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Bern University of Applied Sciences

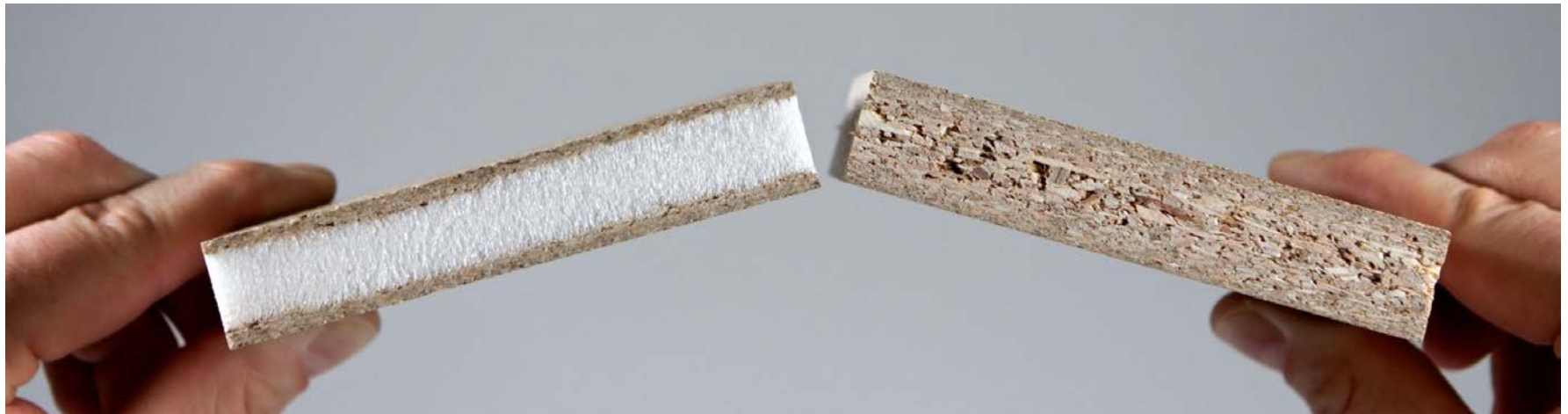
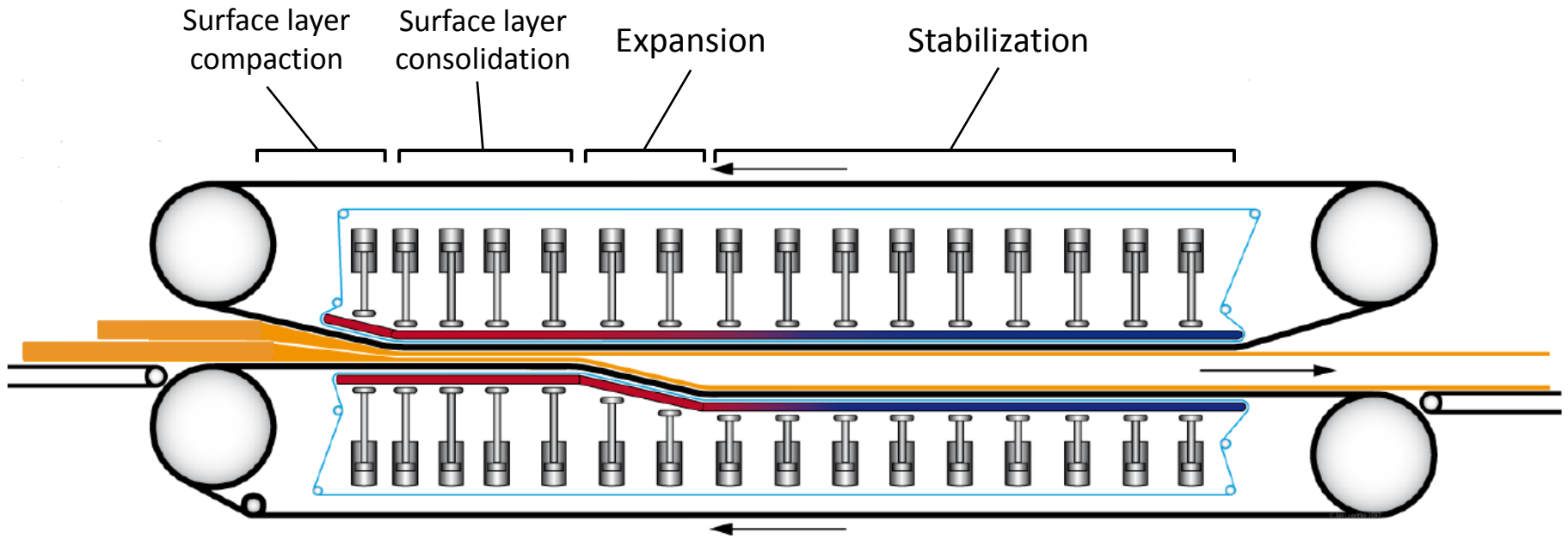


# LCA of an Ultralight Particleboard

Christelle Ganne-Chédeville

- ▶ Bern University of Applied Sciences, Architecture, wood and civil engineering

# ULPB vs. PB



### 3. Approaches

Environmental Impacts?



