

Optimizing Resource Efficiency and Carbon Intensity in the Wood Processing Sector in Austria

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Background

- Efficient **resource use** has major priority, especially for renewable resources
- That means marketability and value creation by a decline of resource use
- The project strives for an object oriented process **model** of the integrated production system of **wood processing** and **paper production**
 - to assess current situation
 - and analyze technology improvement

Aims of the project

- The model should provide
 - appraising impacts of new technologies to the economic and ecological performance
 - Technical improvement
 - Changed basic conditions
 - Structural changes
 - identifying coherences and synergies of process chains and their variability
 - revealing potentials of the wood processing sector to provide the energy sector
 - Basis for unambiguous decisions for further steps

Scope

The scope of the examination was on the following raw materials and products

- Forestal biomass

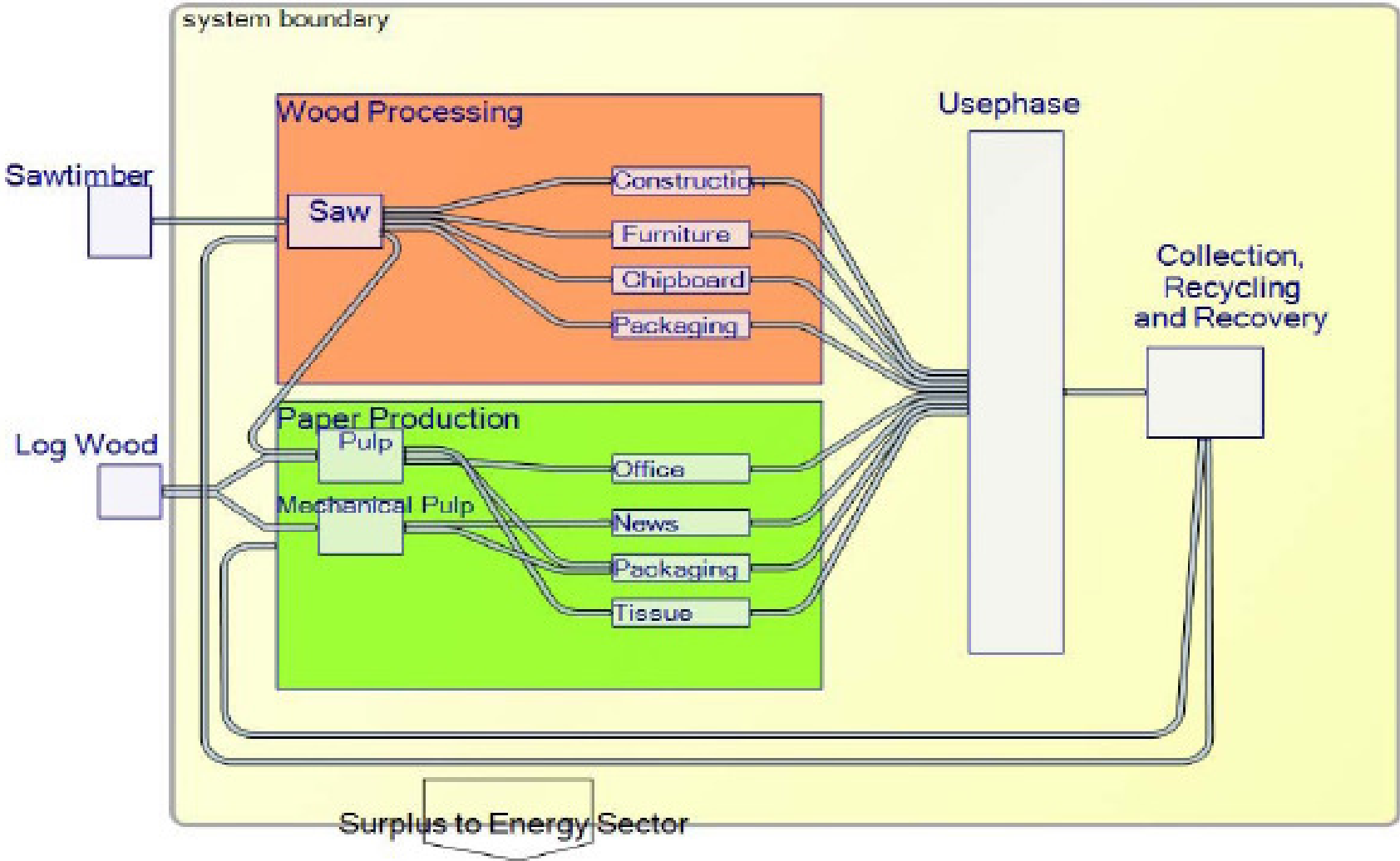
 - stem wood, thinning material, log wood, matured stand, alternative raw materials

