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**GREEN DEAL INITIATIVES, SUSTAINABLE MANAGEMENT, MARKET DEMANDS, AND NEW PRODUCTION
PERSPECTIVES IN THE FORESTRY-BASED SECTOR**

LIFE CYCLE ASSESSMENT (LCA) STUDY FOR EARLY DESIGN STAGES OF WOODEN WALL COVERINGS WITH ENHANCED AESTHETICS AND FUNCTIONALITY

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1. INTRODUCTION

As consumers, we tend to come into contact with a product at only one stage of its life cycle.

... Most of you purchased computer or device on which you are viewing this presentation. You will use it for a while ... **before getting rid of it** ... for one reason or another.

**... WHAT YOU WILL DO WITH A
COMPUTER AFTER YOU STOP USING
It!?!?**

You can try to sell it, ... donate it or just throw it away, and that will be the end of your time ('with the computer')

.... AND THEN YOU HAVE A PROBLEM!!!

The modern world faces problems because the products and processes we use (and depend on) in order to maintain our lifestyle:

- deplete resources,
- they create toxic materials
- emit greenhouse gases...



In order to reduce environmental impacts, alternative products and processes have been developed - electric cars, recycled paper and biodegradable garbage bags ... **Sustainable wood products (and processes)**

QUESTION IS:

How do we know that these "green" alternatives are preferable to conventional ones?

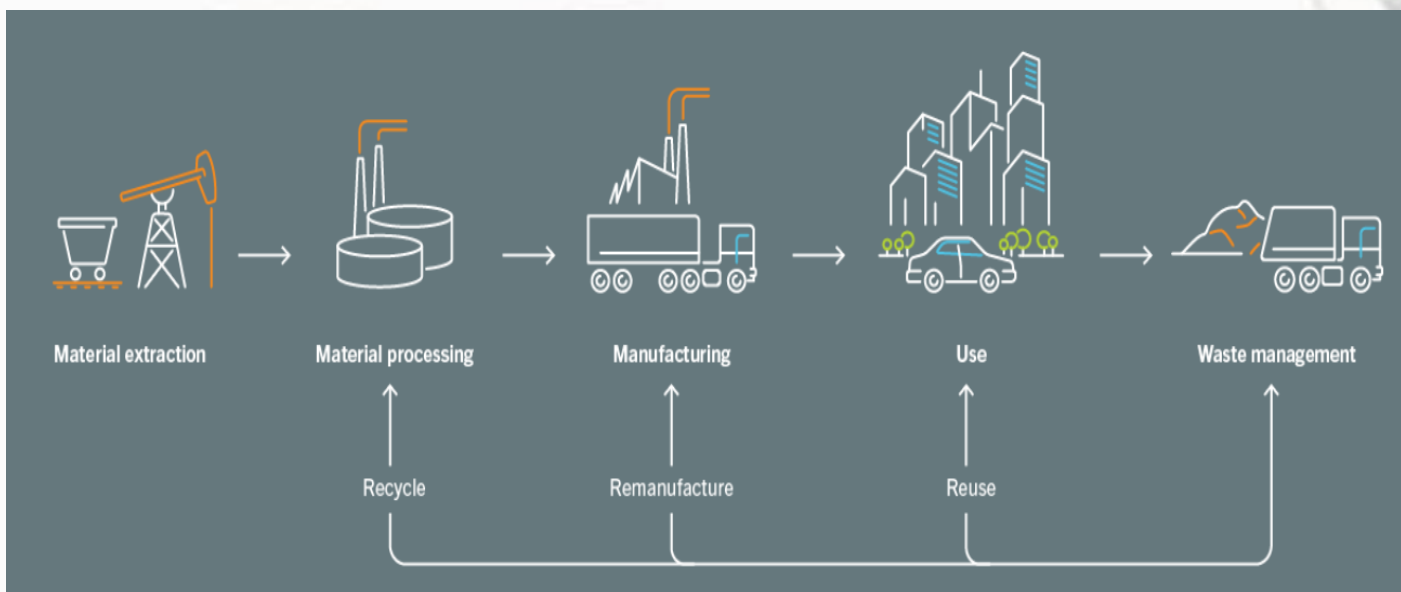
How do we determine that the impact of a certain product on the environment is excessive?

