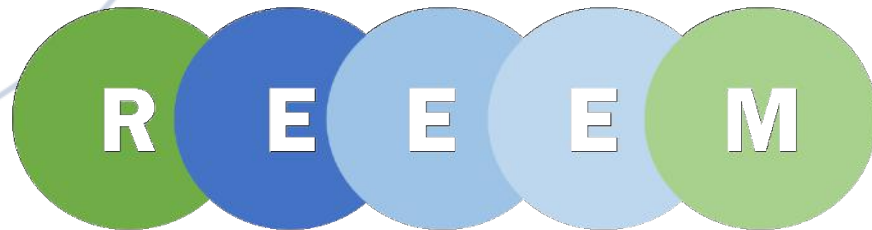


Distributional and energy poverty impacts of energy transition

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Outline

- Definitions
- General overview of energy poverty
- The impact of district heating prices on energy poverty indicators
- Distributional impacts of subsidies for residential energy technologies
- Distributional impacts of energy transition scenarios



Definitions

- **Distributional impacts** of energy transition consist of the differing cost and benefits across specific population groups.
- **Energy poverty** is the situation where individuals are not able to adequately heat (or provide necessary energy services) in their homes at affordable cost (Pye et al., 2015)
- **Energy poverty** occurs where a household finds it difficult or impossible to ensure adequate heating in the dwelling at an affordable price and having access to other energy-related services, such as lighting, transport or electricity for use of the Internet or other devices at a reasonable price (European Economic and Social Committee, 2011/C 44/09)

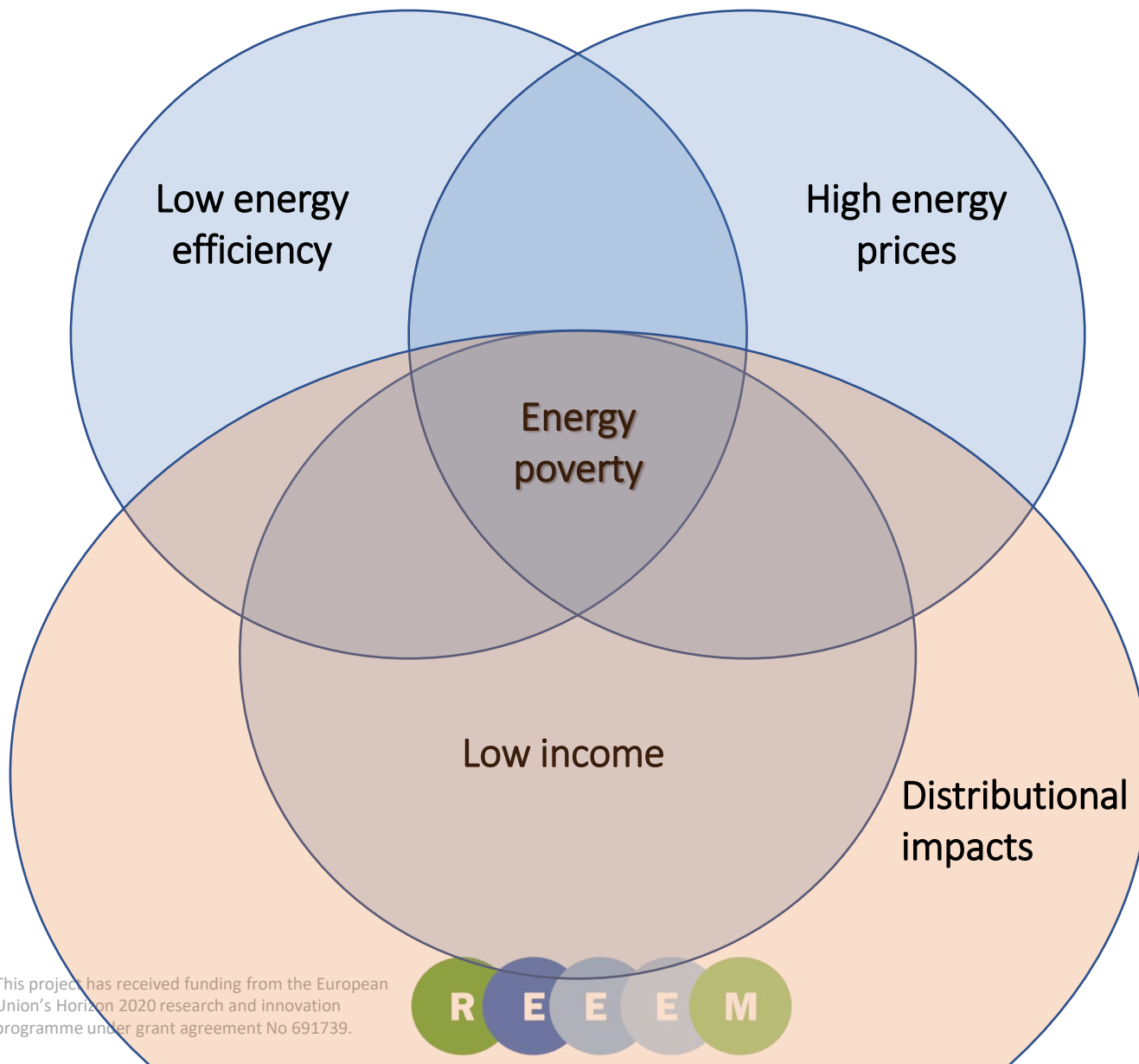
Pye S, Dobbins S, Baffert C, Brajković J, Grgurev I, Miglio D R and Deane P 2015 *Energy Poverty and Vulnerable Consumers in the Energy Sector Across the EU: Analysis of Policies and Measures* London, Insight_E



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Factors of energy poverty



Regulation 2018/1999 on the Governance of the Energy Union and Climate Action

- Article 3

Integrated national energy and climate plans

<...>

3. With regard to their integrated national energy and climate plans, Member States shall:

<...> (d) assess the number of households in energy poverty taking into account the necessary domestic energy services needed to guarantee basic standards of living in the relevant national context, existing social policy and other relevant policies, as well as indicative Commission guidance on relevant indicators for energy poverty.

In the event that a Member State finds, pursuant to point (d) of the first subparagraph, that it has a significant number of households in energy poverty, on the basis of its assessment of verifiable data, it shall include in its plan a national indicative objective to reduce energy poverty. The Member States concerned shall outline in their integrated national energy and climate plans, the policies and measures, which address energy poverty, if any, including social policy measures and other relevant national programmes.

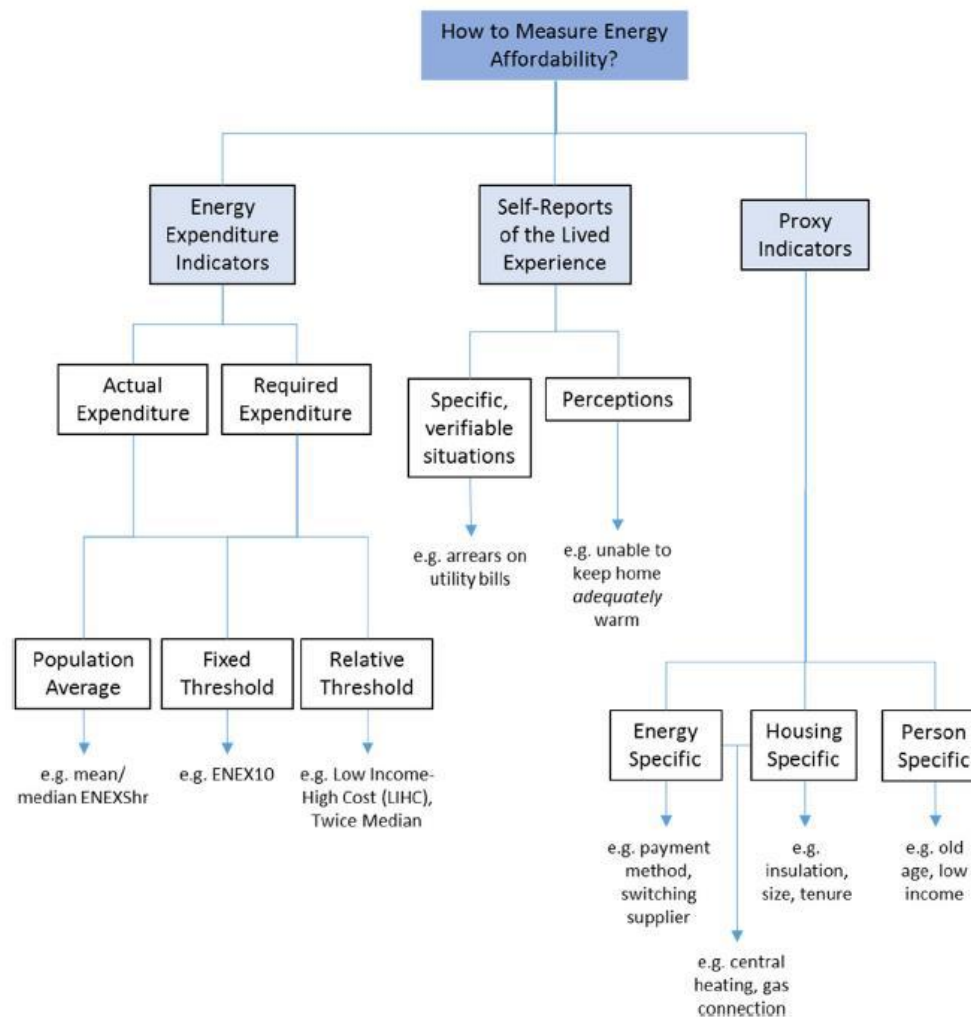
REGULATION (EU) 2018/1999 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the Governance of the Energy Union and Climate Action,



