TransFair-AT

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Assessing Households' Vulnerability To Carbon Pricing

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Background

- Distributional effects of climate policy instruments have become increasingly relevant both in research and in political discussions
- Acceptance of climate policies strongly depending on their perceived fairness
- (Presumed) regressivity of climate policy instruments (most notably fiscal measures) often impedes an evidence-based discussion on the political level and is used as an argument against the implementation of respective measures

Objective of the TransFair-AT project:

Comprehensive and innovative model-based analyses of the economic incidence and social impacts of a complete decarbonisation of the sectors residential buildings and passenger transport in Austria by 2040 under different compensation measures

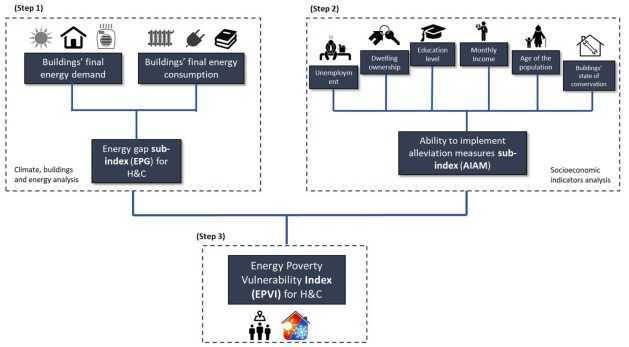
→ Identification of Just Transition Pathways

- Development of decarbonisation scenarios
- Identification of vulnerable groups
- Development of targeted compensation mechanisms to mitigate the burden of these climate policies for particularly vulnerable groups
- Iterative linking of the macroeconomic model DYNK with, the transport demand model MARS, the vehicle choice model SERAPIS, and the building stock model Invert/EE-Lab to simulate the impacts

Literature Overview

- Definition and Measurement of Energy Poverty
  - Boardman (1991): Households unable to secure adequate energy services for 10% of their income
  - Hills (2012): Low Income High Costs (LIHC) Indicator
  - EU SILC: Qualitative Indicators ("Inability to keep home adequately warm")
- Definition and Measurement of Energy Vulnerability
  - "Risk of households falling into a situation of energy poverty" (Llera-Sastresa et al. 2017)
  - Multi-dimensional indices (e.g. Gouveia et al. 2019 – EPVI, Walker et al. 2012)
- Definition and Measurement of Transport Poverty and Vulnerability
  - Affordability measures: Low Income High Costs (LIHC) Indicator
  - Multi-dimensional indices for transport vulnerability (e.g. Berry et al. 2016, Kelly et al. 2023)
- Distributional impacts of carbon pricing in Austria (e.g. Kirchner et al. 2019, Eisner et al. 2021, Kettner et al. 2023)

Energy Poverty Vulnerability Index (EPVI)



