

Energy efficient renovations in single-family houses: homeowners perspectives

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Background

- Sweden has approximately 4.5 million dwellings
 - 44% are single-family houses
 - 56% are apartments in multi-family buildings
- The residential and service sectors accounts for ~40% of the national final energy use
- Approximately 80% of the sector's energy use is for space heating and hot water
- Addition of new houses to the existing stock happens slowly
- House owners are an important actor to reduce energy use in this sector



- A large number of energy efficiency measures in building sector are widely available which provide net benefits (IPCC, 2007)

However

“Nine out of ten technologies that hold potential for energy and CO₂ emissions savings are failing to meet the deployment objectives needed to achieve the necessary transition to a low-carbon future.” (IEA, 2012)



Benefits and Barriers for energy renovation (ER) in single-family houses

Benefits

Energy cost reduction

Better indoor environment

Increase in property value

Improving the aesthetics

Reducing GHG emission

Barriers

High investment costs

Inconvenience in routines

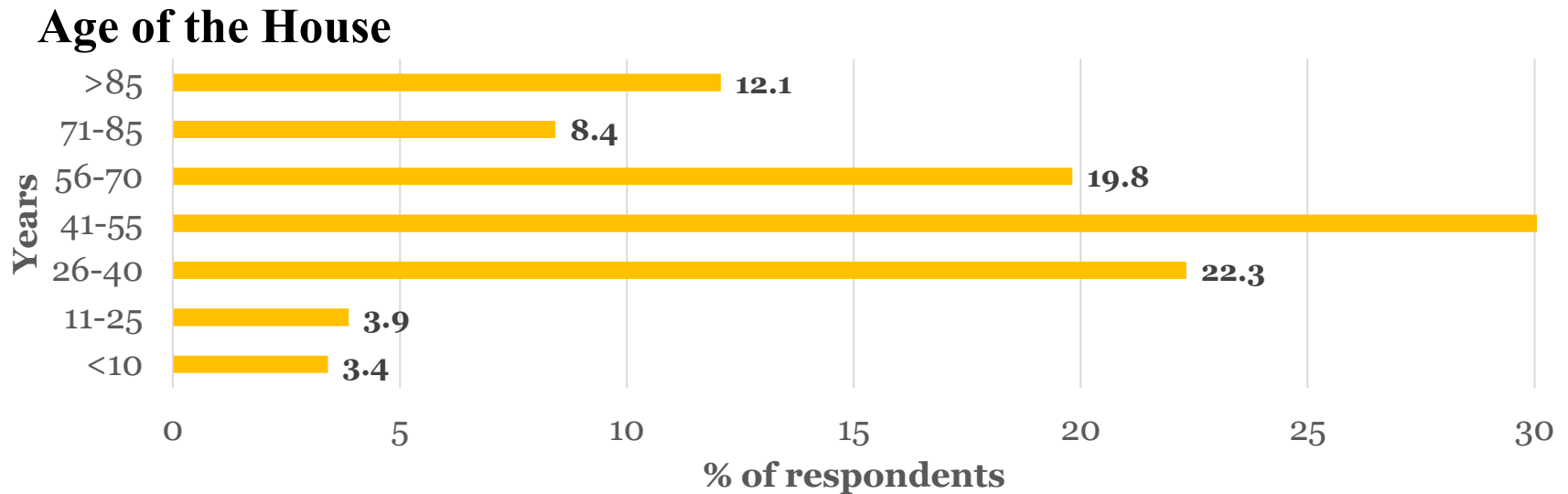
Lack of reliable information

Lack of time



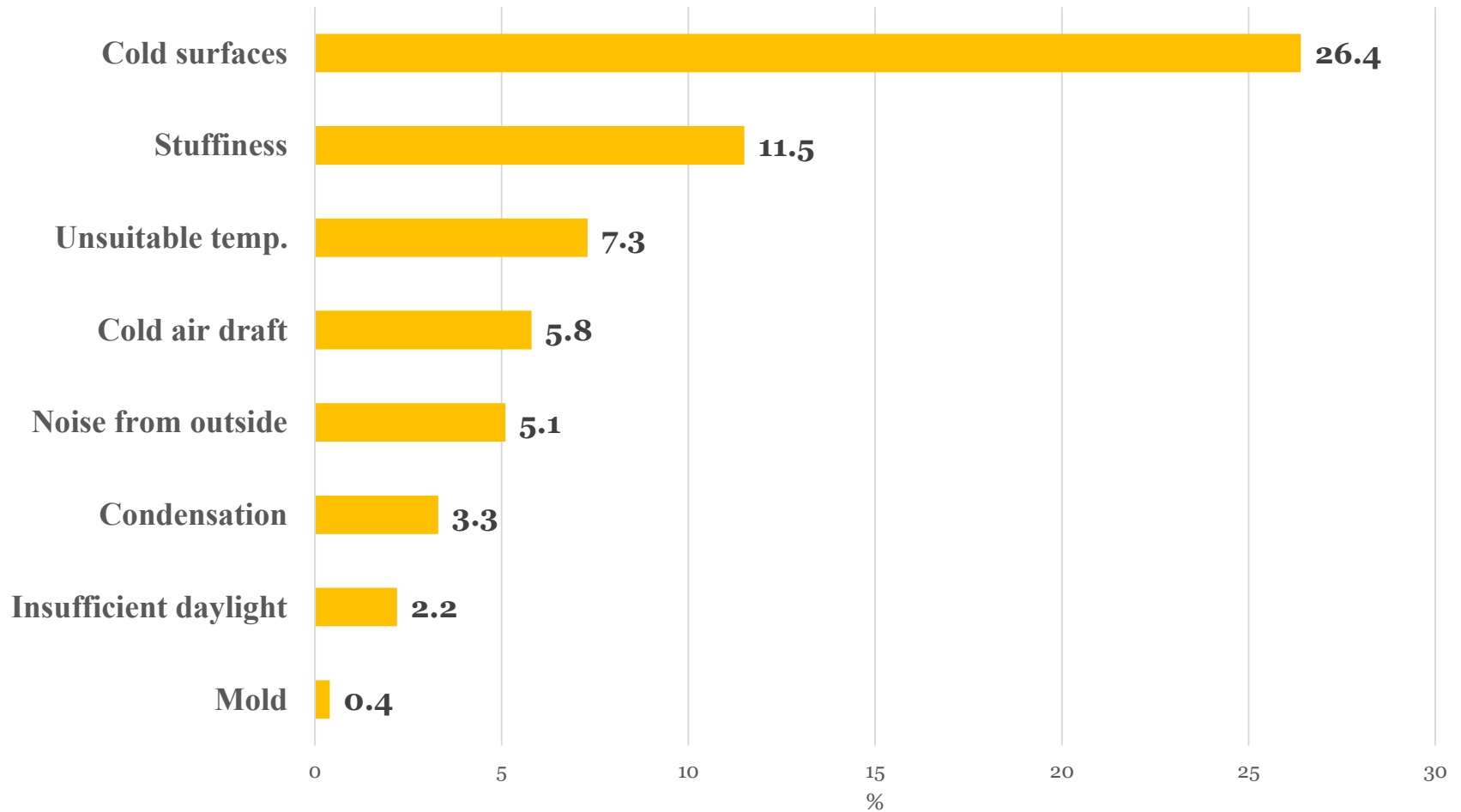
Methodology

- Questionnaire survey of **single-family house owners** in Northern Sweden
- Conducted during spring 2017
 - Response rate: 29% (approximately 450 responses)
 - Majority (59%) of respondents were >55 years
 - Male: 55%; Female: 45%