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Energy poverty indicators



Source: Deller, D., *Energy affordability in the EU: The risks of metric driven policies*. Energy Policy, 2018. **119**: p. 168-182.



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Primary indicators used by EU Energy Poverty Observatory

- **Arrears on utility bills:** Share of (sub-) population having arrears on utility bills.
- **Low absolute energy expenditure (M/2):** Share of households whose absolute energy expenditure is below half the national median.
- **High share of energy expenditure in income (2M):** The 2M indicator presents the proportion of households whose share of energy expenditure in income is more than twice the national median share.
- **Inability to keep home adequately warm:** Share of (sub-) population not able to keep their home adequately warm, based on question "Can your household afford to keep its home adequately warm?"

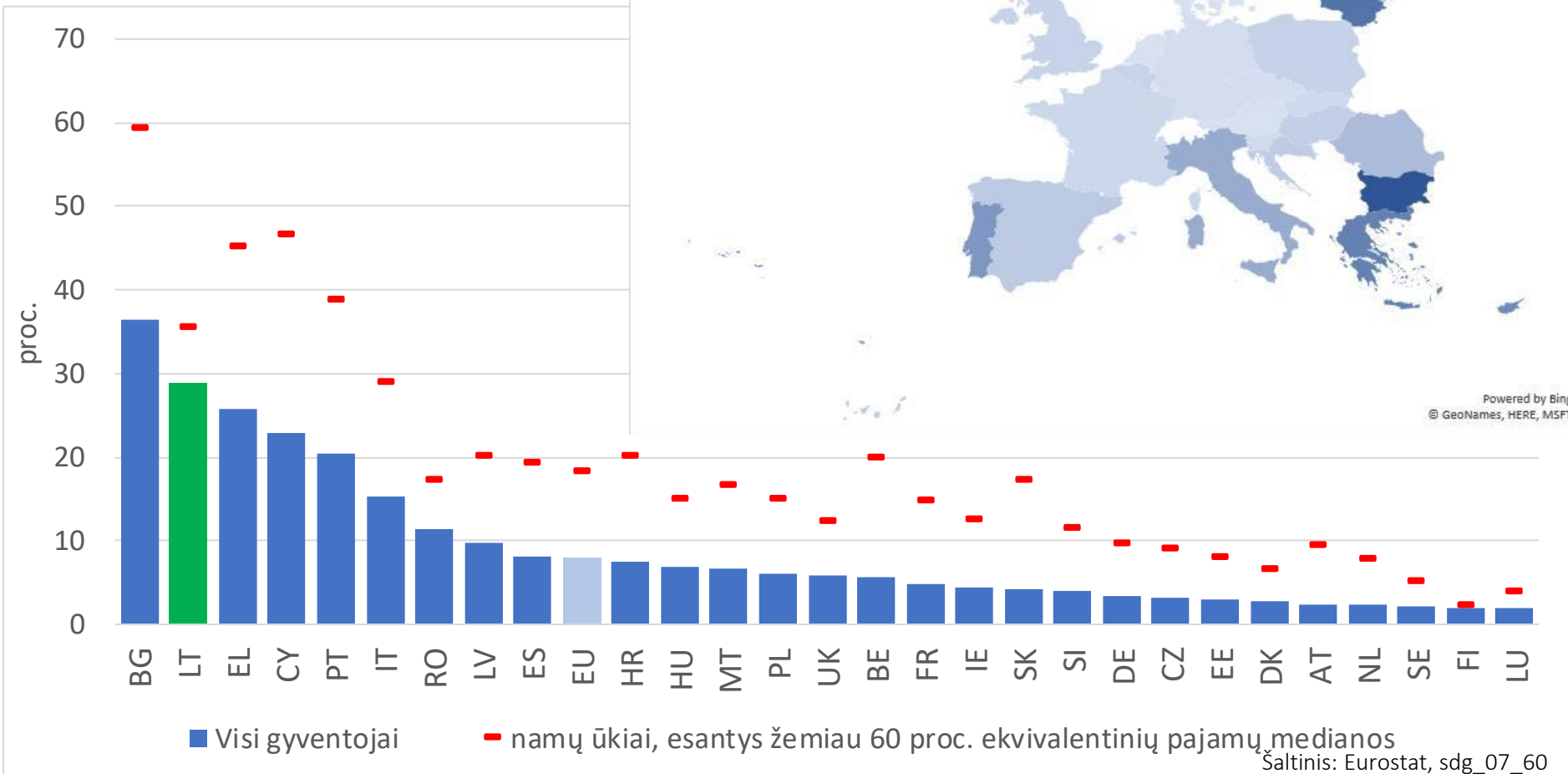
Source: <https://www.energypoverty.eu/indicators-data>



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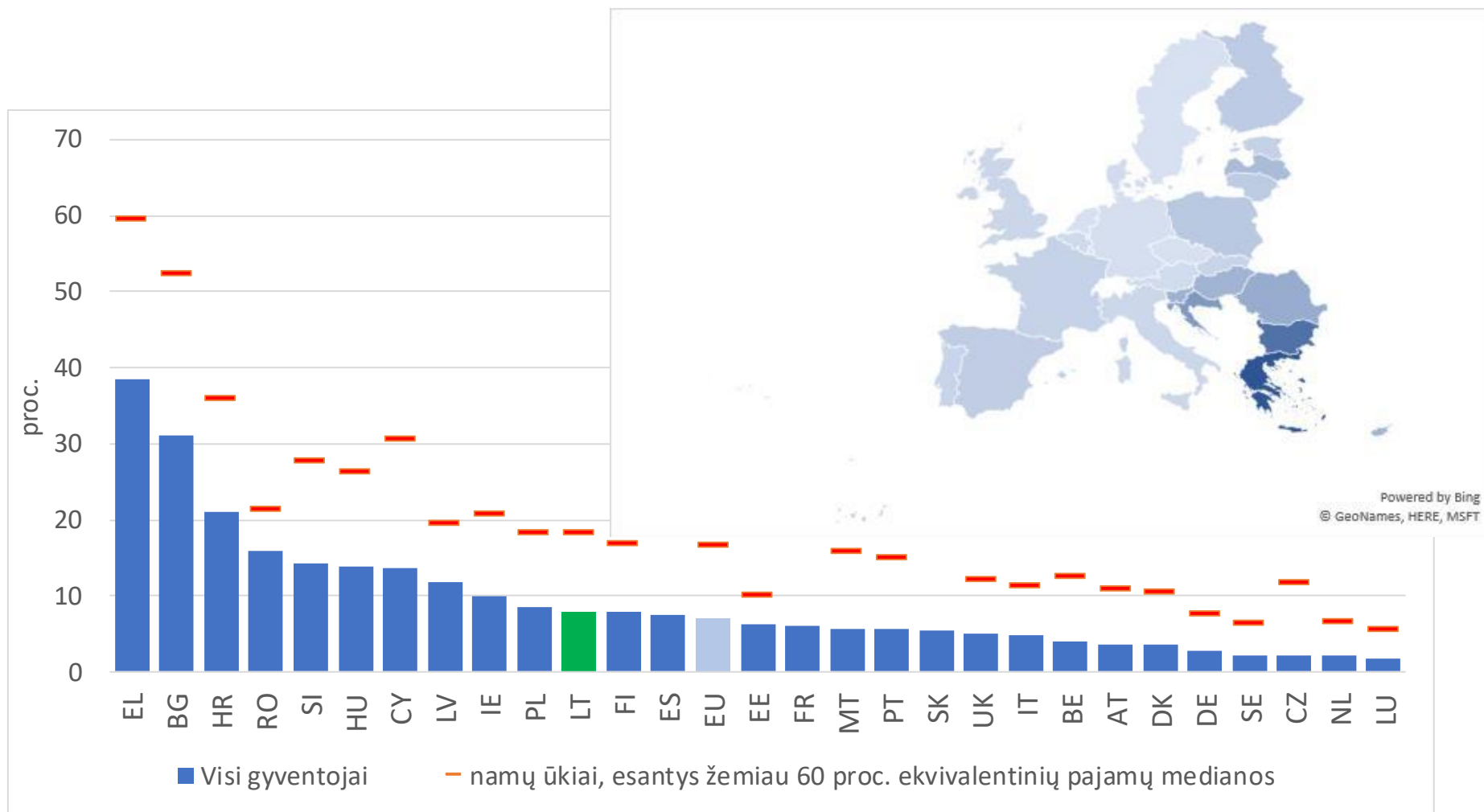


