

# Environmental impacts of agro- municipal resource use in an Alpine municipality

Iris Kral

**7<sup>th</sup> CASEE Conference**  
**"The Role of Life Sciences in Europe's 2020 Strategy"**

**22th – 24th May, 2016**



# Introduction

# The problem in Alpine areas

- Traditional open landscape disappearing - reforestation
- Threatens tourism, specialized eco-systems and eco-system services, and increases risk of natural hazards

## Case study Alpine municipality in Austria

- Dependent on tourism and tourism dependent on open landscape
  - 517 ha grassland no longer in production (Frühauf 2013)
  - Lignified biomass not appropriate as feed
- Local biogas production - a viable/interesting alternative?

# Steam Explosion I

Pretreatment of biomass

- high temperature, saturated steam (140 -240 °C) for 5 – 20 min
  - rapid pressure drop
- easily digestible input material for anaerobic digestion



# Method

- LCA adds all emissions and resource use (e.g. diesel use and CO<sub>2</sub> emissions) from manufacturing to disposal
- LCA calculates their environmental impacts
- LCA works for products and production systems at different scales

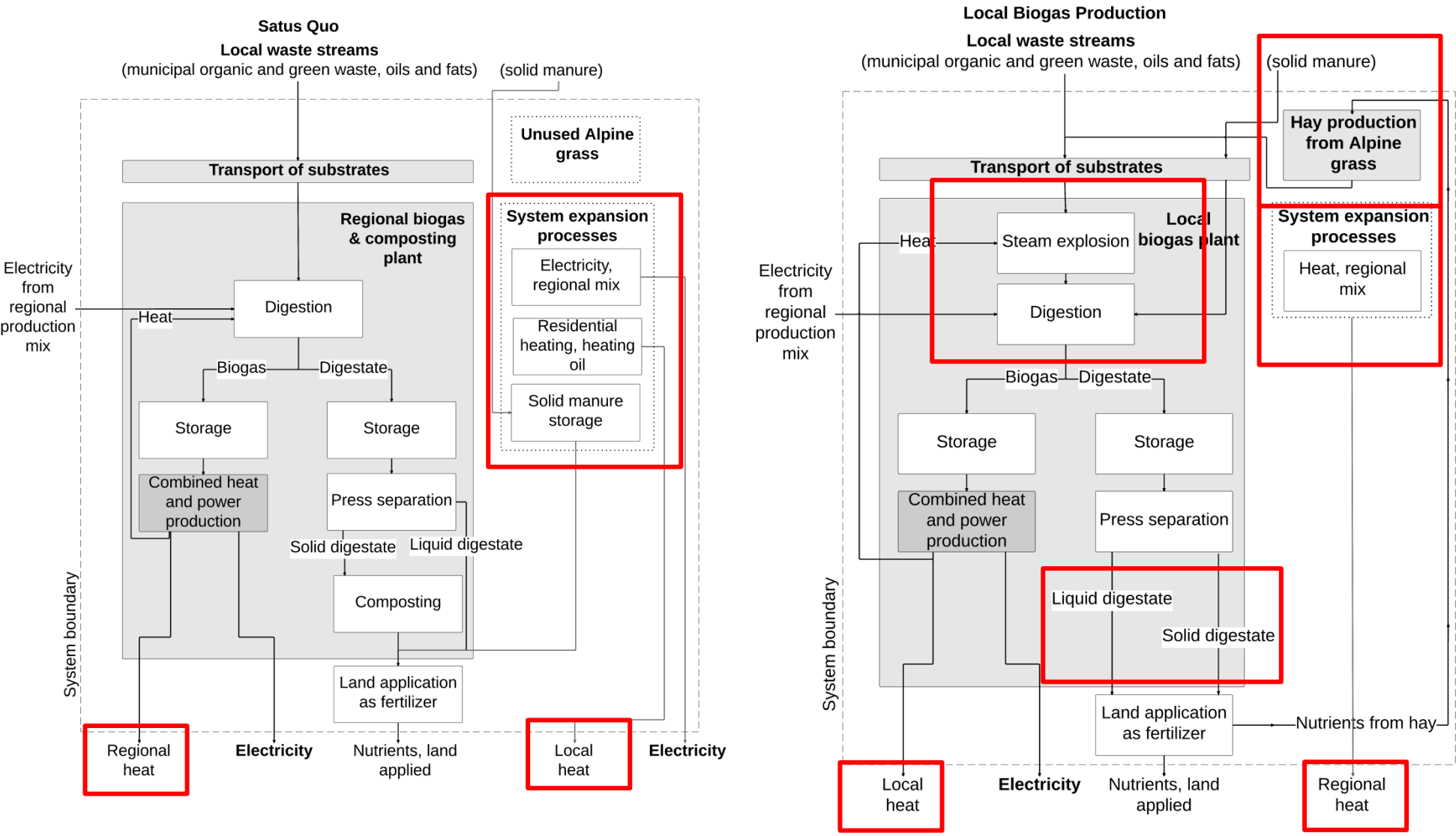


Roman 2013



# Case study methods

# Scenario comparison- Overview



# Key numbers

- Rated power of the CHP (combined heat and power) unit: 500 kW<sub>el</sub>
- Main components of biogas plant: concrete, asphalt, crushed rocks, steel, iron
- Electrical efficiency: 38%
- 50% off-heat usage



# Life cycle assessment specifics

- Functional unit: 1 kWh<sub>el</sub>
- Open LCA v.1.4 with adjusted ReCiPe Midpoint and CED methods for analysis
- Primary data sources: CHP and steam explosion technology manufacturers; case study municipality
- Database for secondary data: ecoinvent v.2.2 (Swiss centre for life cycle inventories, 2010)
- Statistical tests: Mann-Whitney-U-test and Wilcoxon-rank-sum-test