Life Cycle Assessment (LCA) is a practice that seeks to answer these and related questions.



... researchers attempt to make a holistic analysis of the ecological implications:

- commercial goods/products and services,
- industrial processes,
- ... companies or institutions... impact savings from another phase.



... to better inform environmental decision-making because the impact created in one phase of the life cycle can cancel out the

2. RESEARCH

- **Incorporating sustainability principles into the early stages of product design** is often more cost-effective and environmentally friendly than retrofitting existing products or processes.
- The availability of data in the early stages of product design is essential for informed decision-making, optimizing resource allocation, and facilitating continuous improvement.
- By leveraging data effectively, **designers can create products that meet user needs, uplift business success, and mitigate negative environmental effects.**

Two versions of a product – wooden wall coverings, in its early design stages, are being analysed using LCA methodology. The goal is to analyse production process of wooden products with enhanced aesthetics and functionality while offering a range of design options and environmental considerations.

Why wooden wall coverings?

Ware a popular and versatile choice for interior and exterior wall finishes in both residential and commercial settings.

They offer a range of aesthetic, functional, well-being and environmental benefits.

wooden wall coverings in this study ...

- they are created form decorative veneer that comes from a local source – Slavonian oak.
- some elements of a product are made from production residue and waste materials, which is considered as a positive initiative regarding the environment.