Inability to keep home adequately warm (2017)



Šaltinis: Eurostat, sdg_07_60

Arrears on utility bills (2017)

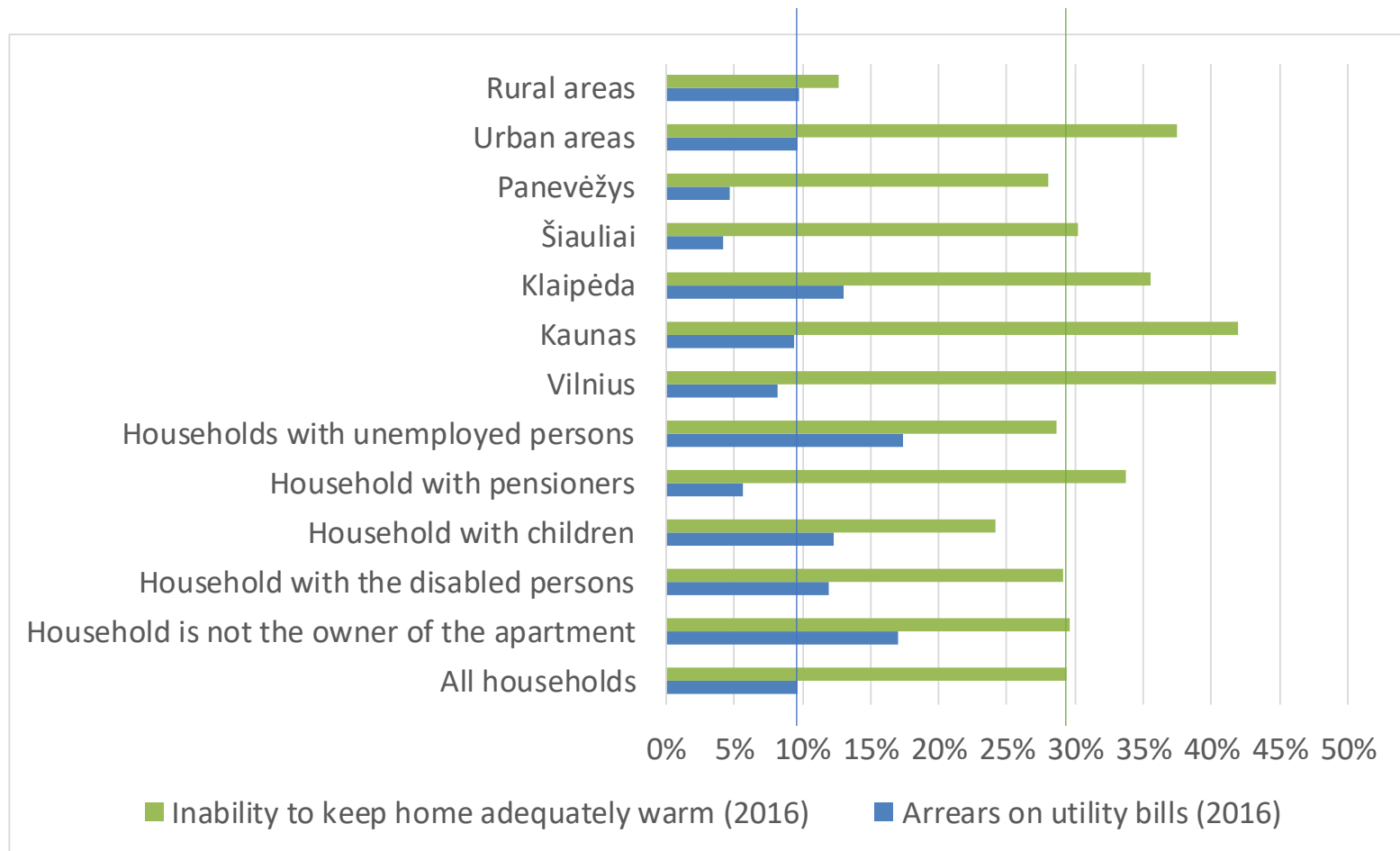


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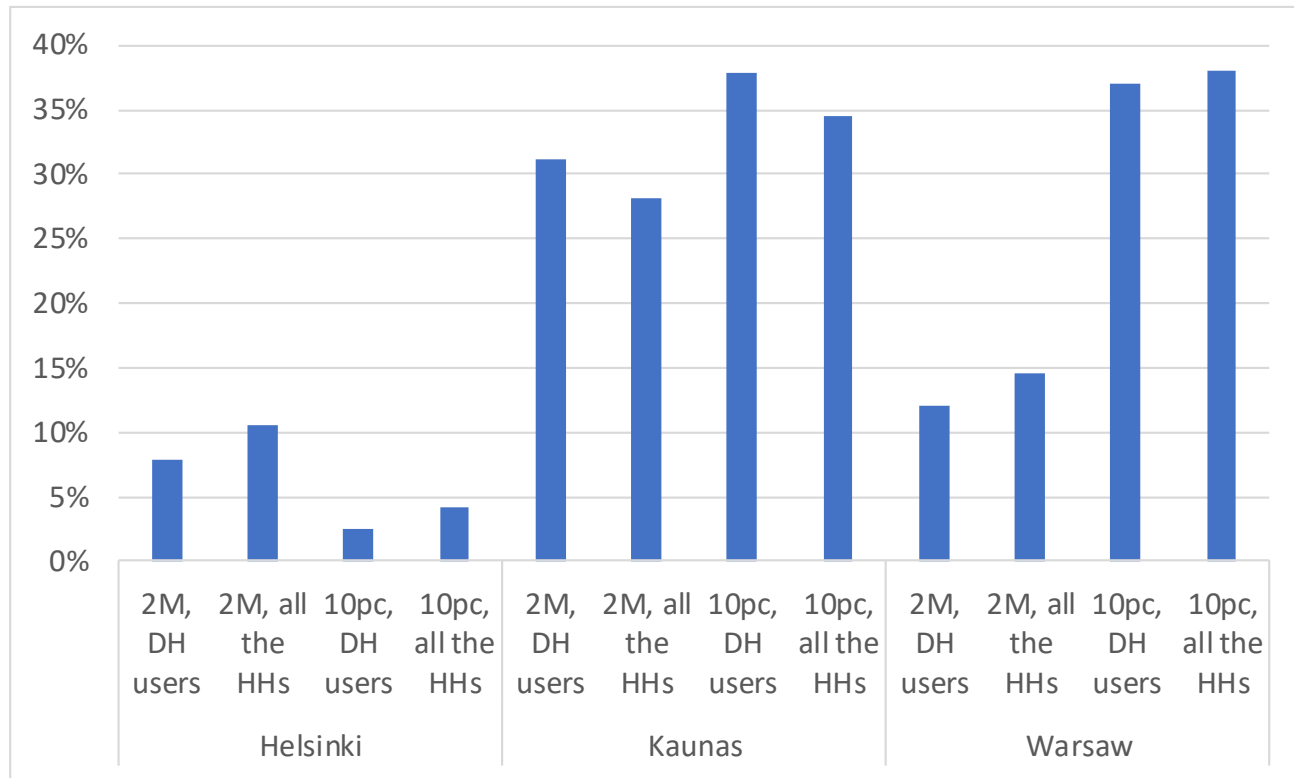