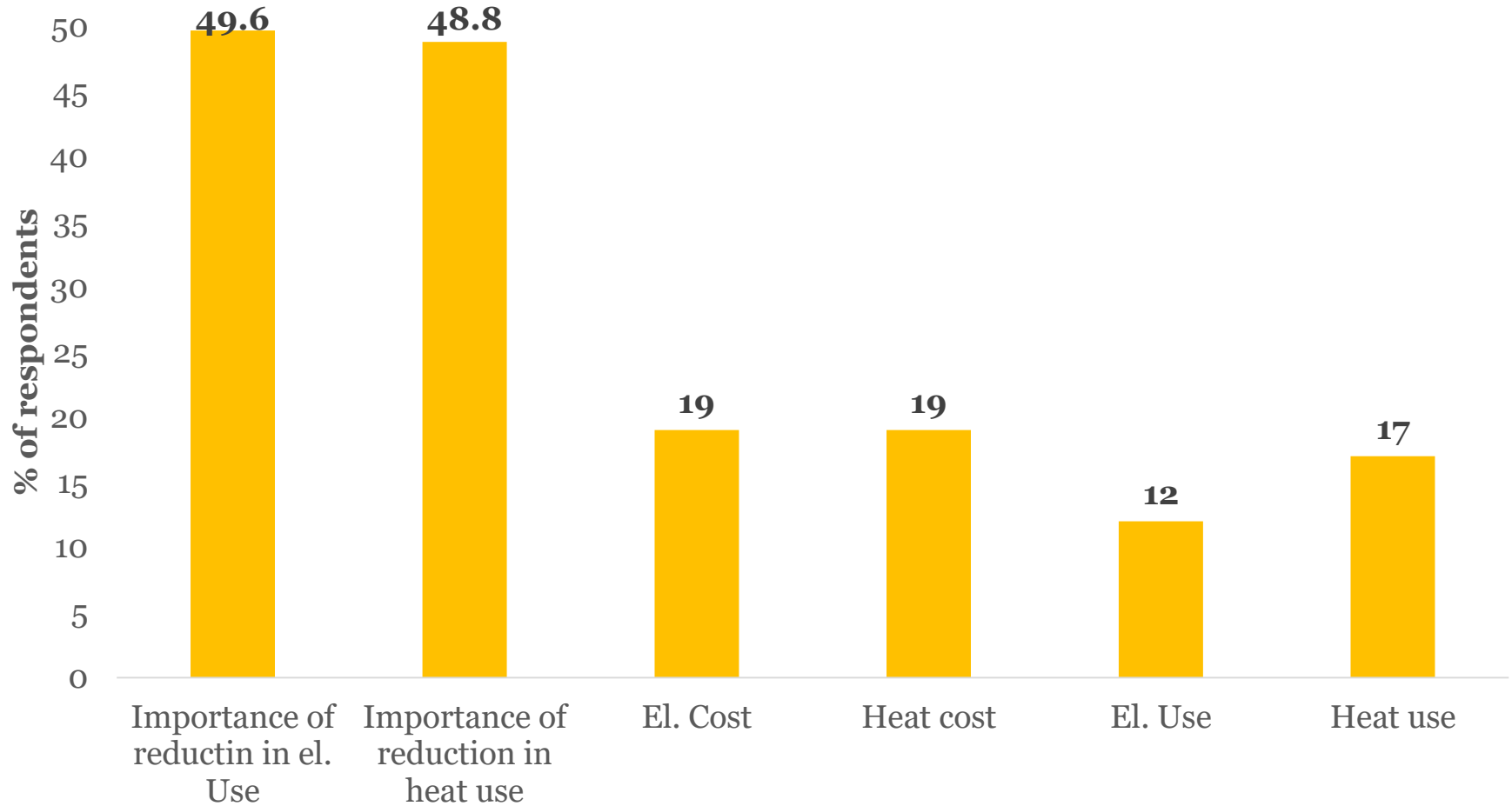


Indoor environmental problems (IEPs)

