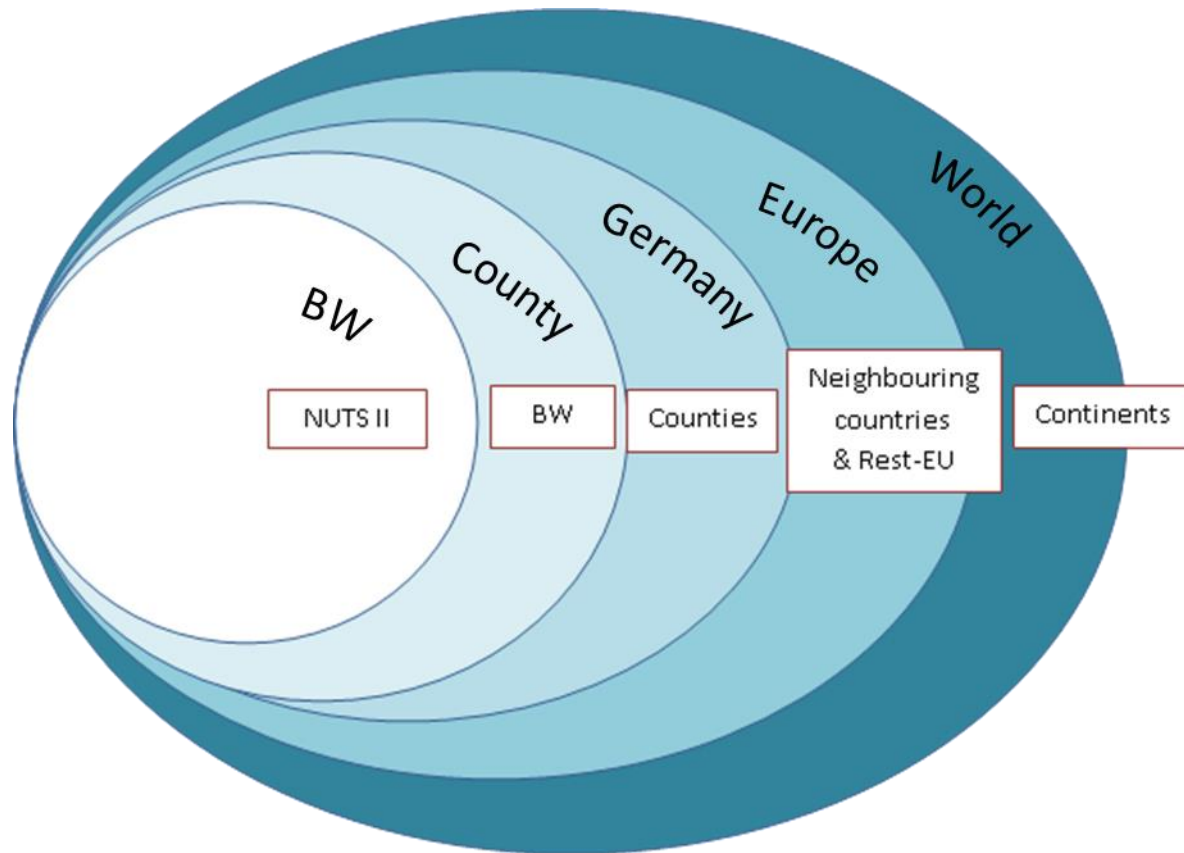
- Common initiative of stakeholders and public administrative:
 - Reflects importance of forestry and wood processing industry in Baden-Wuerttemberg, Germany, economically, but also from a land use, environmental and rural development perspective
 - Foster networking of enterprises and collaboration between enterprises and research institutions...
 - ...to benefit from opportunities of emerging bio-economy, e.g. increased use of wood chips for heating...
 - ...and to increase competitiveness



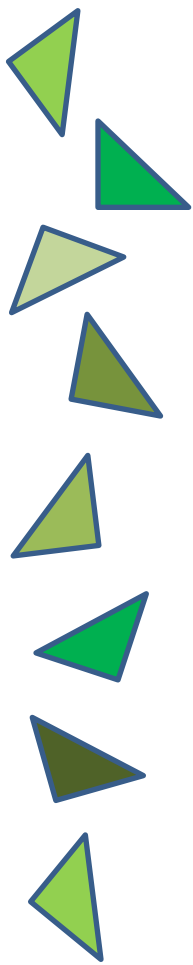
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- Analyses effects of market and policy changes on forestry and related industries in Baden Wuerttemberg...
 - ... but reflects link to national and global markets for wood and wood based products
 - Bio-economic, partial equilibrium model
 - Recursive-dynamic, yearly steps
 - Perfect competition, imperfect foresight
 - Production, Consumption, Bi-lateral trade, Prices
 - Calibrated against medium-term baseline (2030)

