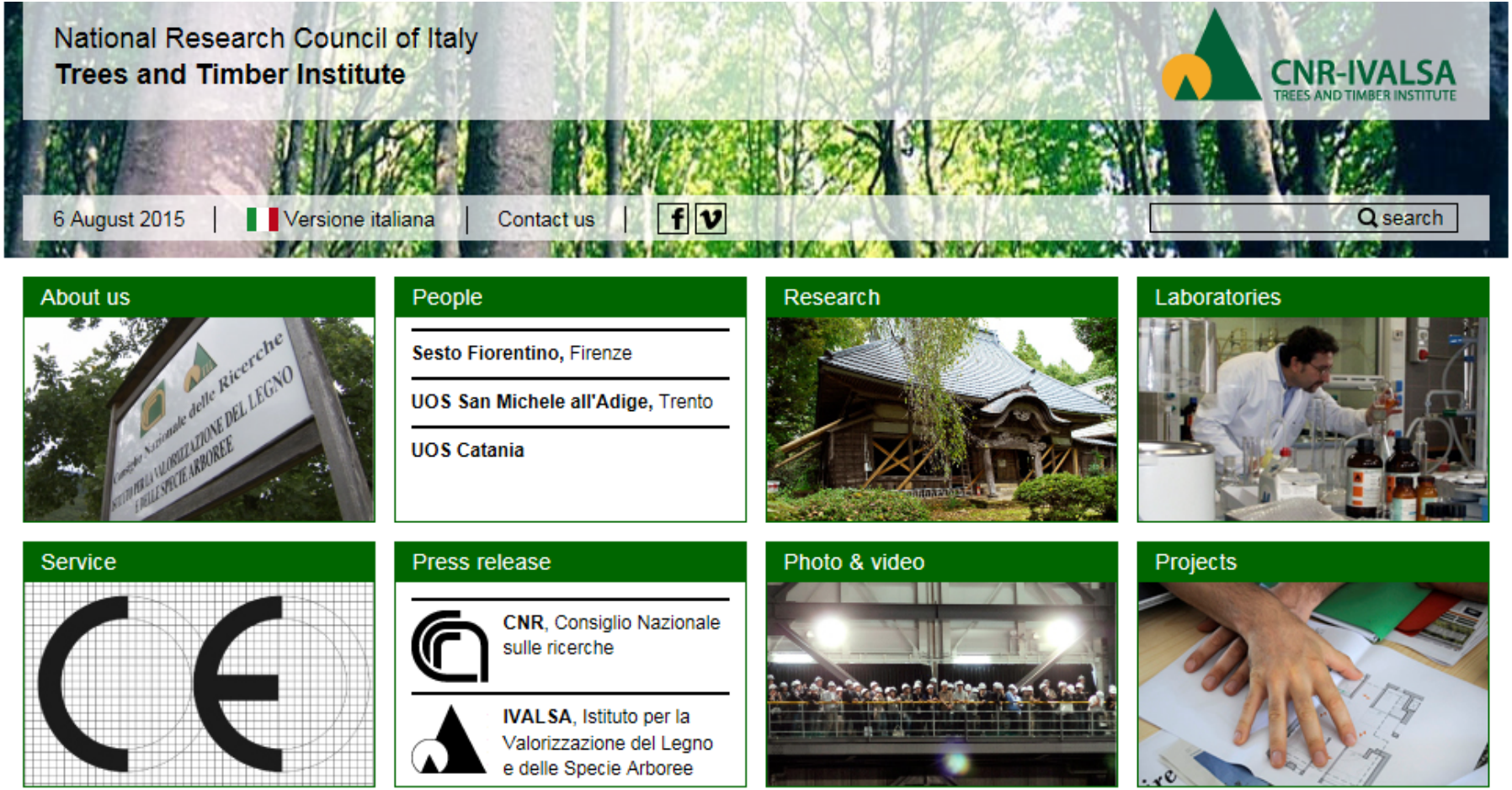

Life Cycle Assessment of wood wool cement board using recycled wood

M. Marra, S. Guercini

FP1407 ModWoodLife

COST Action FP1407 2nd Conference: Innovative production technologies and increased wood products recycling and reuse

Brno, Czech Republic, 29-30 September 2016

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Life Cycle Assessment is a methodology to evaluate the environmental burdens associated with a product, by identifying and quantifying materials and energy used and wastes released to the environment.

