

# The Complexity of Great Green Transformations

## *A Socio-ecological Perspective*



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**Input at the European Forum Alpbach**  
**Session moderator: Stefan Thurner**

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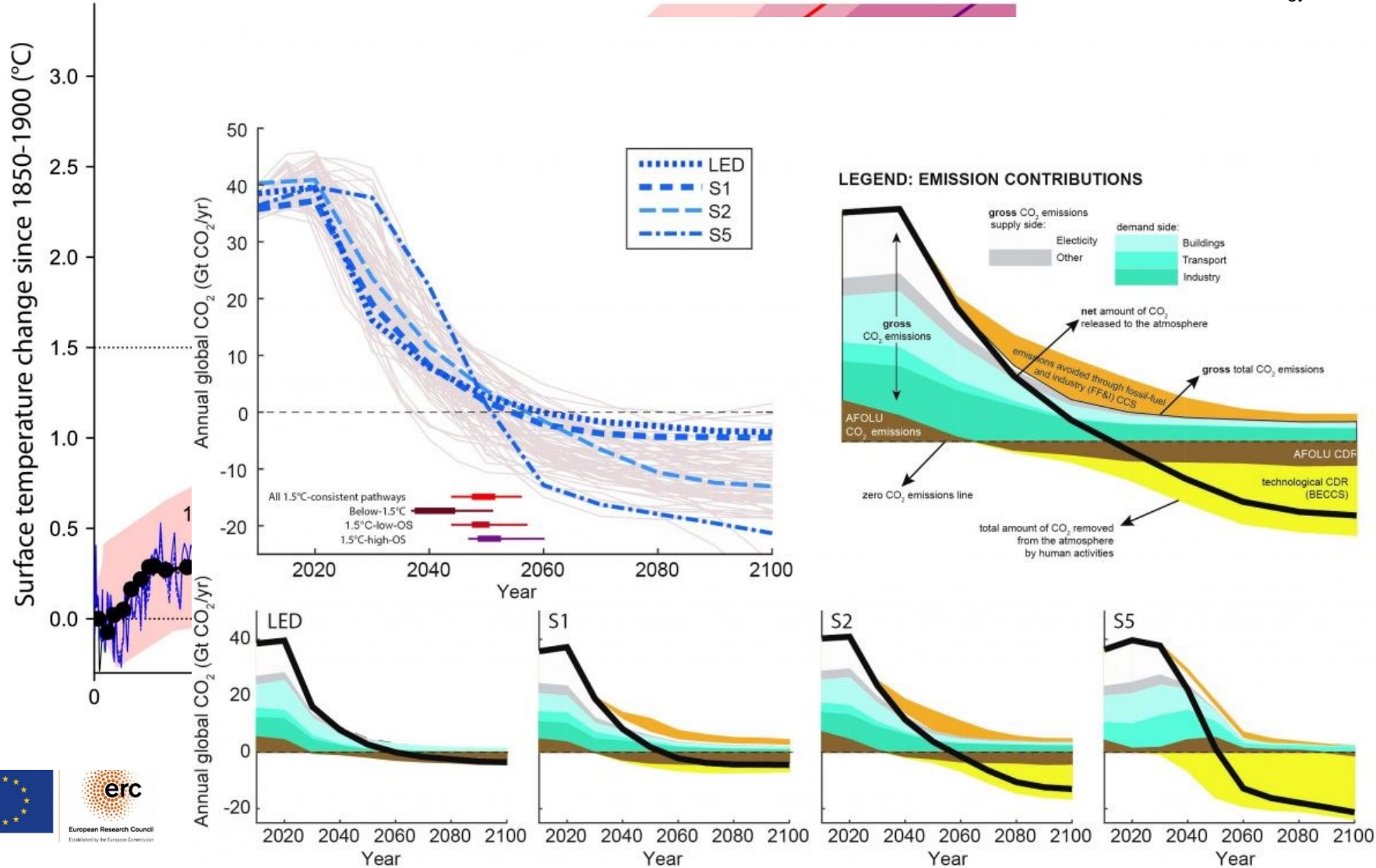
**FWF**

