



University of Stuttgart
IER Institute of Energy Economics
and Rational Energy Use



**ENERGY EVALUATION
EUROPE CONFERENCE 2025**
SHAPING THE FUTURE OF ENERGY AS THE DECISION
MAKERS MEET TOGETHER
25 SEP - 26 SEP 2025
BERLIN



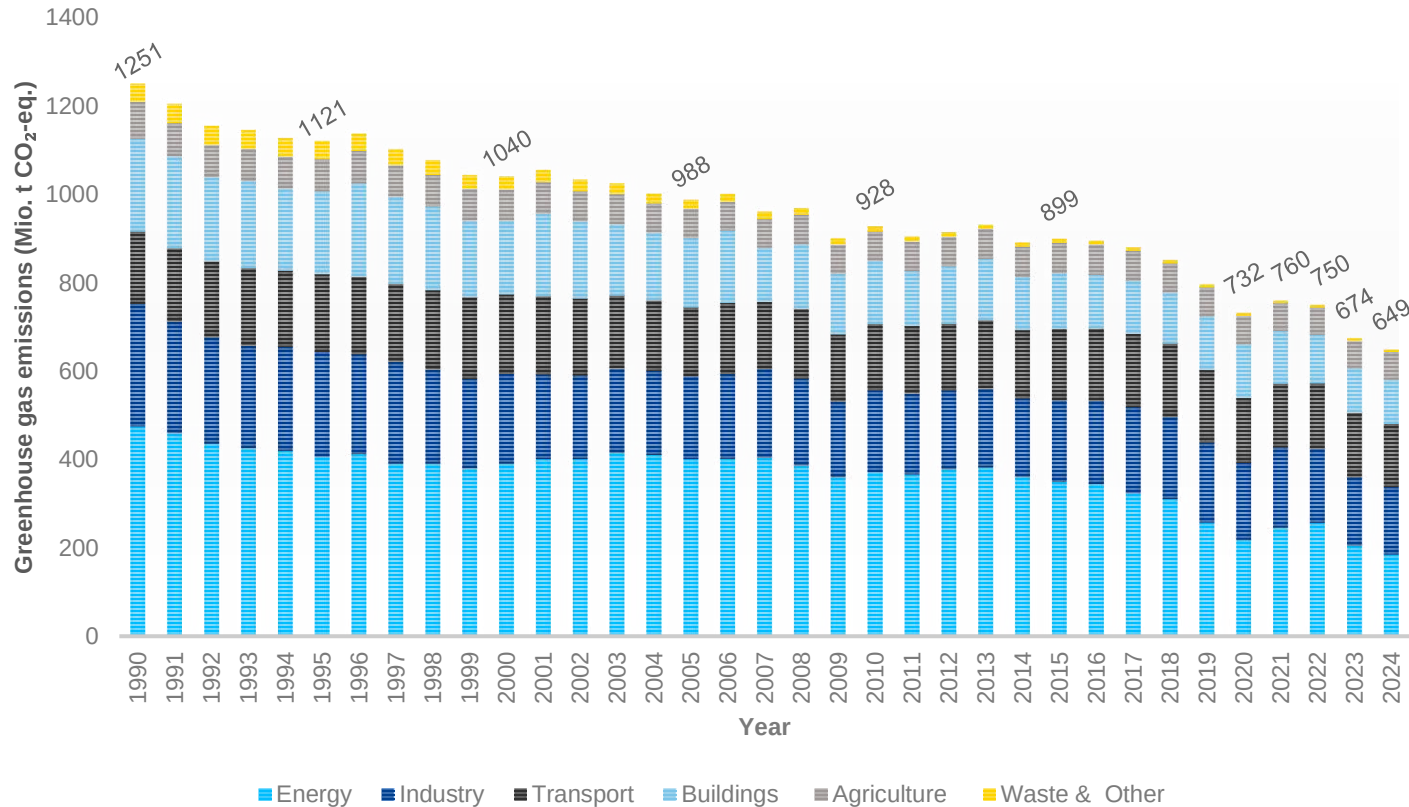
Scope, Scale and Strategy

Insights from the evaluation of company specific
decarbonization plans

Alexandra
Löwenstein,
Peter Radgen

Motivation

GHG emissions in Germany by sector over time



- Goal 2030:
438 mio. t CO₂-eq.
- Key pillars of decarbonization:
 - Scale up renewables.
 - Boost energy efficiency across all sectors.

► **Net-Zero 2045**

[1]

Motivation & Context

From net-zero talk to action



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- Module 5 “Transformation Plans” introduced in 2021:
 - Supports the development of GHG reduction pathways aligned with the GHG Protocol, covering
 - Scope 1 (direct emissions),
 - Scope 2 (indirect emissions from purchased energy),
 - and optionally Scope 3 (value chain emissions).

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From money to impact: our logic



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Input

Output

Outcome

impact

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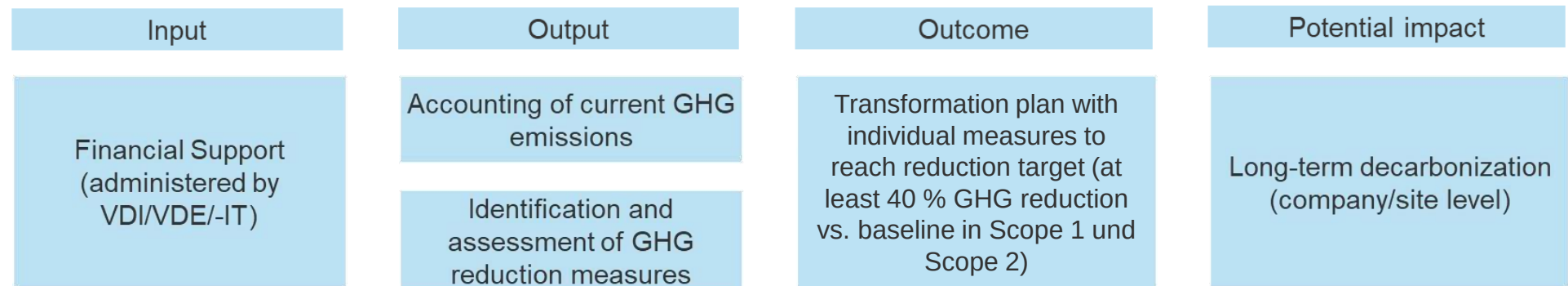
Potential impact