Typical Assessment  
EPD - attributional  
Following EN 15804  
and prEN16485

- + Hot Spots
- + Eco-Design
- + Building context

Consequential approach  
**Holistic**

- + Aggregating / expanding
- + «What if?»
- + Testing scenario
- + processes affected by a substitution

# 4. EPD Approach: Goal and Scope

## ▶ Goal and Scope:

- ▶ What?: an in-development ULPB which in-line foaming (NRP66 Thömen)
- ▶ Why?: forecasting the main environmental issues
- ▶ For who?: technology developers + public authority + future industrial partners
- ▶ In case of publication are comparison stipulated? Yes, if possible!

## 2 Main specific questions:

1. Are there environmental benefits when EPS is substituted by a biopolymer (PLA) in the foam (core layer)?
2. Do bio-based ULPB have environmental benefits compared to a conventional particle board (PB)

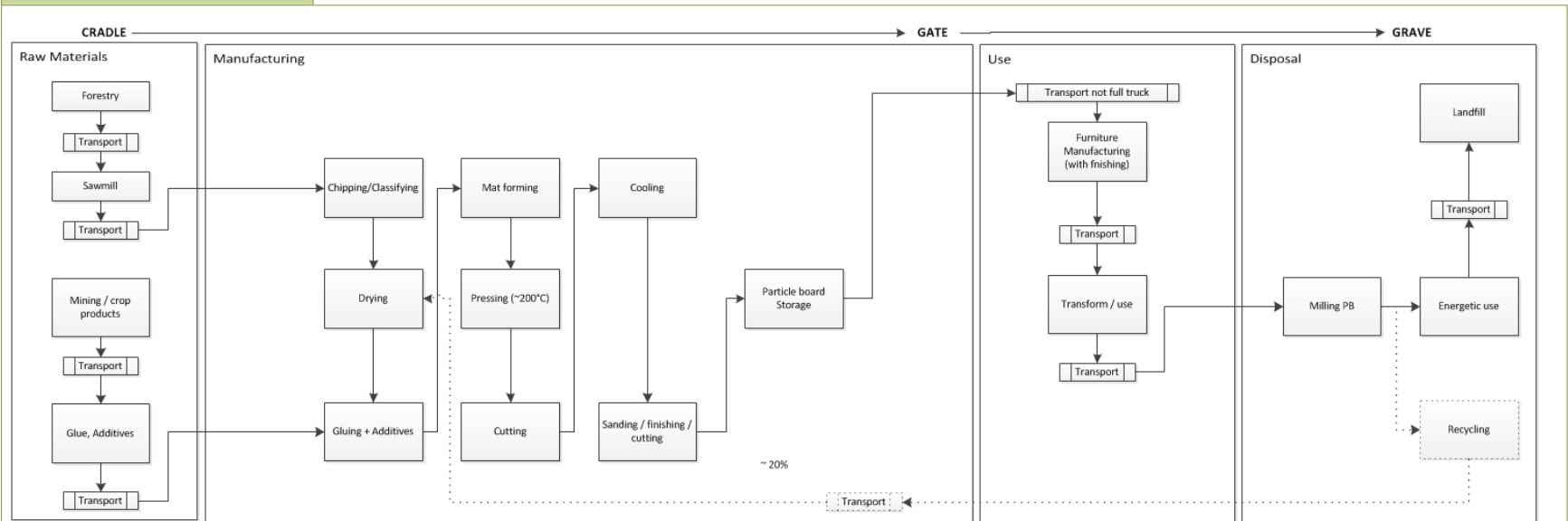
# 4. EPD Approach: System Boundaries and Units

- ▶ System boundaries:
  - ▶ Cradle to grave (excepted use phase) following EN15804
  - ▶ Manufactured in Switzerland
  - ▶ End-of-life scenario considered: municipal incineration plant
- ▶ Functional unit: 1 m<sup>3</sup> panel (thickness 19 mm), raw, fulfilling technical requirements for the utilisation as furniture shelf board, with the same life span.