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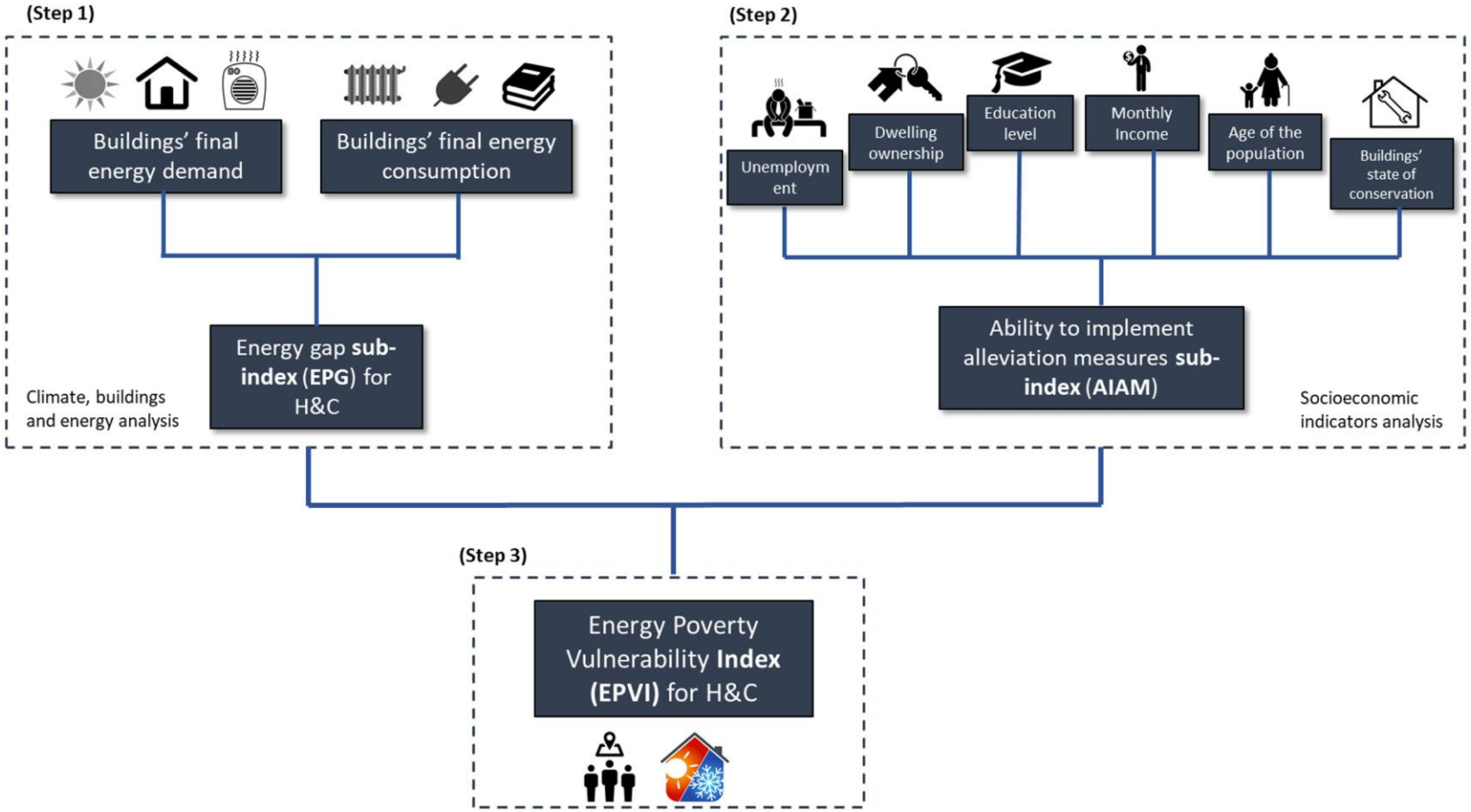

Source: Gouveia et al. (2019)

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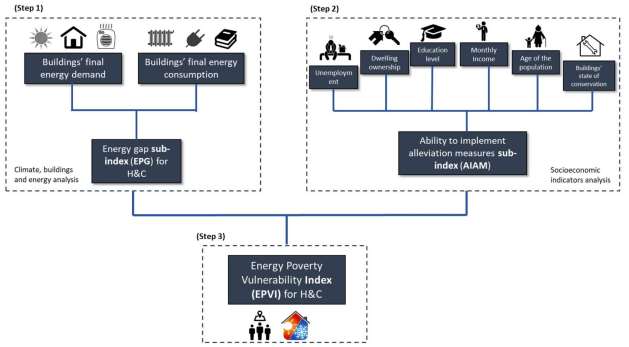

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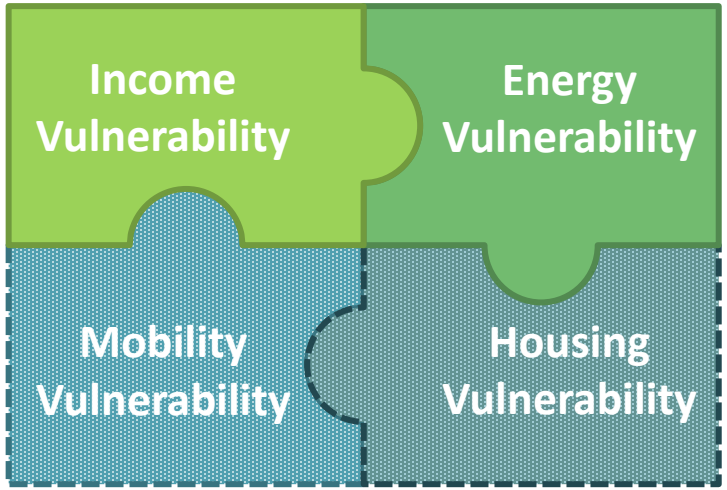
Definition of Vulnerability to Carbon Pricing by EC (Regulation (EU) 2023/955)