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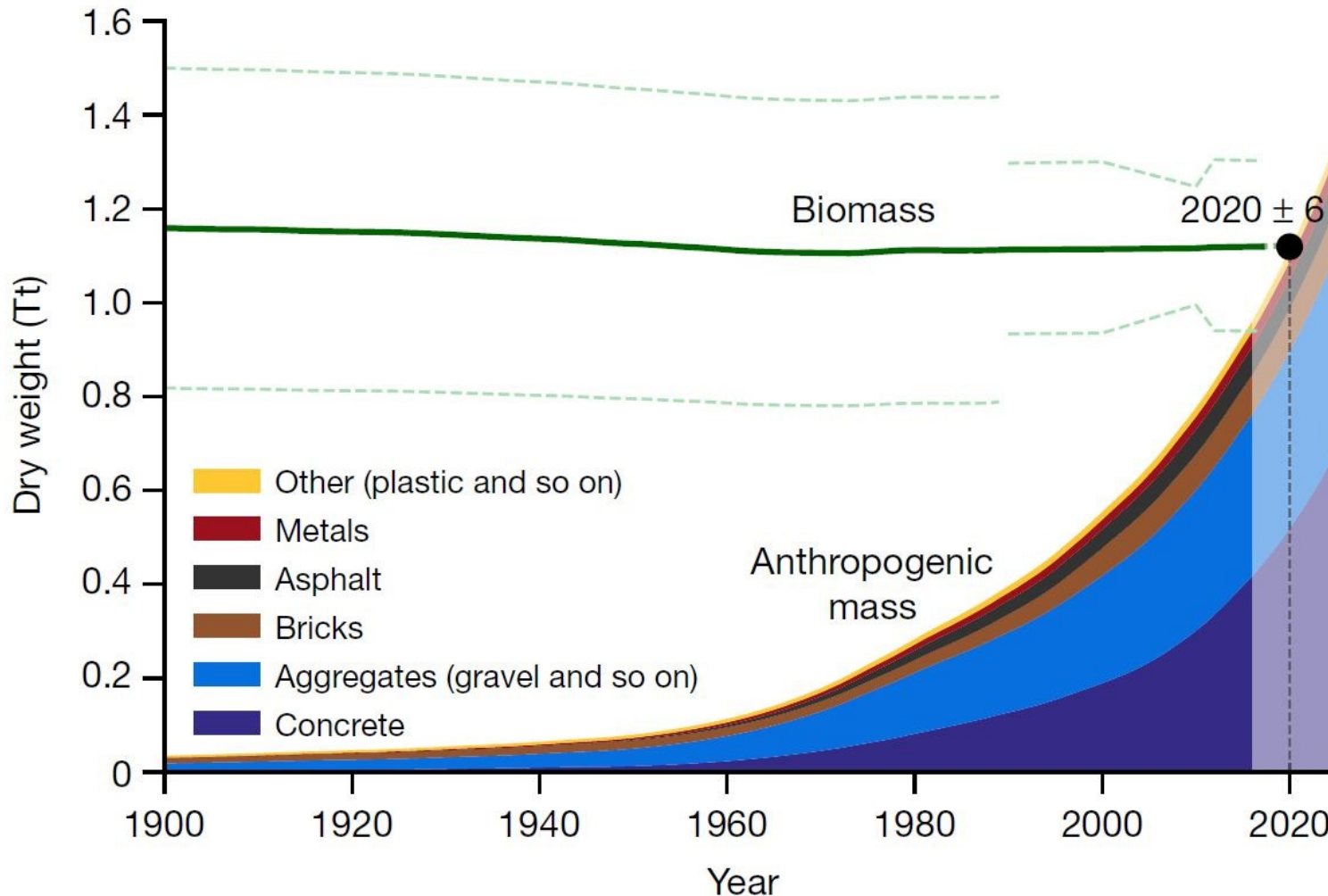
# Historic emission trends vs requirements for Paris target of 1.5



# Global accumulation of buildings & infrastructures vs. biomass



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**1:1 coupled with GDP**

**1900: stock-building materials ~20%**

**Now: stock-building materials ~55%**



Elhacham *et al.* 2020, *Nature* **588**; based on Krausmann *et al.* 2017, *PNAS* **114** and Erb *et al.* 2018, *Nature* **553**