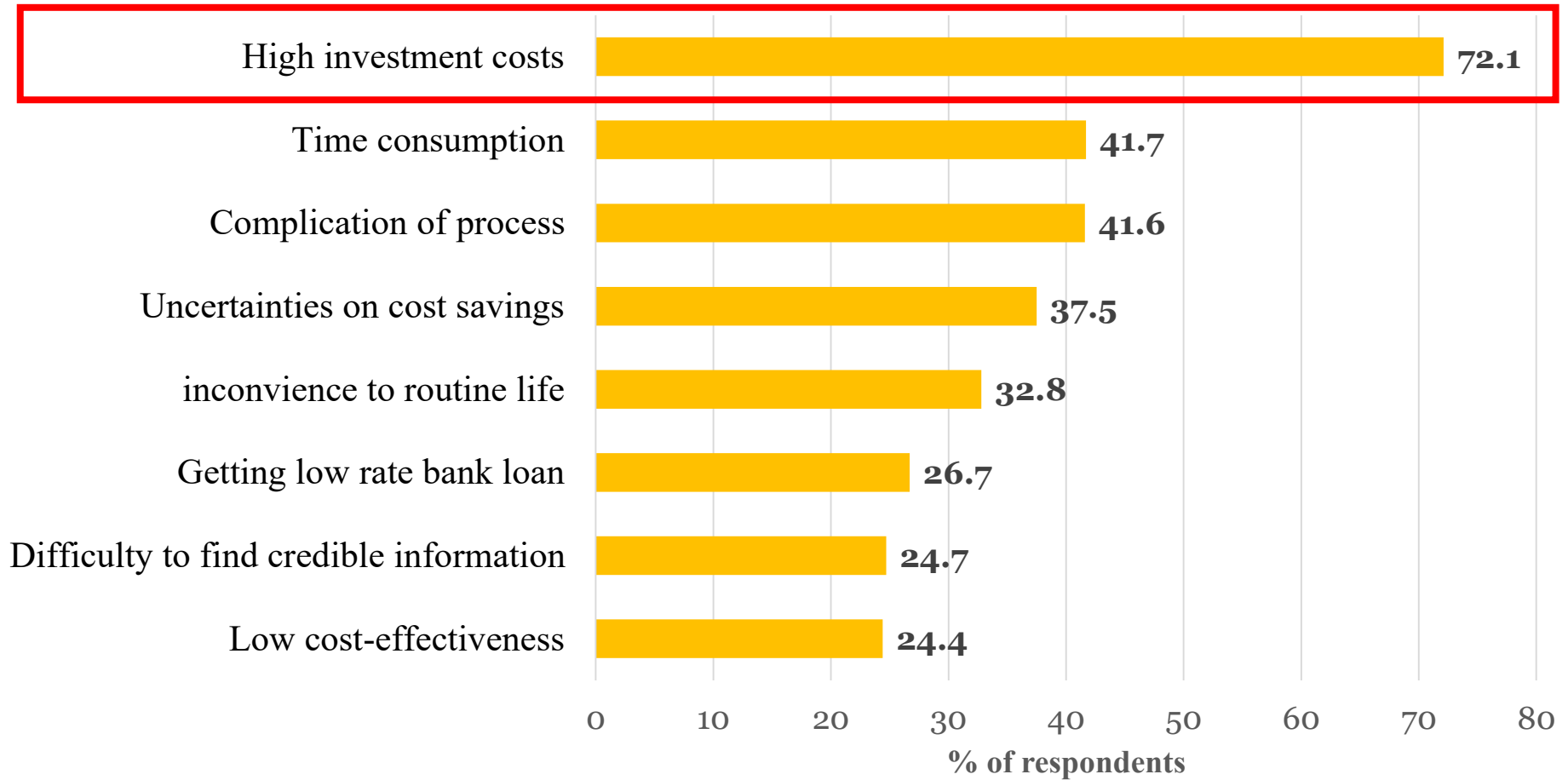
Approximately 46% respondents stated that they have at least one IEP in their house