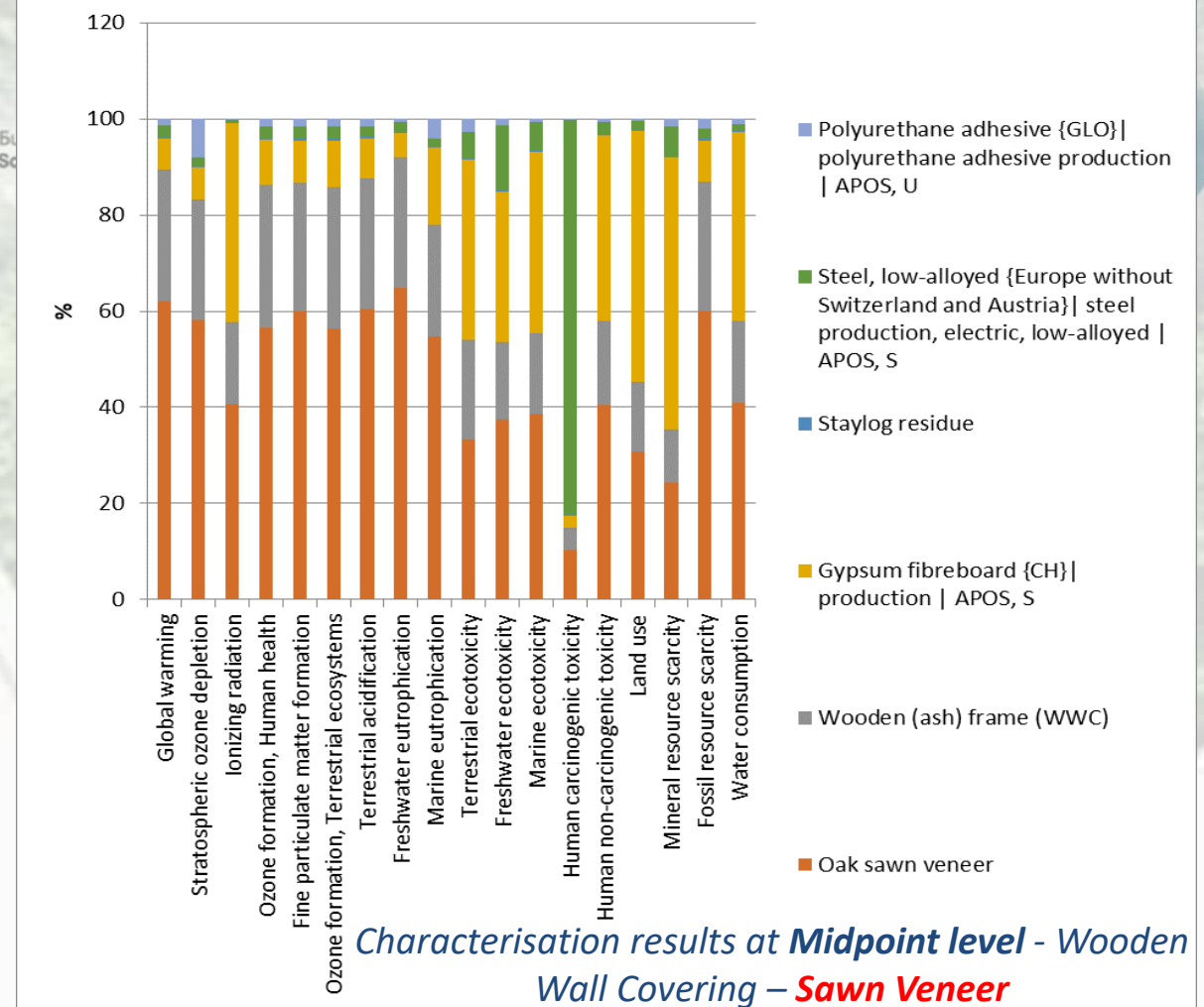
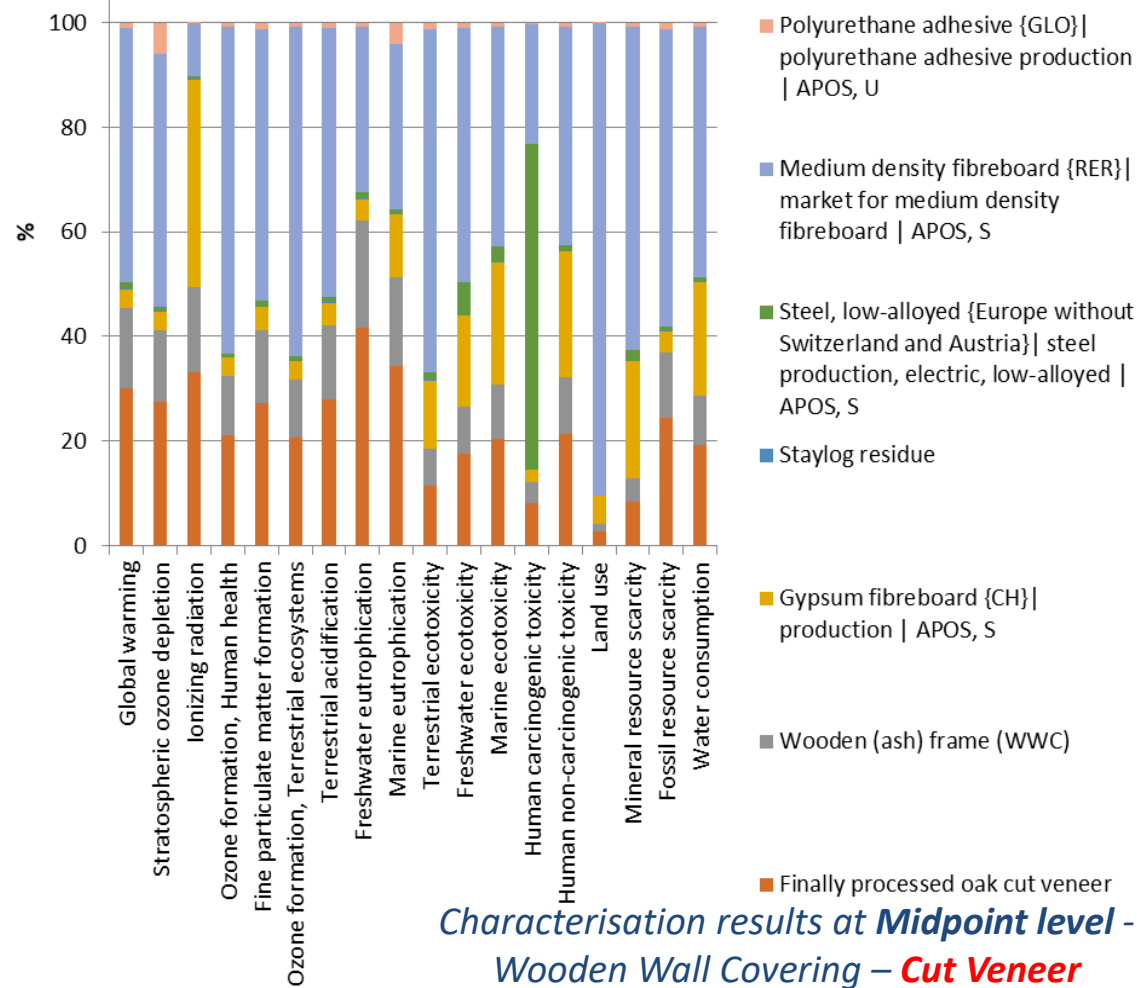
The importance of LCA, regarding the early design process in this study, manifest itself mostly in identification of production hotspots (materials, energy and fuel consumption, transportation, and processes) which offers solid foundation for informed decision-making and early intervention which are important steps for continuous improvement.