The eco-profile resulting from LCA can help to identify and evaluate opportunities to improve environmental performances of the product assessed.

A cradle-to-gate LCA was performed to identify the environmental impacts related to wood wool cement board production.

It was developed by a sensitivity analysis of the raw material sources:

- logs obtained by forest thinning
- recycled timber waste of building demolition

The sensitivity analysis was carried out taking into account the influence of the percentage of recycled wood.

Wood Wool Cement Board

WWCB is a building material made from wood wool and cement.

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The main characteristics are:

- Acoustic performance
  - noise absorption
  - sound insulation

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The main characteristics are:

- Acoustic performance
- Thermal properties
    - heat accumulation
    - thermal insulation

Wood Wool Cement Board

WWCB is a building material made from wood wool and cement.

The main characteristics are:

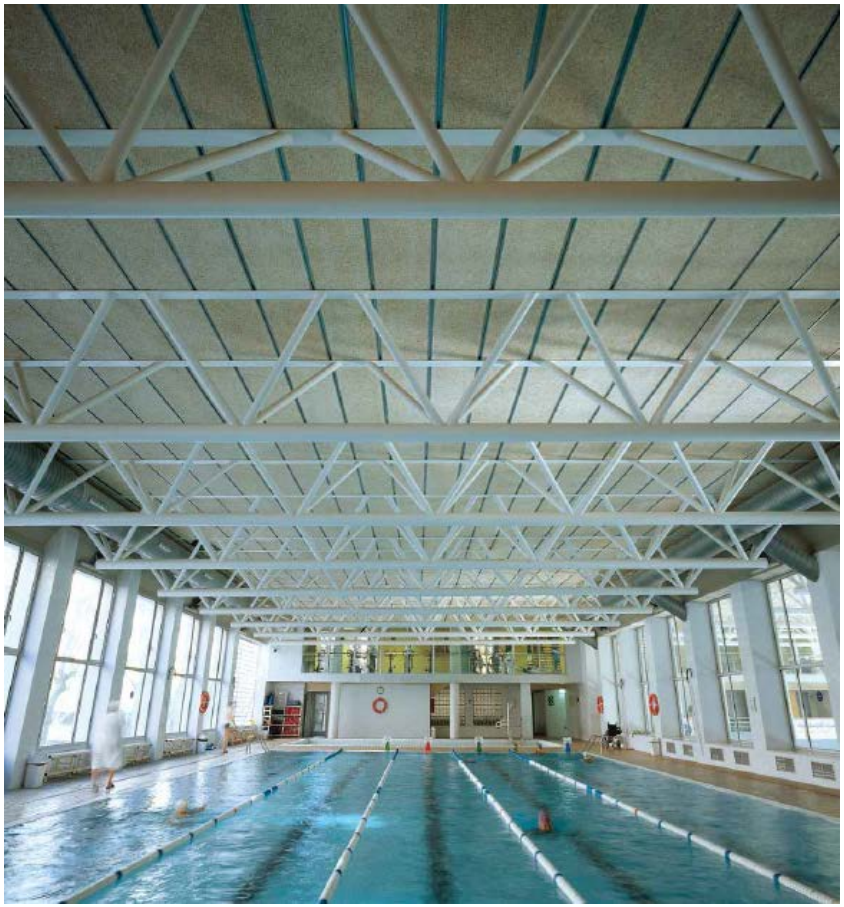
- Acoustic performance
- Thermal properties
- Fire resistance
    - Euroclass Bs1 fire reaction

Wood Wool Cement Board

WWCB is a building material made from wood wool and cement.

The main characteristics are:

- Acoustic performance
- Thermal properties
- Fire resistance
- Internal and external use
    - low dilatation coefficient
    - mould and fungi resistance



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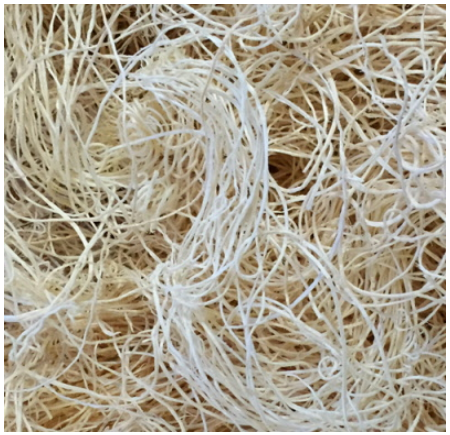


LCA. Goal and scope

Goal was to fulfill a comprehensive life cycle inventory of wood wool cement board manufacture.