- Products

 - Pulp, paper and cardboard: Office, magazine, newsprint, tissue, pulp and fibre products

 - wood processing: furniture, chipboard, construction and packaging

System boundaries

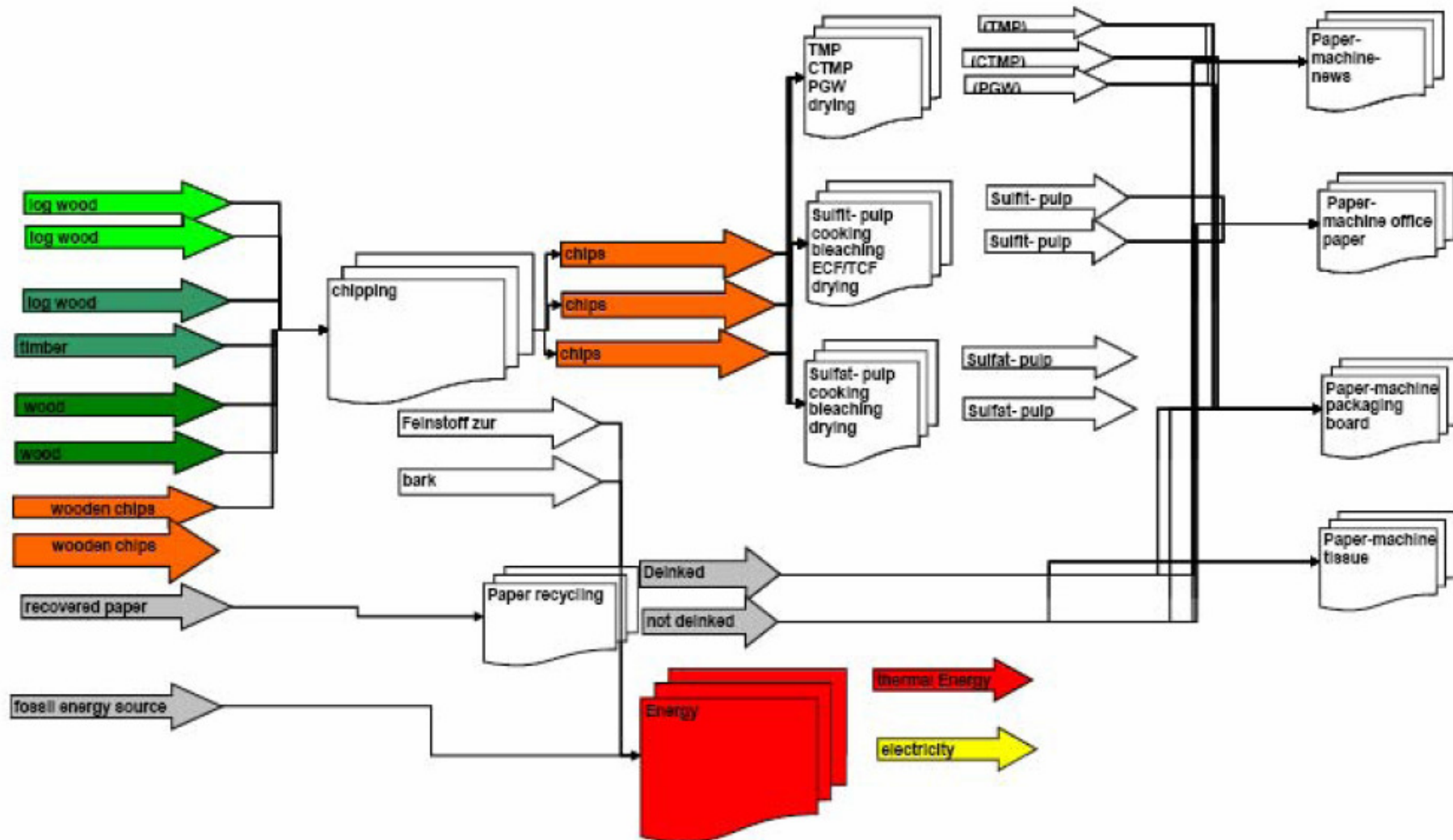


Target parameters

- **Resource efficiency**
 - Input: CO₂fix, m³ wood, water
 - Output: products and function
- **Energy efficiency**
 - fossil energy carrier, biogenic energy carrier, uncoupling of energy
 - Potential synergies to energy sector
- **C/CO₂ balance**
