

# The significance of energy poverty on the assessment of residential energy demand and emissions in Germany

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## Motivation and analysis

Consumers at the heart of the energy transition are key to unlocking the potential to achieve energy and climate change targets. Households are not a homogenous group and several key factors (such as income) influence how they are able to participate in the energy system.



### Households

#### Significant consumers of energy:

Households consumed ~**28% of the final energy consumption** in 2013. Together with personal *transport*, households are responsible for **47% of final energy consumption**.

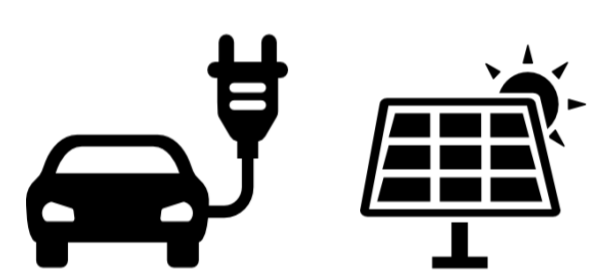
The majority of the household **energy budget** is for transport (42%) followed by space heating (40%).



### Energy Poverty

#### Energy poverty on the rise:

Estimates put **11-21%** of the population vulnerable to or in **energy poverty** due to *high energy bills* (increasing energy prices and low efficiency), *low income* (incomes increase slower than energy prices) and *poor energy efficiency* (in buildings and appliances).



### Energy Transition

#### Households key to successful energy transition:

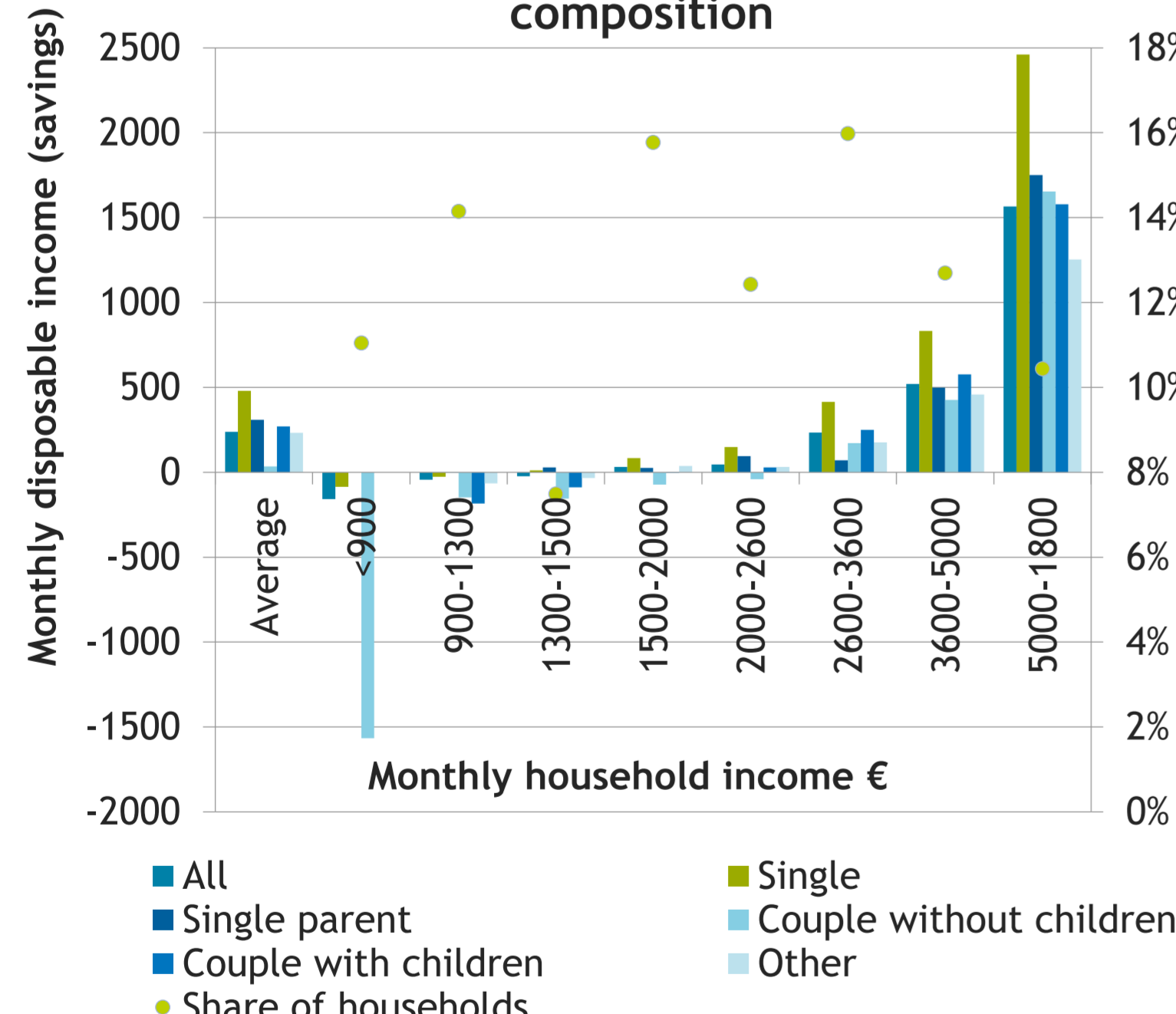
Households should contribute towards targets:

- 14% heating with renewables
- 10% renewables in transport
- -10% electricity demand
- -20% heating demand
- -10% transport demand

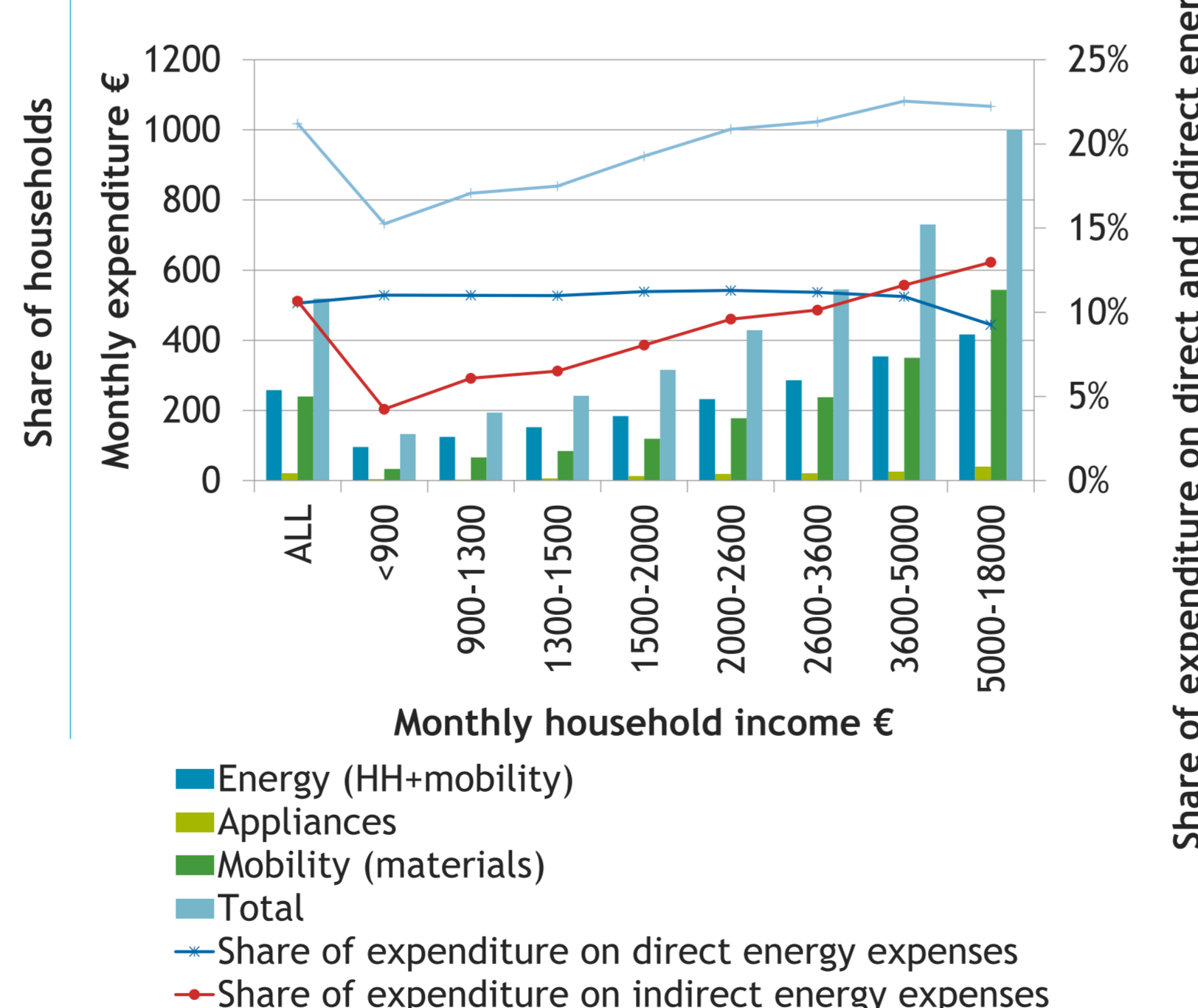
There is a need for a holistic and detailed assessment of household energy and private transport to account for socio-demographic differences and ensure all households are able to participate in the energy transition towards achieving targets.