Scope was to develop and improve the product design.

Factory

- Northeast Italy
- 100.000 m³/year

Data quality

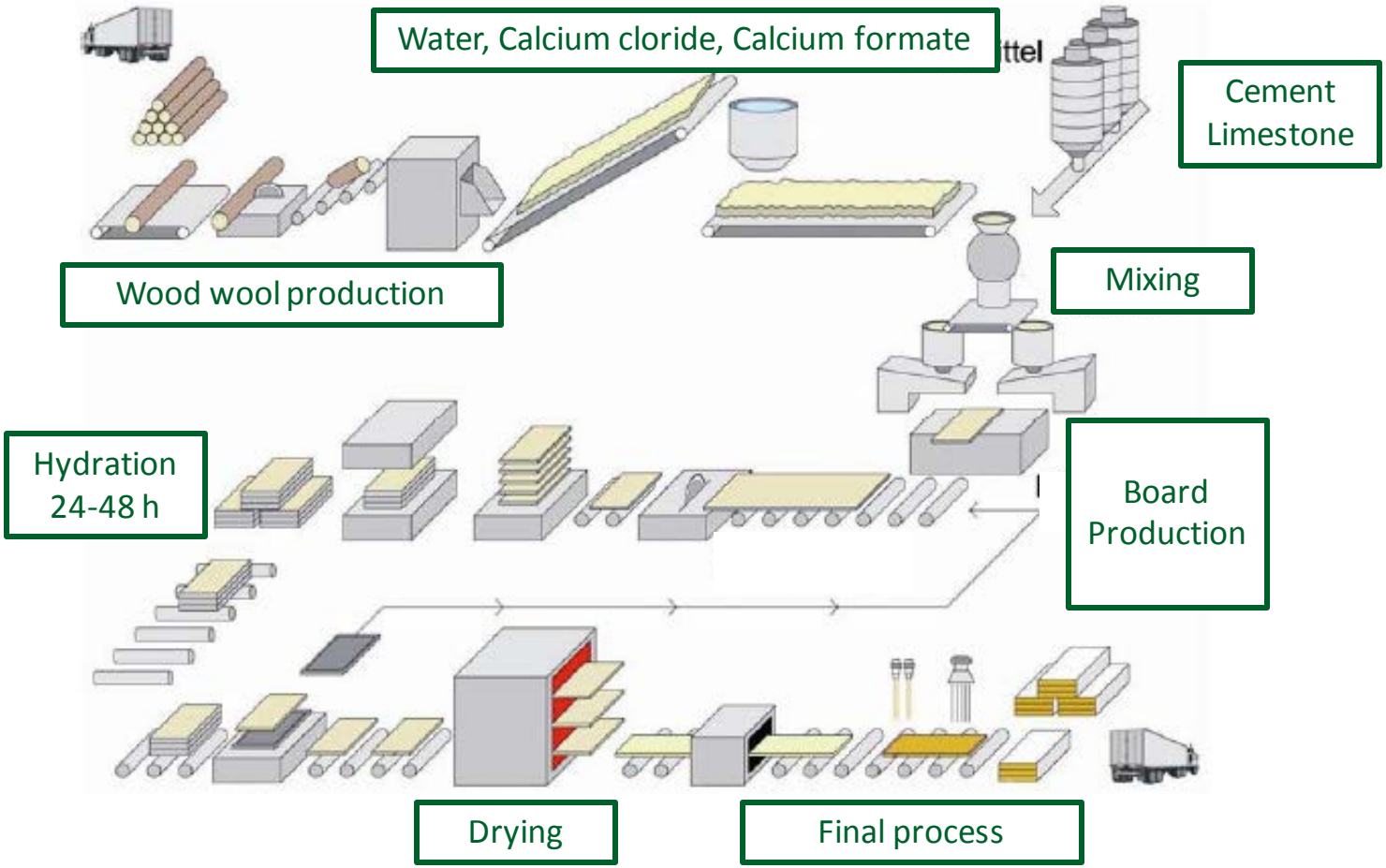
- 2 years on-site measurement
- Ecoinvent v3.1 and JRC ILCD database