Functional unit and system boundaries

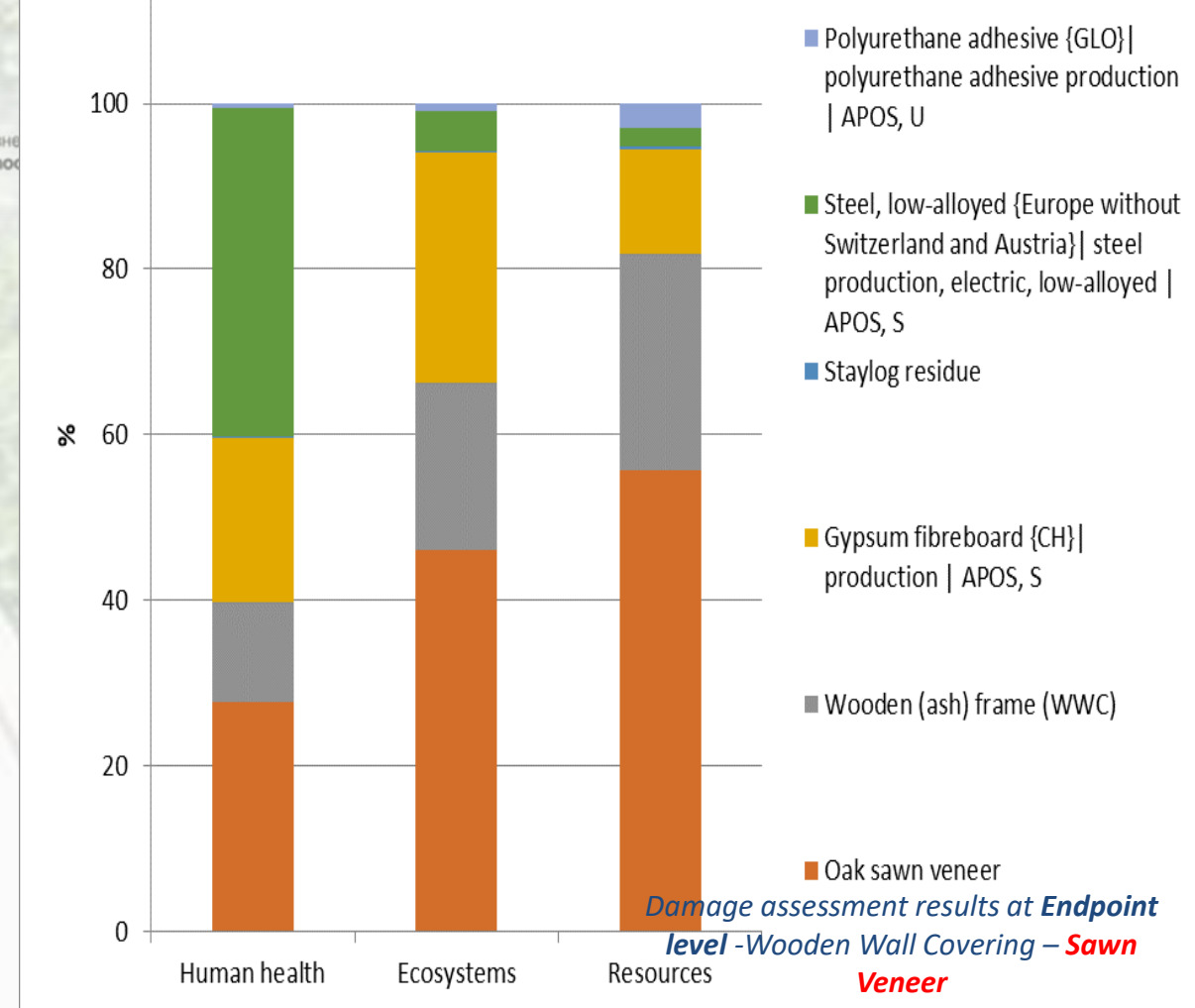
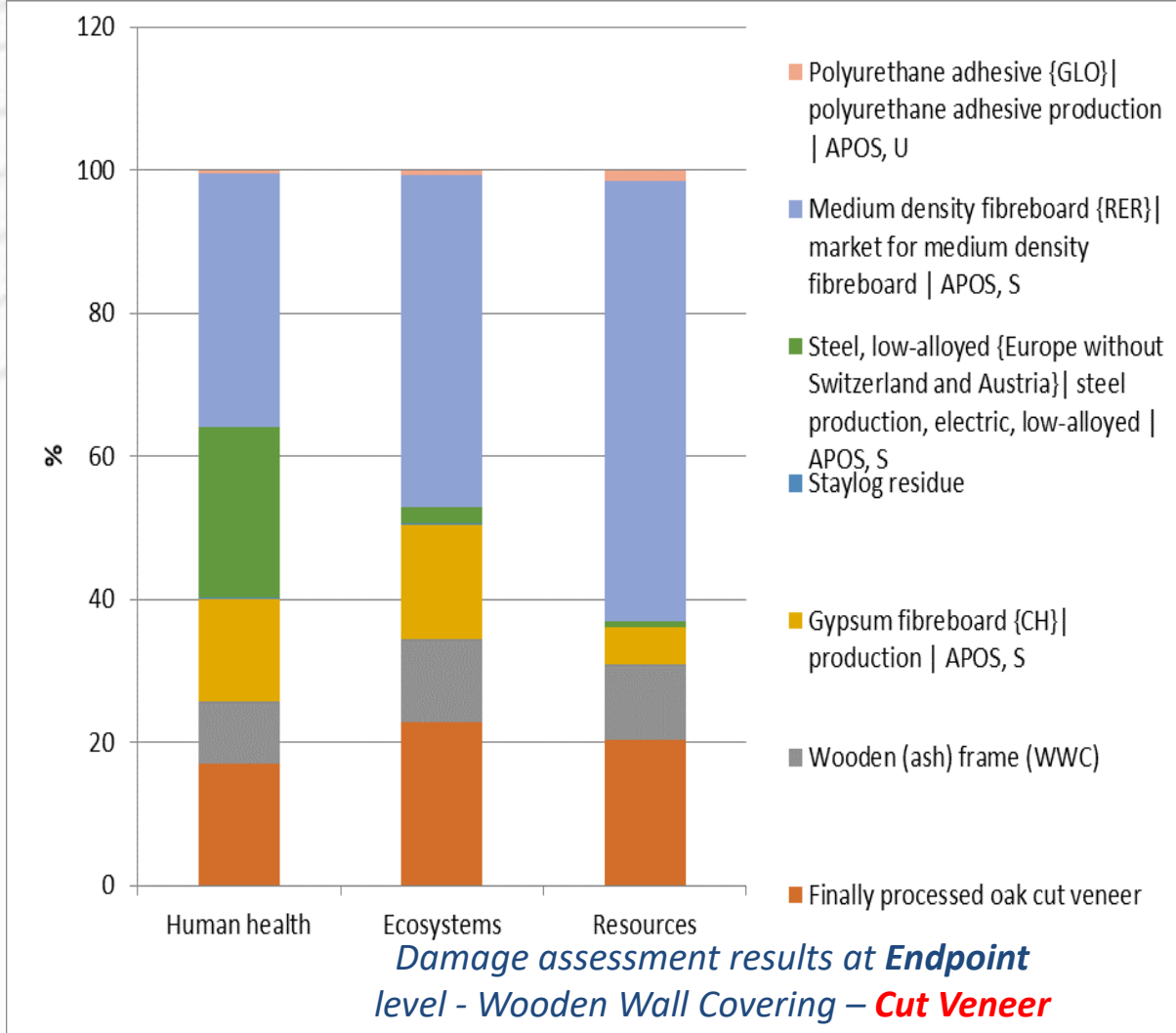
- 1 kg of wooden wall covering
- environmental impacts of wooden wall coverings are assessed through raw material extraction, and manufacturing phase, which is a variant of LCA with **cradle-to-gate approach**.