Šaltinis: Eurostat, *ilc_mdcs07*

Energy poverty in different types of Lithuanian households



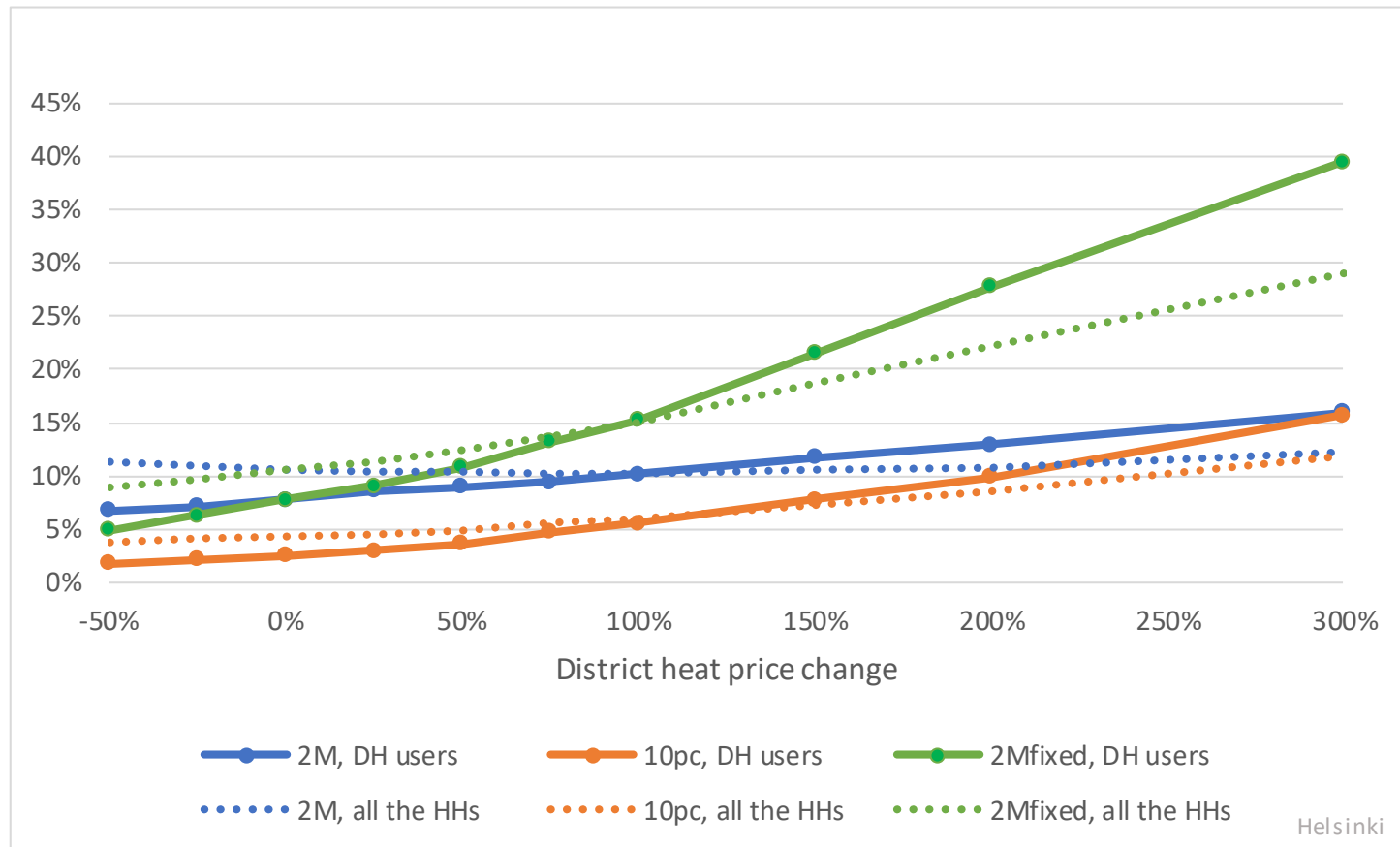
Energy poverty indicators in district heating case study areas



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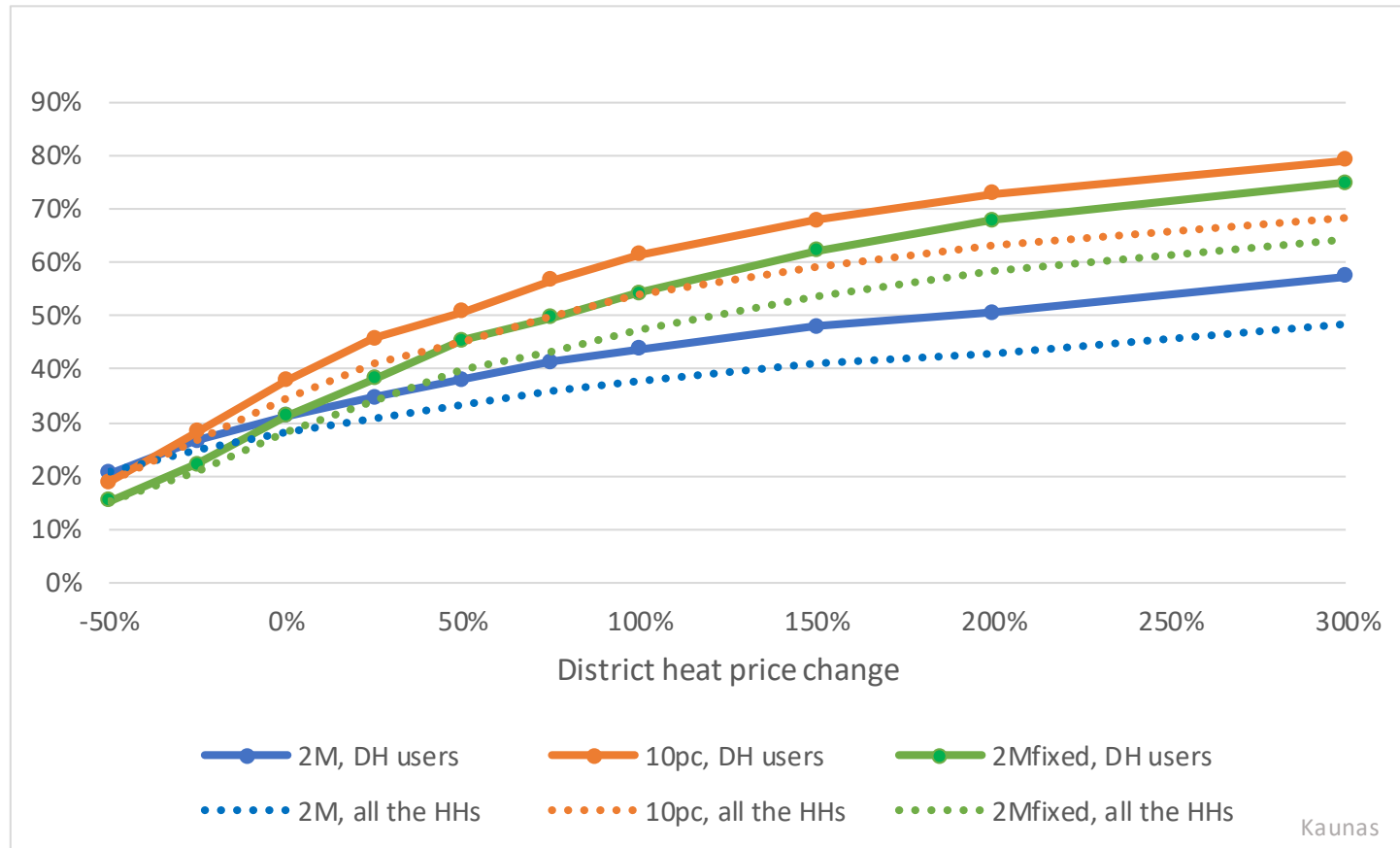
The relationship between district heat price level and energy poverty in Helsinki region