Metodology

- ISO 14040
- LCIA: ReCiPe Midpoint (H) v1.12
- Functional unit: mass, 1 kg WWCB
- System boundary: cradle-to-gate

LCA. Goal and scope

- System boundary

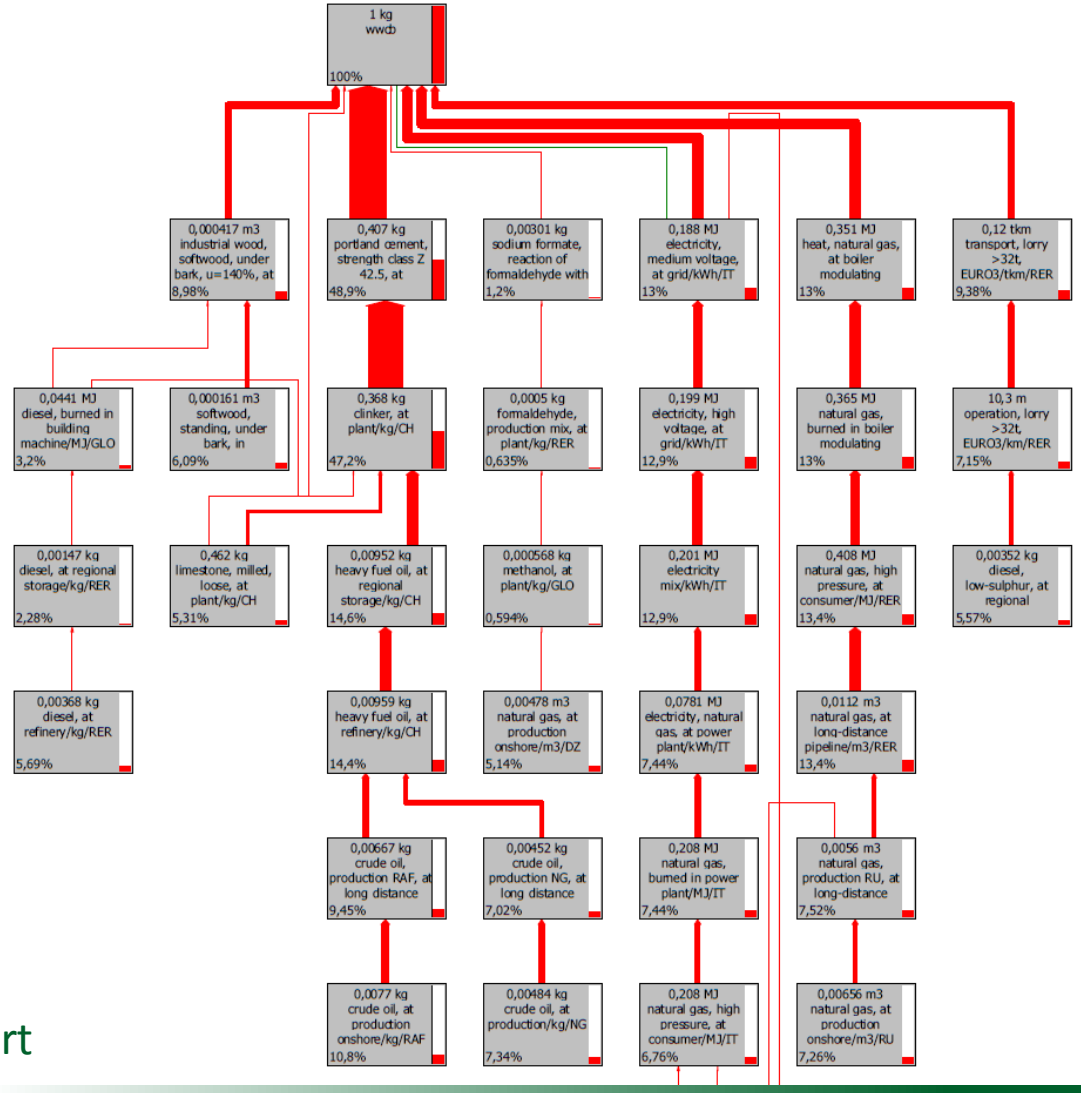


LCI

- Life cycle inventory inputs, outputs and impact indicators were quantified using functional unit