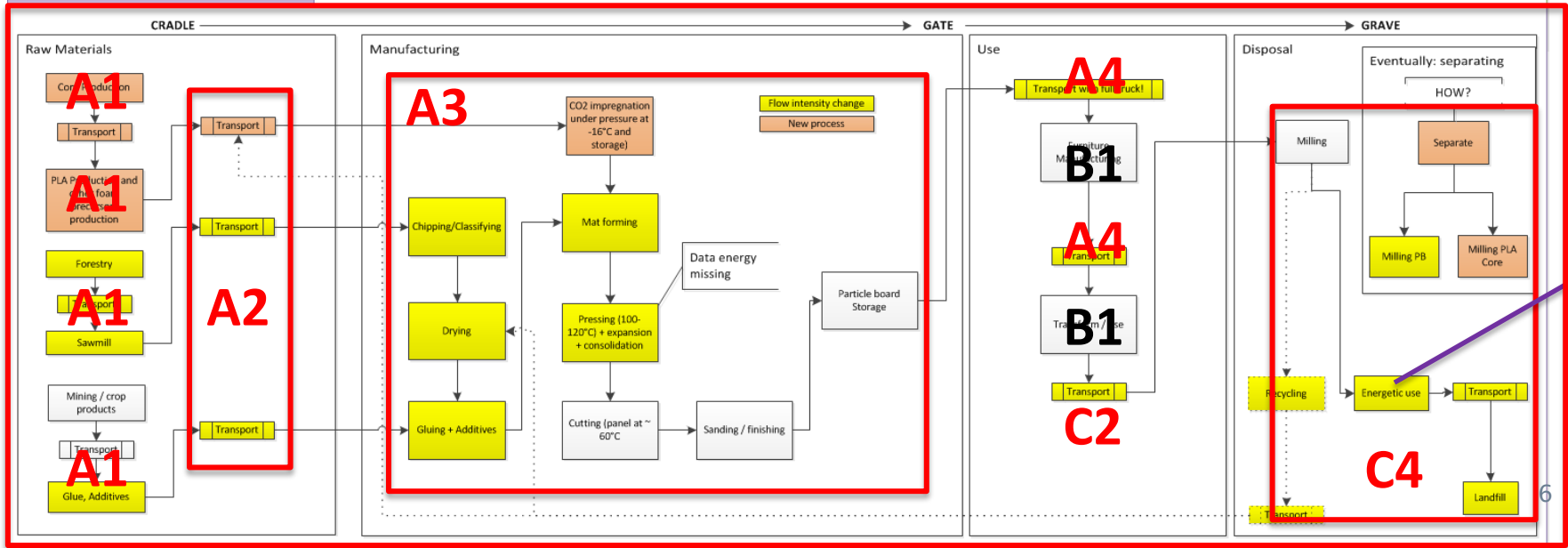


# 4. Inventory and module attribution

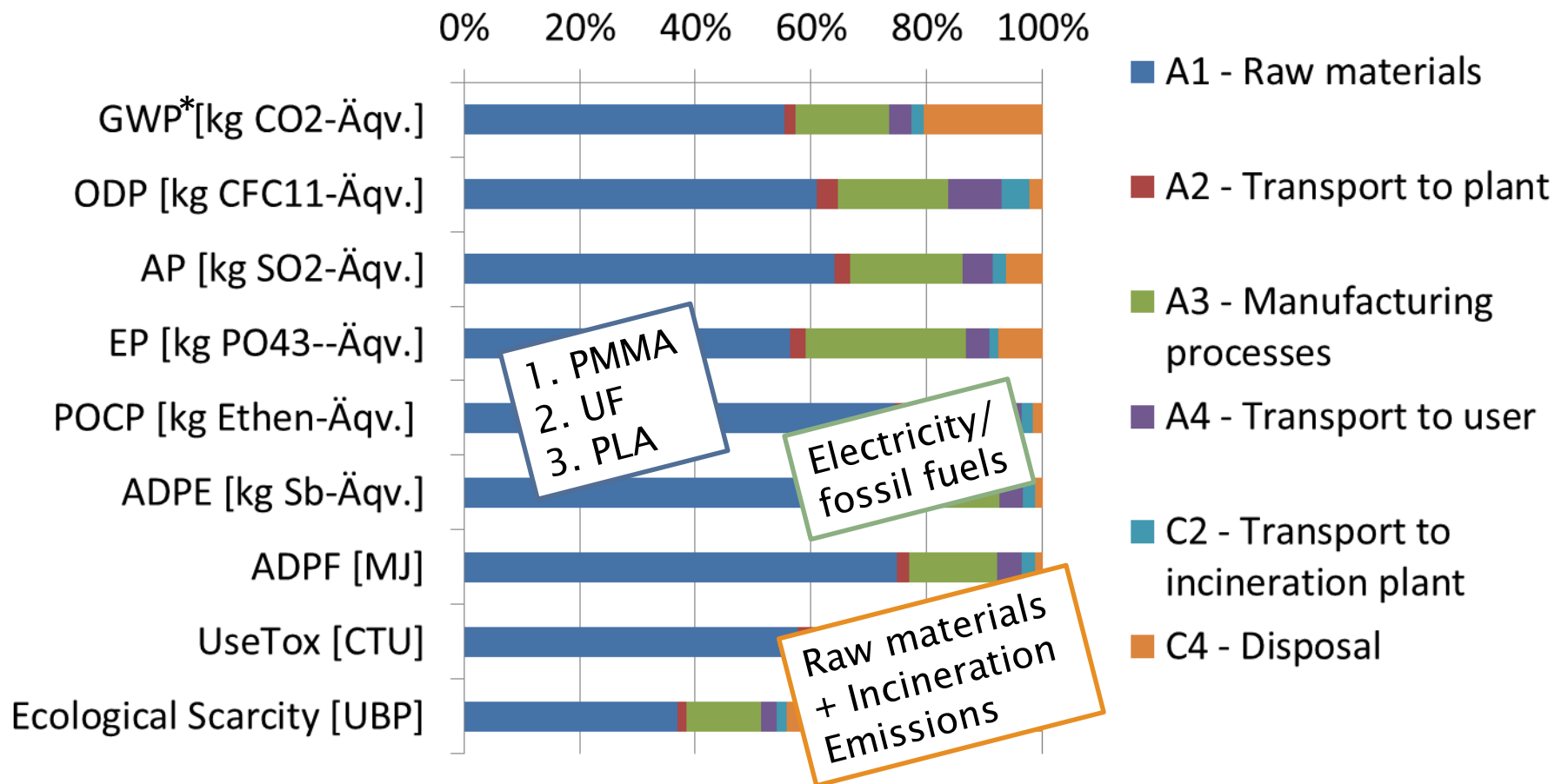
Particleboard Indoor use – Life cycle Flowchart