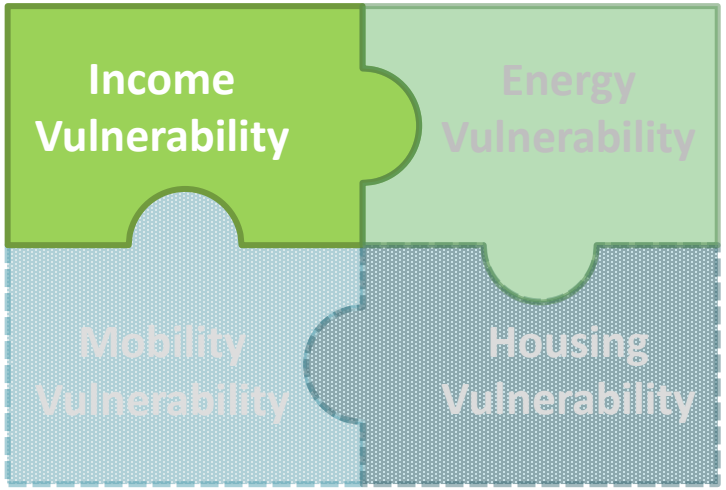
- Vulnerable households: "households in **energy poverty or** households, including lower middle-income ones, that are **significantly affected by [carbon pricing impacts]** and **lack the means to renovate the building they occupy**"
  - Energy poverty: "a household's lack of access to essential energy services, where such services provide basic levels and decent standards of living and health, […], caused by a *combination of factors*, including at least *non-affordability, insufficient disposable income, high energy expenditure* and *poor energy efficiency of homes*" (Directive (EU) 2023/1791)
- Vulnerable transport users: "individuals and households in **transport poverty**, but also individuals and households, including low income and lower middle-income ones, that are **significantly affected by [carbon pricing impacts] and lack the means to purchase zero- and low-emission vehicles** or to **switch to alternative sustainable modes of transport**, including public transport"
  - Transport poverty: "individuals' and households' *inability or difficulty to meet the costs of private or public transport*, **or** their *lack of or limited access to transport needed for their access to essential socioeconomic services and activities*, taking into account the national and spatial context"

Development of a Composite Index for Identifying Vulnerable Households



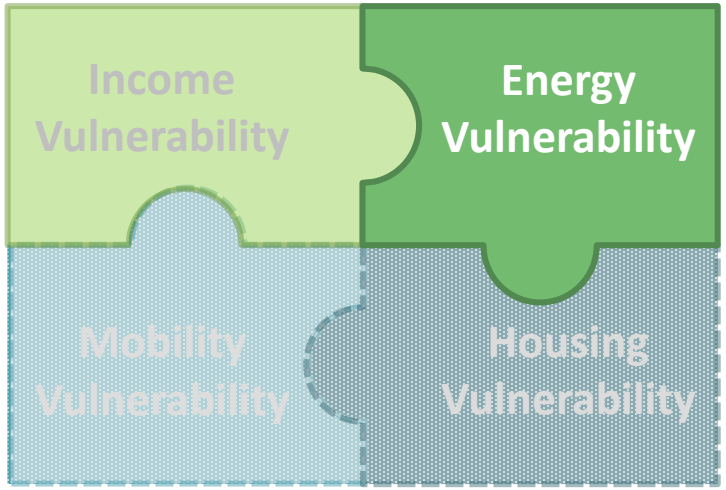
- What are the characteristics?
- Which key indicators provide clues to the relevant sub-aspects?
- Limitations:
  - Data sources / data availability?
  - Representation in models