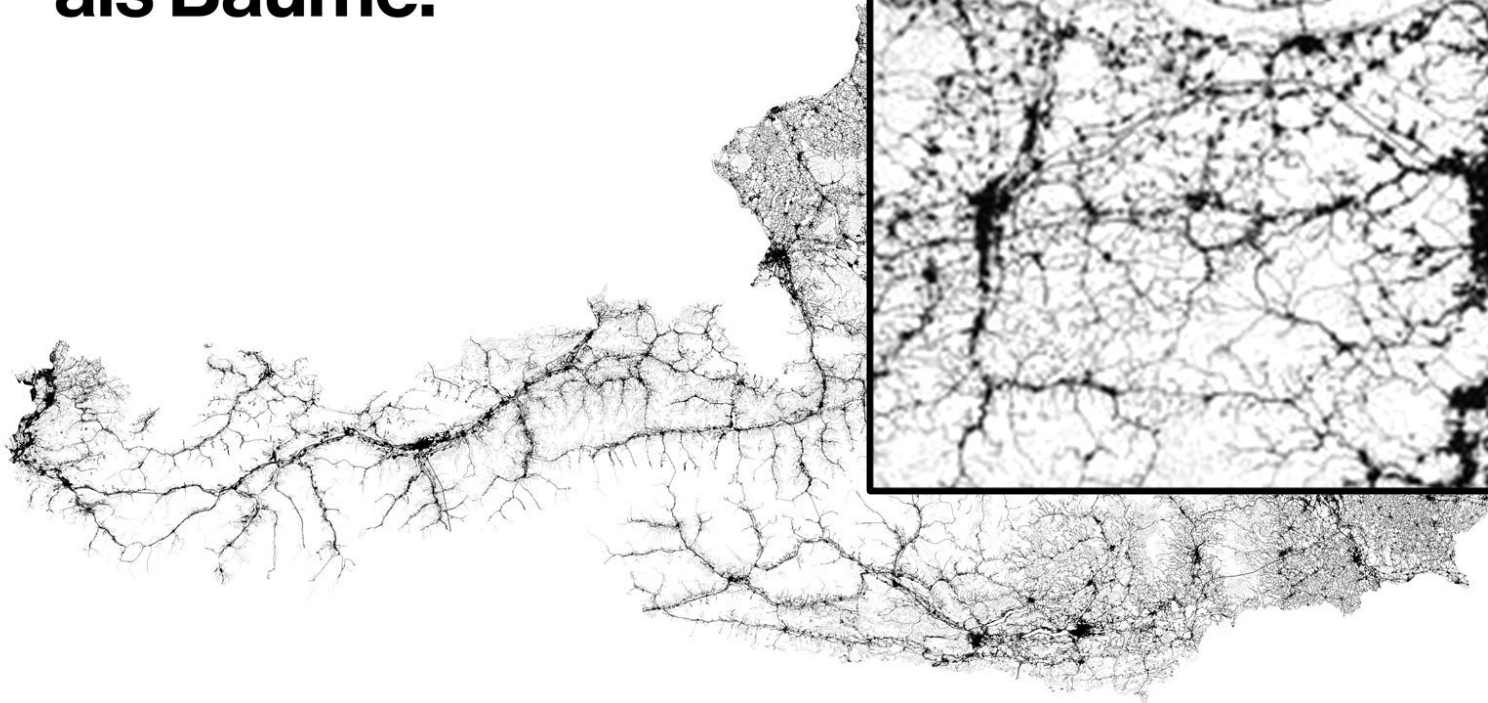
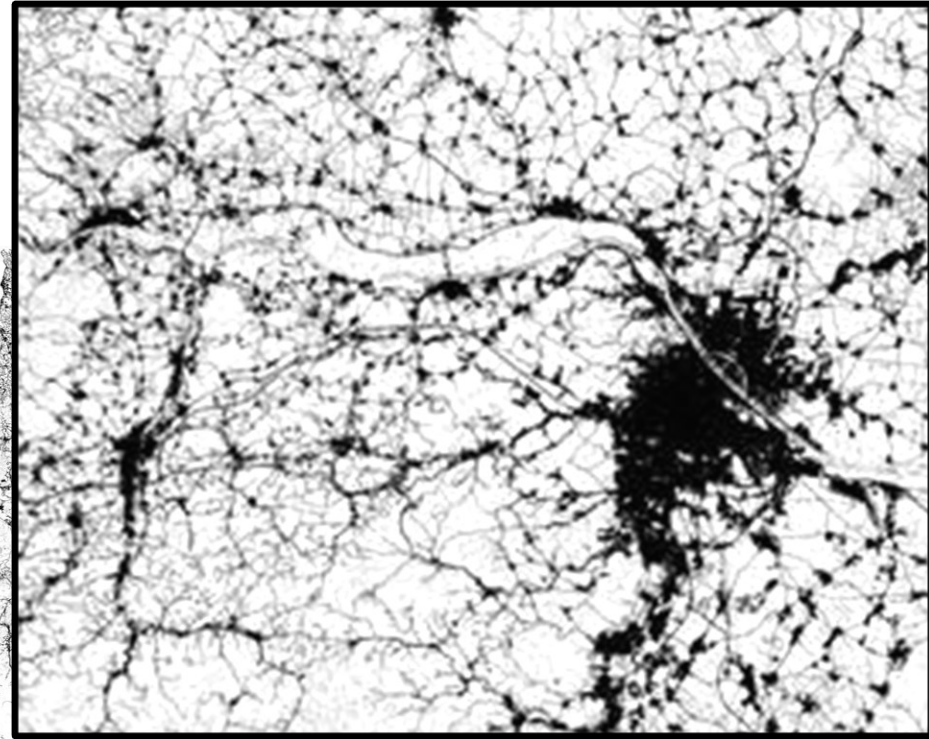


