BIO4 PRODUCTS
Creating sustainable resources for process industry

Sustainability of biobased materials from pyrolysis oil

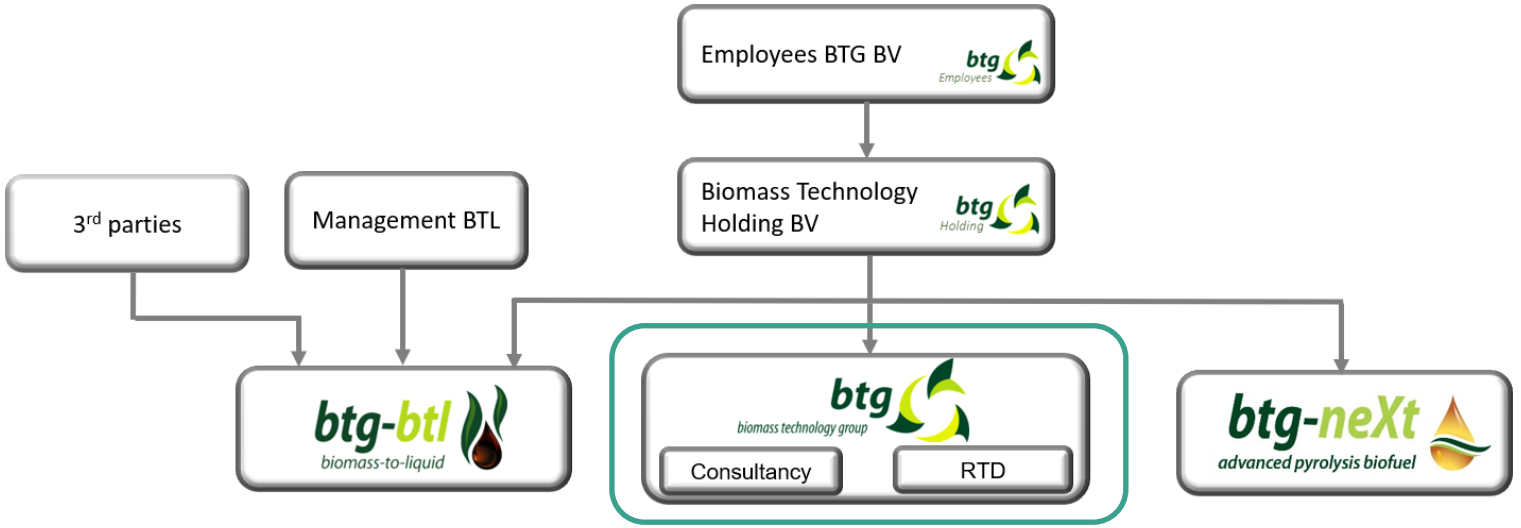
BTG, Jurjen Spekreijse

Enschede

April 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 723070.