- **Emissions**
 - Conventional emissions to air(CO₂, NO_x,SO₂, dust)
 - Water: BOD₅, COD (AOX, heavy metals,.....)

Description of the model (1)

horizontal assembly - paper sector



Description of the model (2)

vertical assembly

- Single processes can be merged on a plan
- Single plans can be used as processes and linked to other processes on plans
- Groups of processes, products or single process chains can be aggregated

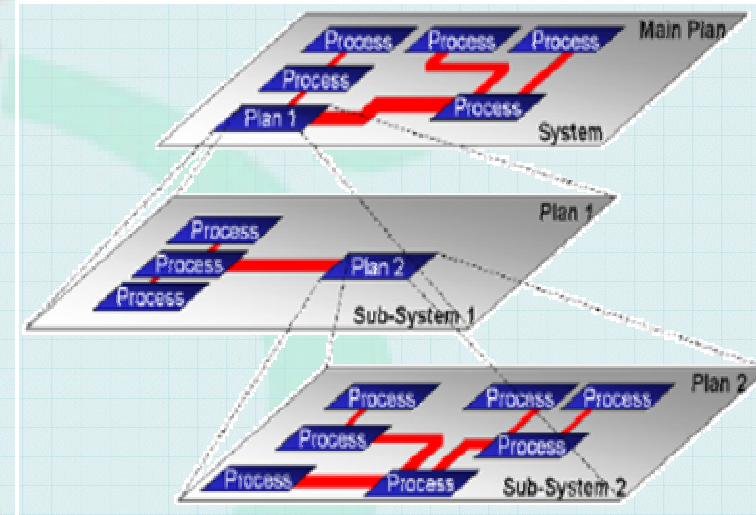


Figure 3: nested plans in GaBi4 [2]

