



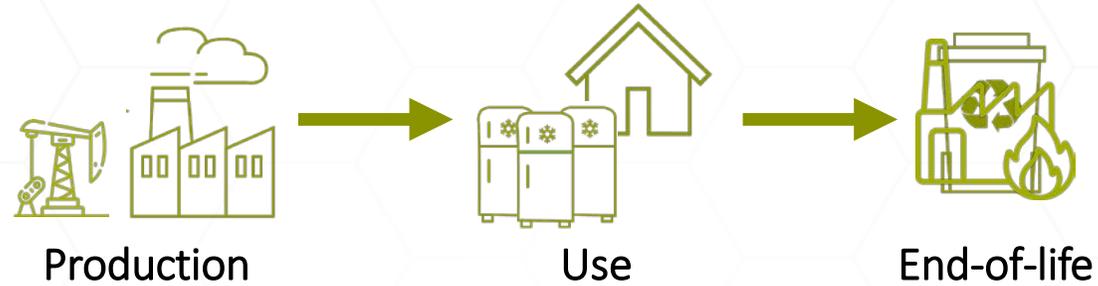
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Decreasing climate change impacts  
with circular value chains

Martin Pillich | 11.09.2025 | Brussels

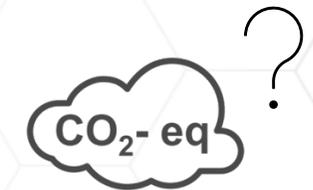
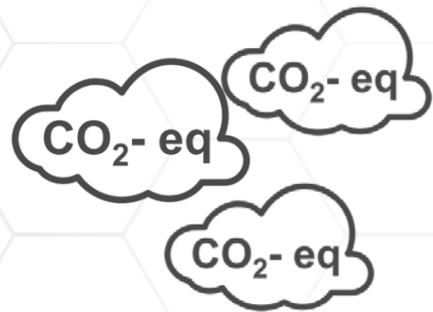
# Circular PU value chains - reduced climate change impact?

From **linear life cycle**  
with a  
**high climate change**  
impact



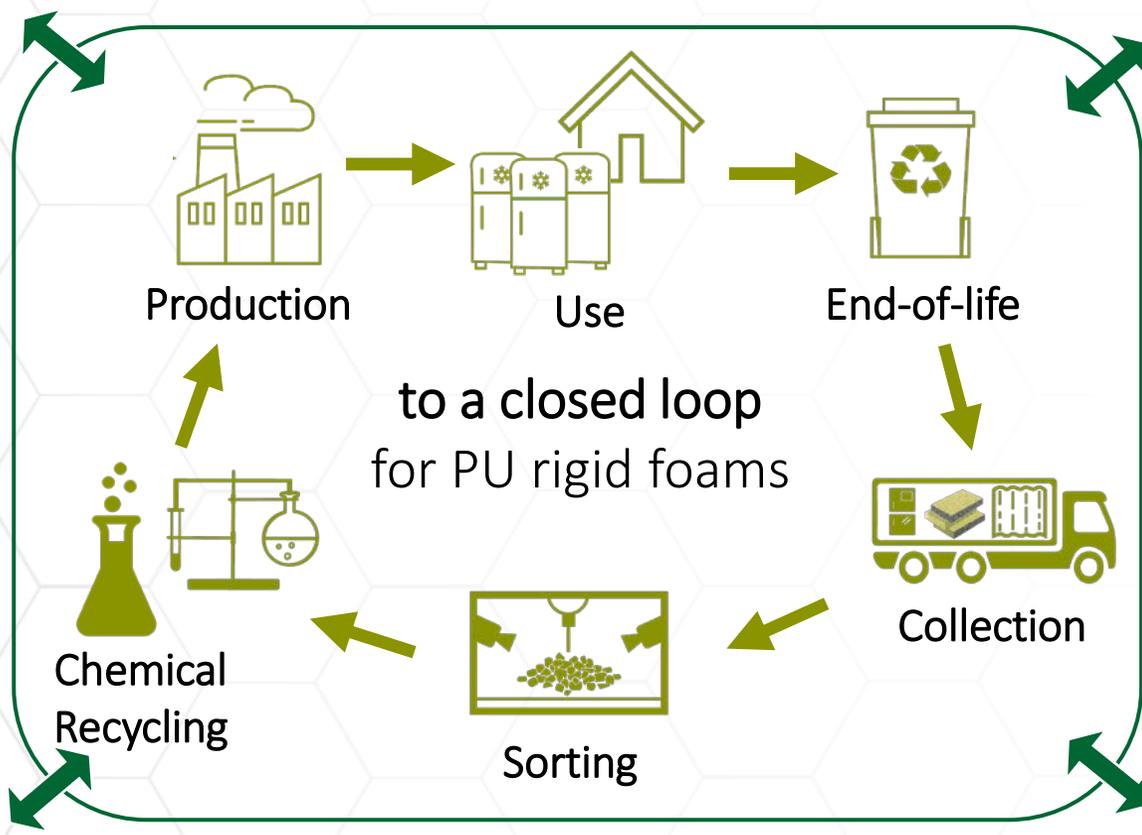
with **lower**  
**climate change**  
impact?