BTG Biomass Technology Group BV



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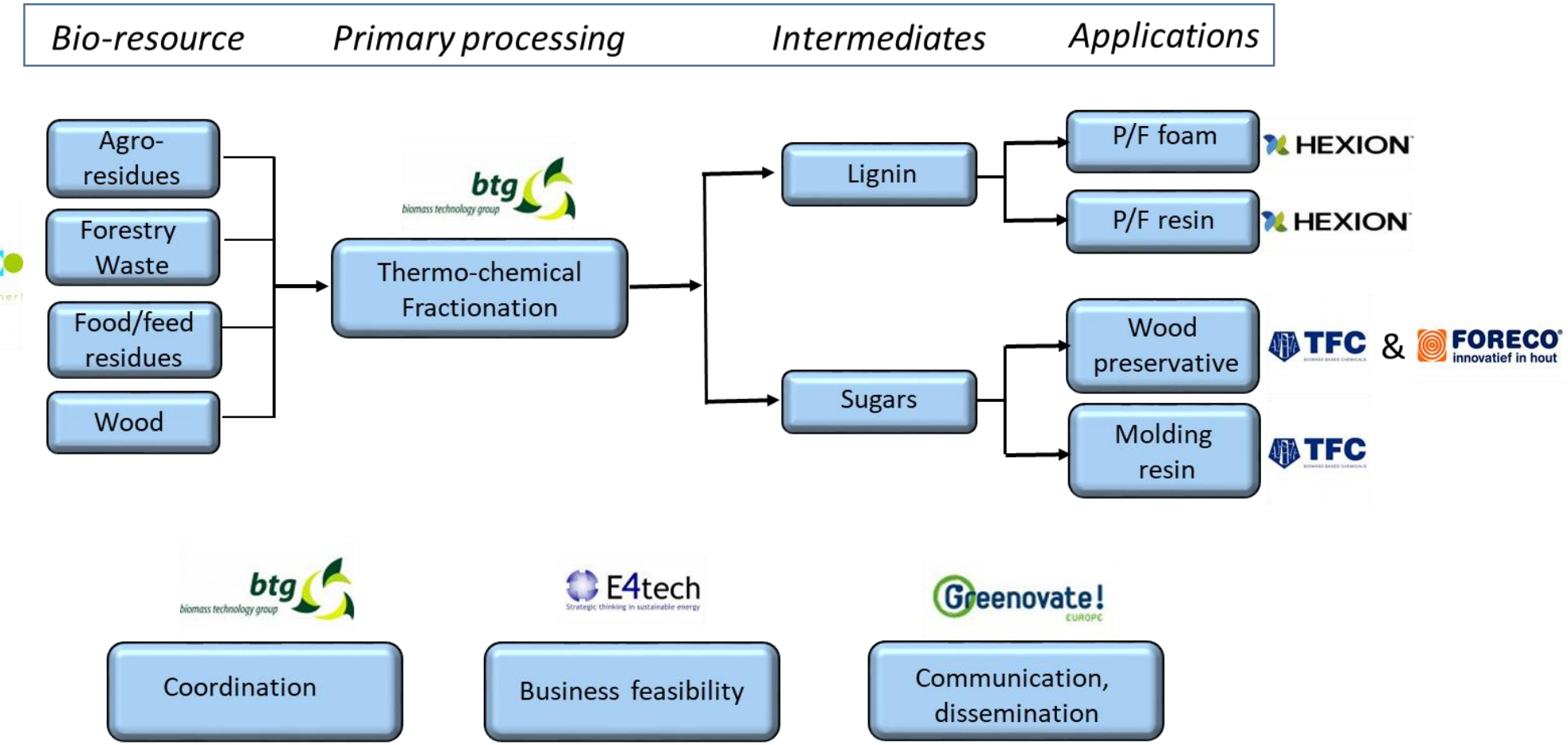
Introduction and objectives



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Introduction and objectives

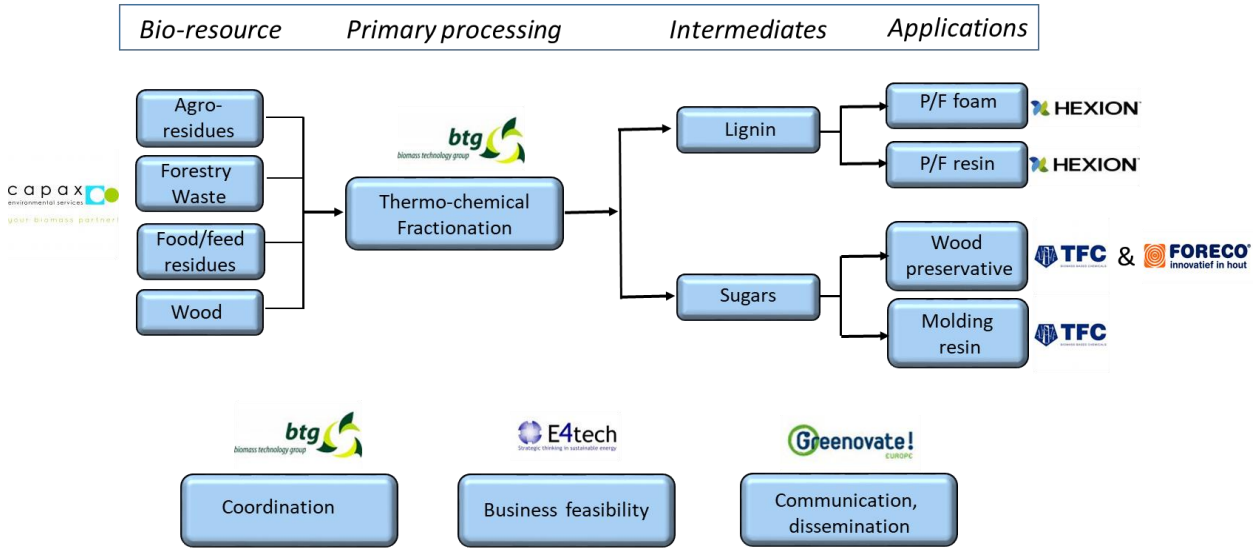
Specific objectives Bio4Products:

- ***Bio4Products*** is a EU (SPIRE, IA) funded project running from 01/09/2016 until 01/09/2020
- Go from TRL 4 to TRL 6/7

- Design, construct & operate a pyrolysis oil fractionation plant at an input capacity of 3 t/d;

- Fossil replacement targets
  - P/F resin: 30-65%
  - Sand moulding resin: 30-65%
  - Creosotes in wood modification: 100%

- Techno-economic & environmental assessment of the whole value chain



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Life Cycle Assessment

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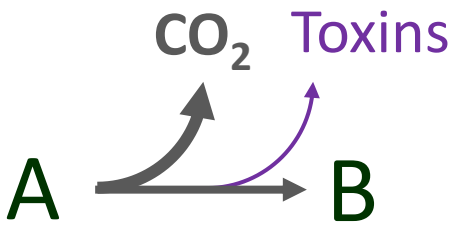
Life Cycle Assessment

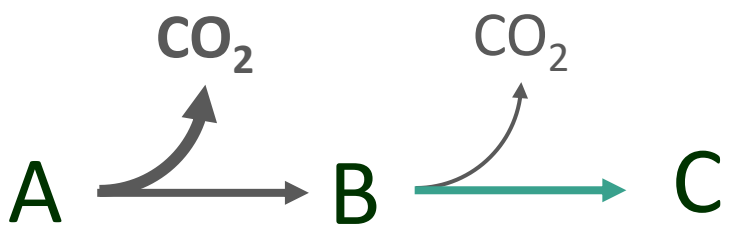
- Life cycle assessment (LCA)
  - Determine **all** environmental impacts over the **entire** value chain

- Prevent burden shifting (or green washing)

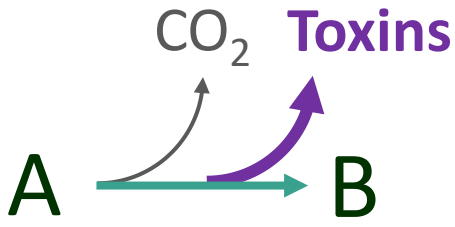
Product 1



Product 1



Product 2



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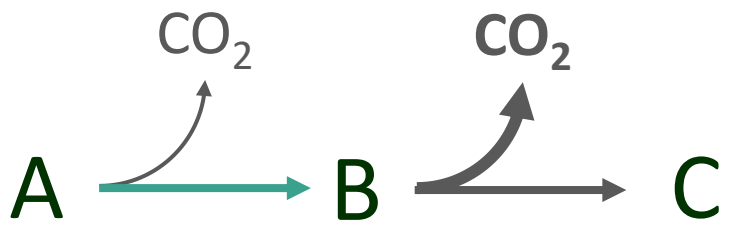