Current model- Pulp and paper industry

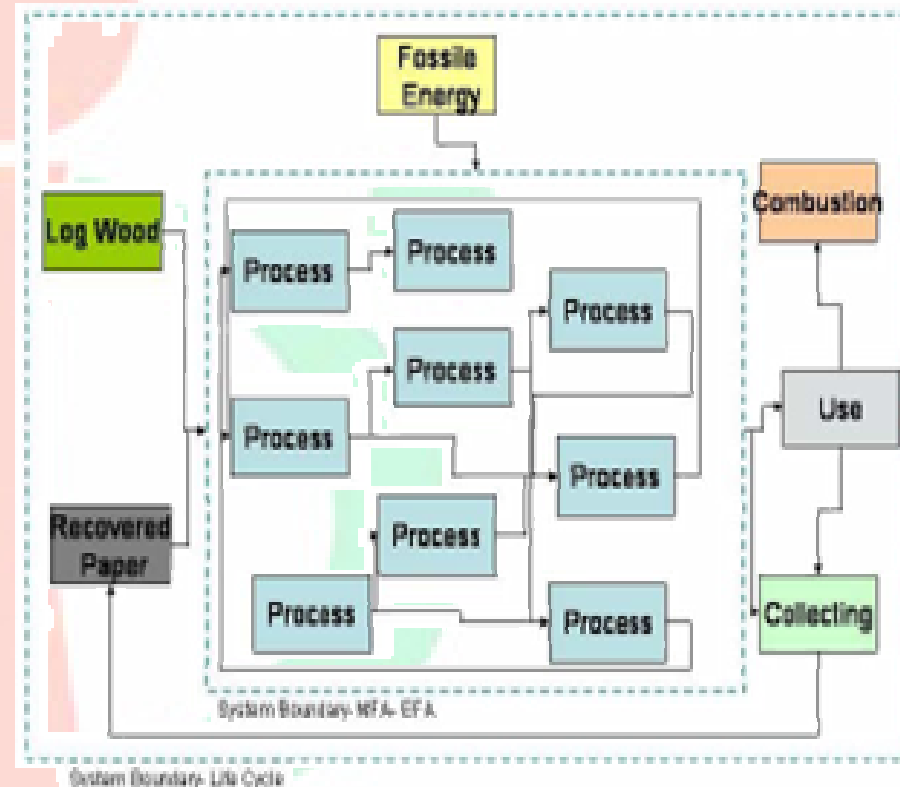
- Two system boundaries

Inner boundary for

- Material flow analysis (MFA)
- Energy flow analysis (EFA)

Outer boundary for

- Life cycle assessment (LCA)



Current model - Data

Pulp and paper in industry (2)

- collection of available information for the production sites in Austria from literature
- Pre- defined process modules out of Databases like ECOINVENT or ProfDB (PE- international)
- Compared with the BAT document and adapted
- Process plans for the single production sites and approximately adapted
- Merging of the single sites to product groups and finally to whole Austrian paper industry
- Possibility to **analyze** and to **balance** the production system

Current model- sensitivities and first results

- The model's sensitivities were tested and validated.
- The determined results are fictitious - they reflect primarily the effects of the model on impacts and changes but not the exact actual situation in reality.

Current results

- Figures fit for
 - material input
 - material flows
 - produced goods
- reasons:
 - Due to lack of data (old)
 - used combustion systems on the sites (mainly natural gas)
- Figures do not fit for
 - energy demand
 - emissions