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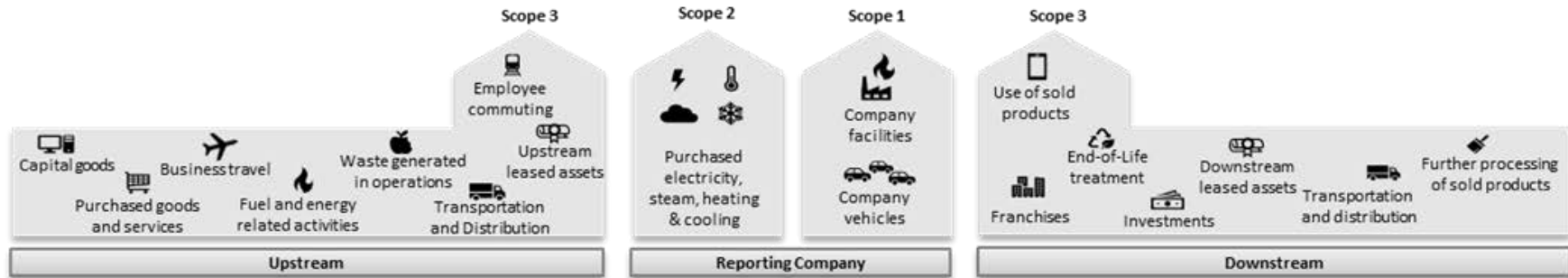
[2]

Motivation & Context

Nice logic model—but what are Scope 1, 2 & 3?

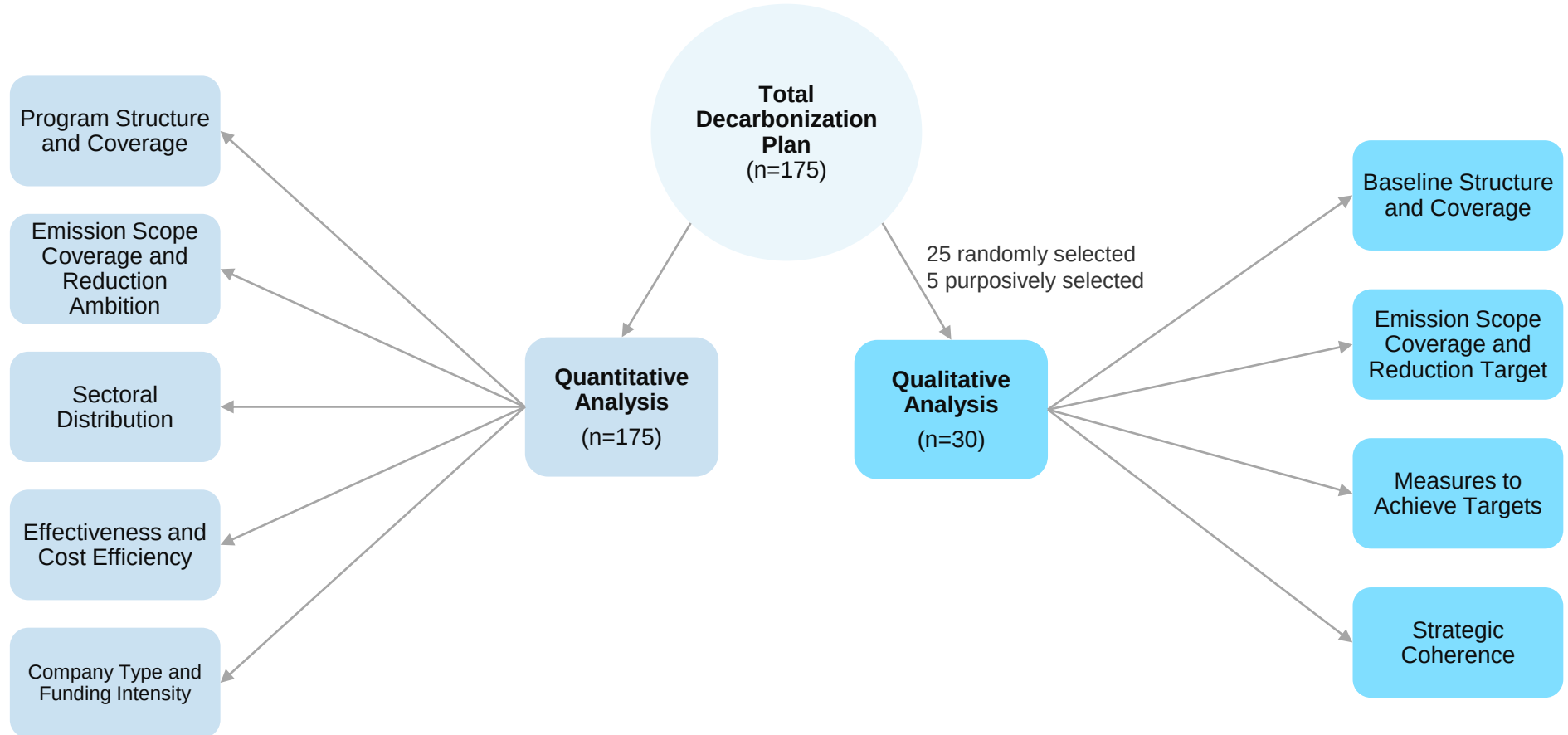


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Methodology

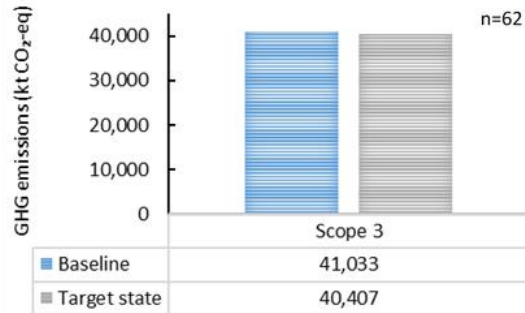
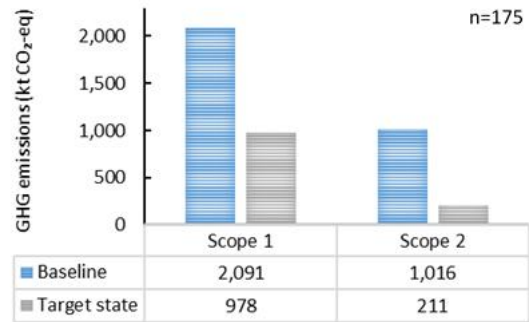
Module 5 (2021 -2023)



