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Life Cycle Assessment of the Pork Value Chain in Germany

Case Study of a German Slaughterhouse

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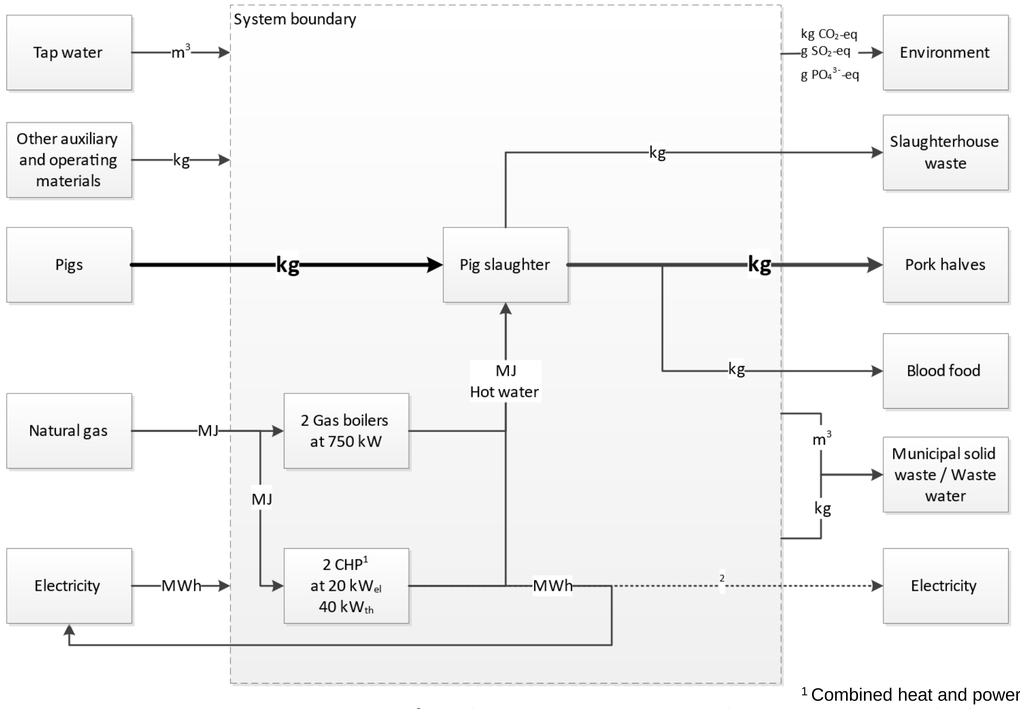
Figure 1 – System Boundaries of the Slaughterhouse



[1] Combined heat and power plant

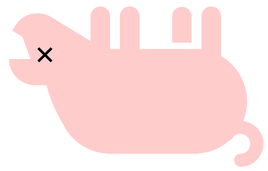
[2] The electricity produced by the CHP plant fed into the grid is negligible according to the operator of the slaughterhouse, hence, it is outside the system boundaries.

Introduction and Goals

The **production of meat** presents a significant **global environmental challenge** [1]. Therefore, it is crucial to examine the environmental impacts specifically related to pork, which is the most widely consumed meat globally [2].

To comprehensively assess the environmental impact, it is essential to closely examine the complete value chain, including factory farming, slaughter, processing, and distribution. The SPECK project aims to address this aspect by conducting a **life cycle assessment** of various value chain stages in **pork production in Germany,** which is ranked as the fourth-largest pork producer [3].

This case study focuses on the production of pork halves at a **slaughterhouse** and aims to determine the underlying environmental impacts. The slaughterhouse primarily slaughters organic animals, primarily pigs but also includes bovine and sheep. Considering the mixed input of different animal species, the study specifically analyzes the environmental impacts associated with pork production, accounting for 75% of the overall operation.



Methods and Approach

Considering ecological evaluation techniques, the life cycle assessment approach is increasingly commonly used to identify and quantify the **environmental impacts of production processes**. Regarding this **acceptance and tangibility**, the use case is evaluated by this method.