Inputs		Outputs	
Water, groundwater consumption	0,28658 kg	Methanol	0,00627 g
Industrial wood, softwood, under bark, u=140%, at forest road	0,41731 dm^3	Dimethyl formamide	0,00208 g
Portland cement, at plant	0,40647 kg	2-Butoxyethanol acetate	0,00170 g
Limestone, milled, loose, at plant	0,14997 kg	Benzene, ethyl-	0,00015 g
Sodium formate, at plant	0,00301 kg	Isopropyl acetate	0,00055 g
Calcium chloride, $CaCl_2$, at plant	0,00319 kg	Acetone	0,00050 g
Alkylbenzene, linear, at plant	0,00095 kg	Ethanol	0,00029 g
Packaging, corrugated board, at p.	0,00053 kg	Heptane	0,03156 g
Packaging film, LDPE, at plant	0,00014 kg	Particulates, unspecified	0,01094 g
Electricity, medium voltage, at grid	0,05505 kWh	Wood, sawdust	0,01566 kg
Heat, natural gas, at boiler >100kW	0,35113 MJ	Rejects	0,01450 kg
Transport, lorry >32t, EURO3	120,4 kgkm	Packaging waste	0,00003 kg

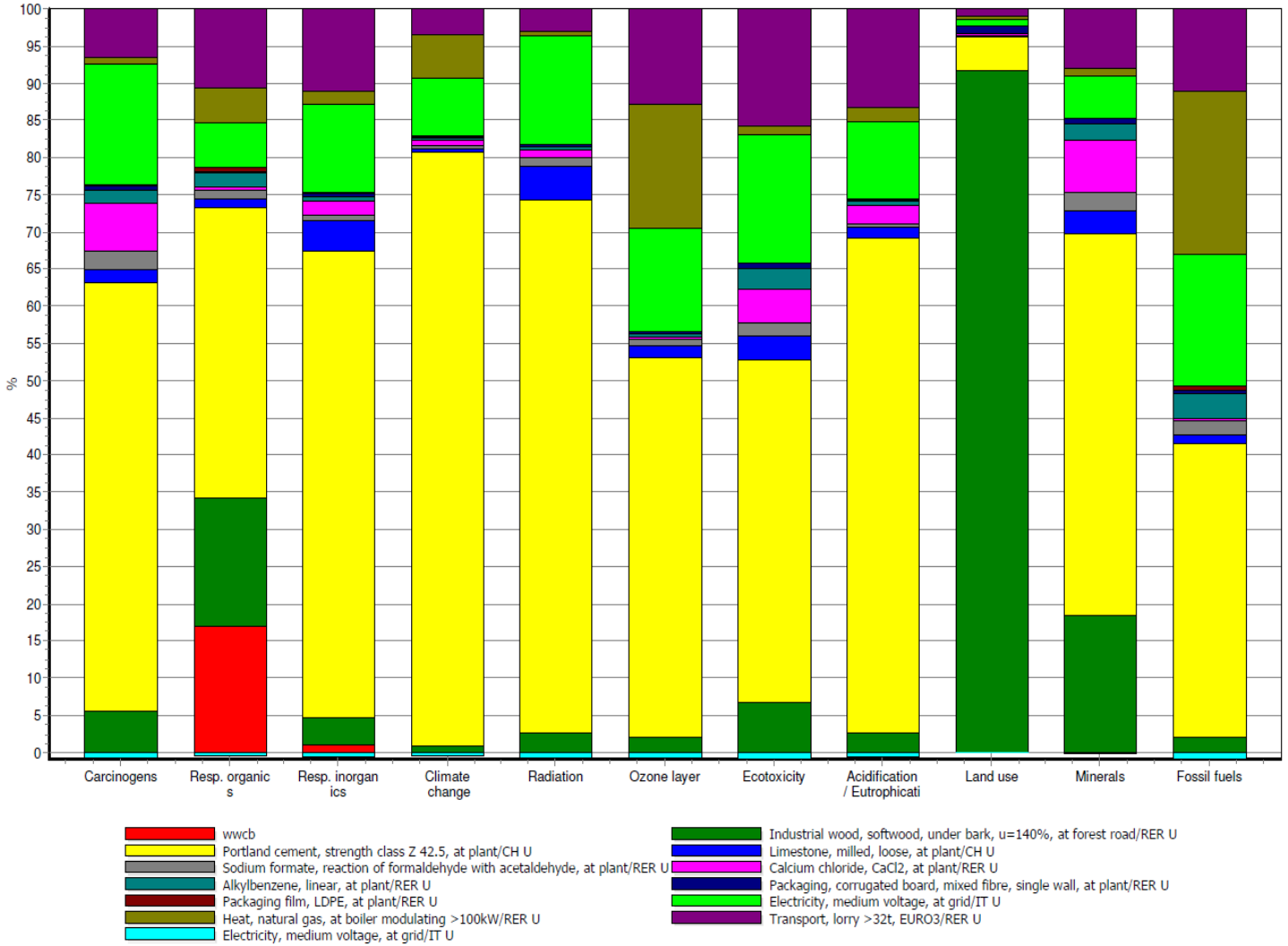
LCI. Network flow chart



SimaPro flow chart

LCIA. Characterization. Midpoint

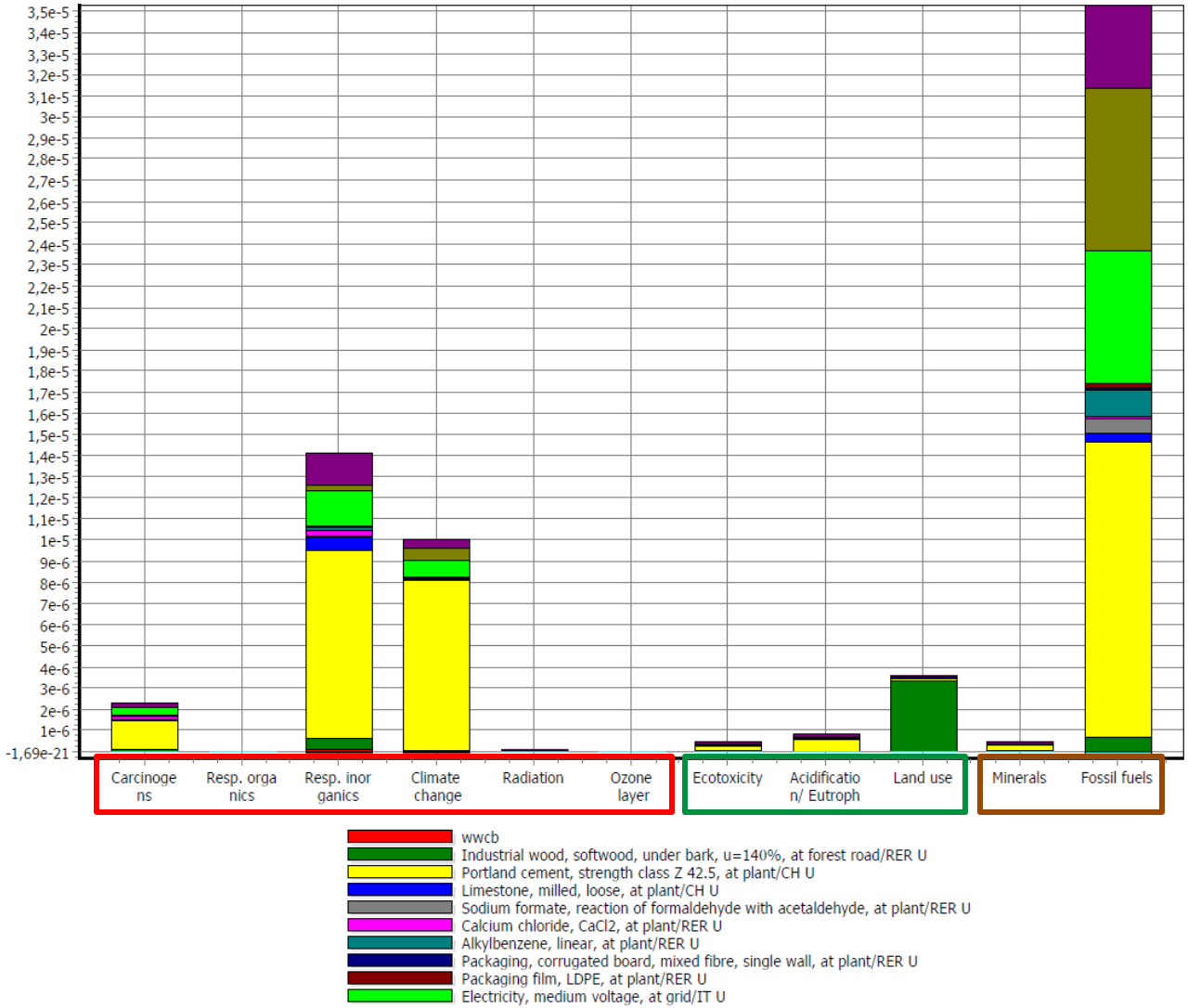
Impact category
- absolute



LCIA. Normalization. Midpoint

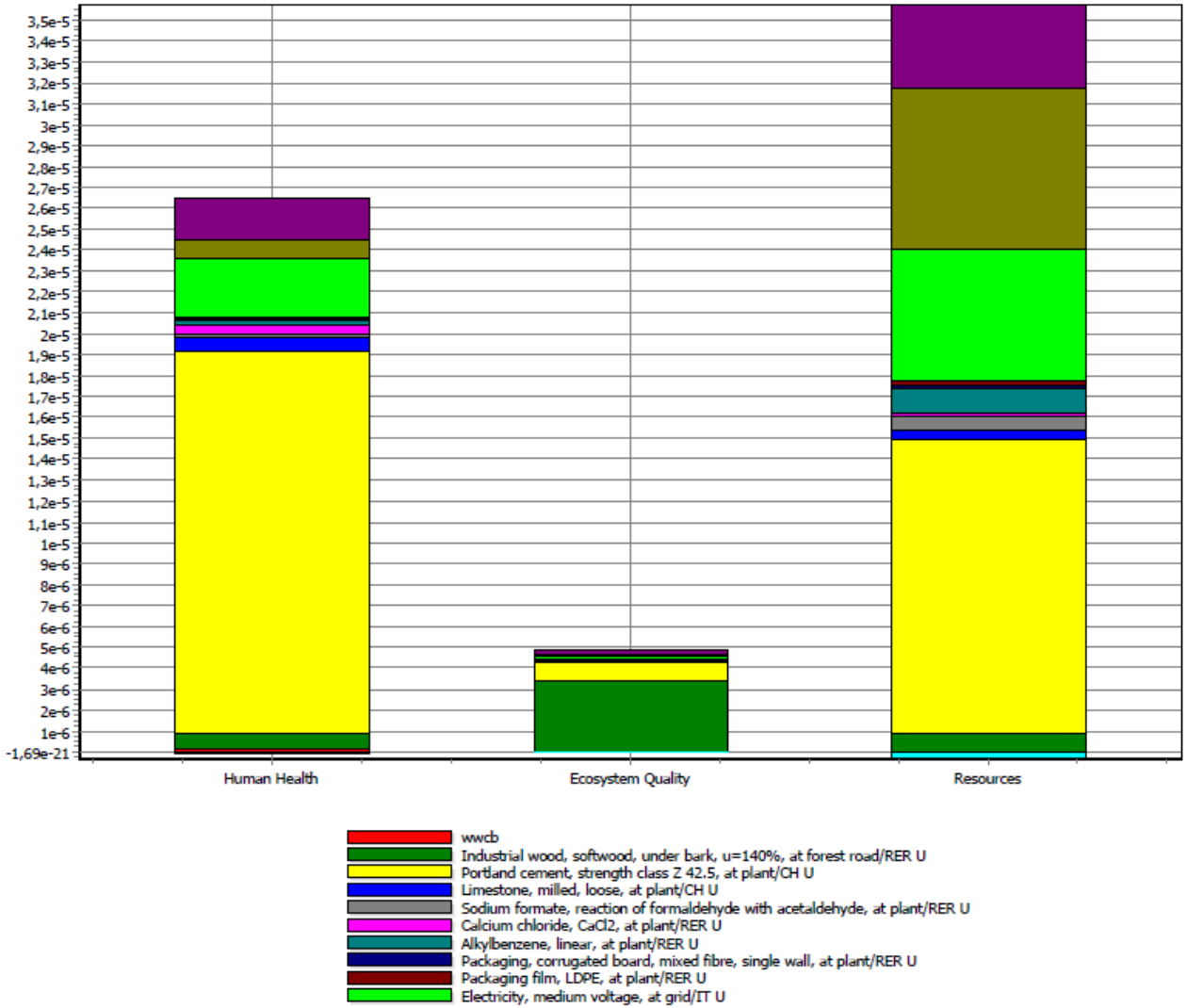
Impact category

- relative



LCIA. Normalization. Endpoint

- Damage category



Recycled wood

WWCB producers have interest in utilizing recycled wood.