# Infrastructures and buildings in Austria outweigh trees by factor >2



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**Mehr Beton  
als Bäume.**



**Grafik:** EOOS Next / Process Studios.  
**Data:** Haberl *et al.* 2021, *Env. Sci. Tech.* 55



# Towards sustainability?

## Reshaping the stock-flow-service nexus

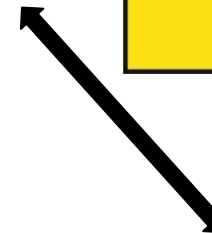
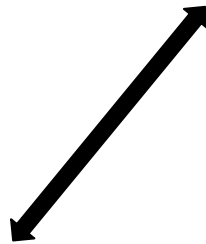


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**Stocks** Buildings, infra-  
structures, machinery

Stocks shape social  
practices of everyday  
life (mobility, shelter, etc.)



**Flows**  
Energy,  
materials



**Services**  
Contributions  
to social well-  
being

Fotos: Helmut Haberl



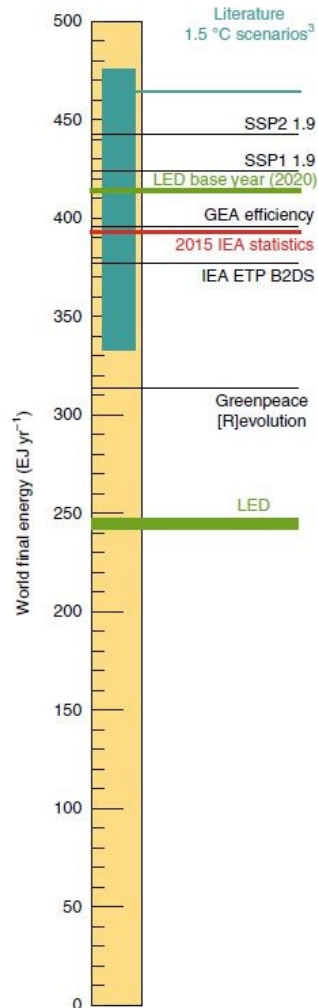
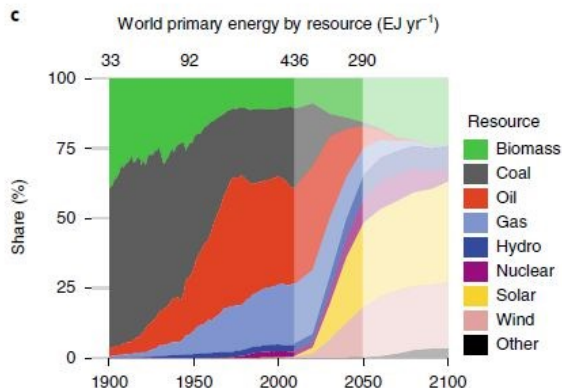
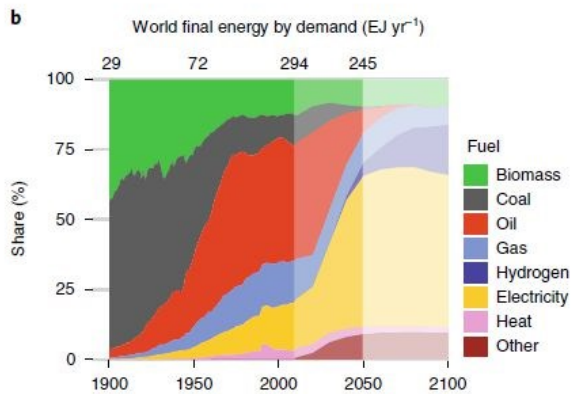
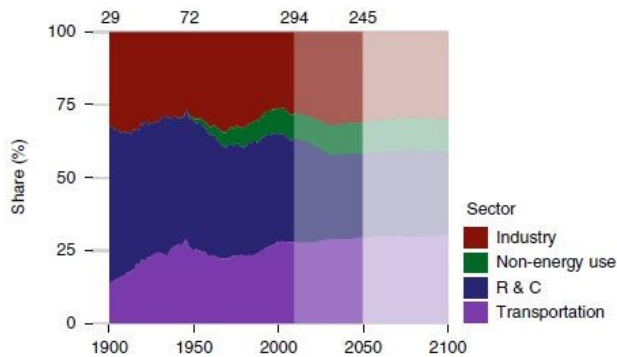
Haberl *et al.* 2017, *Sustainability* **9**; Kalt *et al.* 2019, *Energy Res. & Social Sci.*, **53**, Haberl *et al.* 2021, *Ecol. Econ.* **182**