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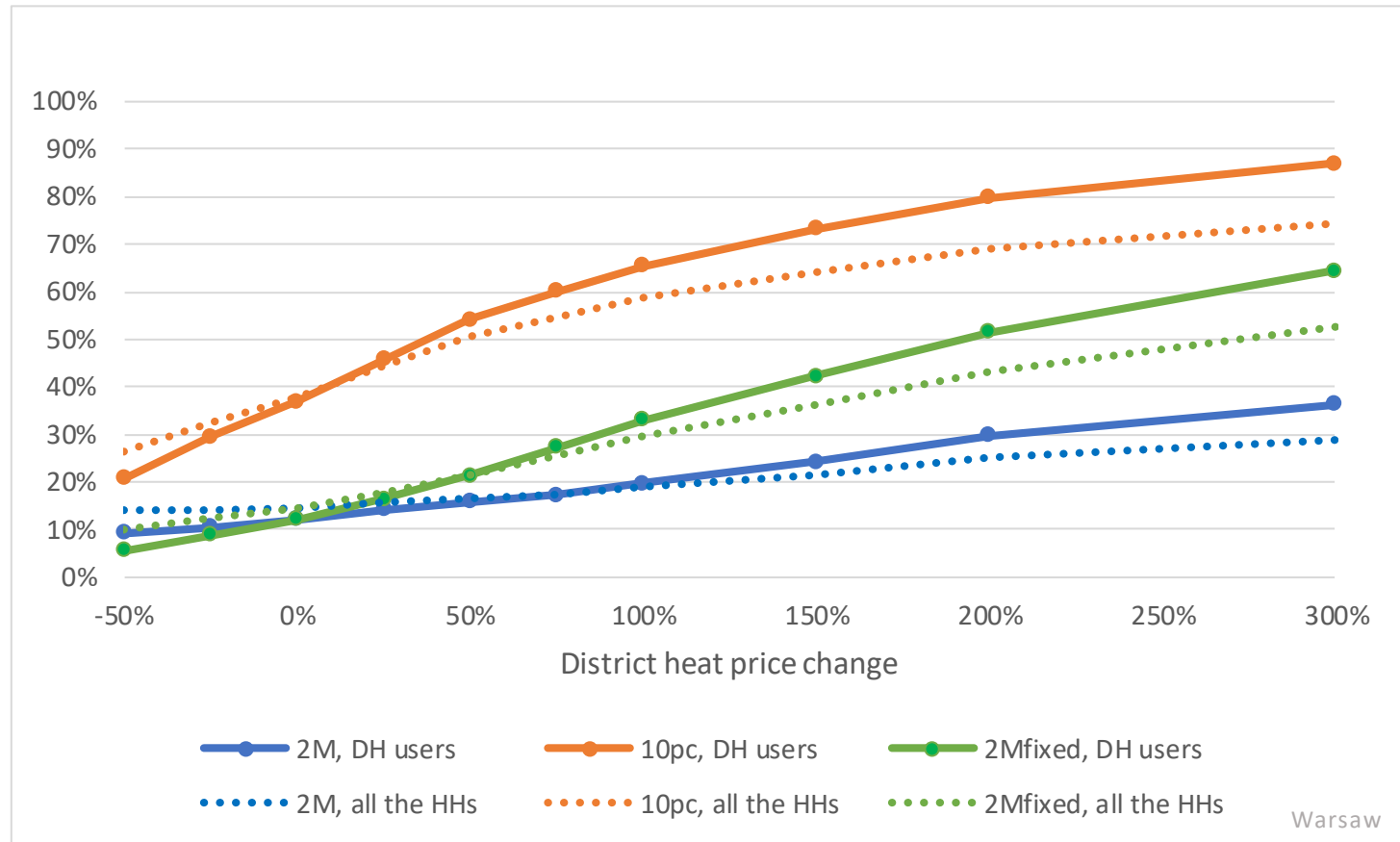
The relationship between district heat price level and energy poverty in Kaunas



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The relationship between district heat price level and energy poverty in Warsaw



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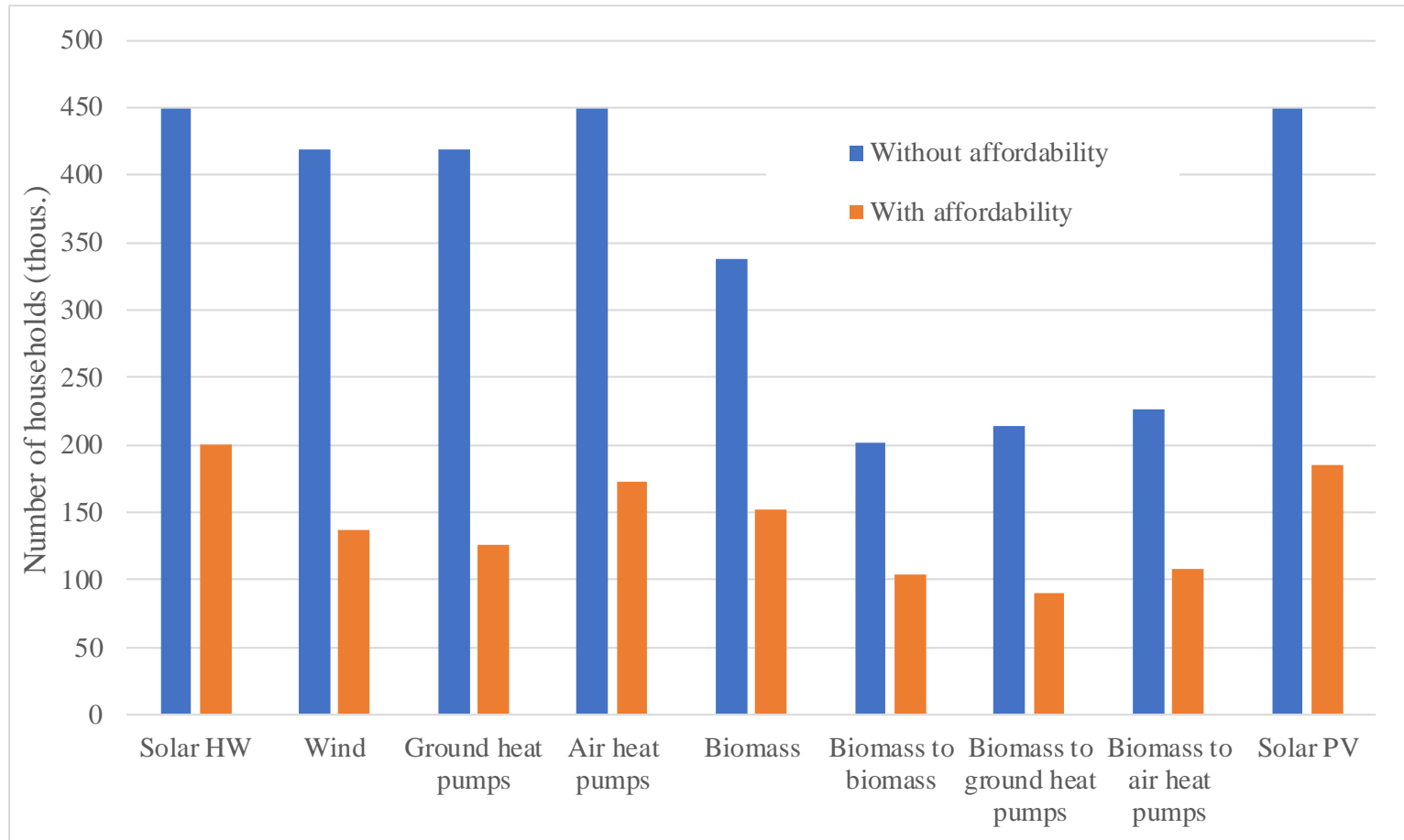