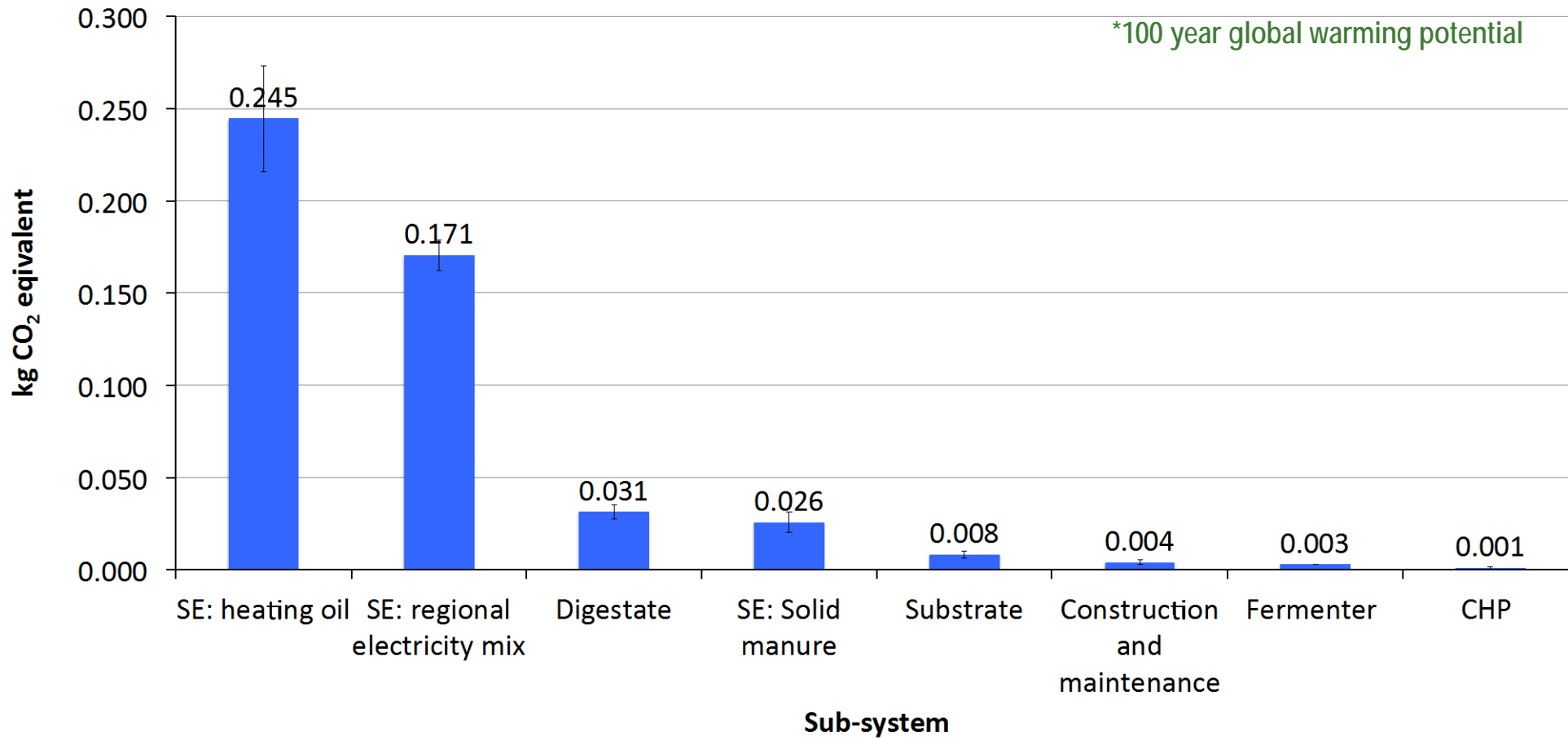


Results

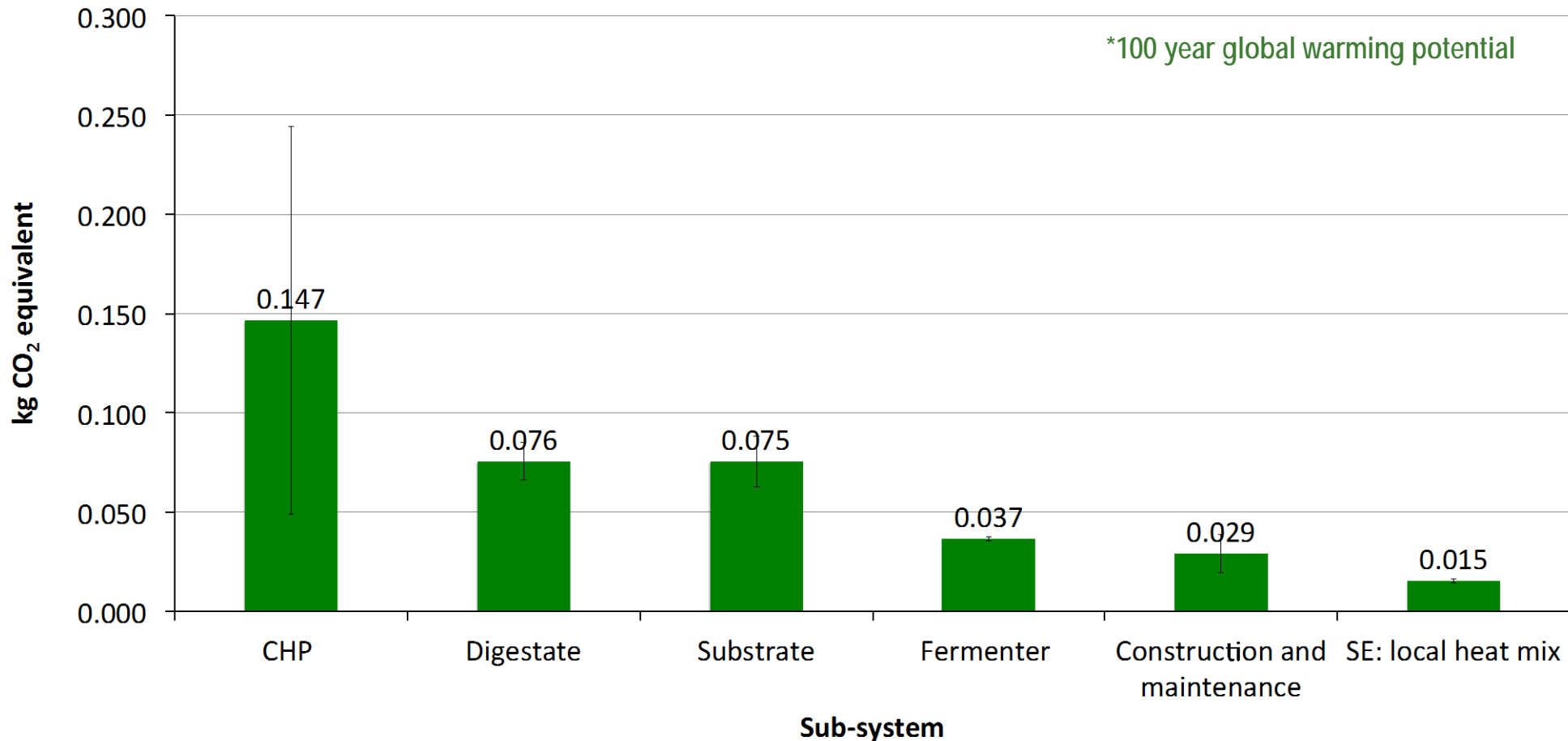
# Global warming potential (GWP100) results

Status quo  
0.488 kg CO<sub>2</sub>-eq  
kWh<sub>el</sub><sup>-1</sup> **VS.** Local Biogas  
0.379 kg CO<sub>2</sub>-eq  
kWh<sub>el</sub><sup>-1</sup>