Impact Assessment Methodology

- LCA analyses concluded for this type of study is classified as **attributive modelling**.
- the SimaPro (version 9.3.0.3) software was used.
- The method selected for LCA analysis is ReCiPe 2016 due to the wide range of characterization factors that provide comprehensive insights regarding negative effects that are displayed on global scale.
- The characterization factors are grouped into two impact categories: **Midpoint**, that is problem oriented, and **Endpoint**, that is damage oriented.



- Interpreting Characterisation results at *Midpoint* level, of a *Wooden Wall Covering – Cut Veneer* - **the highest impact on the environment has an MDF board**, followed by the process of getting cut oak veneer and gypsum fiberboard.
- Interpretation of Characterisation results at *Midpoint* level, of a *Wooden Wall Covering – Sawn Veneer* - **the most negative effect on the environment have the process of getting oak sawn veneer**, followed by gypsum fiberboard and the process of getting ash frame.



- Interpreting Damage assessment results at *Endpoint* level, of a **Wooden Wall Covering – Cut Veneer** - the highest impact on human health, ecosystems and resources **has an MDF board**, followed by the process of getting cut oak veneer and gypsum fiberboard.
- Regarding the interpretation of Damage assessment at *Endpoint* level, of a **Wooden Wall Covering – Sawn Veneer** - the most negative effect on the environment have **the process of getting oak sawn veneer**, followed by ceiling gypsum tiles and the process of getting ash frame.

SUMMARY

Sustainable product design is essential for safeguarding the environment.

Wood has the potential to be a material of the future due to its renewability, carbon sequestration capabilities, low environmental impact, versatility, biodegradability, aesthetic appeal, and positive effects on health and well-being.

Environmental footprint calculations are essential in the early design stages of production processes for identification of environmental hotspots, informed decision-making, optimization of resource use, achieving cost savings and meeting sustainability goals.

Interpretation of the results has shown that both impact categories, *Midpoint* and *Endpoint*, are showing similar environmental concerns.

The results presented in this study will serve as a base for a further development of a wooden wall coverings in context as a standalone product, but also as modular part of a wooden load bearing and partition walls.



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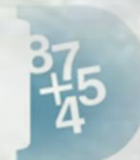
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