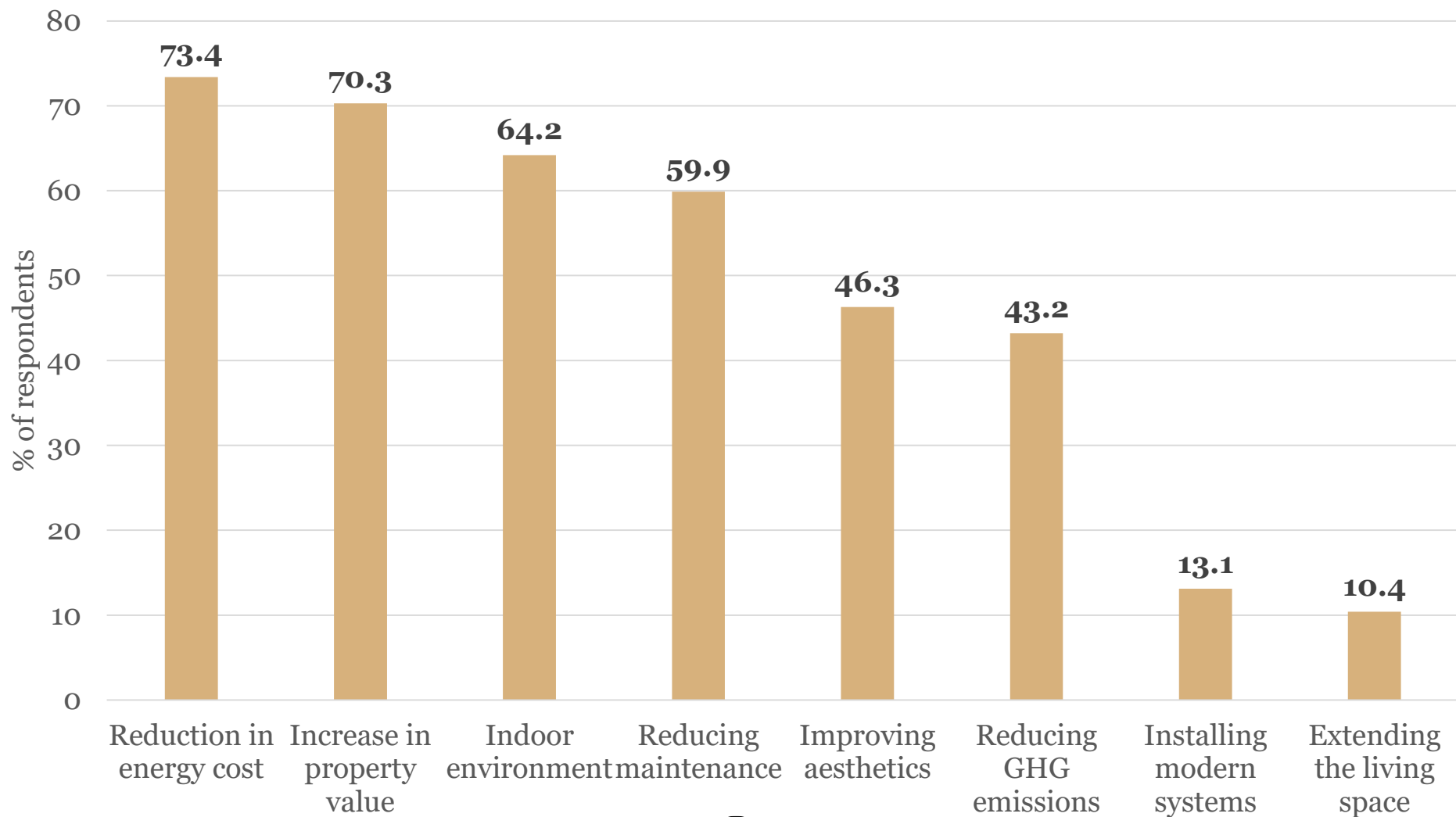
Attitudes towards energy use reduction and perception on household energy use and cost



Barriers to energy renovation



Motivating factors for energy renovation



Homeowners intention for energy renovation

24% of the respondents shown interest for energy renovation during 2018-2020



“Motivated” groups

Demographic factors

Age (18-45 years)
Children below 18 years
University education ≥ 3 yr
Full time job

“House-related” factors

Age of the house (41-55 yr)
Tenure period (1-3 years)
Experience to adopt EEMs in the previous 3 years