23-Sep-25

Results & Discussion

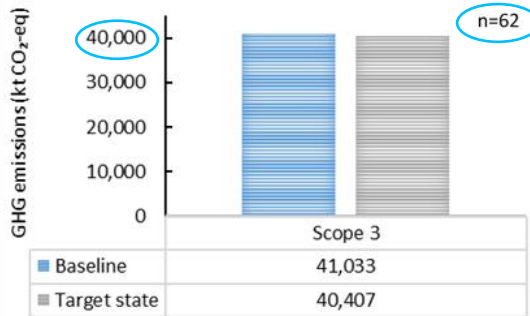
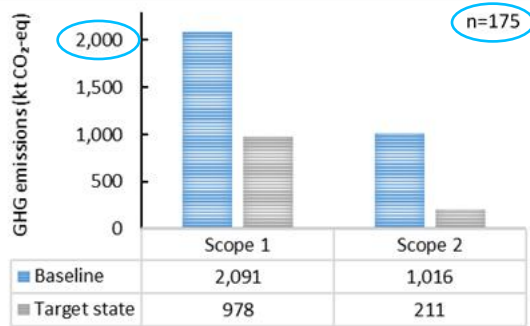
Quantitative Analysis (n=175)



- The total **planned** reduction **targets** of the transformation plans:
 - Scope 1 emissions: 1.1 million tons of CO₂-eq. (-53 %)
 - Scope 2 emissions: 0.8 million tons of CO₂-eq. (-79 %)
 - Scope 3 emissions: 0.6 million tons of CO₂-eq. (-2 %)
 - Addressed in 62 of 175 plans, but contributed little to overall reductions.

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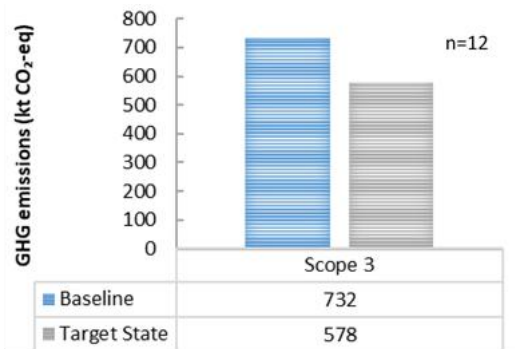
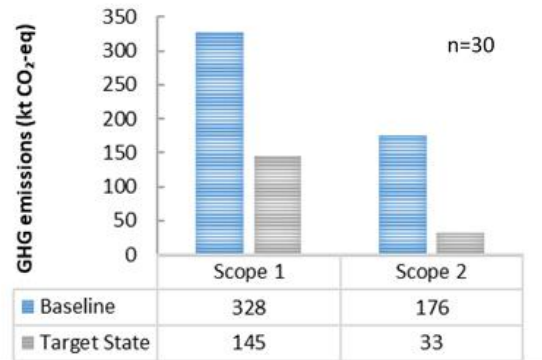
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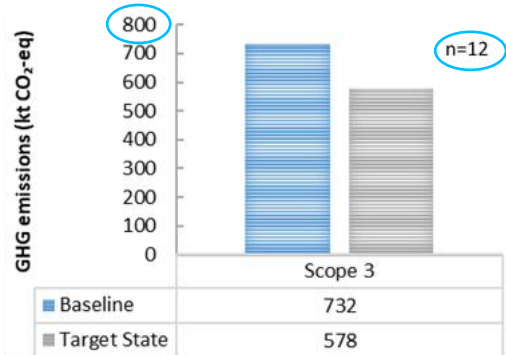
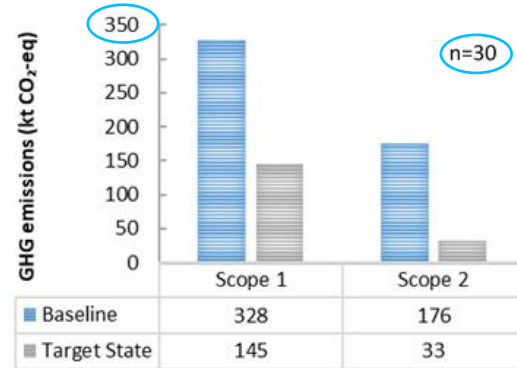
Qualitative Analysis (n=30)



- 25 random + 5 specific decarbonization plans:
 - 14 SMEs
 - 11 LEs
- **Planned reduction targets:**
 - Scope 1 emissions reduced by 55 %
 - Scope 2 emissions reduced by 81 %
 - Scope 3 emissions reduced by 21 %
 - Addressed in 12 of 30 plans, but contributed little to overall reductions.

