

# Life Cycle Assessment of an artisanal Belgian blond beer

## CHEMICAL ENGINEERING

*Processes and Sustainable Development*

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6/11/2012 - Lille



# Laboratory of Chemical Engineering

- LCA: more than 10 years of expertise
  - Evaluation of the environmental impact of processes
  - Redaction of environmental product declarations
  - Development of databases
  - Academic research + external studies
  - Participation to several regional and European projects
  - Formation activities
    - Master degree course (starting in 2011)
    - Carbon Management certificate (ULg – UCL)
    - “Greenwin”: competitiveness cluster of the environment technologies



# Laboratory of Chemical Engineering

## ■ The LCA team

- ❑ Sandra Belboom – PhD student
  - What is the best use of sugar crops? Environmental assessment of two applications: biofuels vs. bioproducts
- ❑ Saïcha Gerbinet – PhD student
  - Use of LCA to determine the environmental impact of thermochemical conversion routes of lignocellulosic biomass: state of the art
  - Modeling of a glass wool process in view of Life Cycle Assessment
- ❑ Sylvie Groslambert – Research Engineer
- ❑ Robert Renzoni – Senior researcher

## ■ Some publications

- ❑ See orbi - <http://orbi.ulg.ac.be/> + author search

# Introduction



- WALAID project
  - WAGRALIM: Agro-industry Competitiveness Cluster
  - Valorization of the agrofood industry by-products
    - 7 research centers and universities
    - 6 industries/SMEs
  - ULg involvement :
    - Life Cycle Thinking – New valorization ways
    - LCA of new products, processes
    - LCA of some existing processes
      - → beer production
      - → impact of packaging choice

# « Golden triple beer » process description

- 6 steps taken into consideration
  1. Culture of barley, malting, grinding and transport to the brewery



BRASSERIE DES  
LÉGENDES

# « Golden triple beer » process description

- 6 steps taken into consideration
  2. Brewing of malt flour mixed with water  
+ filtration step → recovered grain cake goes to step 6



# « Golden triple beer » process description

- 6 steps taken into consideration
  3. Wort boiling for 90 min  
+ hops addition



BRASSERIE DES  
LÉGENDES

# « Golden triple beer » process description

- 6 steps taken into consideration
  4. Wort settling and cooling  
Fermentation using yeast  
Guard of the beer at 4°C during 25 days



BRASSERIE DES  
LÉGENDES

# « Golden triple beer » process description

- 6 steps taken into consideration

## 5. Packaging



BRASSERIE DES  
LÉGENDES

# « Golden triple beer » process description

- 6 steps taken into consideration
  6. Washing of grains envelopes recovered by filtration after brewing → for animal feed