76% of the respondents



“Un Motivated” groups

Demographic factors

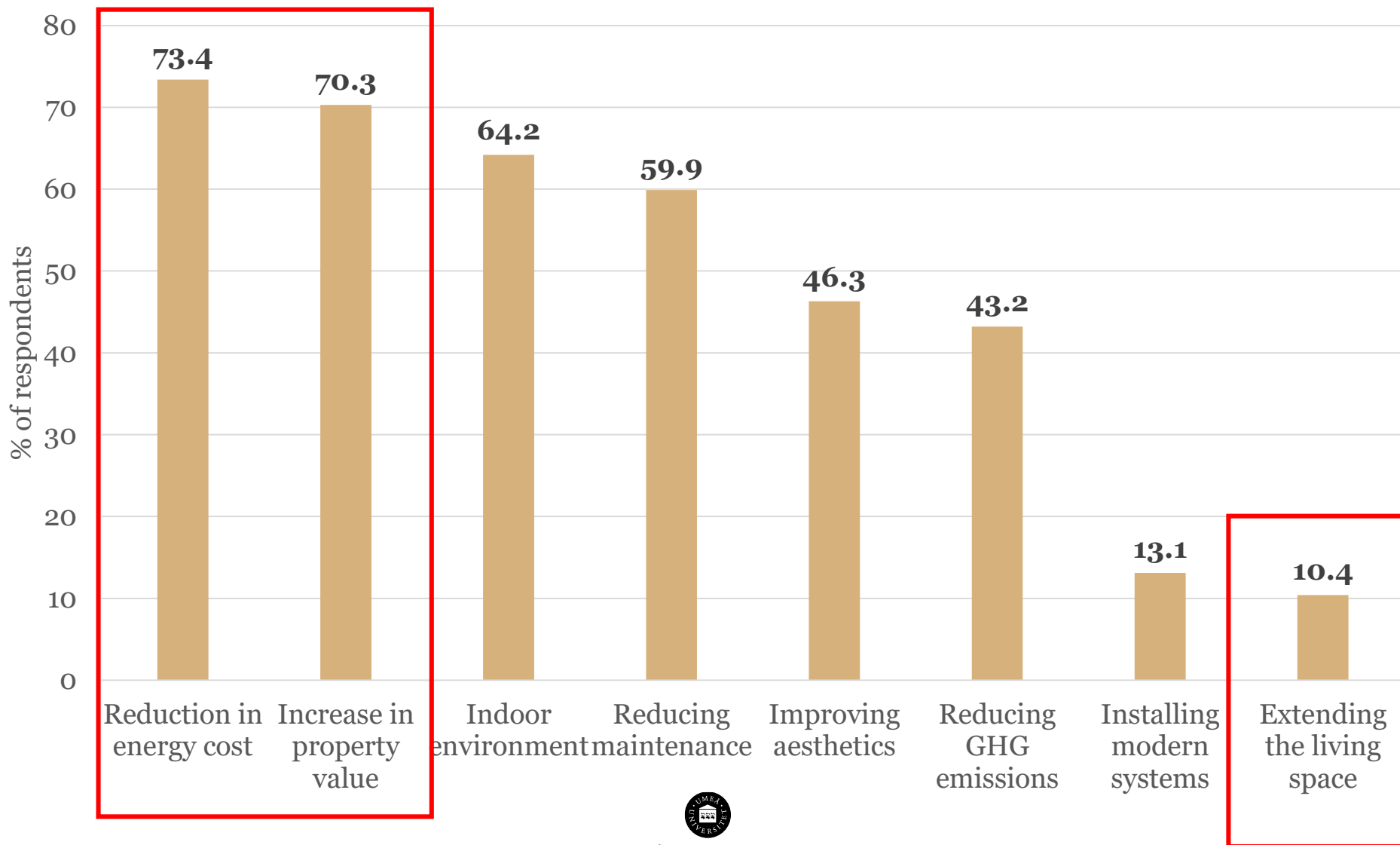
Age (>65 years)
Low and high income Gr
Primary/secondary Educ.
Pensioner

“House-related” factors

Age of the house (<25 yr)
Tenure period (>40 years)
No Experience to adopt EEMs in the previous 3 yrs



Motivating factors for energy renovation



Comparison of “motivated” and “unmotivated” groups on benefits and barriers

Benefits

Reducing the energy cost and increasing the property value are important for both motivated and unmotivated groups

Motivated groups are more likely to consider indoor environment improvement and extending living space as important benefits from ER

Barriers

High investment cost for ER is considered as a barrier by both motivated and unmotivated groups

Unmotivated groups are more likely to consider access to low interest loan and reliable information as barriers to undertake energy renovation



Conclusions

- 24% of homeowners may undertake ER during 2018-2020
- 70% homeowners think energy cost reduction is an important benefits from energy renovation
 - There is no statistically significant relationship between energy cost reduction and intention to carry out energy renovation.
- Improvement of indoor environment is a determinative benefit that motivate homeowners to implement ER
 - Addressing IE problems provide opportunities for energy efficiency improvement
- Younger homeowners (<45 years) are more likely to implement ER
- Those who moved recently to single-family houses are more likely to undertake ER renovation
 - Aesthetics improvement and extending living space are important



Tack!

For further reading:

- Azizi, S., Nair, G., Olofsson, T., 2019. Analysing the house-owners' perceptions on benefits and barriers of energy renovation in Swedish single-family houses. *Energy and Buildings* 187-196.
- Azizi, S., Nair, G., Olofsson, T., 2020. Adoption of energy efficiency measures in renovation of single-family houses: a comparative approach. *Energies*.