Ultralight particleboard – Life Cycle Flow Chart



# 4. Impact assessment of ULPB PMMA/PLA 50/50



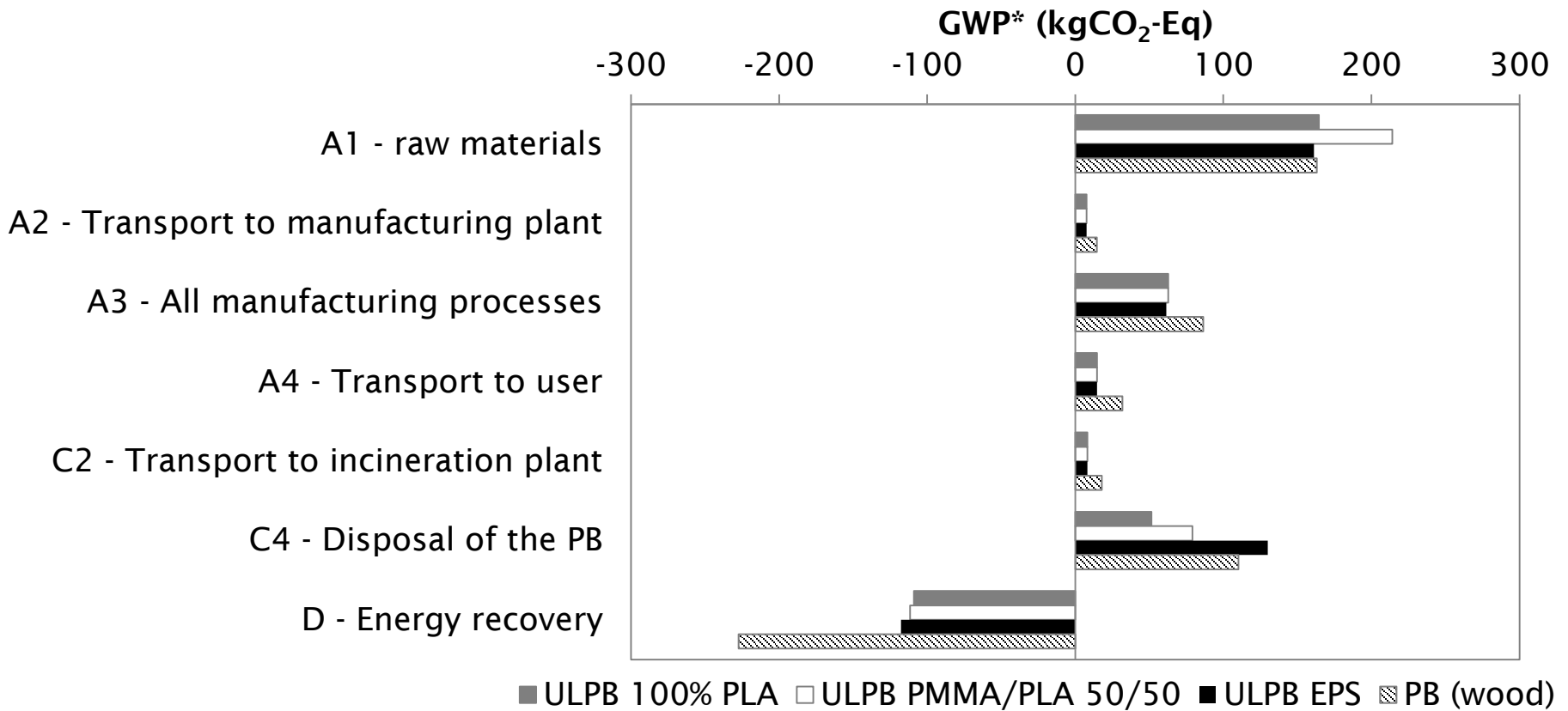
## 4. Assessed panels (core layer substitution)