to a closed loop  
for PU rigid foams



# Life cycle assessment determines climate change impact

## Life Cycle Assessment (LCA)



Mass

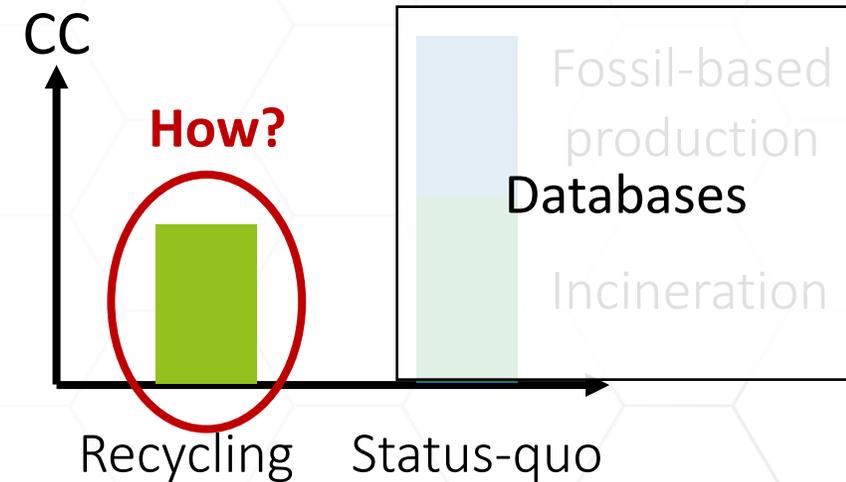
CO<sub>2</sub>-eq  
climate change impact

Energy

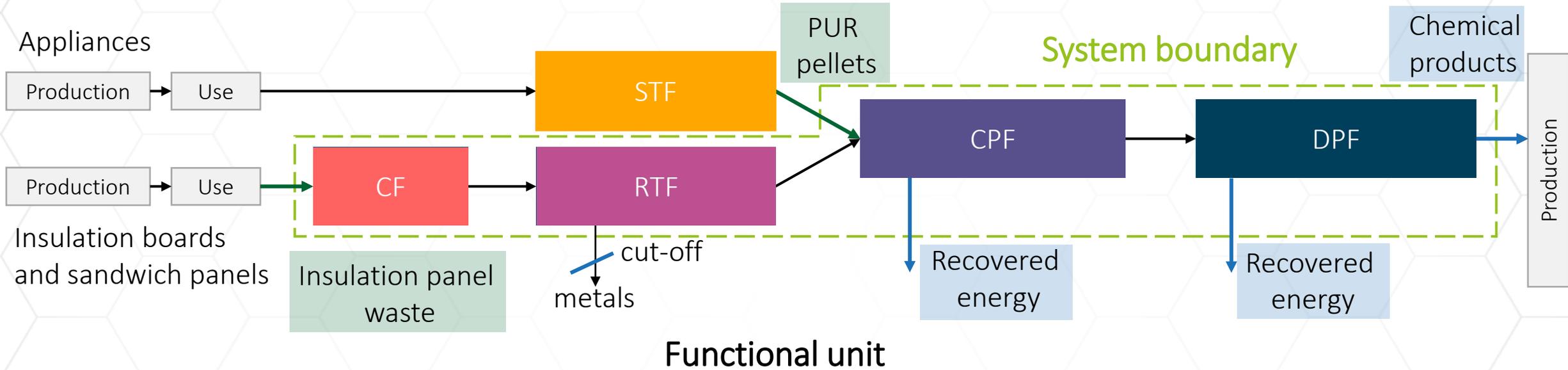


Goal of LCA:

Compare impact of circular value chain against status-quo



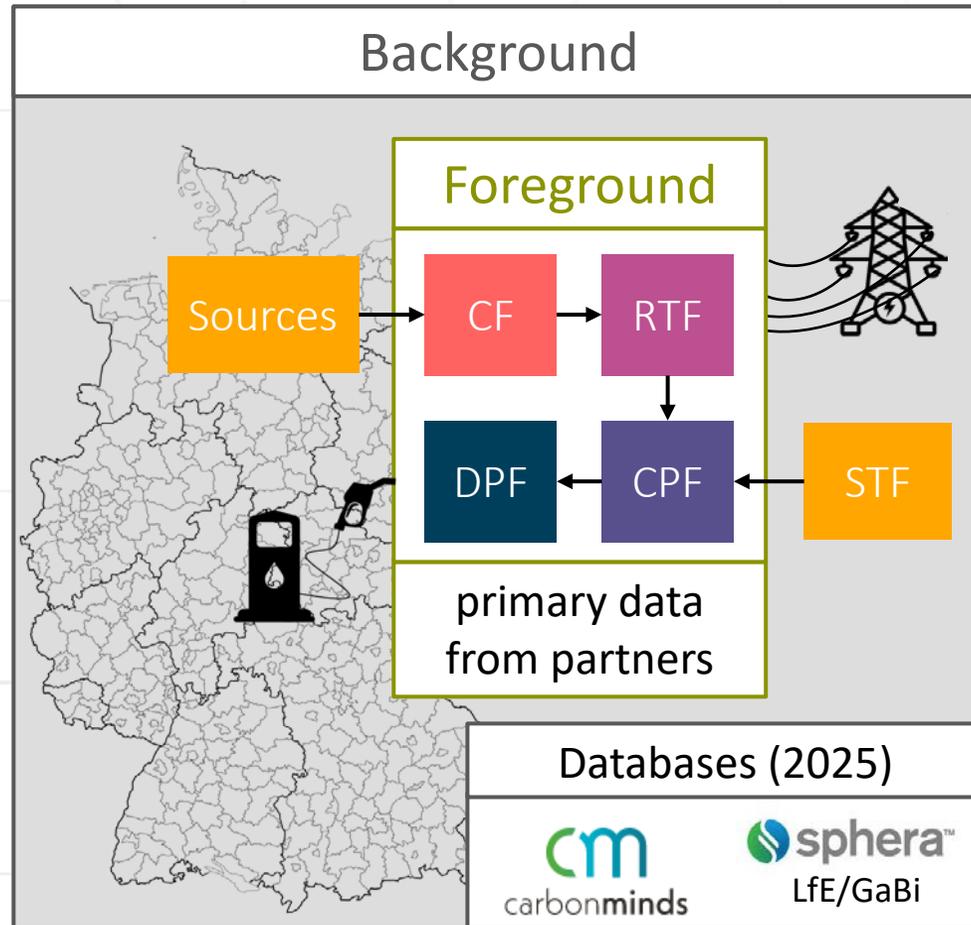
# Functional unit considers treatment and production



## Functional unit



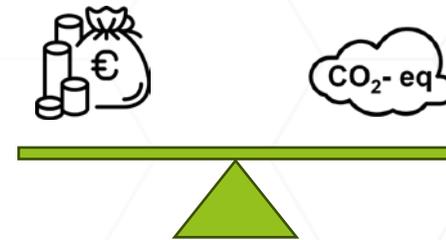
# A circular value chain embedded in Germany



*Recap:* Optimization determines capacities and locations for minimal costs

*Now:* **Functional unit**  
 Treatment | Production  
 must be fulfilled if not by recycling than by linear system