Subsidies for residential energy technologies in Lithuania

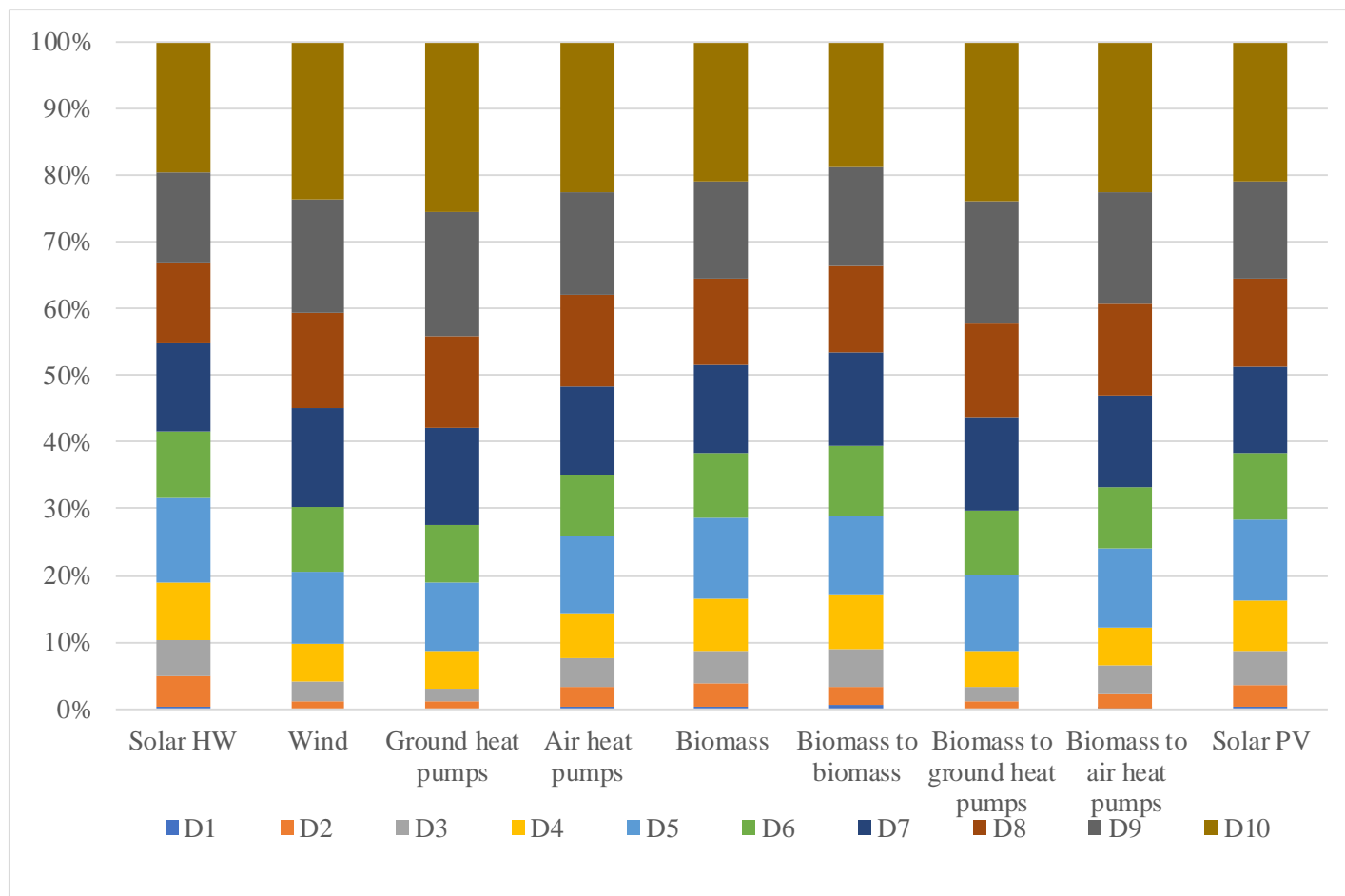
| Energy technology | Short name | Support intensity |
|----------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------|
| The utilisation of renewable energy sources in individual residential buildings | | |
| Solar photovoltaic | - | 336 Eur/kW |
| Solar collectors for water heating | Solar HW | 128-160 Eur/m2 |
| Small wind power plants (up to 10 kW) | Wind | 557-683 Eur/kW |
| Heat pumps (ground-water) | Ground heat pumps | 343 Eur/kW |
| Heat pumps (air-water) | Air heat pumps | 193 Eur/kW |
| Heat pumps (air-air) | - | 121 Eur/kW |
| Efficient biomass boilers (to replace fossil fuels) | Biomass | 41 Eur/kW |
| The replacement of old biomass boilers | | |
| Biomass pellet boilers | Biomass to biomass | 50% of standard investment (48.75-122.92 Eur) |
| Heat pumps (ground-water) | Biomass to ground heat pumps | 50% of standard investment (202.9-726.75 Eur/kW) |
| Heat pumps (water-water) | - | 50% of standard investment (202.9-726.75 Eur/kW) |
| Heat pumps (air-water) | Biomass to air heat pumps | 50% of standard investment (213.51-551.88 Eur/kW) |
| The installation of RES electricity generation sources in households | | |
| Solar PV | Solar PV | 323 Eur/kW |



Households that might receive investment subsidies



The composition of households that could receive investment subsidies

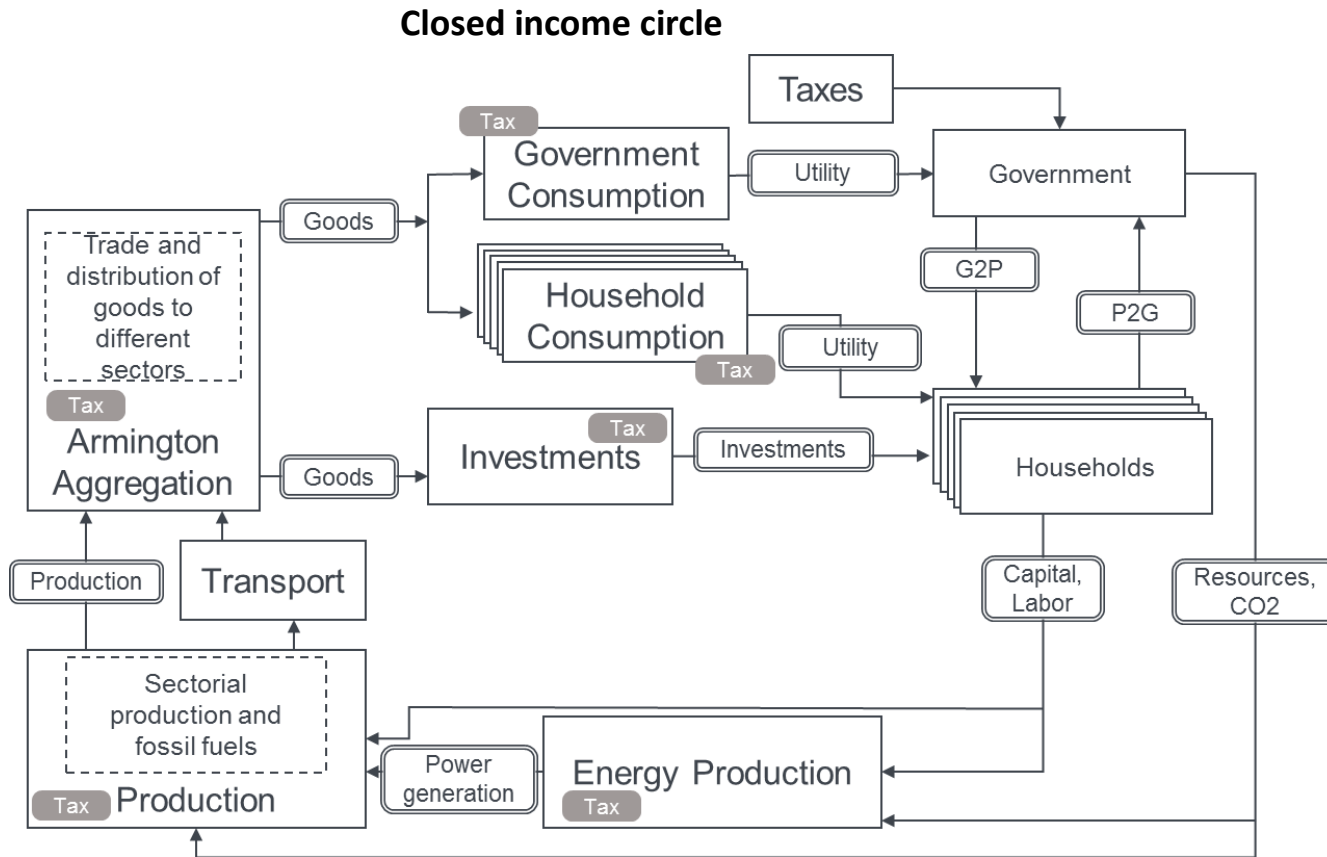


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Computable general equilibrium model NEWAGE