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Spatial resolution



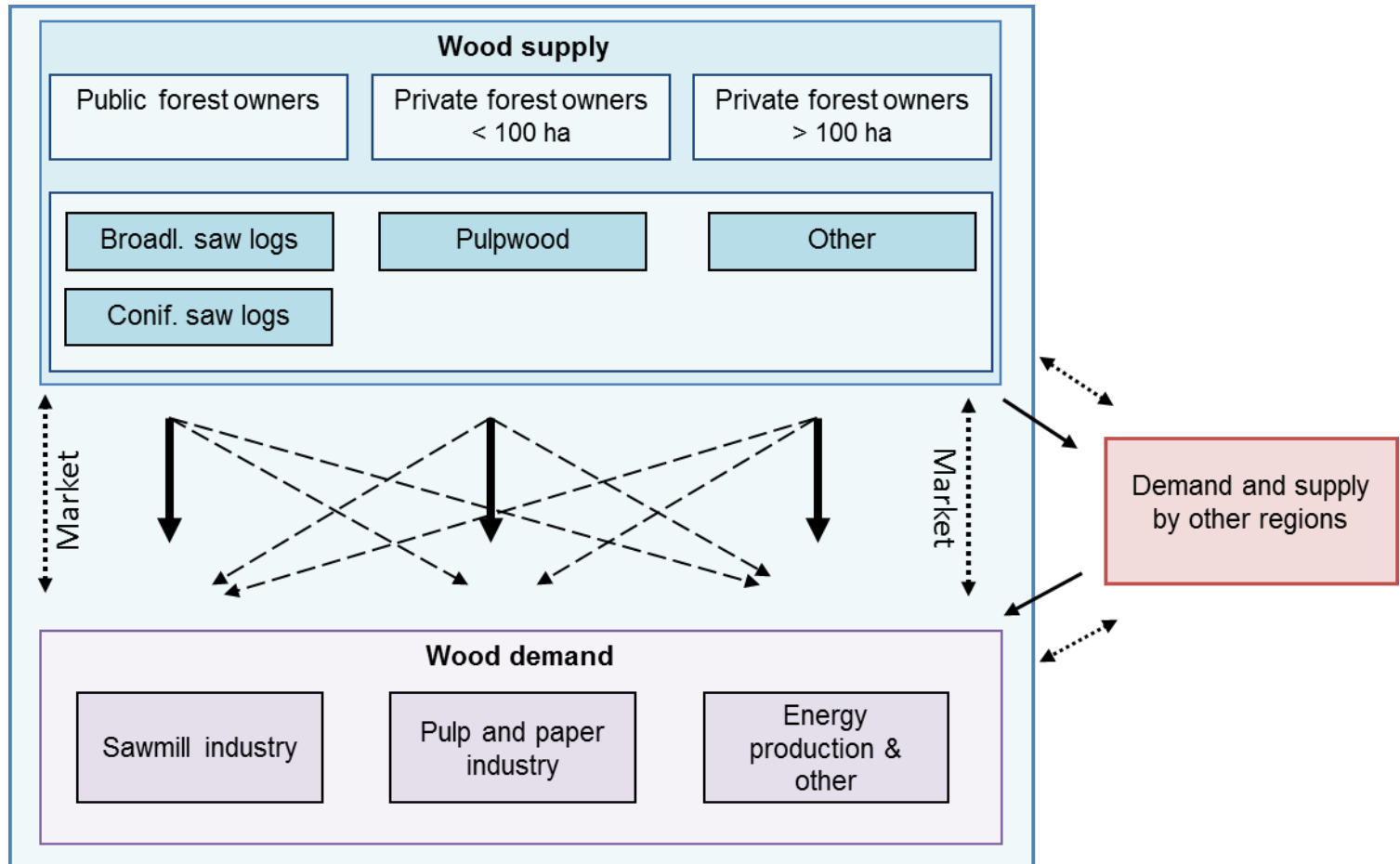
1990 – 2010

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- Germany/ BW: German federal forest Inventory
 - EUROPE: UNECE/FAO Forest & Timber statistics
 - World: Global FAO Forest statistics

- Production
- Demand
- Export, import (bi-laterally)
- Harvest quantity
- Forest ownership
- Assortments
- Forest area
- Growth rates
- Production shares
- Import and export unit values as price source

