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Research and Development along the Forest Wood Chain in the Northeastern German Lowlands

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Introduction – natural vs. current forest landscape

1) sub-maritime climate
   • beech forests

2) sub-continental climate
   • oak-pine forests (Sessile Oak)

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Hofmann & Pommer 2005 (modified)
Challenges along the Forest Wood Chain

- **Economic risks** of extensive areas of pure pine stands
- Impact of increasing **Drought** on the forestry
- Little experience with the **Management** mixed Oak-Pine Forests
- Little knowledge about the **Ecological Effects** of the transformation of pure Pine Stands in mixed Oak-Pine-Forests
- Necessity of innovative Solutions for the **Treatment and Marketing** of small dimensioned oak wood
- Optimization of the **Timber Supply Chain** (forest logistics)

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Partners – transdisciplinary and international

- **BTU Cottbus**
  (Chair of Soil Protection and Recultivation / Research Center Landscape Development and Mining Landscapes)

- **TU Dresden** (Forest Utilization)

- **University of Applied Sciences Eberswalde** (Forest Utilization)

- **University of Applied Sciences Wildau** (Logistics)

- **Potsdam Institute for Climate Impact Research** (PIK)

- **Landesforstanstalt Eberswalde** (LFE)

- **Verband der Säge- und Holzindustrie Nord e.V.** (Pressure group)

- **Holzindustrie Templin GmbH** (Sawmill)

- **Forest Research Institute, Warsaw** (IBL)

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## Structure – Research and Development along the Forest Wood Chain

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Research and Development along the Forest Wood Chain
Integration of Stakeholders in Research

- **Practical Workshops** with Stakeholders along the Forest Wood Chain
- **Presentation** of aims and results in all fields
- **Discussion** with stakeholders and excursions to the study areas
- More than **1,200 guests** at 7 workshops (2006-2008)
Aims – from Seed to Utilization

1) **Threat** and **Adaptation** Potential of Sessile Oaks

2) Characterisation of **Climatic Parameter** for Oak Regions

3) Implementation of **Root Distribution** in Modeling of Forest Growth

4) Quality and Quantity of **Soil Organic Matter**

5) Impact of Forest Management on **Wood Quality**

5) **Decision Support System** for the Management of Oak-Pine Forests

6) **Wood Properties** of small dimensioned Oak Wood

7) **Thermal Modification** of small dimensioned Oak Wood

8) Optimization of the **Timber Supply Chain**

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1) False-time Series
Forest transformation of pure pine stands to mixed oak-pine forests

2) Climate Gradient
Mixed oak-pine forests of increasing continentality

3) DSS
Decision Support System for the management of mixed oak-pine forests in this region

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Study Design – Chronosequence and Climate Gradient

1. **False-time Series**  Brandenburg

2. **Climate Gradient**  Sachsen-Anhalt - Poland

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Threat and Adaptation Potential of Sessile Oaks

1) Current Situation

Crown Transparency

- A3
- A4
- K1
- K2
- K3
- K4
- K5

2) History

Increase in Diameter 1864-2006

3) Adaptation Potential

Refugia along the Climate Gradient

West

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Characterisation of Climatic Parameter for Oak Regions

1) Climatic data of the distribution area of the relevant tree species

2) Development of “climate envelope models” for forest trees

3) Characterization of recent climate and climate scenarios of different regions of oak distribution

Water Balance per year [mm] for 1951-2000 and Distribution of Sessile Oak

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Implementation of Root Distribution in Modeling of Forest Growth

1) **Root distribution** in deeper soil horizons

2) **Implementation** in model on forest growth

3) Sensitivity analysis of **growth rate**

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Quality and Quantity of Soil Organic Matter

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Impact of Forest Management on Wood Quality

Determination of wood quality in mixed oak-pine stands by means of **internal and external properties** with feedback to management

**Single mixture** with negative impact on wood properties

Better quality via **mixture in groups** of tree species

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Decision Support System for the Management of Oak-Pine Forests

Study Sites
- site quality
- structure
- growth
- quality

Growth Simulation BWIN / Brandenburg

Forest Data (DSW²) | Management Directive Brandenburg

Overall conditions and aims

Decision Support System
Java-based program for the development of individual management scenarios

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Wood Properties of small dimensioned Oak Wood

Investigation of all properties of small dimensioned oak wood relevant for the utilization in close cooperation with the timber industry:

- Which dimensions and qualities are worth being used?
- Which are the special properties of small dimensioned oak wood?
- How important are necroses?
- The same wood is passed on to the UAS Eberswalde for the thermal modification ...

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Thermal Modification of small dimensioned Oak Wood

- Close *cooperation von science and industry* for the development and production of thermally modified small dimensioned oak wood
- *Laboratory chamber* of UAS Eberswalde for the analysis the impact of high temperatures on the properties of oak wood
- *Thermic chamber* at the Holzindustrie Templin (sawmill) for the industrial production of thermally modified oak wood
Software for Disposition and Information in the Timber Supply Chain

- **Web-based platform**: electronic provision of data relevant for timber transport
- **Timber transport exchange** offers and placing of orders to reduce empty drives
- **GIS-based display of stacks of wood** with descriptions of distance in offers to improve route planning
- **Map-based off-road description** as navigational aid, no instruction of carrier necessary
- **Digital delivery note** to promote continuous flow of data in the timber supply chain
- **Close cooperation with stakeholders** of forestry, timber industry and timber transport in the course of the development
Test of PDA- and RFID-technology in the Forest Wood Chain

- Use of modern **information and communications technology** to connect the stakeholders among each other and with the stacks of wood
- Test and implementation of **PDA technology** for data exchange between the stakeholders (i.e. digital delivery note)
- Test and implementation of **RFID technology** for labeling of stacks of wood and identification along the transport chain
- Prevention of mistakes in stack identification via transponder-ID
- **Mobile use (PDA)** of off-road description for navigation and digital delivery note for quality assurance
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