# Global low-energy demand scenario: less energy, same services



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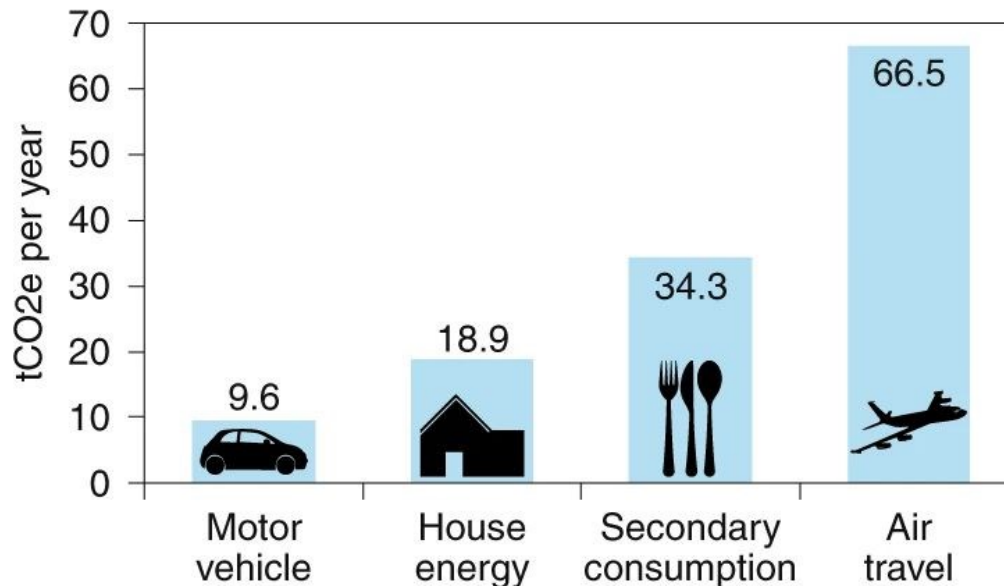


- Global final energy strongly reduced until 2050
- Same energy services as in current trend
- Meets 1.5° climate target
- Avoids controversial technologies (BECCS)
- Completely different investment patterns:
  - Low-energy buildings
  - Transport-sparing settlements
  - Resource-sparing as top priority

# Inequality of GHG emissions between super-rich and average people

**Fig. 1: The estimated carbon footprint of a typical super-rich household of two people.**

From: Shift the focus from the super-poor to the super-rich



**Super-rich:**  
65 tCO<sub>2eq</sub>/cap/yr  
**Austrian average:**  
9 tCO<sub>2eq</sub>/cap/yr  
**Global average:**  
6.5 t CO<sub>2eq</sub>/cap/yr  
(AT: UBA, Global: PBL)

Data were derived from four consumption habit surveys, and show the average of four carbon-footprint calculators for each of four consumption categories. Total emissions are approximately 129.3 tCO<sub>2e</sub> per year.



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Free data download:  
<https://www.wiso.boku.ac.at/en/institut-fuer-soziale-oekologie-sec/data-download/>



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