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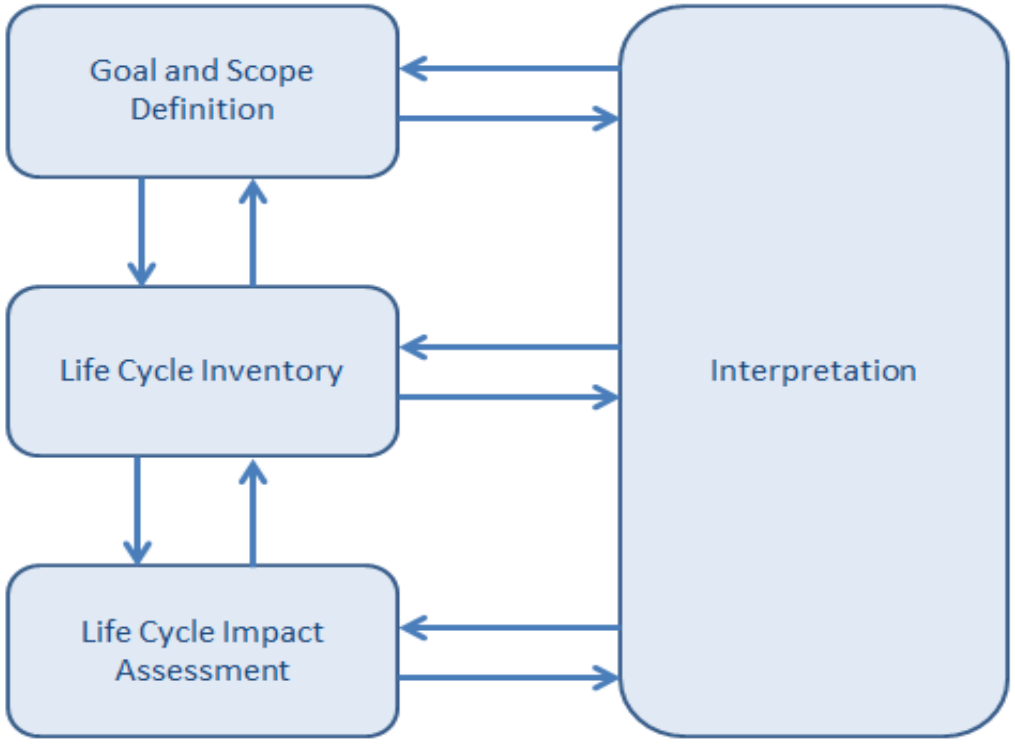
Life Cycle Assessment



Phases of an LCA according to ISO 14040 ISO14040:2006

- Bio4Products process is in development, therefore assumptions are required
- Focus on greenhouse gases with an eye on burden shifts

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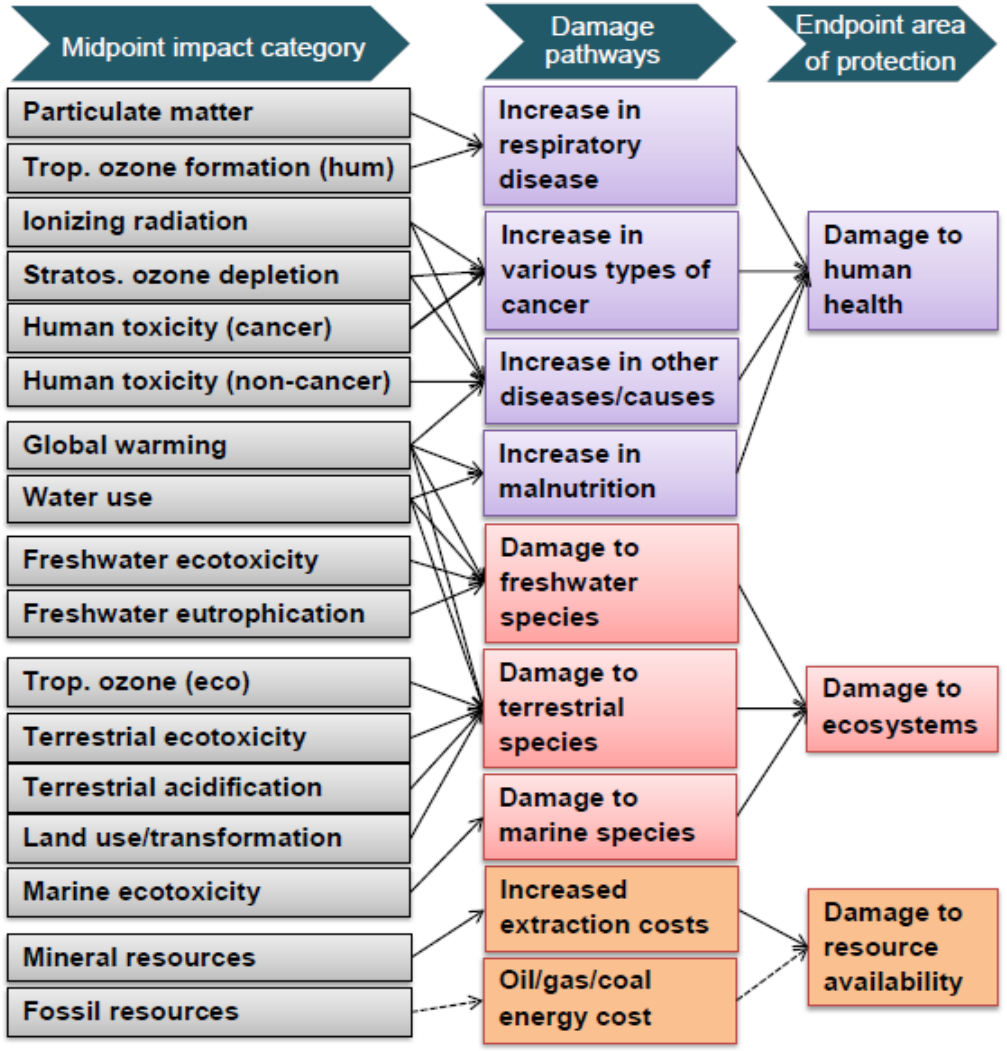
Technical details