Dimension I: Income Vulnerability



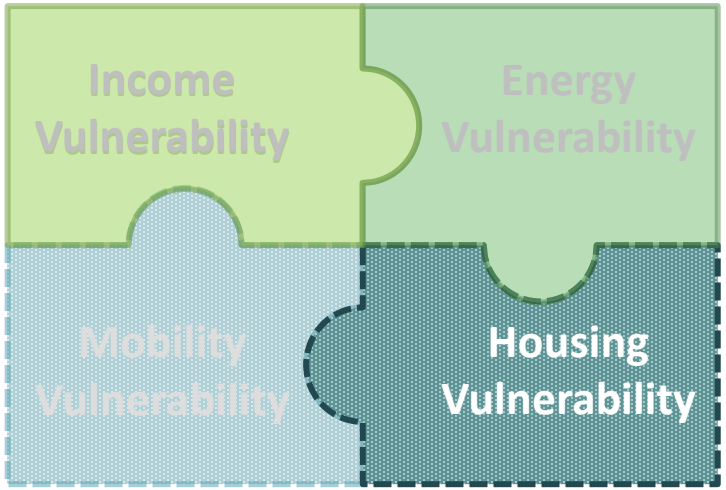
- Characteristics:
  - Low income (below 60% of the equivalized median income; corresponds to the group at risk of poverty)
  - (Low) middle income (above 60% of the equivalized median income to below 180% of the equivalized median income)
- Indicator:
  - Equivalized net household income of max. 140% of the equivalized median income
- Data source: HBS

Dimension II: Energy Vulnerability



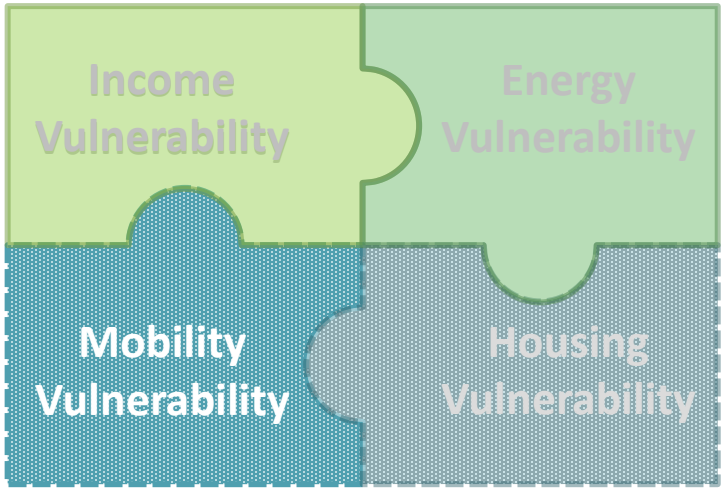
- Characteristics
  - Unaffordability of access to basic energy services
    - Unaffordability of adequate supply of heating, cooling and lighting
    - Unaffordability of energy to run household appliances
  - High energy costs
- Indicators
  - Use of fossil fuels at home
  - Perceived unaffordability to keep the apartment adequately warm
- Data sources: HBS, EU-SILC

Dimension III: Housing Vulnerability



- Characteristics
  - Inability to renovate dwelling or change heating system
- Indicators
  - Households living in rent
  - Households living in apartment buildings
- Data source: HBS

Dimension IV: Mobility Vulnerability

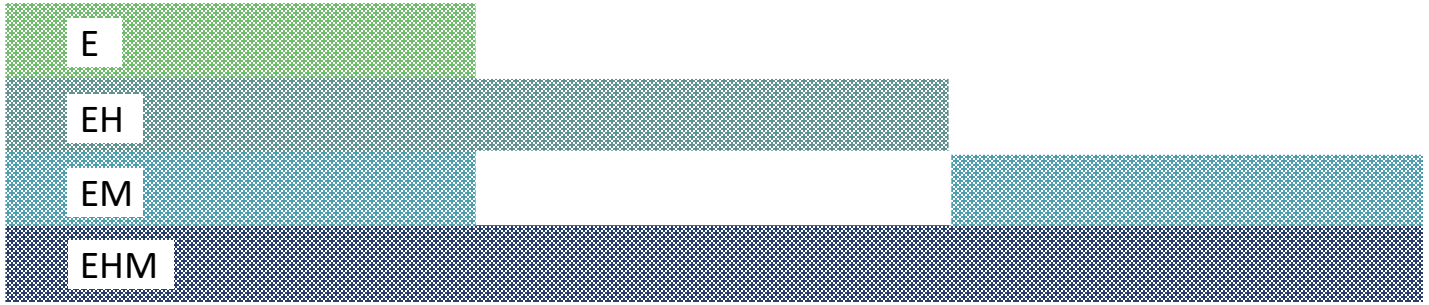


- Characteristics
  - Households that lack the means to purchase zero- and low-emission vehicles
  - Household that lack the means to switch to alternative sustainable modes of transport
- Indicators
  - Households living in areas with poor quality of public transport
- Data source: Special Evaluation by Statistics Austria – linked to HBS