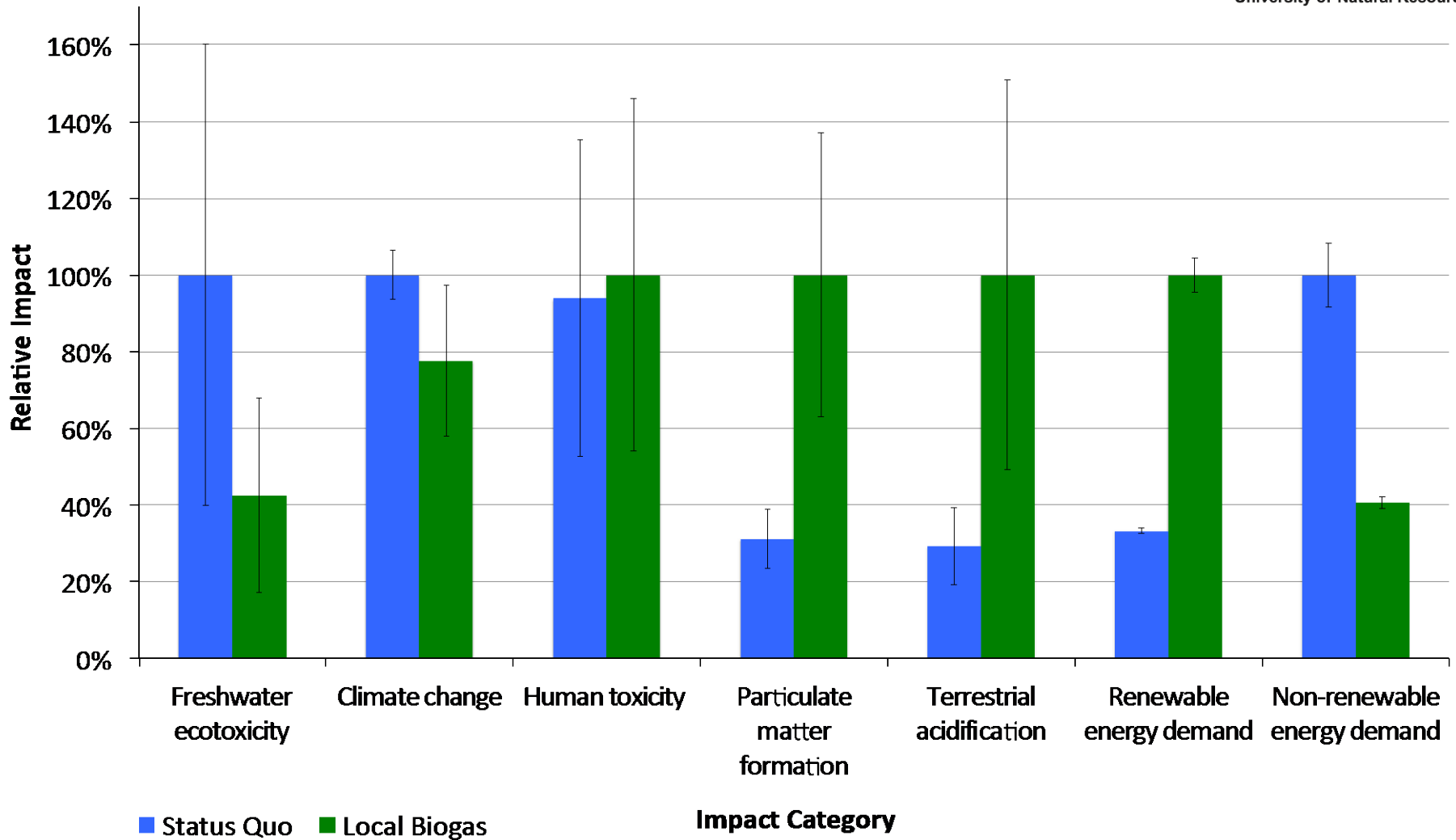
# Global warming potential\* of status quo 0.488 kg CO<sub>2</sub>-eq kWh<sub>el</sub><sup>-1</sup> - Contributions



# Global warming potential\* of local biogas 0.379 kg CO<sub>2</sub>-eq kWh<sub>el</sub><sup>-1</sup> - Contributions



# Comparison of impact categories



# Conclusions

- Locally produced biogas has a very high probability of having **significantly lower global warming potential** than status quo.
- However there is **no clear overall “winner”** for all impact categories



Thank you for your attention!

Project team: Molly Saylor, Iris Kral, Gerhard Piring  
Alexander Bauer, Andreas Gronauer