Assessed panel systems in Aveny:

Panel system	Description
PB	Conventional Particleboard (as in EcoInvent database)
ULPB EPS	Ultra light particleboard produced in one step with Expandable Polystyrene (developed in Hamburg)
ULPB PLA/PMMA 50/50	Ultra light particleboard as last laboratory formulation with a mix (50/50%) of Polylactid acid and Polymethylmetracylat
ULPB PLA	Ultra light particleboard with 100% bio-based foam (target of the project)

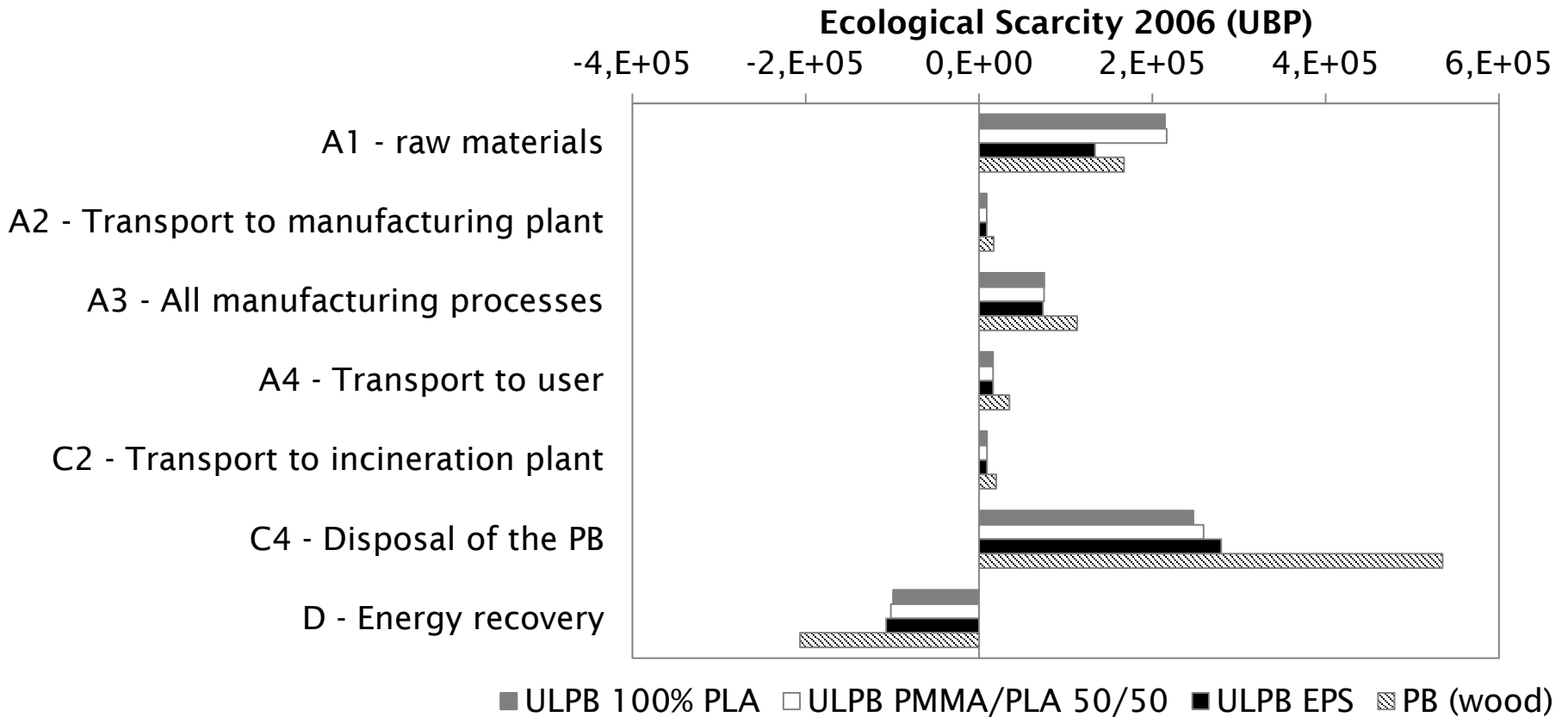


# 4. Effect of core layer composition substitution on GWP\* (without biogenic carbon)

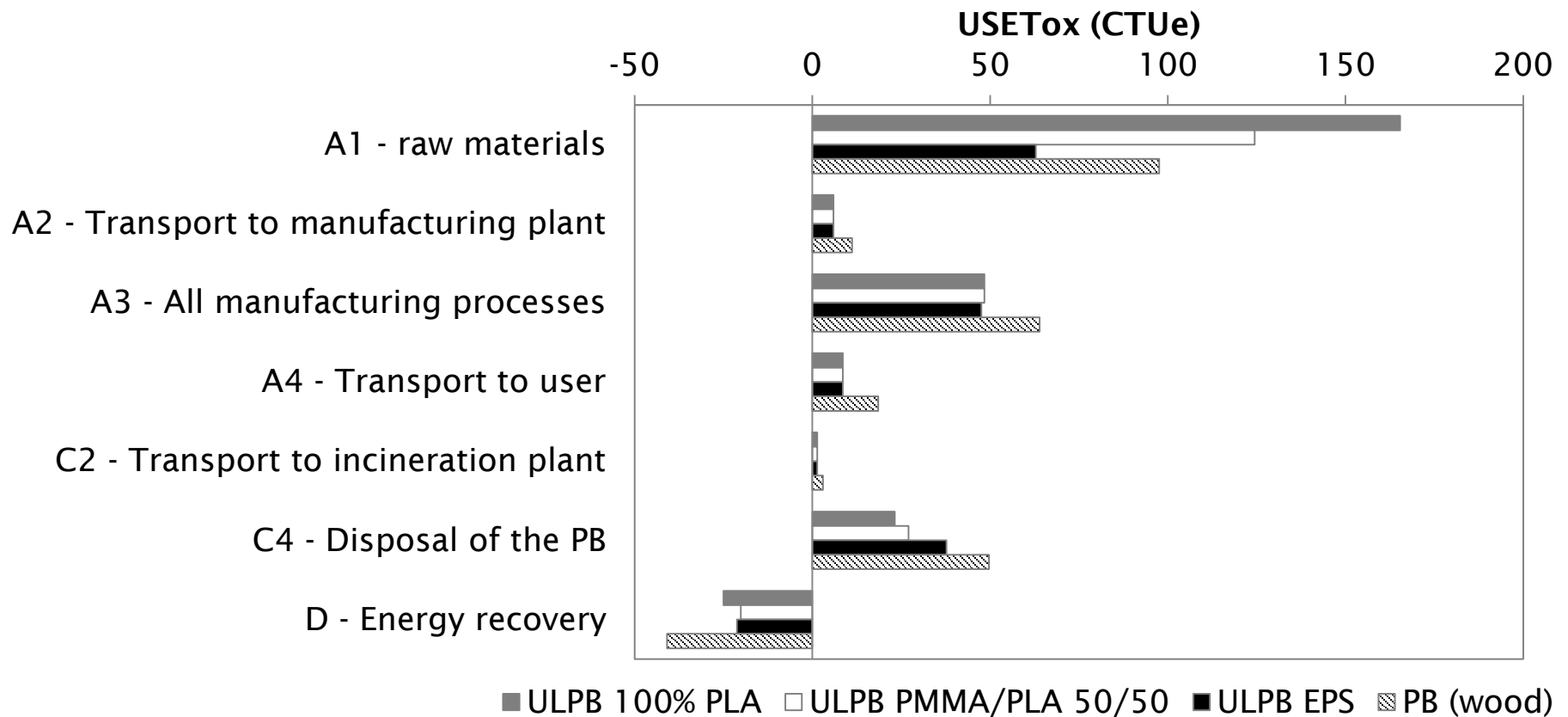


Each kg of PLA substituted by PMMA = increase of 6 kg fossile CO<sub>2</sub> emissions