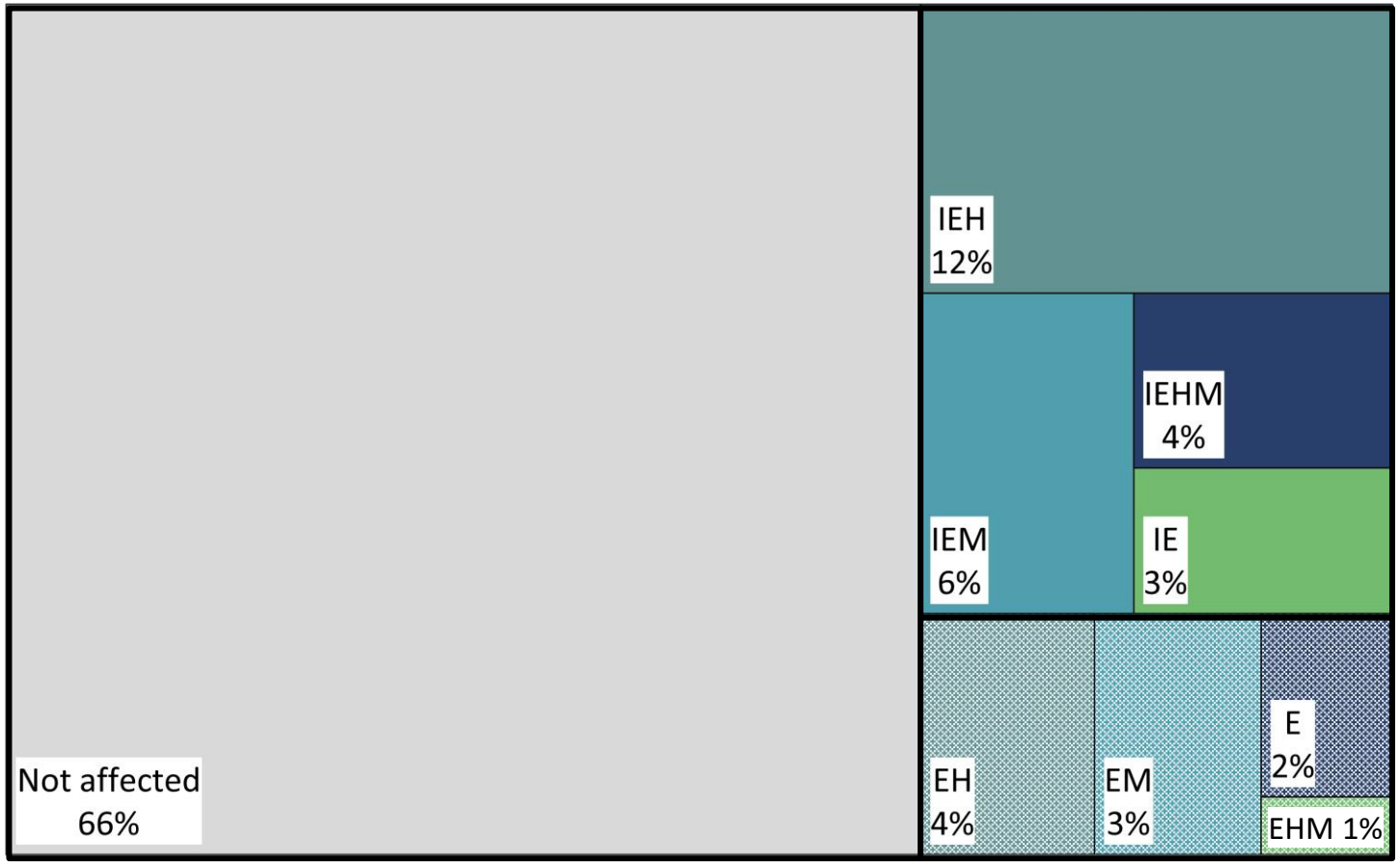
Four Types of Vulnerable Households

Index of vulnerable households

Income vulnerability	Energy vulnerability	Housing vulnerability	Mobility vulnerability
Equivalised disposable household income below 140% of the national median equivalised disposable income	Use of fossil fuels at home **or** Perceived unaffordability keeping home adequately warm	Household living in rented accommodation **or** Household living in muti-family houses	Household in living in regions with poor public transport quality