Goal and Scope

- Define system boundaries: Slaughterhouse (see Fig. 1)
- Identify and visualize the ecological influences of the process
- Determine the most influential impact factors

Functional Unit

- **1 kg of carcass weight** (see Fig. 1: pork halves)
- Consistent with [4] [5] [6]

Inventory

- Product flows: Input pig and output pork
- Auxiliary flows: Energy, water, etc.
- Processes: Slaughter process, heat and power generation
- **Key aspects:** Electric and thermal energy provision
- Data: Database ecoinvent Version 3.9.1
- Calculation: Open-source Software OpenLCA

Impact Assessment Three impact categories are chosen according to literature findings [4] [5] [6]: **Global Warming (GWP)**, **Acidification**, and **Eutrophication**, calculated with the method CML baseline.

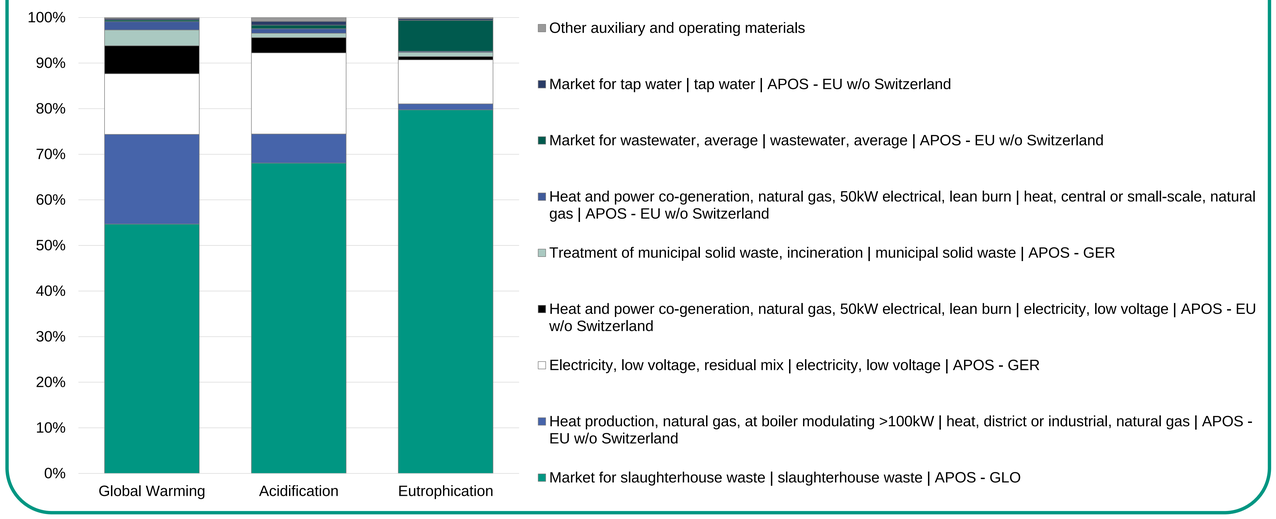
Results

GWP	Acidification	Eutrophication
0.313 kg CO_2-eq	**0.51 g SO_2-eq**	**0.68 g PO_4^{3-}-eq**

1 kg carcass weight

- Enormous impact of the specific waste flow of **slaughterhouse waste** (see Fig. 2)
- GWP and Acidification: **energy production and supplies** generate a considerable impact
- Eutrophication: **Wastewater treatment** has a recognizable influence

Figure 2 – Results of the LCA with relative representation of the influences



Conclusion

- Compared to similar studies, the results of the impact categories in this case study could be located in a **justifiable range** [6].
- The impact of slaughterhouse waste is **significant**, hence, the underlying data must be examined when interpreting the results.
- Energy use is a great influence caused by the **energy intensity** of the necessary process steps.

References
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