- presence of pollutants,
- shape and dimension of timber,
- incompatibility with equipment and technology processes

Recycled wood

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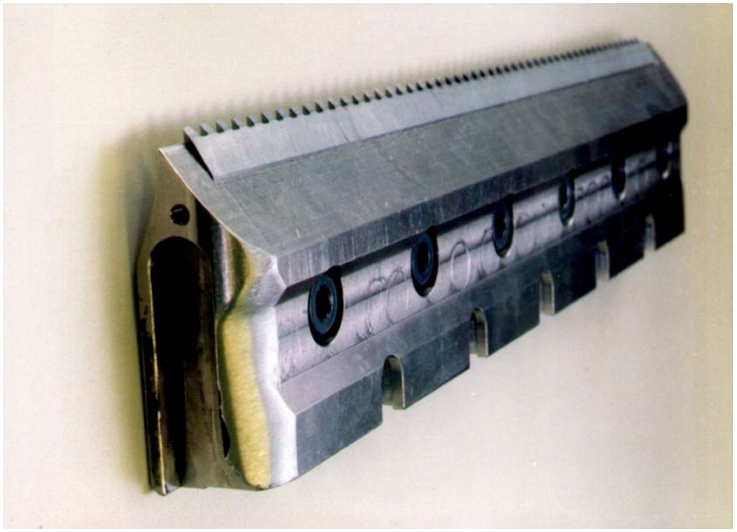
Wood Wool Production

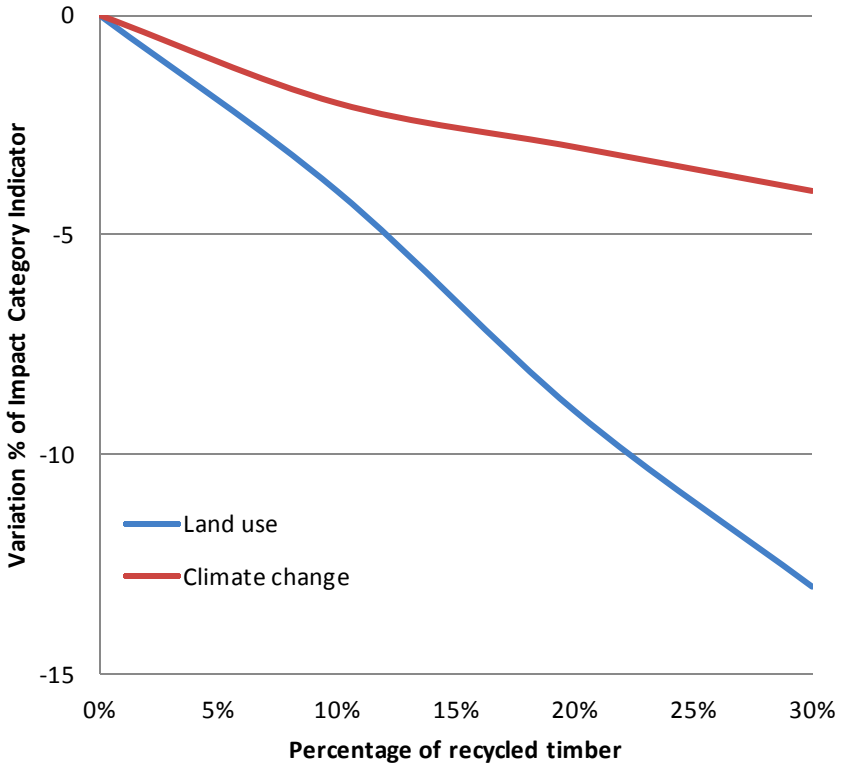


Recycled wood

Demolition collection centre

Recycled **waste quality requirements** and **production system specifications** were considered to develop the recycling management.

Sensitivity analysis



Raising the fraction of recycled timber from 0 to 30% respect to virgin log

- decreases the consumption of land (-13% m^2 yr of "Land use") and
- reduces the global warming potential (-4% CO_{2eq} to air) of "climate change".

Conclusions

- The use of recycled timber helps to reduce environmental impacts in the WWCB manufacturing process.

- To develop wood recycling in the WWCB production is necessary to consider
  - waste quality requirements,
  - production system specifications.

CNR-IVALSA
TREES AND TIMBER INSTITUTE

Thank you

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