## Case for a disaggregated assessment

Potential to afford high upfront investment costs by income group and household composition



Direct and indirect energy expenditure by income group



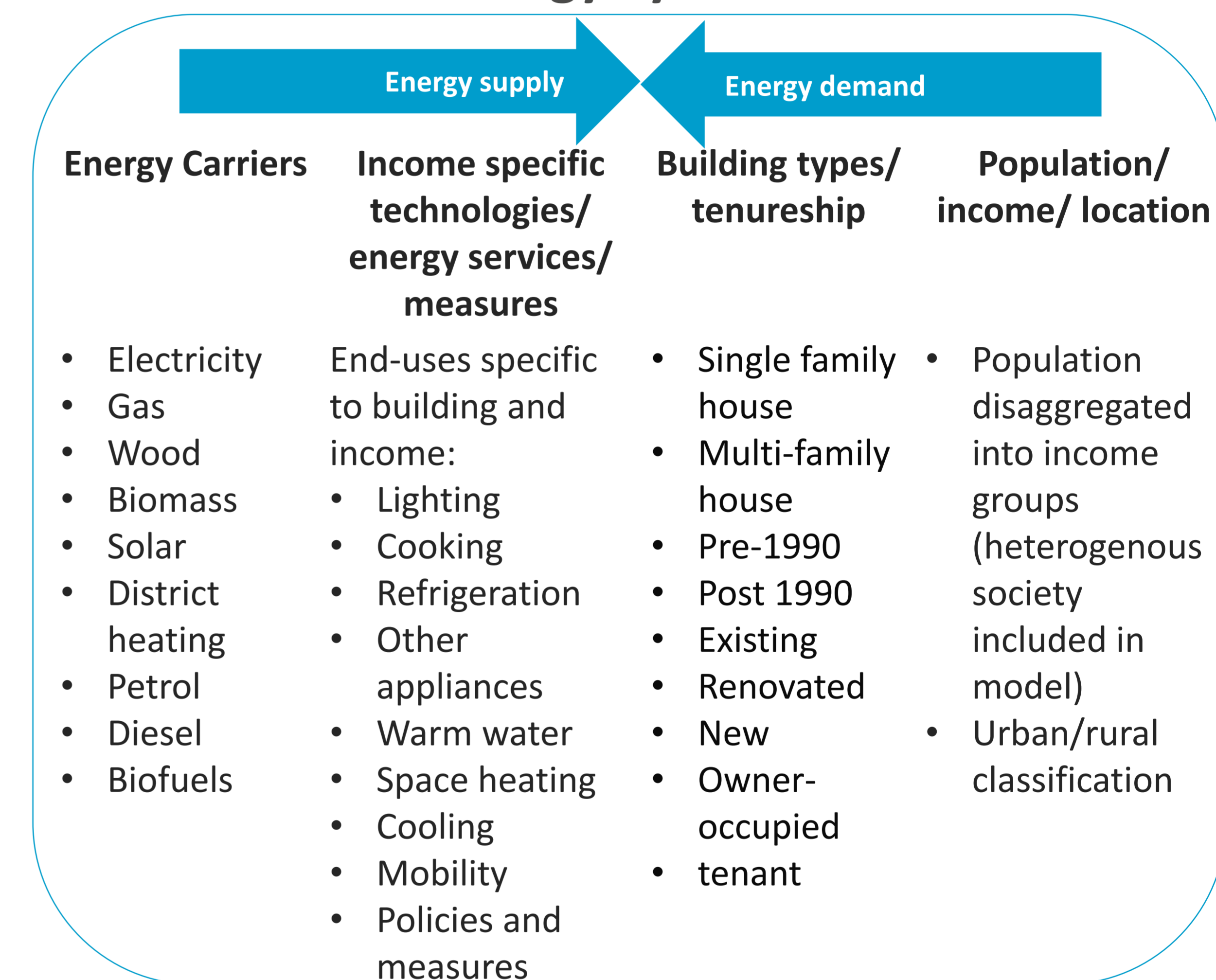
- The majority of households have insufficient funds or do not have the decision-making power to invest in energy efficient and renewable upgrades and technologies
- 39% of all households have higher than average disposable income (>239€ monthly) available for potential investments
- 24% of all households have higher than average disposable income available and are home owners
- As income increases, so does the indirect energy expenditure (e.g., investment in appliances, home improvements)

## Methodology

Adaptation of the TIMES-Germany model with disaggregated representation of households into heterogeneous groups based on socio-economic characteristics.

The model will account for budget constraints and investment decision making profiles in a two-step process (investment + operation) through a mix of capacity constraints and discount rates. The Reference Energy System is expanded and a scenario analysis explores options for policies and measures.

### Reference Energy System for model



### Scenario analysis

Scenario Type	Scenario Name	Description
Reference scenarios	Status Quo	Aggregated household sector, baseline, business as usual, all expected policies implemented
	Reference	Disaggregated, household sector, baseline, business as usual, all expected policies implemented
Investment scenarios	Investment costs	Constraints for financial ability of households to invest in technologies (budget constraints for each income group plus disposable income for energy) Including additional measures, such as: • Energy Savings Check ( <i>Stromsparcheck</i> ) • Tenant electricity model ( <i>Mieterstrom</i> )
	Measures	• Building renovation • Renewable and energy efficient heating and household appliances • Subsidies

## Modelling outcomes

- Improved representation of households and insights into expected contribution towards targets
- Recognition of and accounting for energy poverty in a holistic energy system analysis towards an integrated policy response
- Exploring the significance of household energy and emissions and energy poverty on achieving the objectives of the energy transition by accounting for budget constraints
- Exploring the improvement of the energy welfare of low income households through policies and measures