- ‘Situation A’, micro-level decision support, attributional modelling

- ISO 14040, ISO 14044
- Simapro 8
- EcoInvent 3.5
- ReCiPe 2016



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Entire chain (cradle to grave)

Harvest of biomass

Pyrolysis

Fractionation

Other products

Coal mining

Creosote production

Wood modification

Production forest

Wood modification

Faunawood

Waste incineration

Creosote wood

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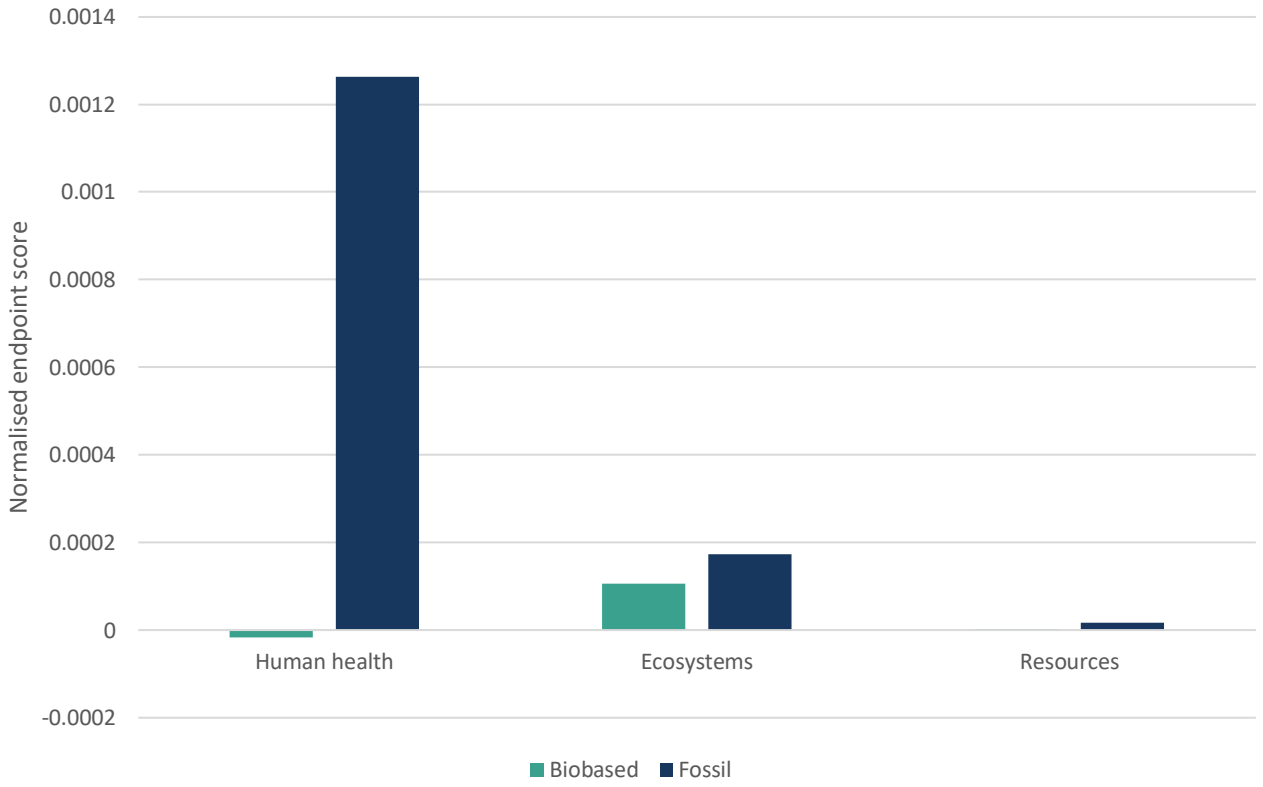
Example LCA result: wood modification