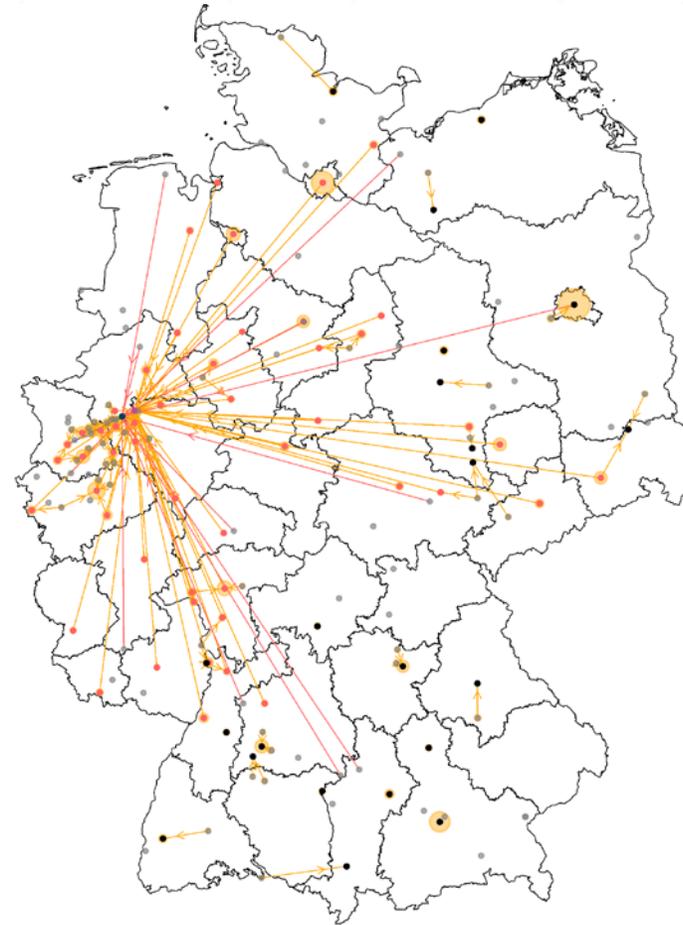
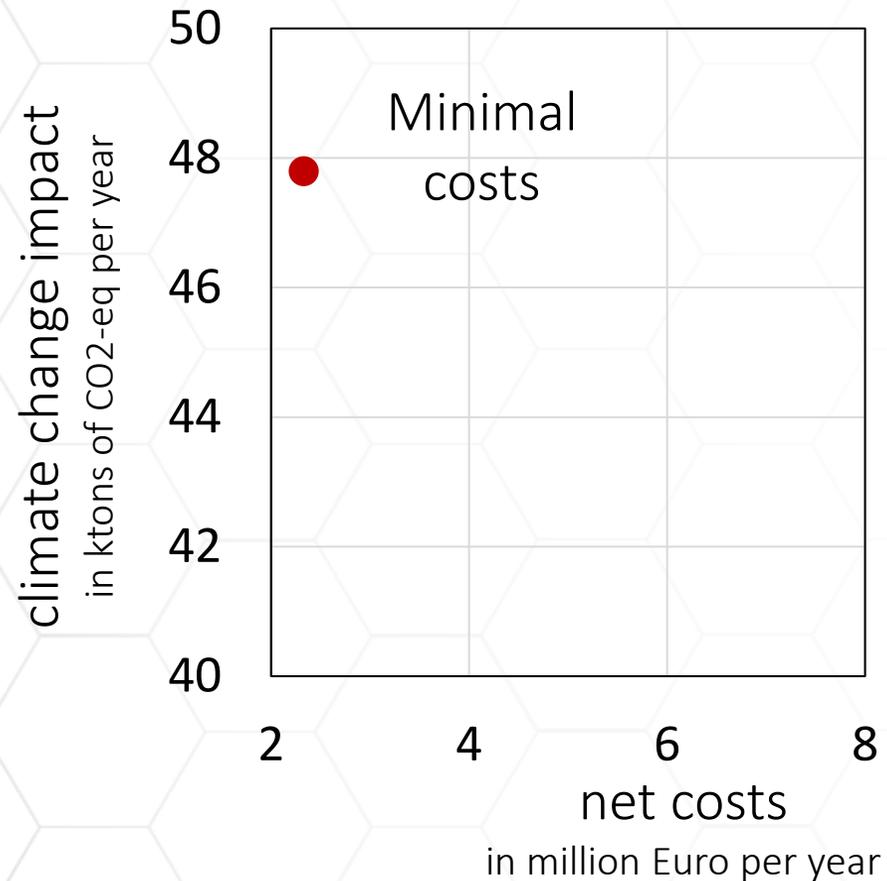
minimize costs