Results & Discussion

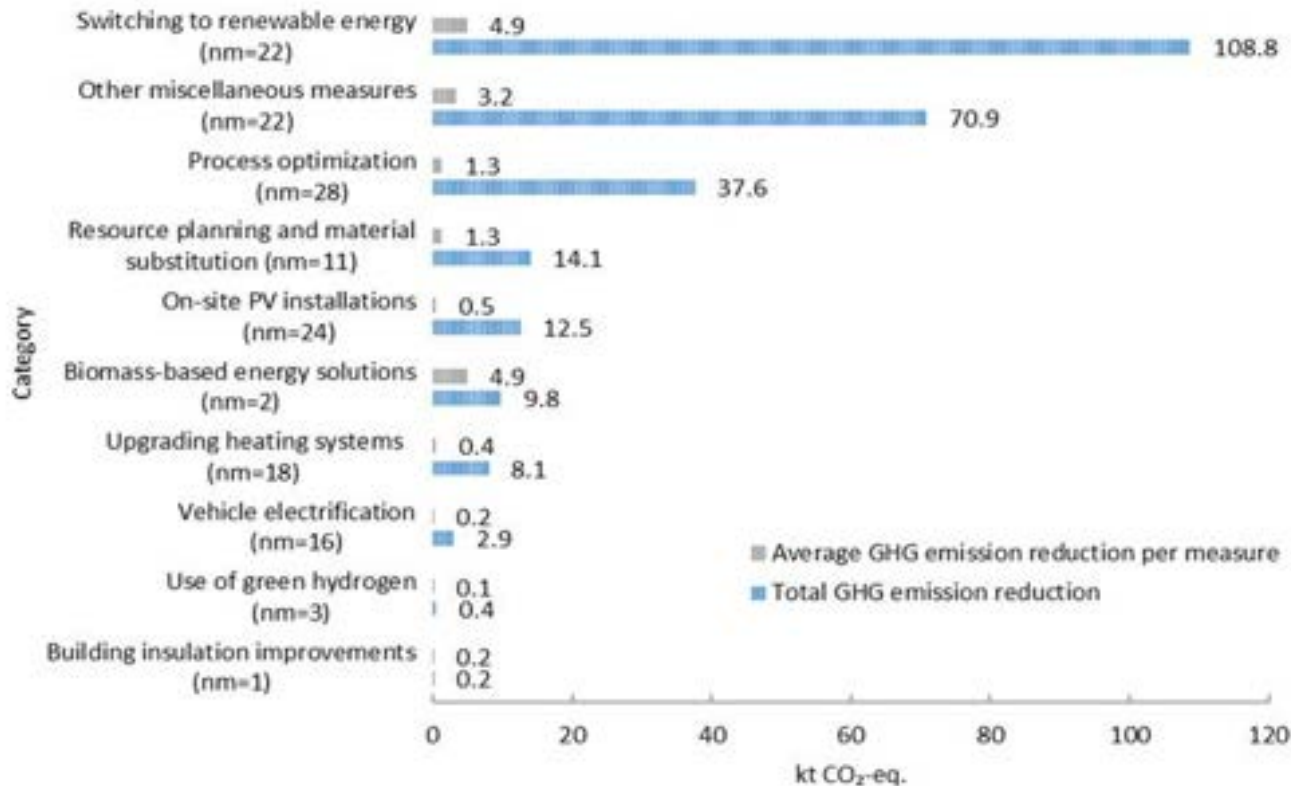
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Results & Discussion

Planned GHG reductions by measure type



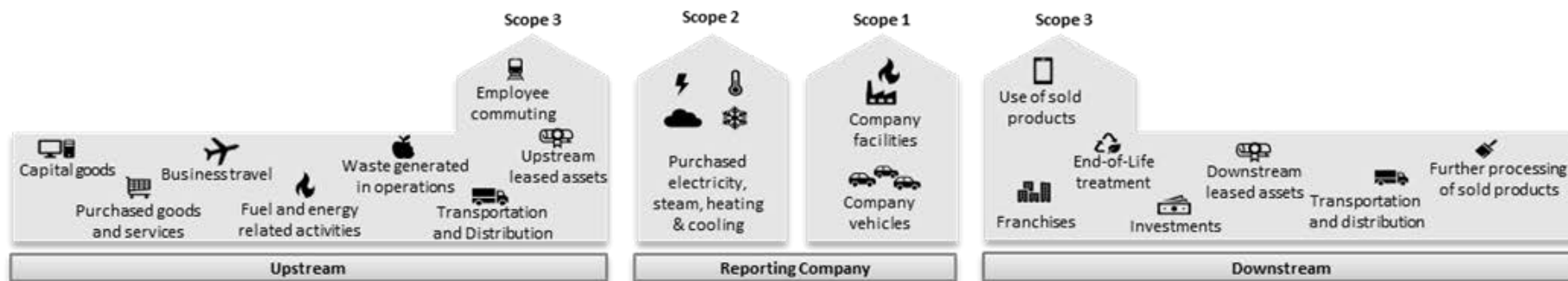
Results & Discussion

Why do Scope-3 emissions dominate yet remain under-addressed?



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Upstream Value Chain

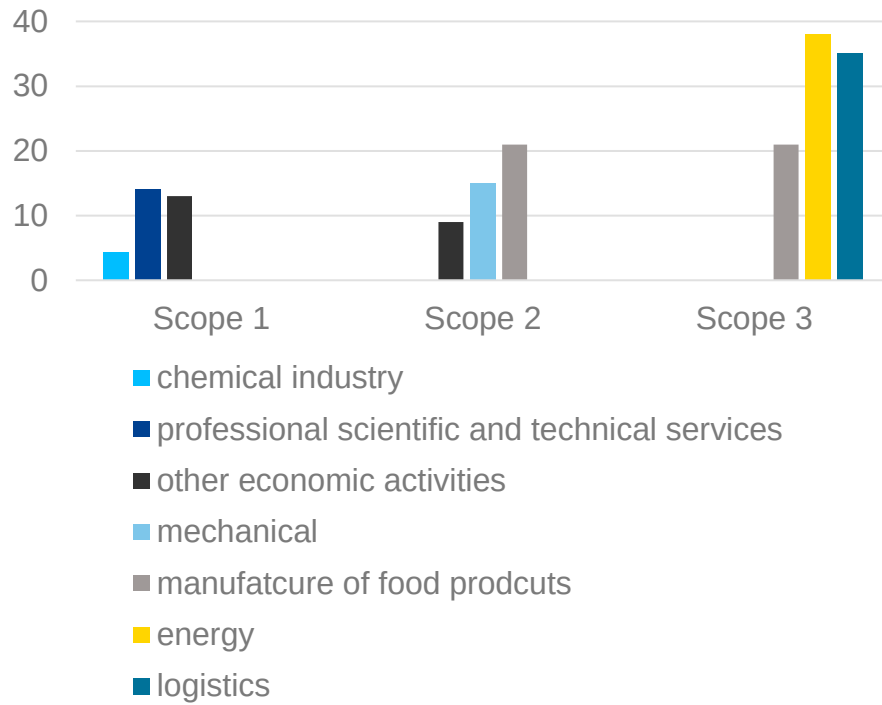
8 different categories

Downstream Value Chain

7 different categories

Results & Discussion

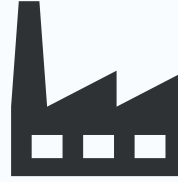
Where do Scope-3 emissions dominate along the value chain?