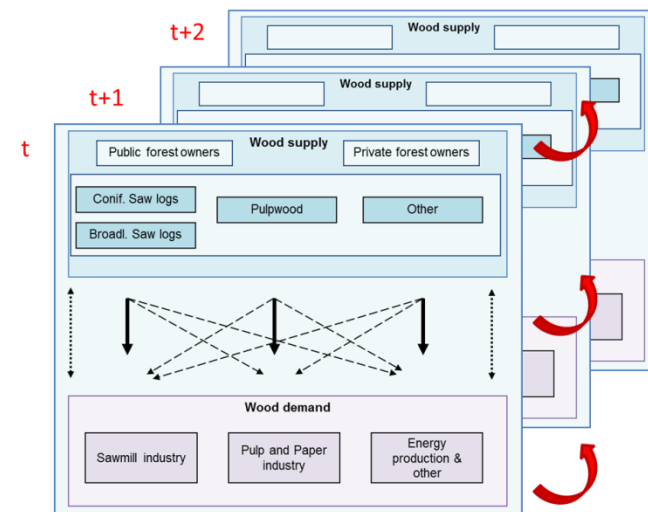
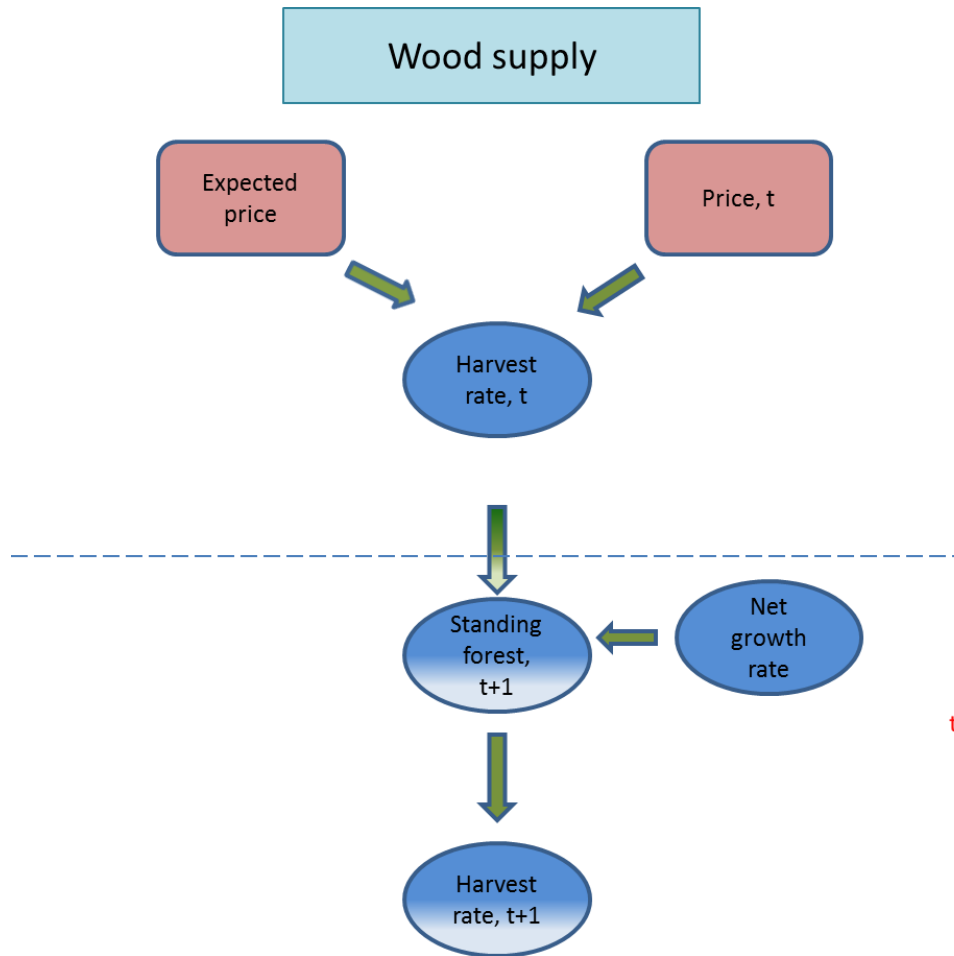
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General structure