minimize climate change

→ **Multi-objective optimization** balances objectives

# Cost optimal system recycles most waste with a central cluster

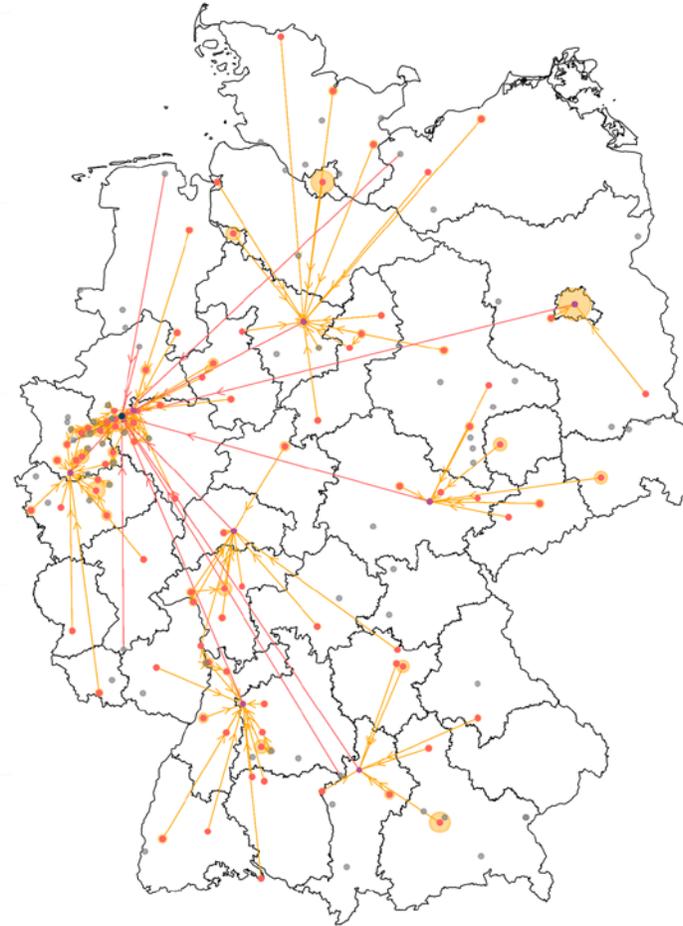
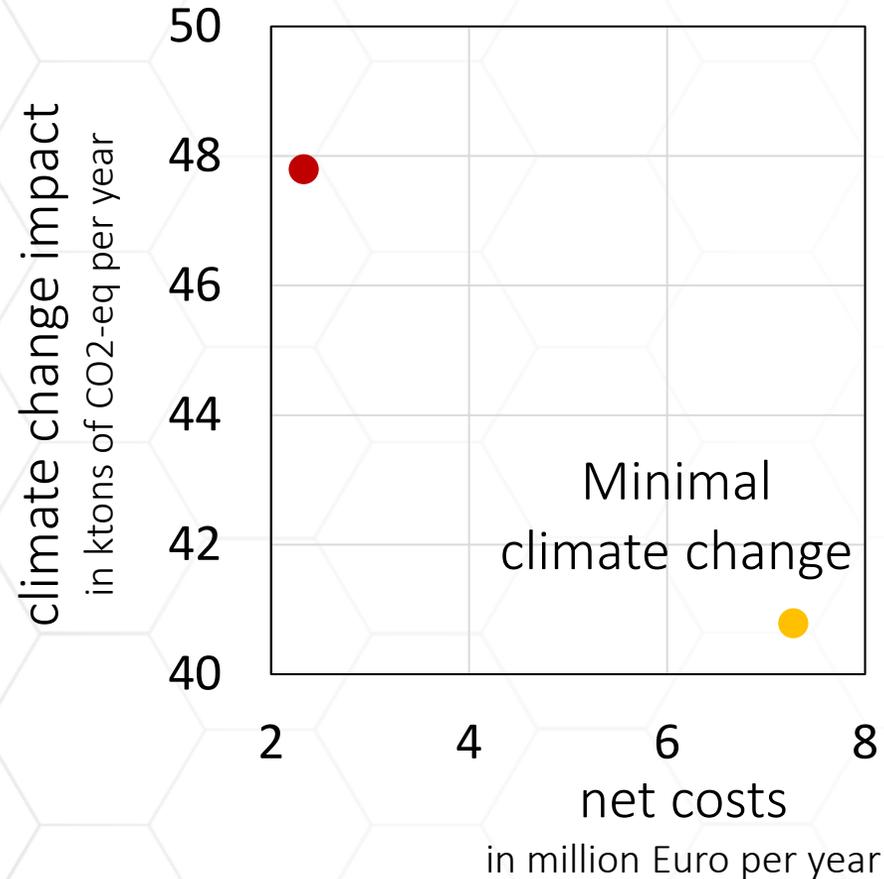