- Functional unit: modification of 1 m^3a of wooden poles.



- Large savings in human health
- Small savings in Ecosystems, due to relatively large impact of the wooden pole itself
- Small impact of fossil resources in fossil case, due to creosotes being a side product

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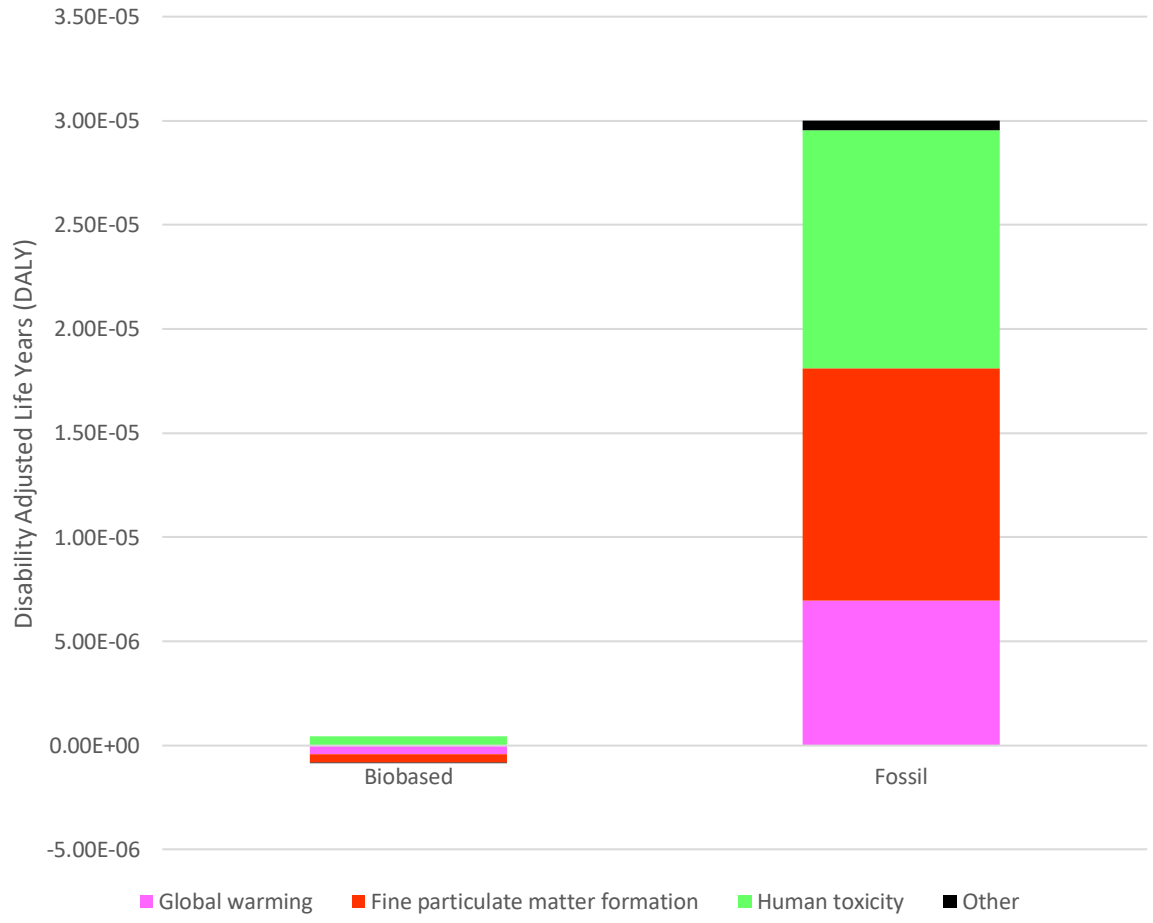
Example LCA result: wood modification