Structure



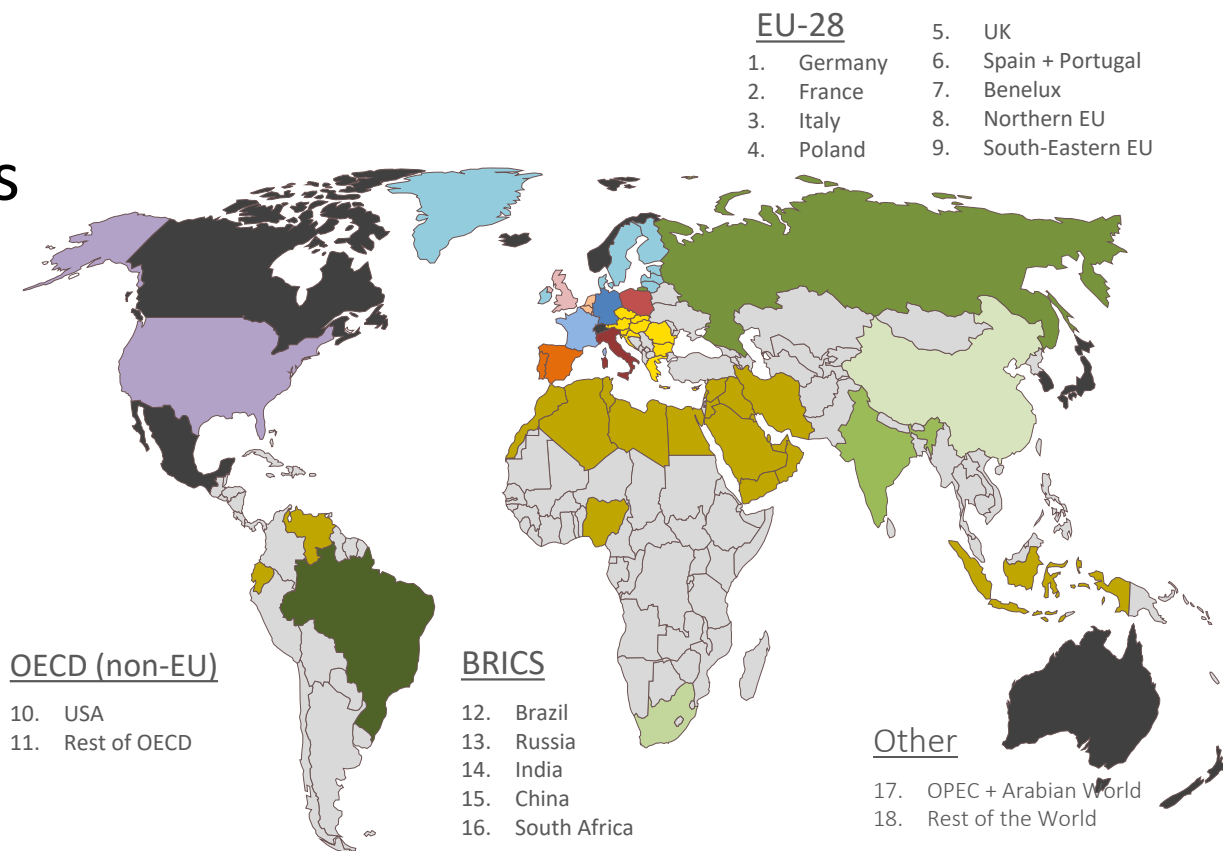
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NEWAGE

Structure

- 18 regions



EU-28

1. Germany
2. France
3. Italy
4. Poland
5. UK
6. Spain + Portugal
7. Benelux
8. Northern EU
9. South-Eastern EU

OECD (non-EU)

10. USA
11. Rest of OECD

BRICS

12. Brazil
13. Russia
14. India
15. China
16. South Africa

Other

17. OPEC + Arabian World
18. Rest of the World



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Scenarios

| | Reference Scenario | Base Pathway | Local Solutions | Paris Agreement - EU | Paris Agreement |
|--------------------------|-----------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| ETS sectors | 62% reduction in 2050 | 83% reduction in 2050 ¹ | 83% reduction in 2050 ¹ | 95% reduction in 2050 compared to 1990 levels | 95% reduction in 2050 compared to 1990 levels |
| non-ETS sectors | no targets | 50 to 80% reduction in 2050 ¹ on the national level Extra European targets: • Industry | 50 to 80% reduction in 2050 ¹ on the national level Extra European targets: • Households • Transport • Services | | |
| Remaining regions | no targets | Regional Push | Regional Push | Regional Push | In line with the 2°C target |

¹ Compared to 2005 levels

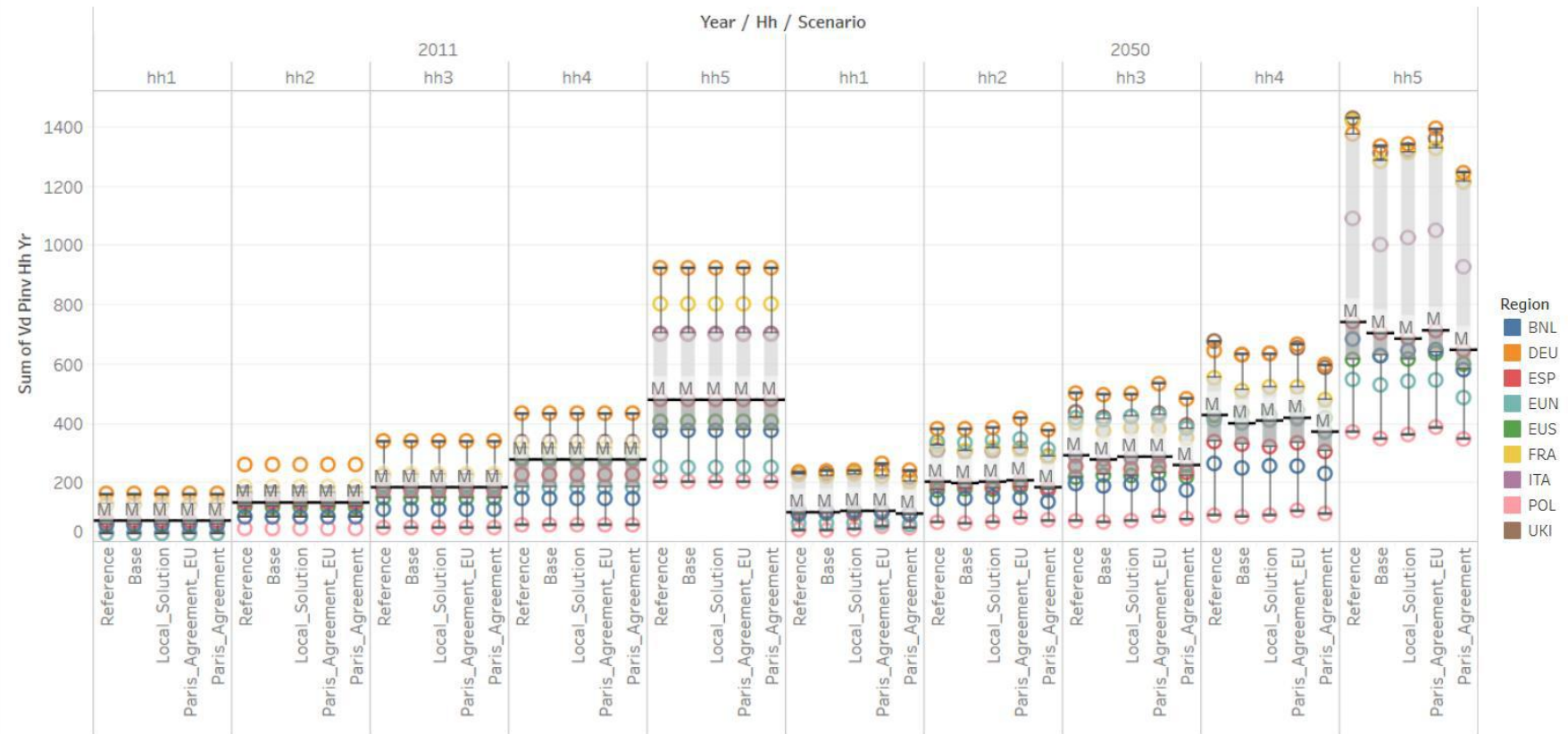


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Distribution of the net income