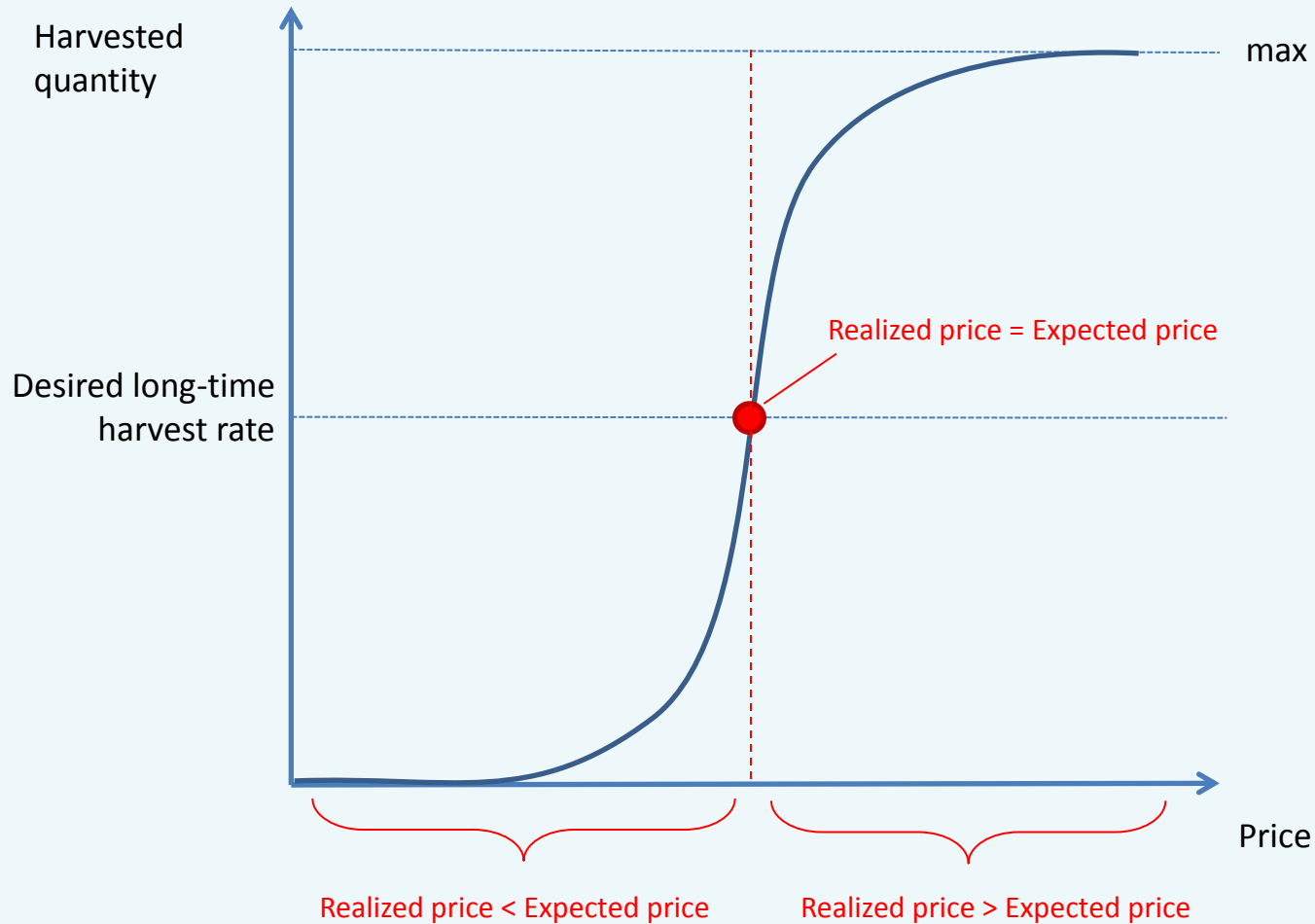
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Wood supply

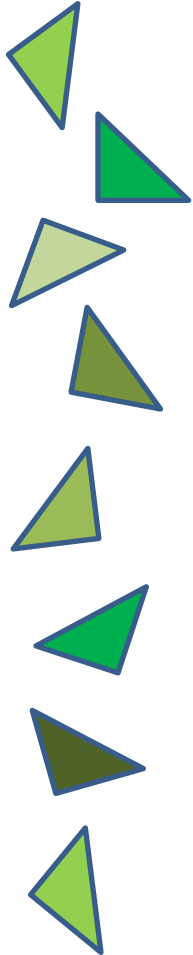


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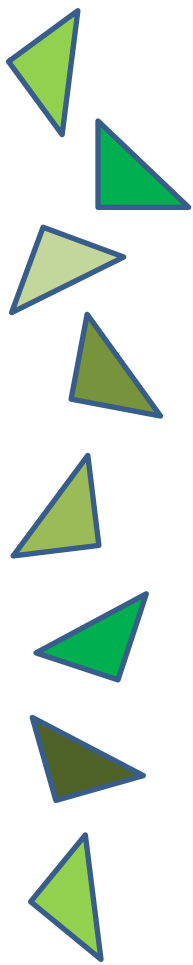
Harvest intensity