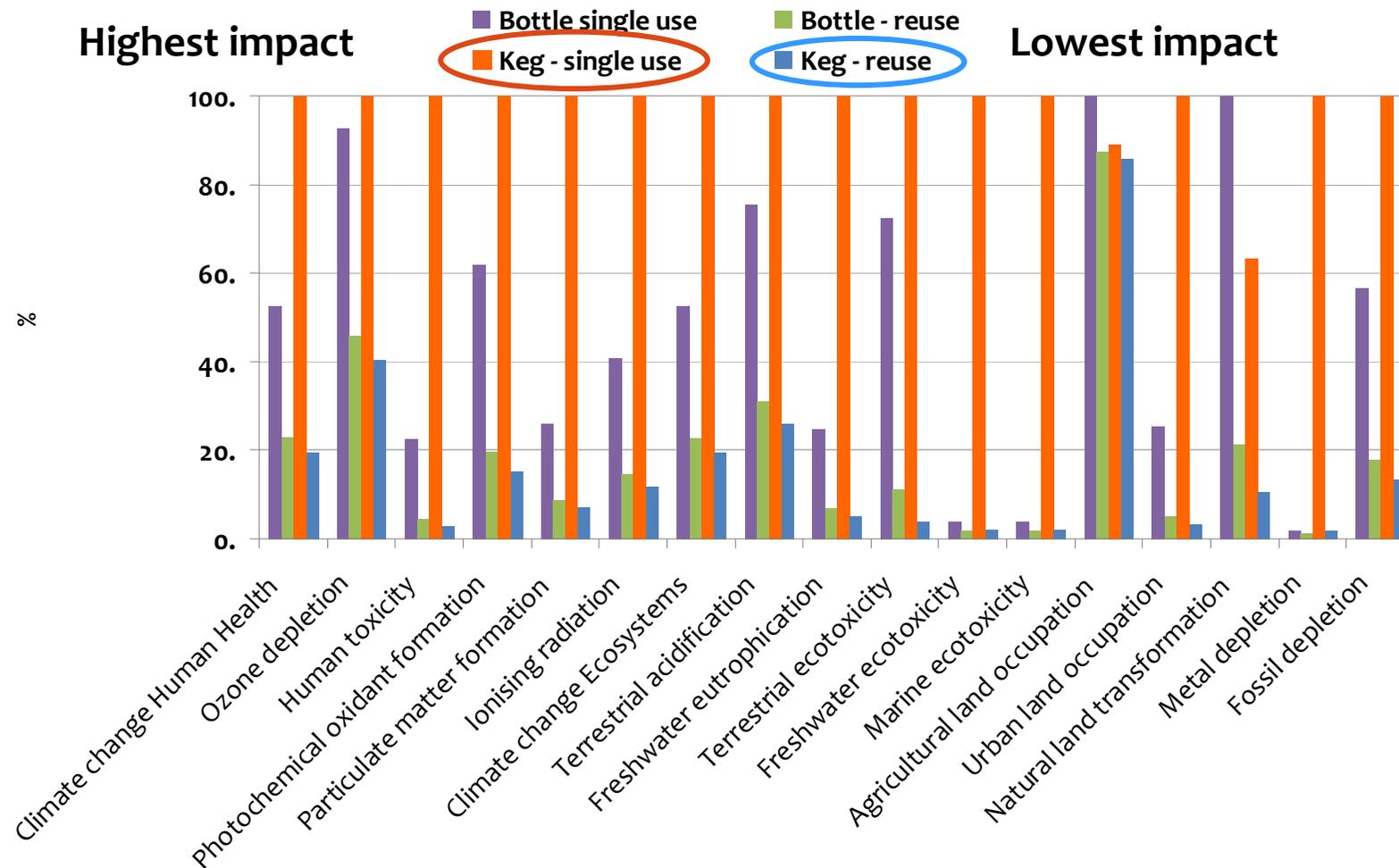
BRASSERIE DES  
LÉGENDES

# « Golden triple beer » process description

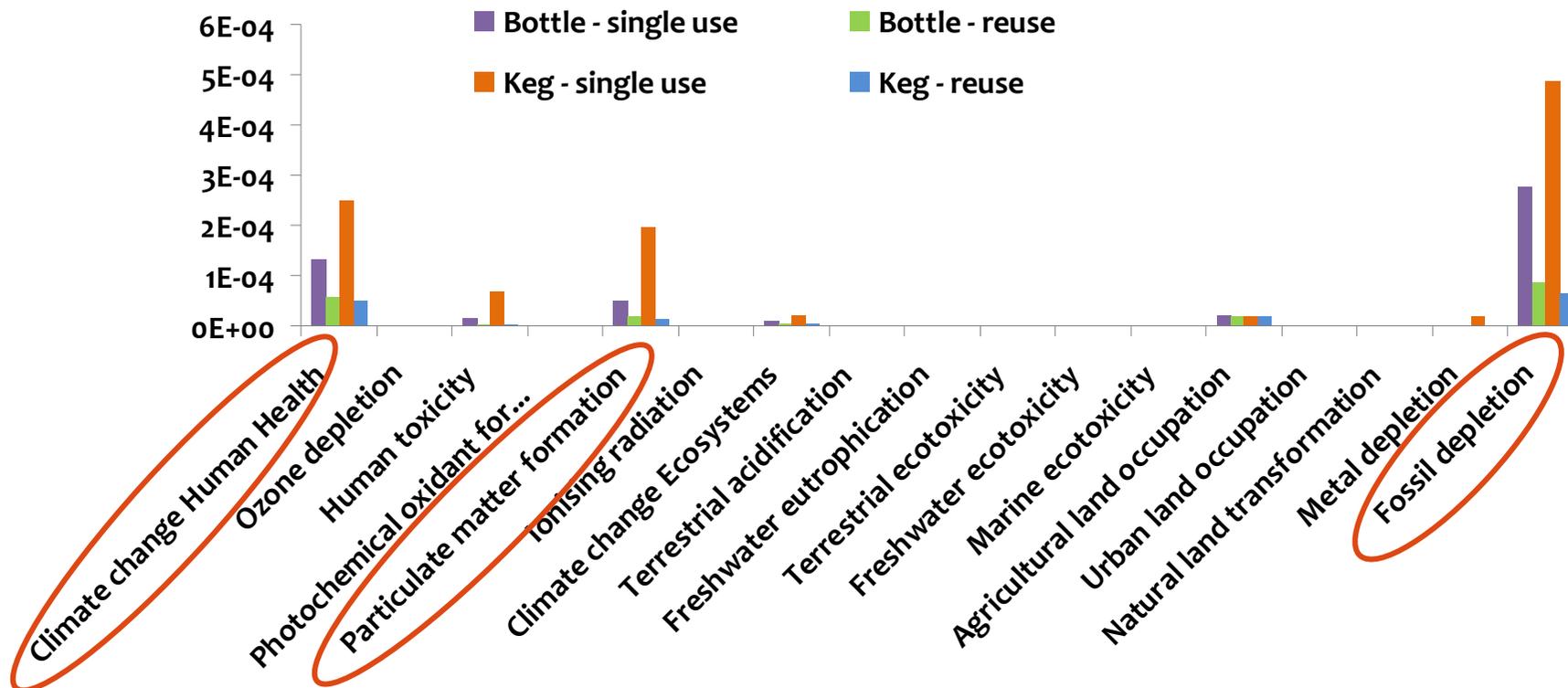
- 4 packaging scenarios for LCA
  - Glass bottle single use: 33 cl
  - Stainless steel keg single use: 20 l
  - Bottle reuse → 9.2 times
  - Keg reuse → 53.5 times
- FU = Production of 1 liter of beer
- Impact assessment method: ReCiPe 2008