- End-of-life combustion of bio-based materials results in negative impacts
- Bio-based routes prevents the carcinogenic impact of creosotes
- Large reduction in fine particulate matter from the production process of creosotes as starting material
- Large saving in GHG emissions of 86%

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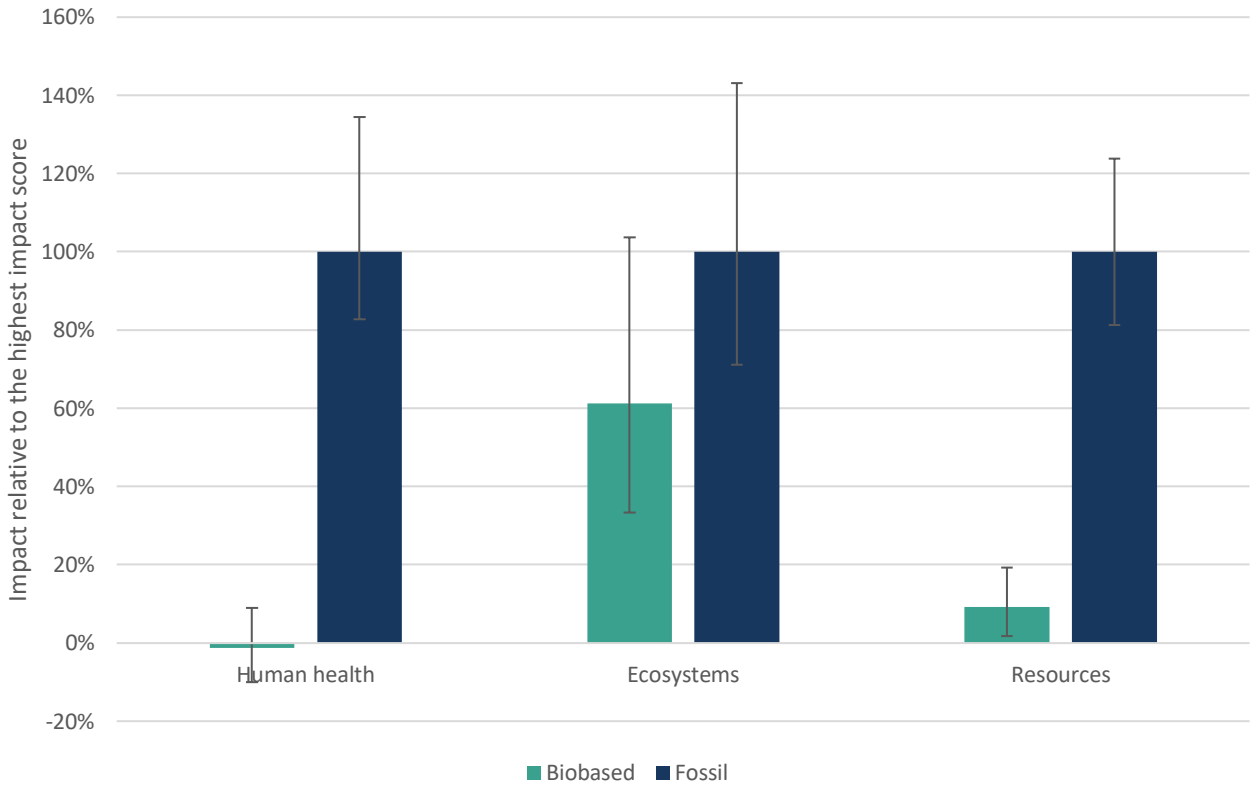
LCA results: Uncertainty analysis



- Monte Carlo approach of 10.000 iterations
- Error bars represent 95% confidence interval
- Graph relative to highest impact score, individual impacts should not be compared

- Significant reduction in environmental impacts for two of three categories

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Conclusions

- All four value chains show significant reduction in greenhouse gases:

	Greenhouse gas reduction (%)
Modified wood	*86*
Phenolic resin	84
Insulation foam resin	93
Sand moulding resin	70

- Overall reduction of environmental impact in all four value chains

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Thank you for your attention!

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