Centralized cluster in west of Germany

- 83% recycled
- rest incinerated

→ Cheaper to incinerate locally than to transport long distances

# Climate change optimal system recycles all waste with decentralized sorting

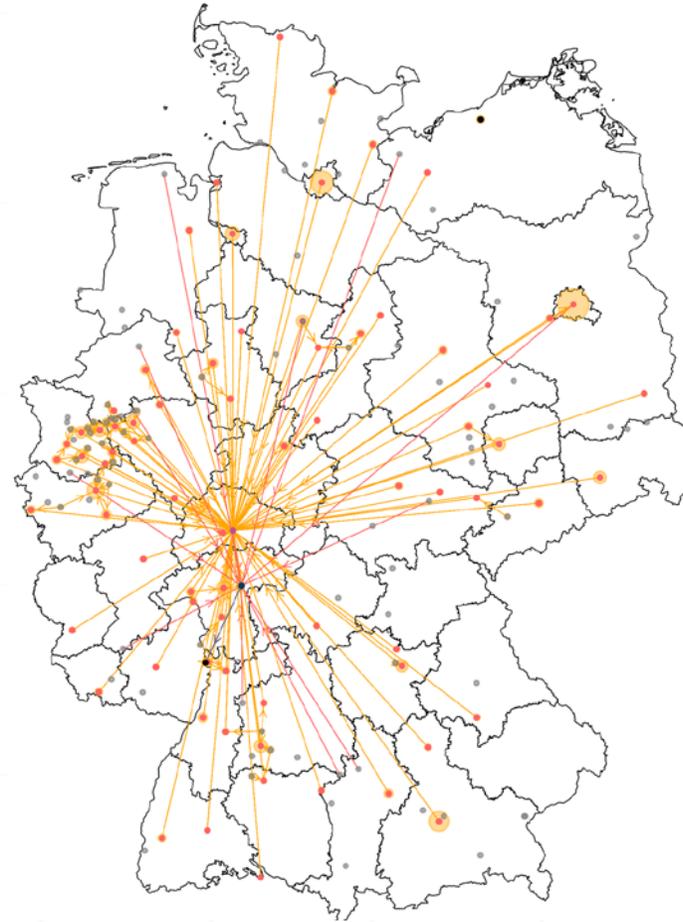
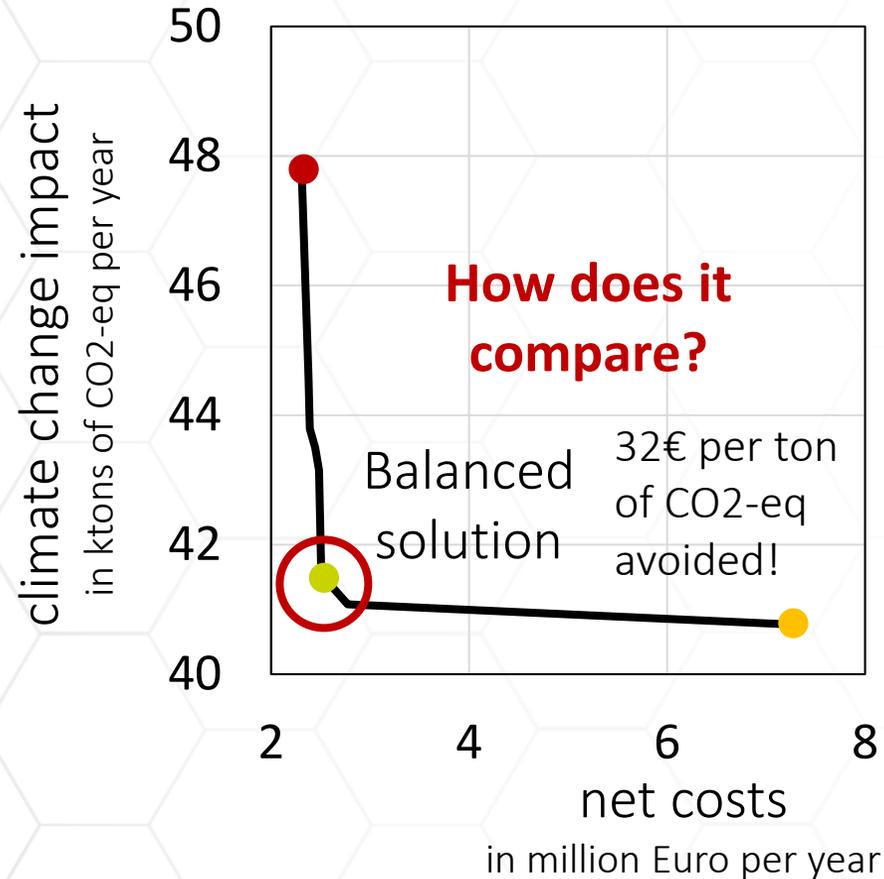