- If companies addressed Scope 3, they **did not** cover all 15 categories defined under the GHG Protocol.
 - Frequently included: business travel, waste, and energy-related activities.
 - More complex categories such end-of-life treatment were often omitted.
 - Rely on proxy data or sectoral averages, which limits comparability and increases the risk of superficial or selectively framed reporting

Results & Discussion

Example: Energy Industry



Reporting Company

Scope 1

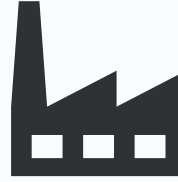
e.g., from power/heat
plants

e.g., electricity for offices,
pumping/compression

Scope 2

Results & Discussion

Example: Energy Industry



Reporting Company

e.g., cat 2 – Capital goods:
power plants, grid
equipment, transformers

Scope 3

Scope 1

e.g., from power/heat
plants

e.g., electricity for offices,
pumping/compression

Scope 2

Scope 3

e.g., cat 11 – Use of sold
products: use of sold
electricity/heat by
customers

Conclusion

Nice start, but we can do better!



- **Scope 3 gap**



- Need standardized Scope 3 methods/guidance.

- **Implications for Program & Policy**



- Simplify procedures; provide templates & SME-targeted support.
- Couple planning support with investment support.
- Add follow-up monitoring to boost commitment/learning.

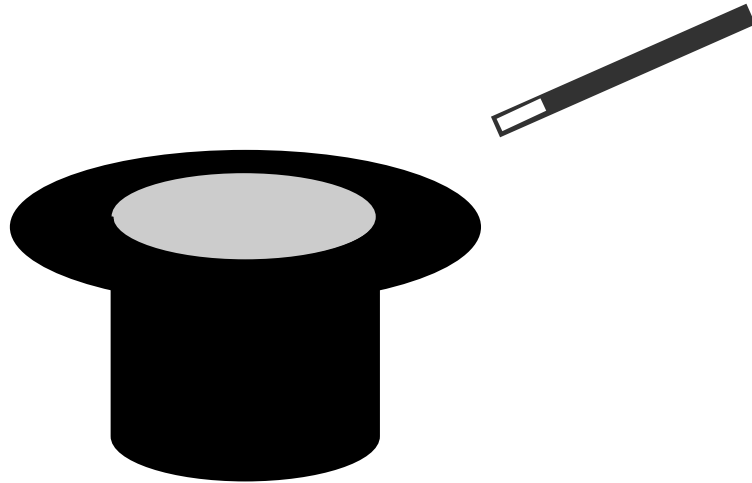
- **Limitations**



- Heterogeneous data; possible selection bias.
- Unknown implementation rate of plans.
- Limited cross-industry comparability for Scope 3.

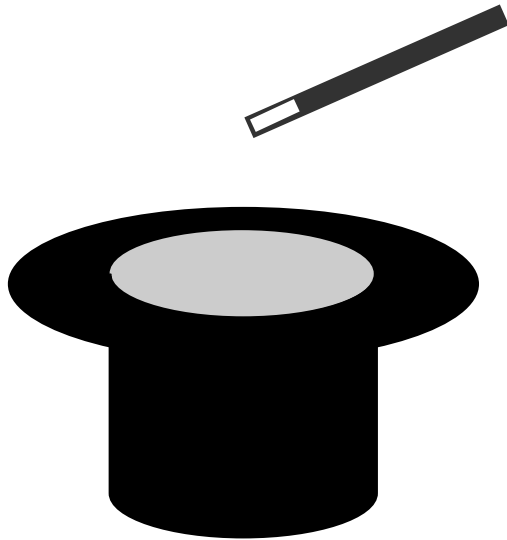
Life Hack

When nothing else works:



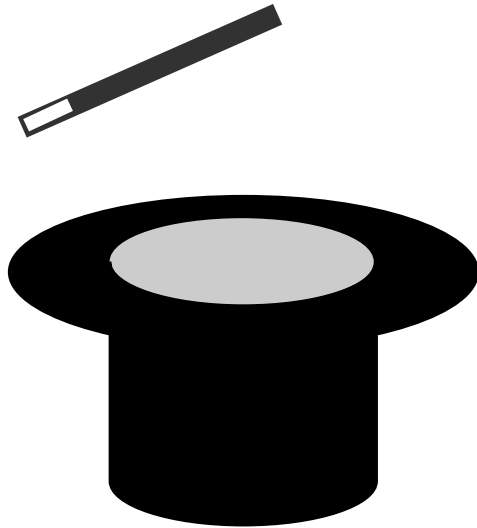
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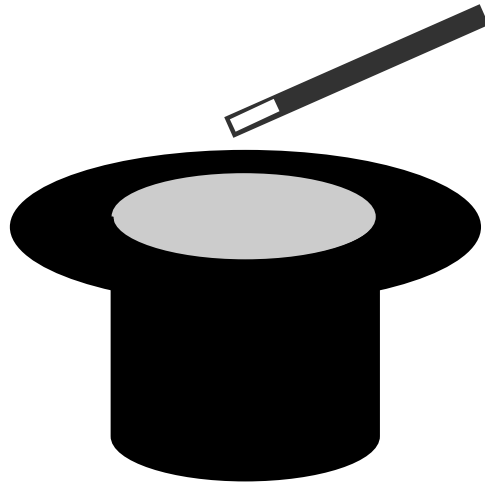
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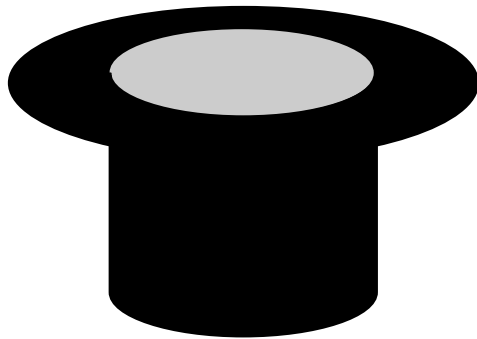
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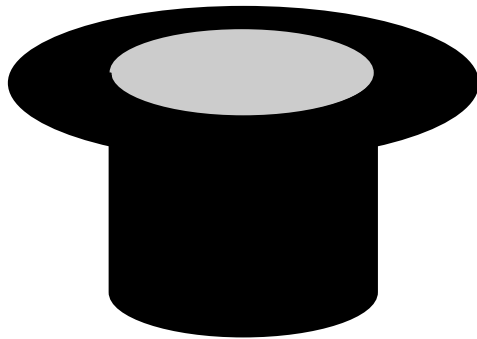
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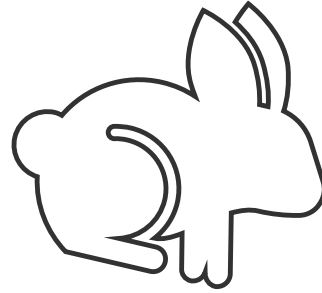
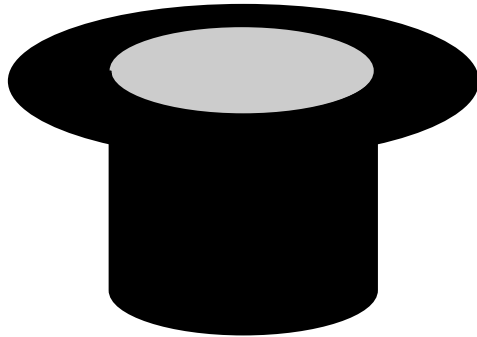
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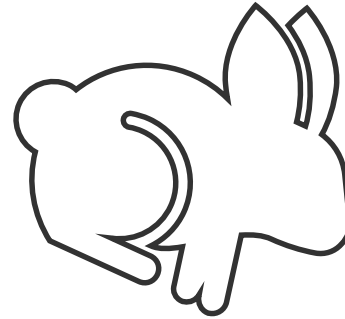
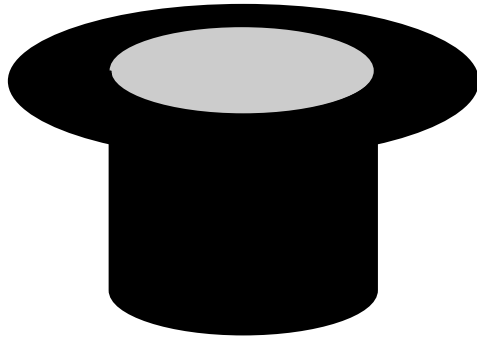
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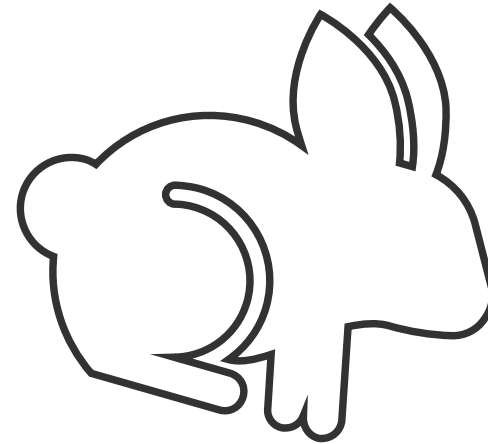
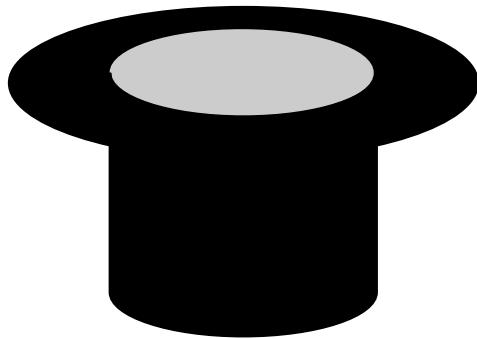
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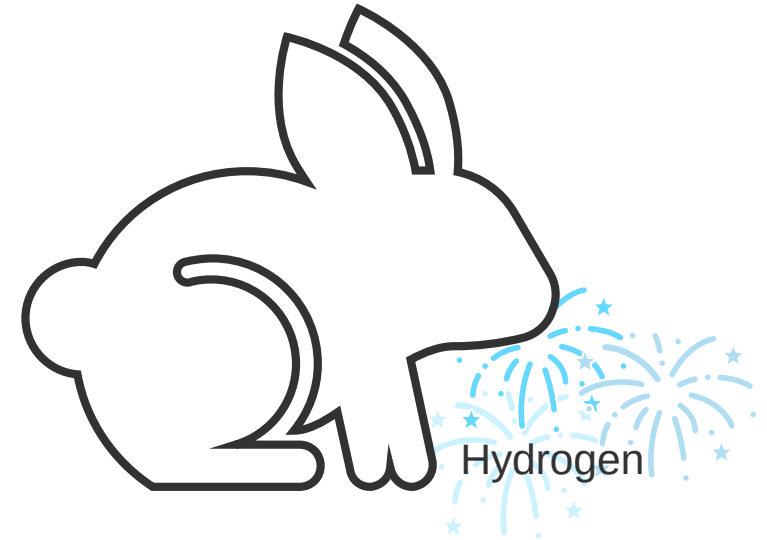
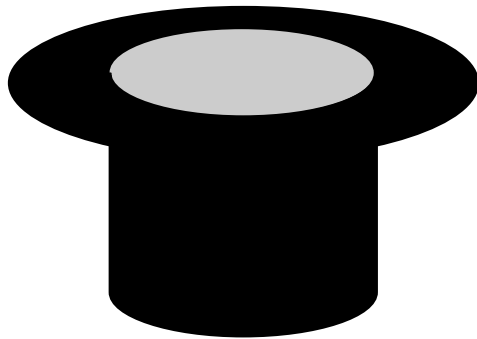
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References



- [1] Own Visualization based on <https://www.umweltbundesamt.de/daten/klima/treibhausgas-emissionen-in-deutschland#treibhausgas-emissionen-nach-kategorien>, 16.09.2025
- [2] Own Visualization based on Neusel et. al.(2024). *Evaluation Bundesförderung für Energie- und Ressourceneffizienz in der Wirtschaft: Jahresbericht 2023*. German Federal Ministry for Economic Affairs and Climate Action (BMWK). <https://www.bmwk.de/Redaktion/DE/Evaluationen/Foerdermassnahmen/241217-evaluation-eew-jahresbericht-2023.html>
- [3] Own Visualization based on Bhatia, P., Cummis, C., Brown, A., Rich, D., Draucker, L., & Lahd, H. (2011). *Corporate Value Chain (Scope 3) Accounting and Reporting Standard: Supplement to the GHG Protocol Corporate Accounting and Reporting Standard*.

Thank you!