# Results – Characterization



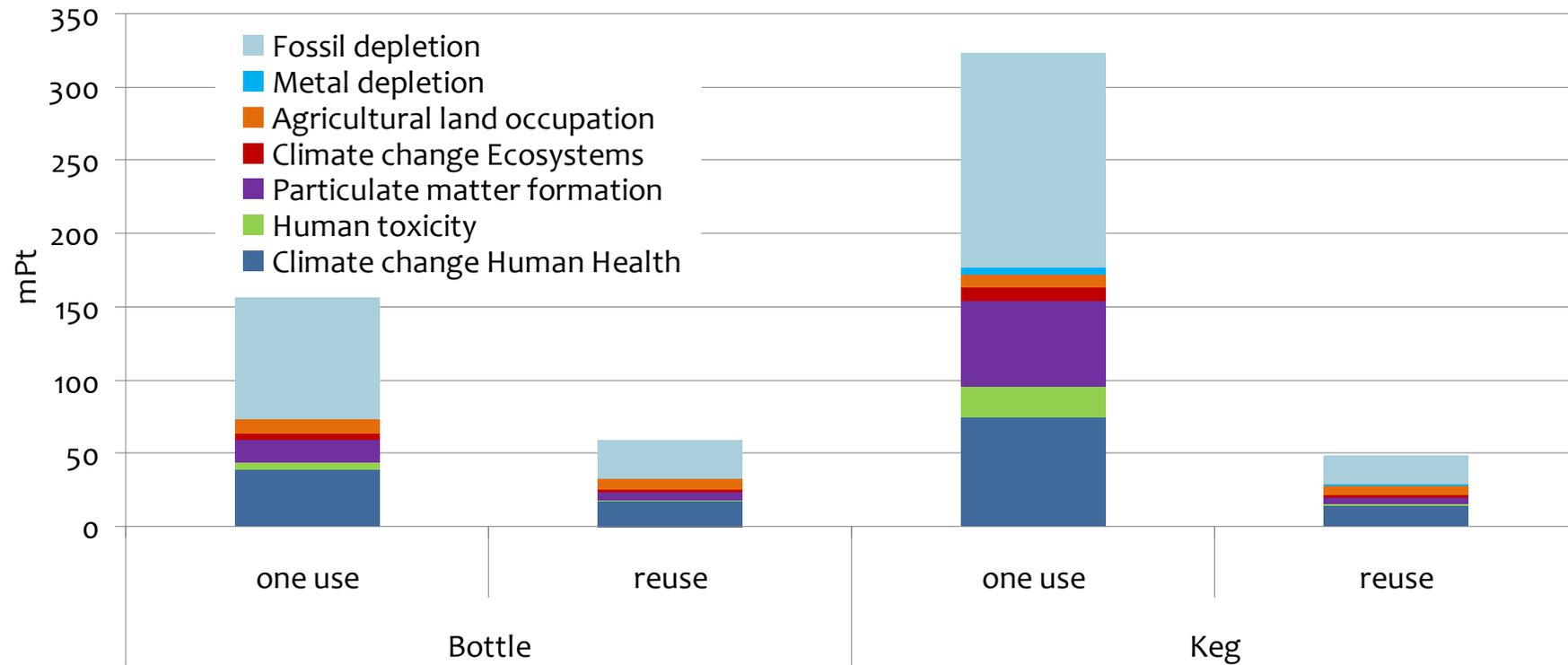
# Results – Normalization



- Impacts associated to packaging step
  - Processes consuming energy

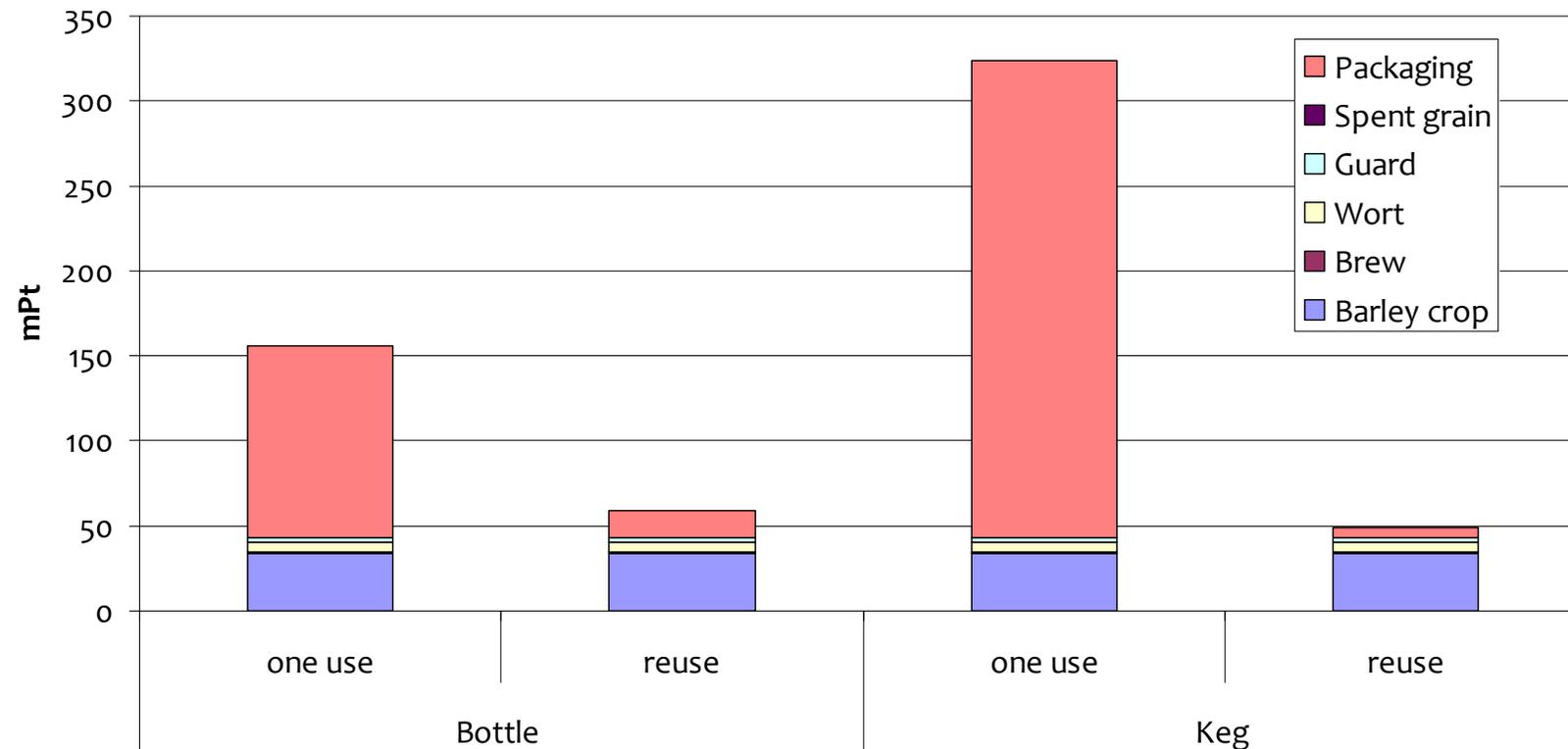
# Results – Single score

- Best option = keg reuse and bottle reuse



# Results – Single score

## ■ Steps analysis



- High importance of packaging
- Weight of steps internal to the brewery: < 20%

# Conclusions

- Importance of
  - Packaging step
    - Best option without reuse = glass bottle
    - Best option with reuse = keg
- Minor impact of steps internal to the brewery  
→ difficulty of improvement
- Perspectives = new valorization ways for recovered grains hulls → allocation ?

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Thank you for your attention!

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