**Centralized chemical cluster  
in west of Germany,  
decentralized sorting**

- 100% recycled
- Reduce transport

➔ Built facilities everywhere,  
avoid transport emissions

# Balanced system recycles all waste with central cluster

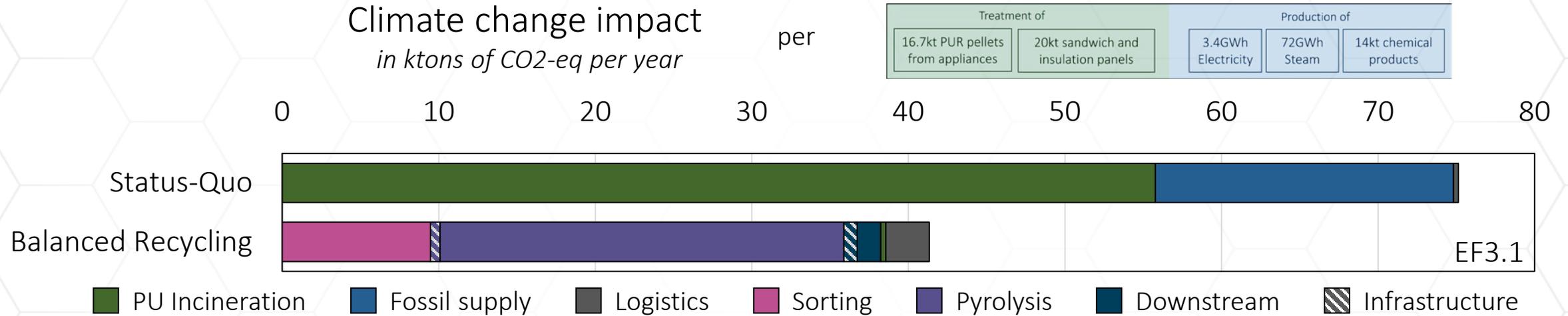


Centralized cluster in center of Germany

- 98% recycled
- Single facilities

→ Get all waste, minimize capital expenditures

# Lower climate change impact from recycling system



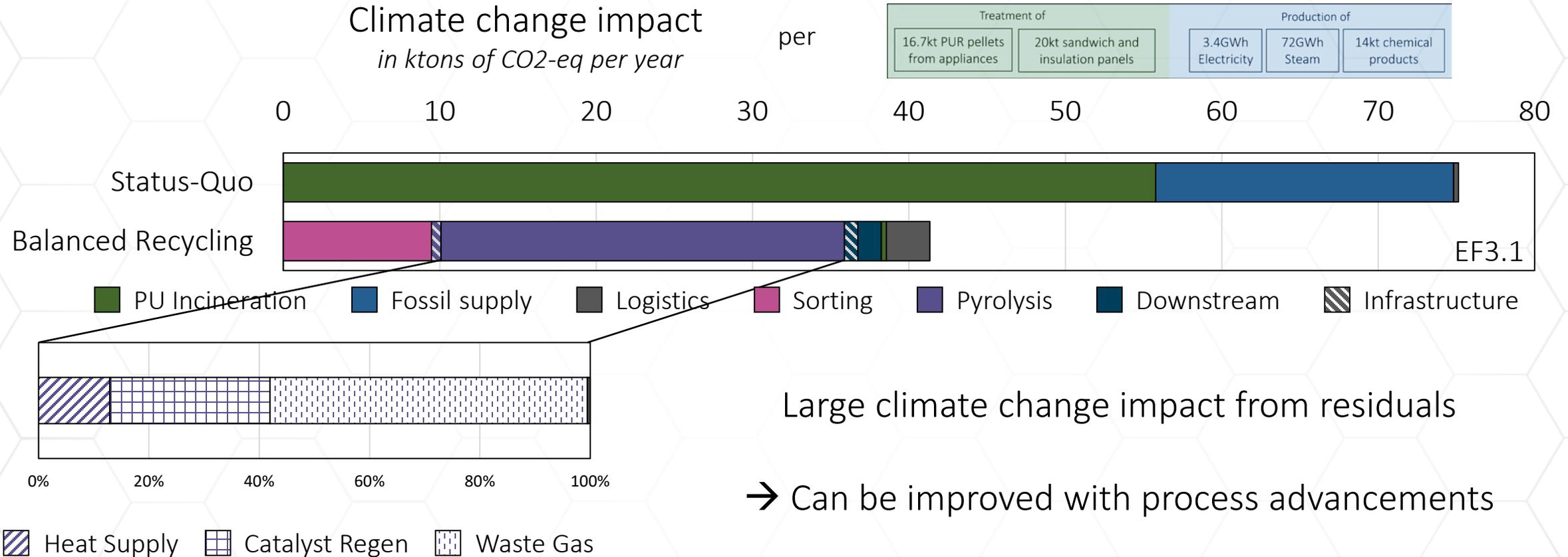
1.  
**40% reduction**  
of climate change impact  
through recycling **already today**