Conclusion and further research- Pulp and Paper sector

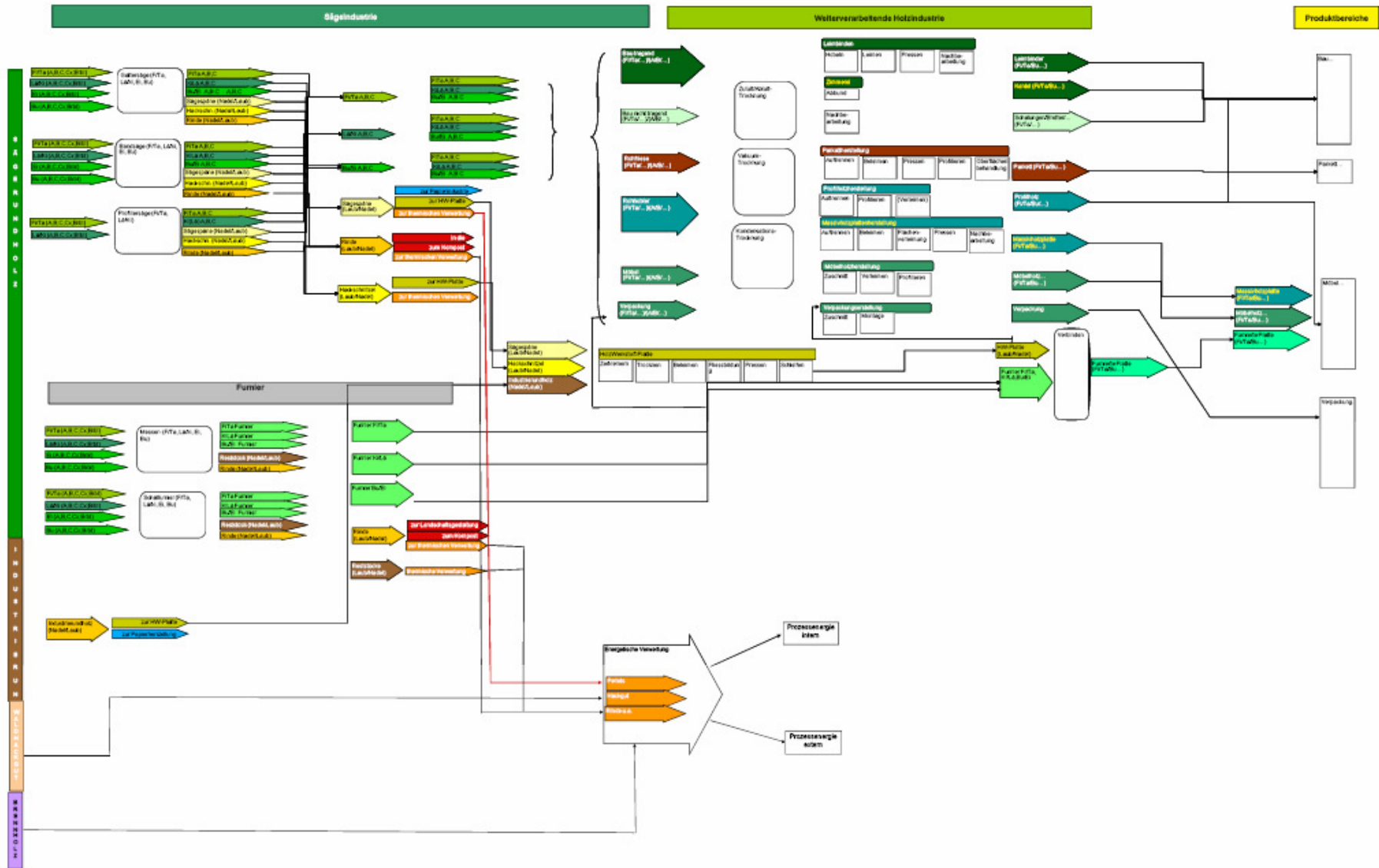
- The existing model is partly adequate but has to be adapted to reflect reality more precise
- In further steps the existing model of the pulp and paper sector will be adapted to the new aspects
 - used modules will be split in single processes to get detailed receivers for technical innovations
For example
Process module “sulphate pulp” is splitted into
the modules “cooking”, “washing”, “bleaching” and “drying”
 - the new processes are now the receivers for new in- and output coefficients

Further research- wood processing

The wood processing sector has to be modeled

- containing the production range
 - construction
 - chipboard
 - packaging
 - furniture
- collecting of the inventory data for the single observed processes and flows in the production chains
- the single processes are connected by their flows into production chains and aggregated to product ranges

Further research- wood processing



Next steps and expected results

- Firstly the two models have to be connected by the main material and energy flows (linking flows of the same state)
- Secondly
 - the two models can then be balanced
 - the production of wood based materials can be analyzed for
 - Resource efficiency
 - Emissions
 - Synergy with the energy sector
- Thirdly
Assessment of the influence of technical innovation on the environmental characteristic and the value creation of the whole system and of single process chains

Thank you for your attention!