Let's stay in touch



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Prof. Dr.-Ing Peter Radgen

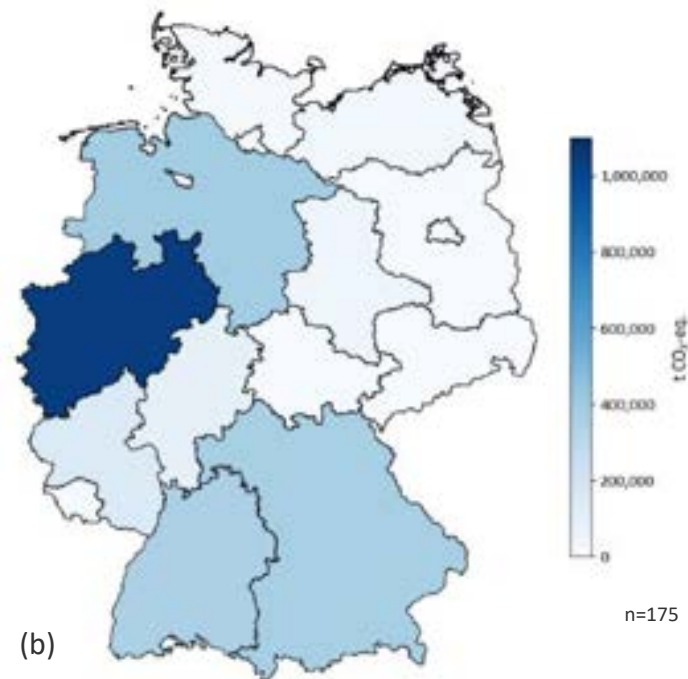
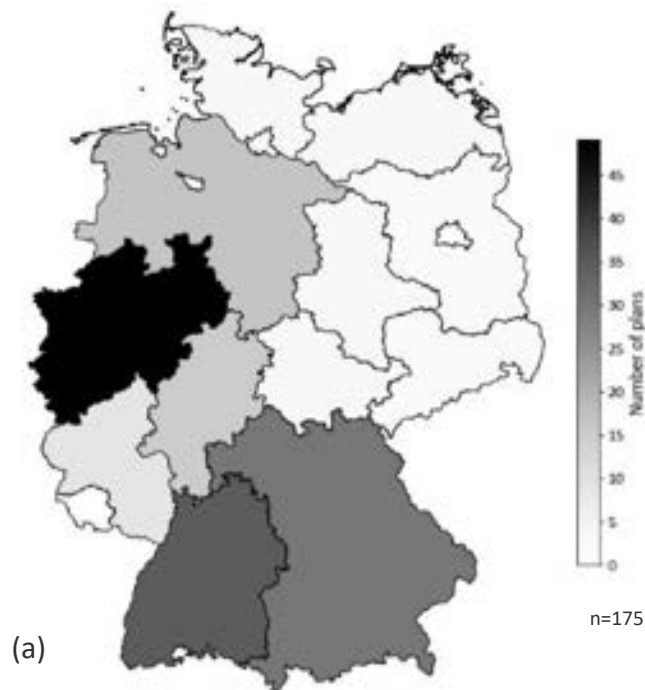
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Results & Discussion

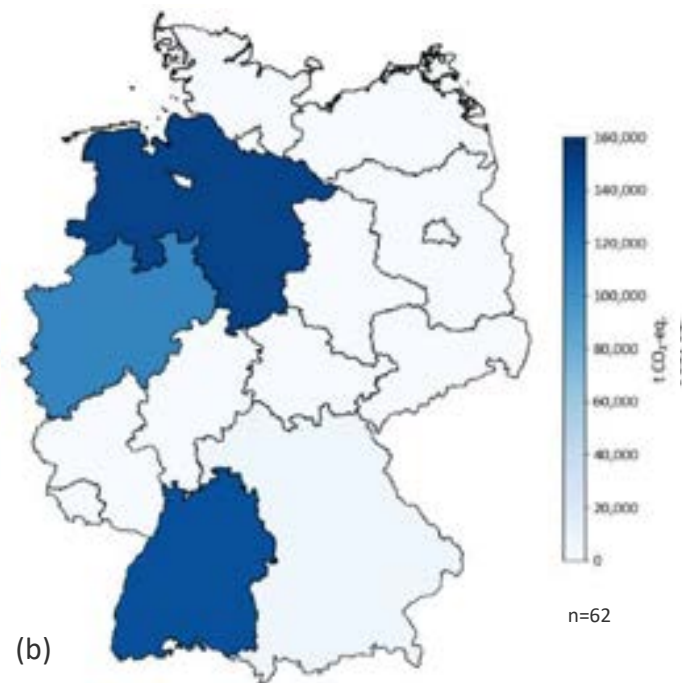
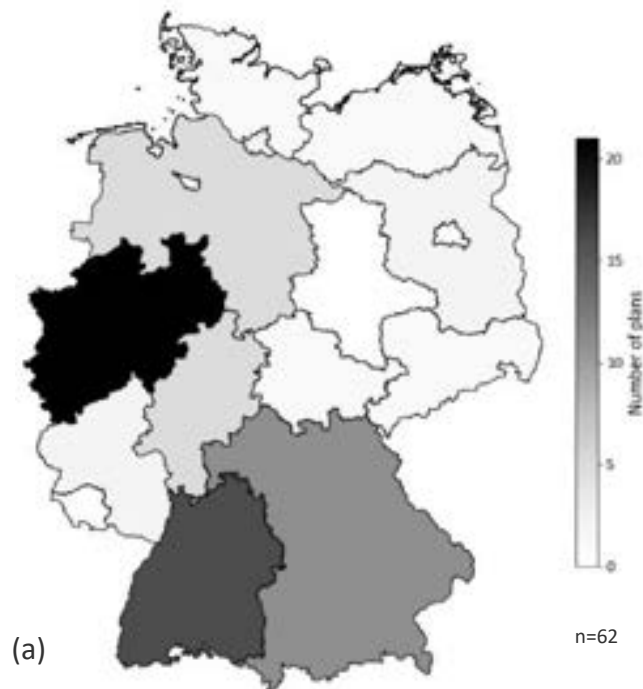
Geographic distribution (n=175)



Geographic distribution of (a) transformation plans and (b) cumulative planned GHG emission reductions (Scope 1–3) by German federal state.