# 4. Effect of core layer composition substitution on Ecological Scarcity 2006

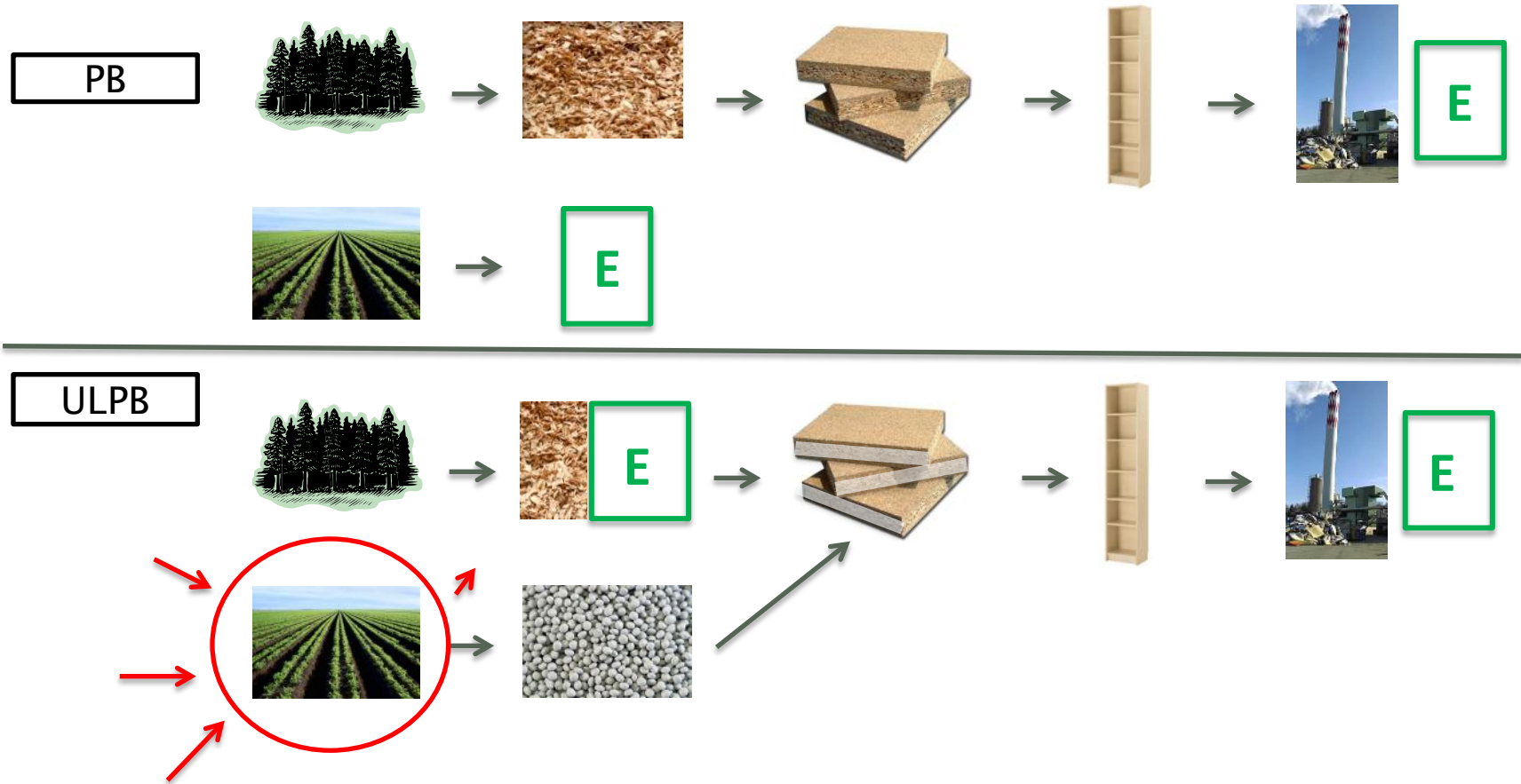


# 4. Effect of core layer composition substitution on Use Tox



# 5. Holistic approach

Problem: What happen if PB is replaced by ULPB in the future?