Households' Vulnerability to Carbon Pricing in Austria

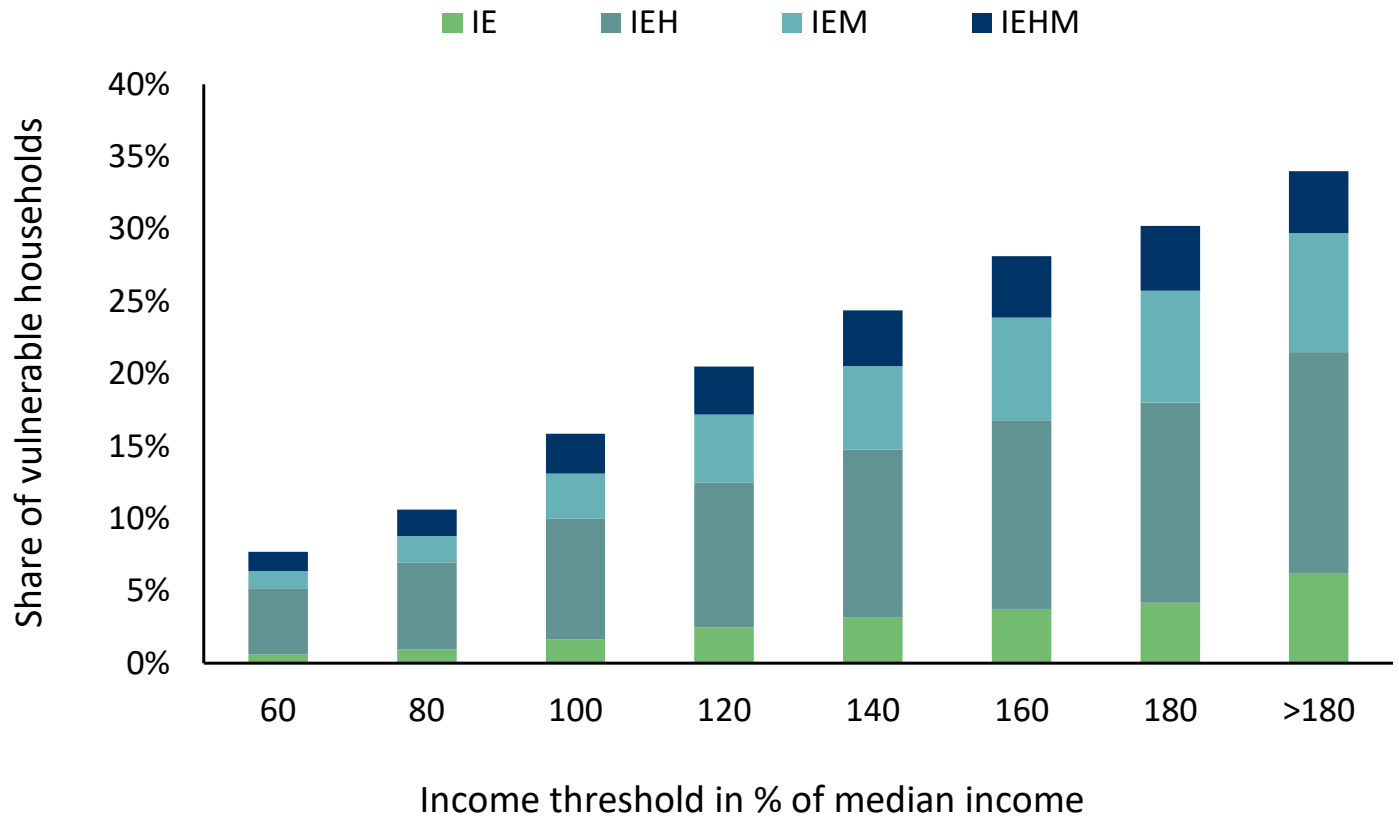


Vulnerable
24%

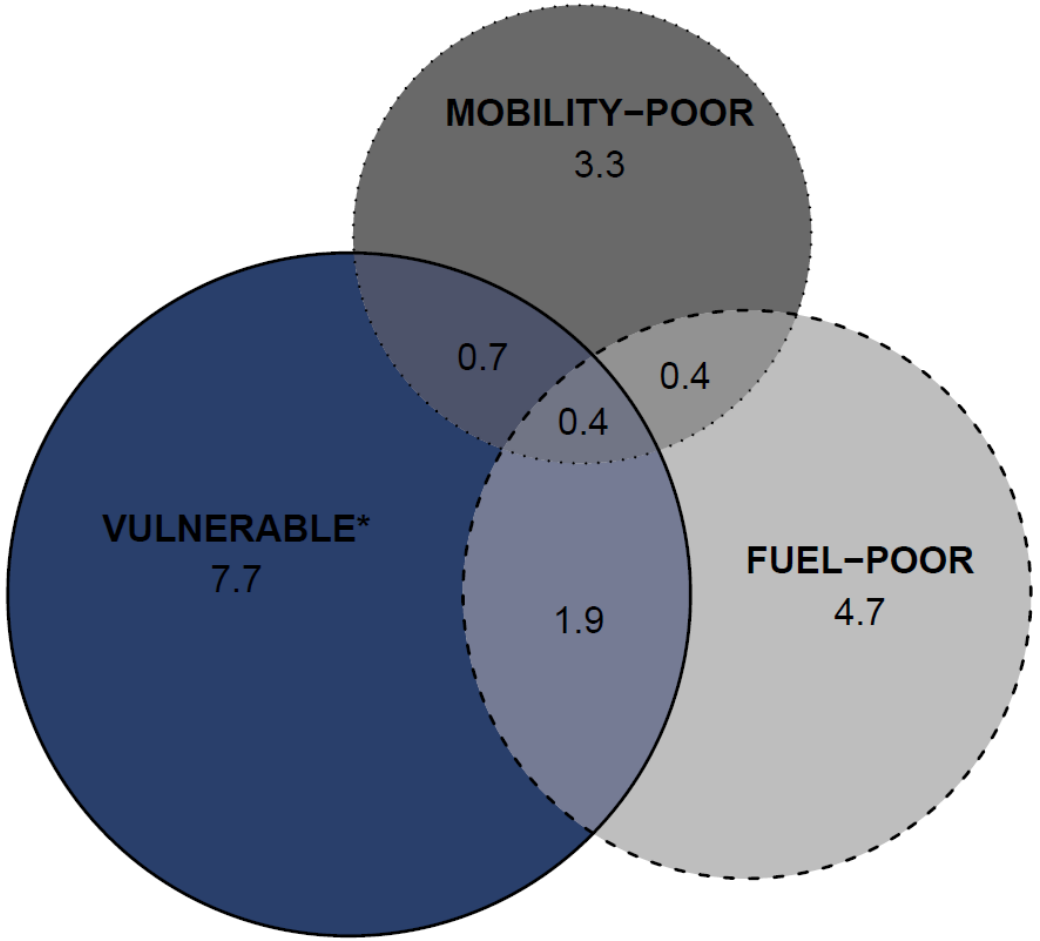
Potentially vulnerable
9%

Source: HBS, EU-SILC; own calculations.

Sensitivity Analysis



Comparison of the vulnerability index and Low Income High Cost Indicators for Energy and Transport Poverty



*Based on 60 per cent income threshold

Source: HBS, EU-SILC; own calculations.

Conclusions

- Up to 34% of Austrian households (potentially) vulnerable to carbon pricing
  - Share of vulnerable households strongly depends on income criterion applied
  - If income threshold is reduced to 60% of the equivalized median income 8% of households are found to be vulnerable to carbon pricing
- Only a very small share of households is (potentially) affected by all four dimensions
  - Higher share of single-family buildings in rural areas ↔ Better public transport infrastructure in urban areas
- Index indicates in which cases vulnerability could be alleviated by subsidies and in which cases other policy instruments would be required
- Index can also be applied to analyse the vulnerability to other climate policy instruments (e.g. ban of fossil drives, improvement of public transport, ban of fossil heating systems)

Thank you!

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Full text:

Bock-Schappelwein, J. & C. Kettner (2024). Households' vulnerability to carbon pricing: A case study for Austria. In É. Civel, C. de Perthuis, J. E. Milne, M. S. Andersen, & H. Ashiabor (eds.), Biodiversity and Climate. Tackling Global Footprints, Edward Elgar Publishing, pp. 167–179. https://doi.org/10.4337/9781035340521.00023

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