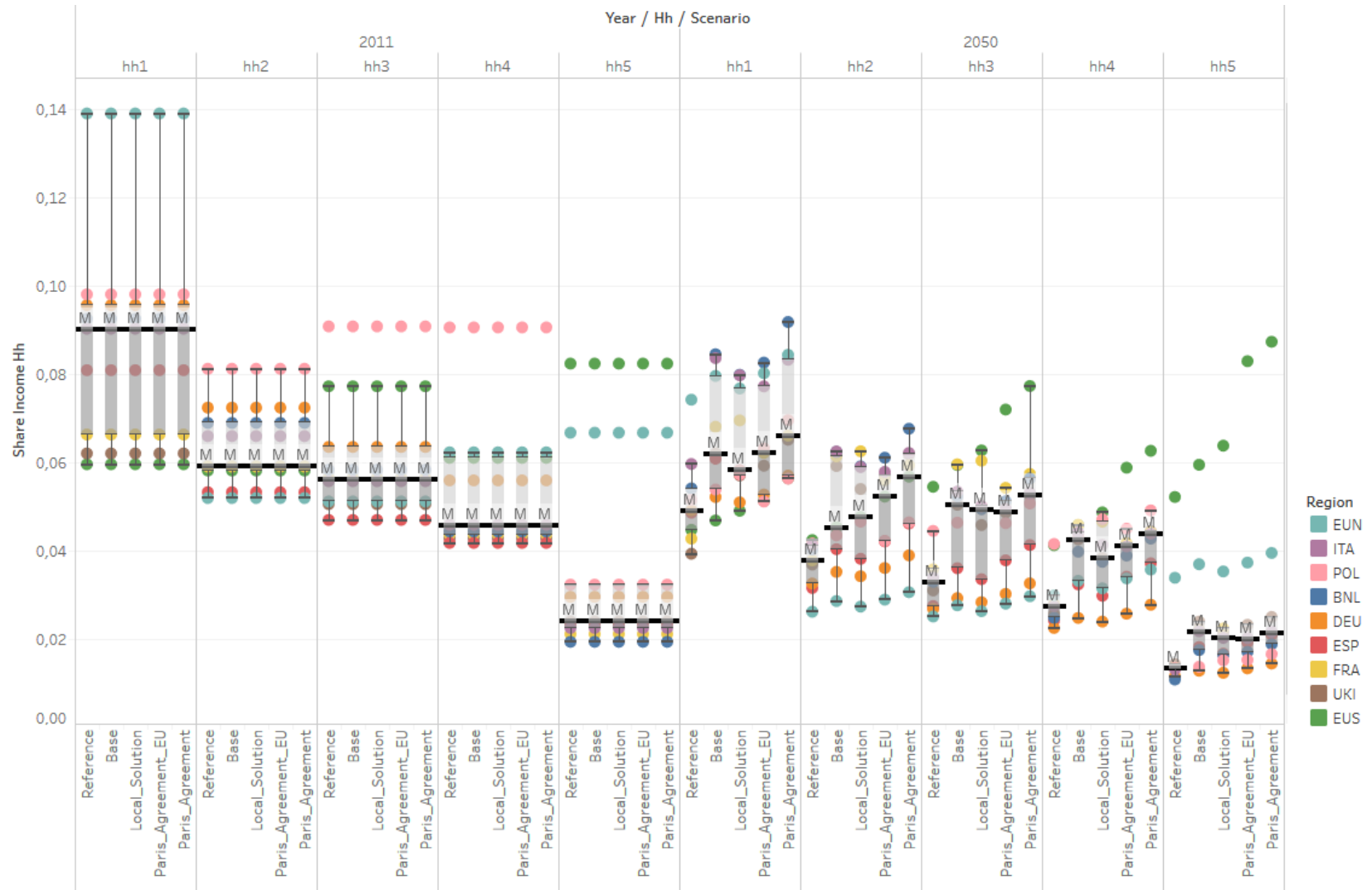
Income_hh



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Share of income dedicated to energy goods

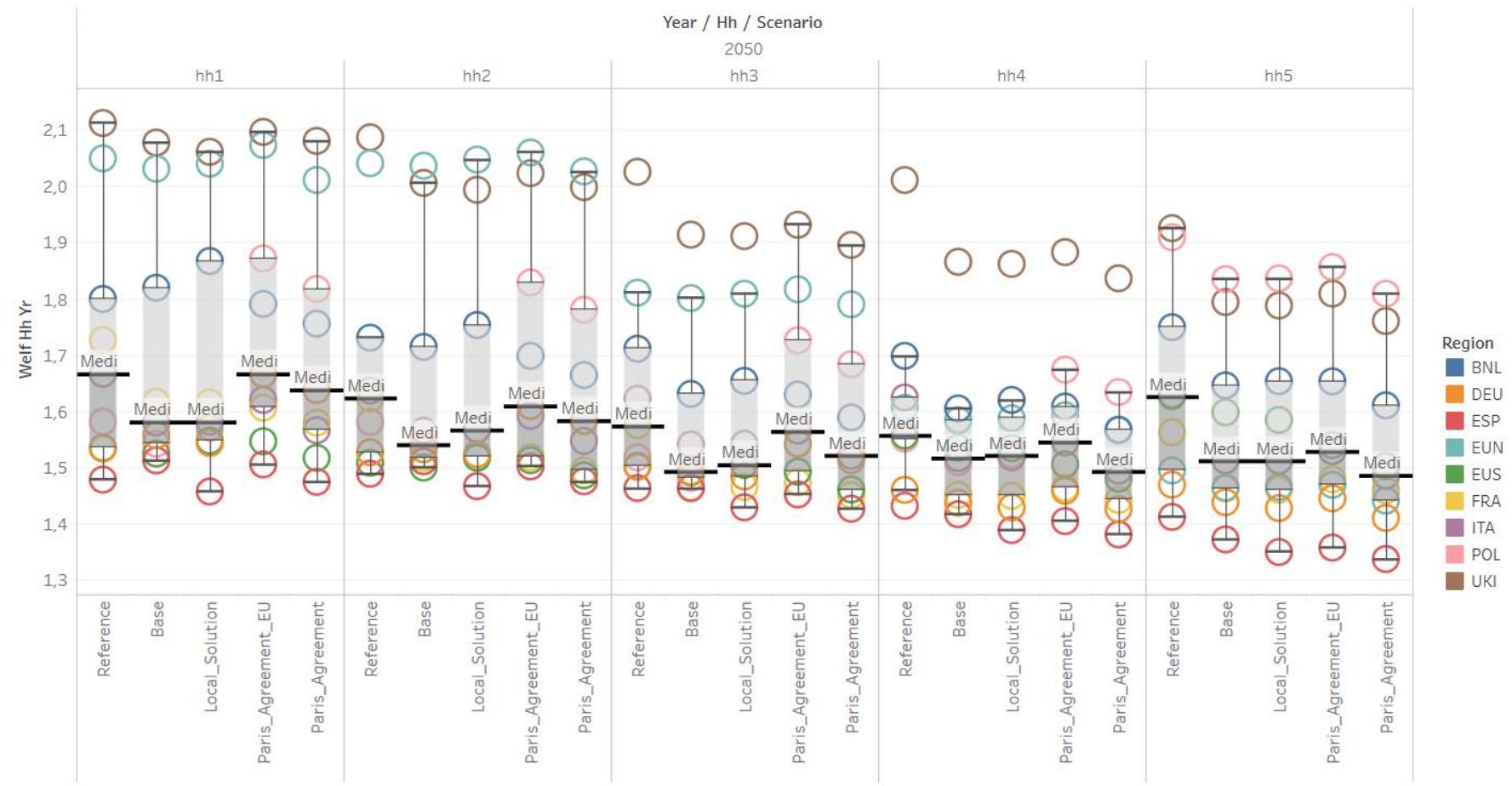


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Welfare levels in 2050 (2011 = 1)

Welfare_hh



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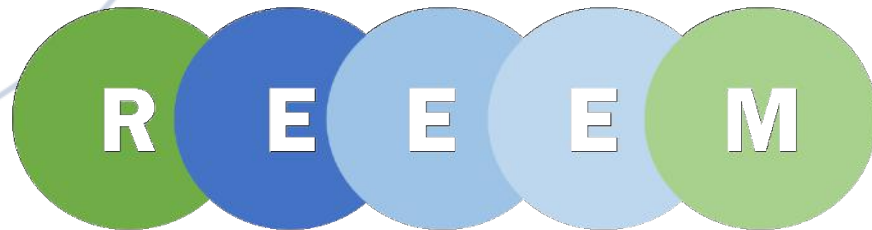
- Active participation of different groups of society is one of the crucial factors for the success of energy transition. Increasing income inequality and energy poverty might prevent some groups from the actions leading towards decarbonisation.
- The societal impacts of energy transition depend on a variety of factors, including structural changes in the economy, macroeconomic impacts, and policy choices.



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