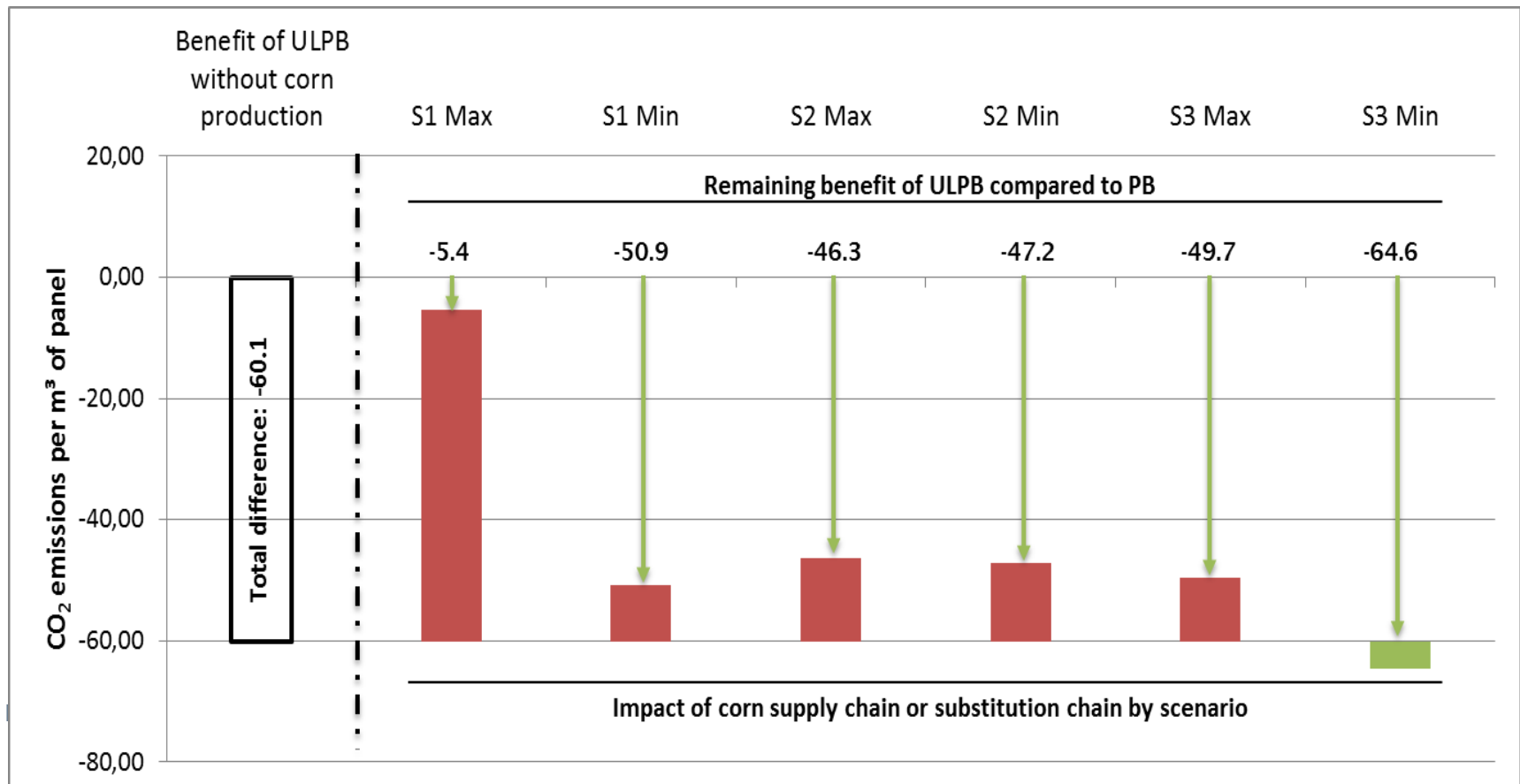
# 5. Holistic approach: scenario for corn



S1: extra corn has to be produced

S2: PLA is produced from corn for ethanol production (substitution by fossil gasoline) – case USA

S3: PLA is produced from corn for methane fermentation (substitution by gas) – case Germany



## 6. Conclusions

- ▶ EPD approach:
  - ▶ Raw materials! -> Disposal!
  - ▶ From A to C module: ULPB has less GWP than PB but more ecotoxic effect (due to PLA)
  - ▶ Hotspot are defined for eco-design
  - ▶ Less biogenic carbon can be stored in ULPB
  
- ▶ Holistic approach:
  - ▶ substitution (PB -> ULPB) should be beneficial for GWP\* for all scenarios
  - ▶ Other indicator for Ecotoxicity are needed to be calculated

# Thank you!

- ▶ Institut für Holzphysik, Thünen Institut, Hamburg (hosting the STSM)



- ▶ COST Action FP1303 (financing STSM)



- ▶ ULPB Project team (KB Materials, furniture and design + team EPFL)



**Resource Wood**  
National Research Programme NRP 66