Results & Discussion

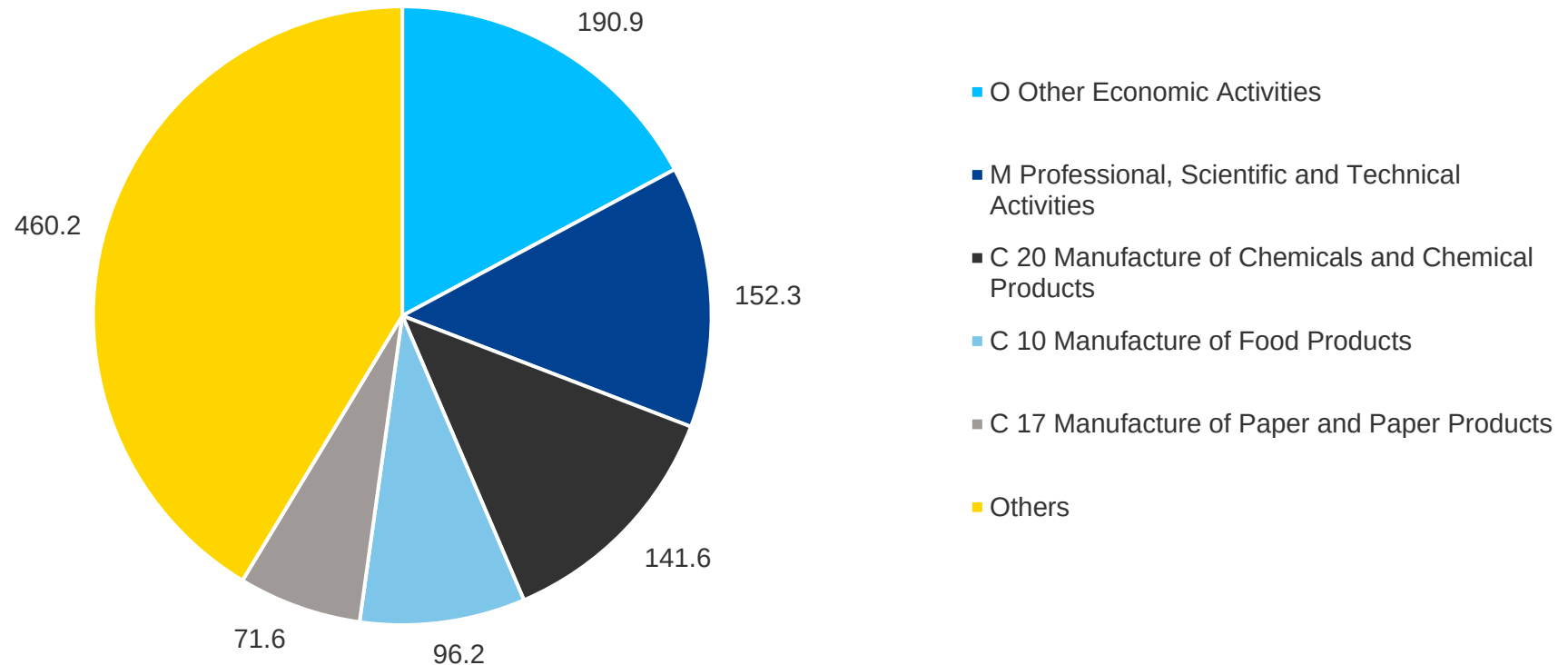
Geographic distribution (n=62)



Geographic distribution of (a) Scope 3-specific decarbonization plans and (b) their cumulative planned GHG reductions by German federal state.

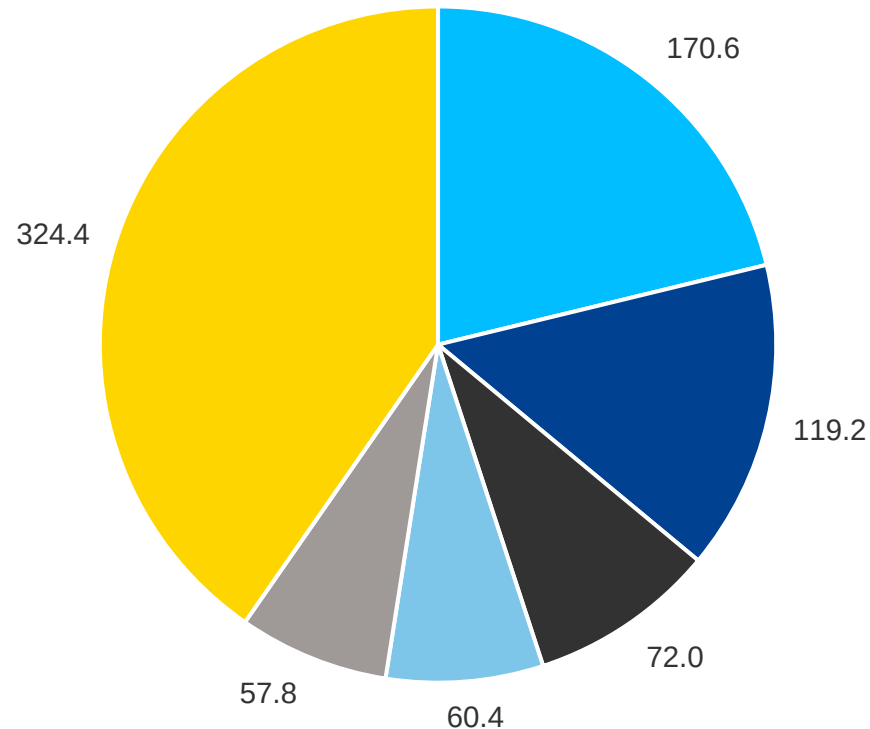
Results & Discussion

Absolute planned Scope 1 emission reduction in kt CO₂ in the next 10 years (n=175)



Results & Discussion

Absolute planned Scope 2 emission reduction in kt CO₂ in the next 10 years (n=175)



- C 10 Manufacture of Food Products
- C 28 Manufacture of Machinery and Equipment
- O Other Economic Activities
- C 20 Manufacture of Chemicals and Chemical Products
- C 24 Manufacture of Basic Metals
- Others

Results & Discussion

Absolute planned Scope 3 emission reduction in kt CO₂ in the next 10 years (n=62)