2.  
**Largest contribution**  
from pyrolysis  
process

3.  
**Infrastructure**  
contributes little  
to overall impact

EF3.1

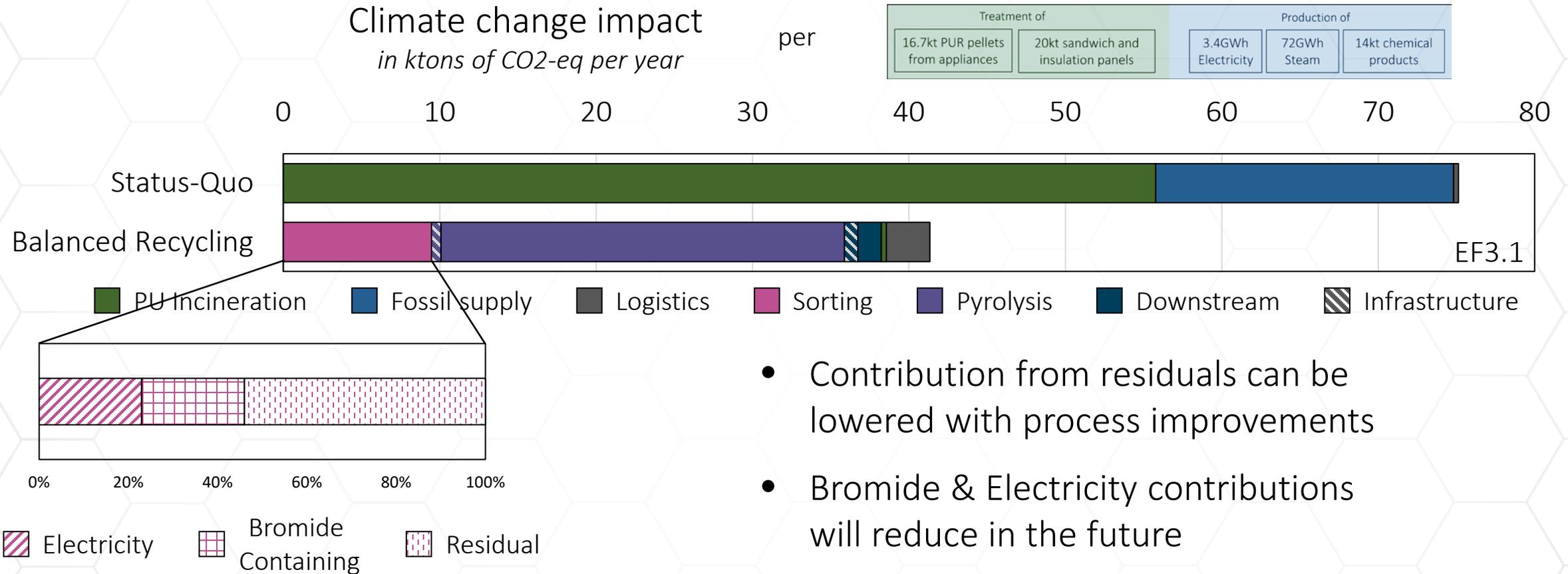
# Chemical process contributes the most to climate change impact



Large climate change impact from residuals

→ Can be improved with process advancements

# Expected reduction of climate change impact due to changes in the future



- Contribution from residuals can be lowered with process improvements
- Bromide & Electricity contributions will reduce in the future

# Chemical recycling is beneficial

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- 1. Capturing all PU rigid foam waste** leverages low abatements costs enabled by recycling value chain in Germany
- 2. 40% climate change reduction** compared to status-quo by chemically recycling PU rigid foam waste in Germany today
- 3. Expected improvements** through cleaner electricity supply and process advancements



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Thank you!

Martin Pillich (mpillich@ethz.ch)