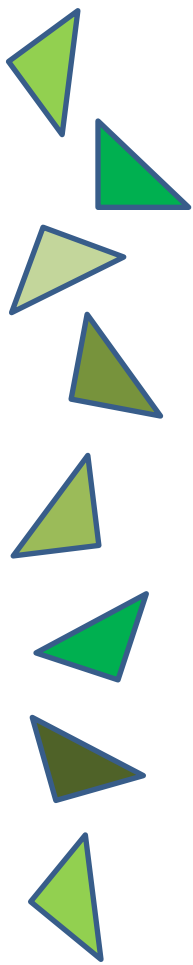


- Simulation based on Armington approach
 - Relaxing assumption of trading homogenous goods
 - Aggregated commodities as imperfect substitutes (tropical woods compared to temperate zone ones, different processing qualities)
=> law of one price does not hold
 - Allows for bi-lateral gross-trade, smooth reaction of import shares to price changes
- Spatial equilibrium concept applied inside Germany:
 - Homogenous goods
 - Price differences driven by transport cost
 - Can alternatively also be used globally



Functional forms and Parameterization

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- **Supply:** double log, plus CET (distribution to different wood parts), plus harvest intensity equations (only Europe)
 - **Demand:** double log plus CES (share of different wood parts)
 - Magnitude of parameters taken from similar models / studies, further literature work ongoing, not yet own econometric work

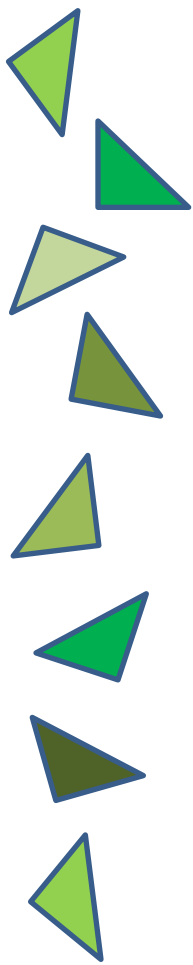
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- Simple polynomial long-term trends of prices (supply, demand, trade flows, prices ...) as a priori
 - Model structure as “data information” (closed market balances reflecting bi-lateral trade, dynamics in supply, optionally: spatial arbitrage condition for prices)
 - Introduction of shock in order to analyze the models reaction due to its mechanisms regarding structure and parameterization

Model plausibility and stability

- Preliminary counterfactual run: 5% yearly increment of standing forest
- Resulting model response to shock:

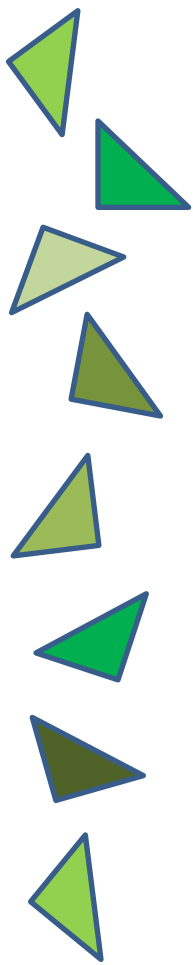
Results by 2030		
Prices:		
BW	↓	30-50%
GER	↓	5-10%
World		~ 0%
Import:		
BW	↓	35-55%
GER	↓	5-12%
World		~ 0%
Domestic sales:		
BW	↑	25-70%
GER	↑	5-10%
World		~ 0%

Technical implementation

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- Data transformations, reference run, calibration, simulation implemented in GAMS (General Algebraic Modelling System)
 - Simulation model as Mixed Complementarity Problem (MCP) solved with PATH
 - Design of Experiments for sensitivity experiments in R combined with parallel execution of model runs
 - Java based Graphical User Interface for model steering and result exploitation (tables, graphs)

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Summary and Outlook

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- BW-GLOBAL-FOR:
 - Complements the few existing (global) forest models with different methodologies (e.g. Armington, CES/CET, MCP, large-scale sensitivity analysis)
 - Prototype version operational
 - Next steps:
 - Incorporate regional data for Baden-Württemberg
 - Improve reference run and parameterization
 - Implementation of specific policy instruments
 - Apply *BW-GLOBAL-FOR* for scenario analysis
 - i.e. FSC certification of public forests in BW

Thank you for your attention!

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