Challenges and solutions for energy renovations – learning from experiences in the Netherlands

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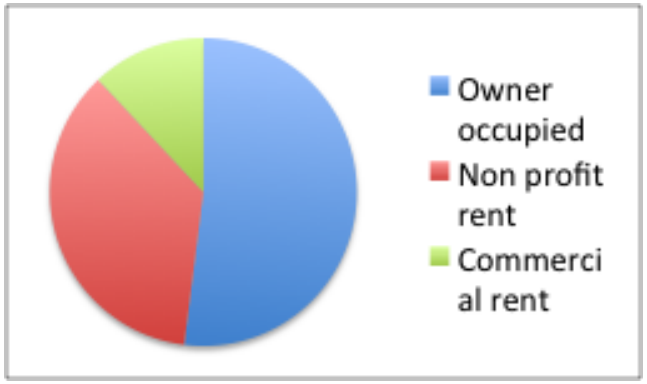
BOUWKUNDE
TU Delft

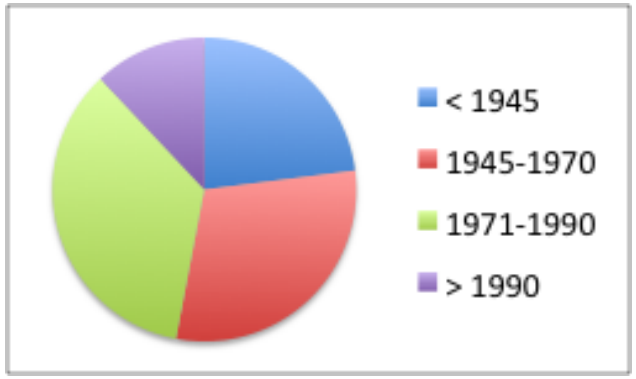
The Dutch Housing Stock

17 million people, 7 million dwellings

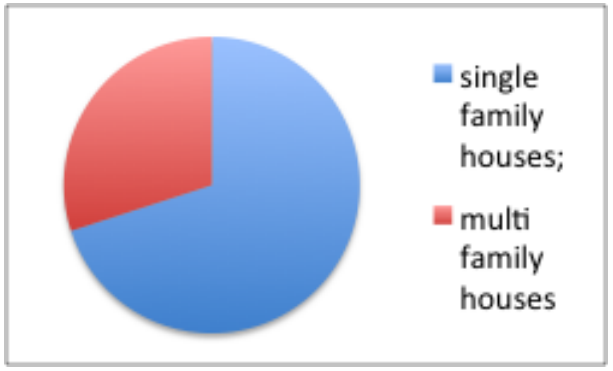
Tenure ship



Year of construction



Type of dwelling



NL / EU Goals

- 40% of energy use: Built Environment
- 2050:Energy neutral + CO2 free Building stock
- 2021 all new housing Nearly Zero Energy
- New housing: 1% per year
- 70% of the stock of 2050 is the current stock
- Very deep renovations on large scale necessary

- NL stock: 7 milj
- New production yearly 50-70.000
- Deep renovations yearly 200-300.000




EU: Main regulatory tools

National regulations based on European directives:
EPBD: Energy Performance of Buildings Directive
EED: Energy Efficiency Directive

For new buildings:
- Energy performance regulations since 1995
- Step by step increase to nearly zero energy by 2021

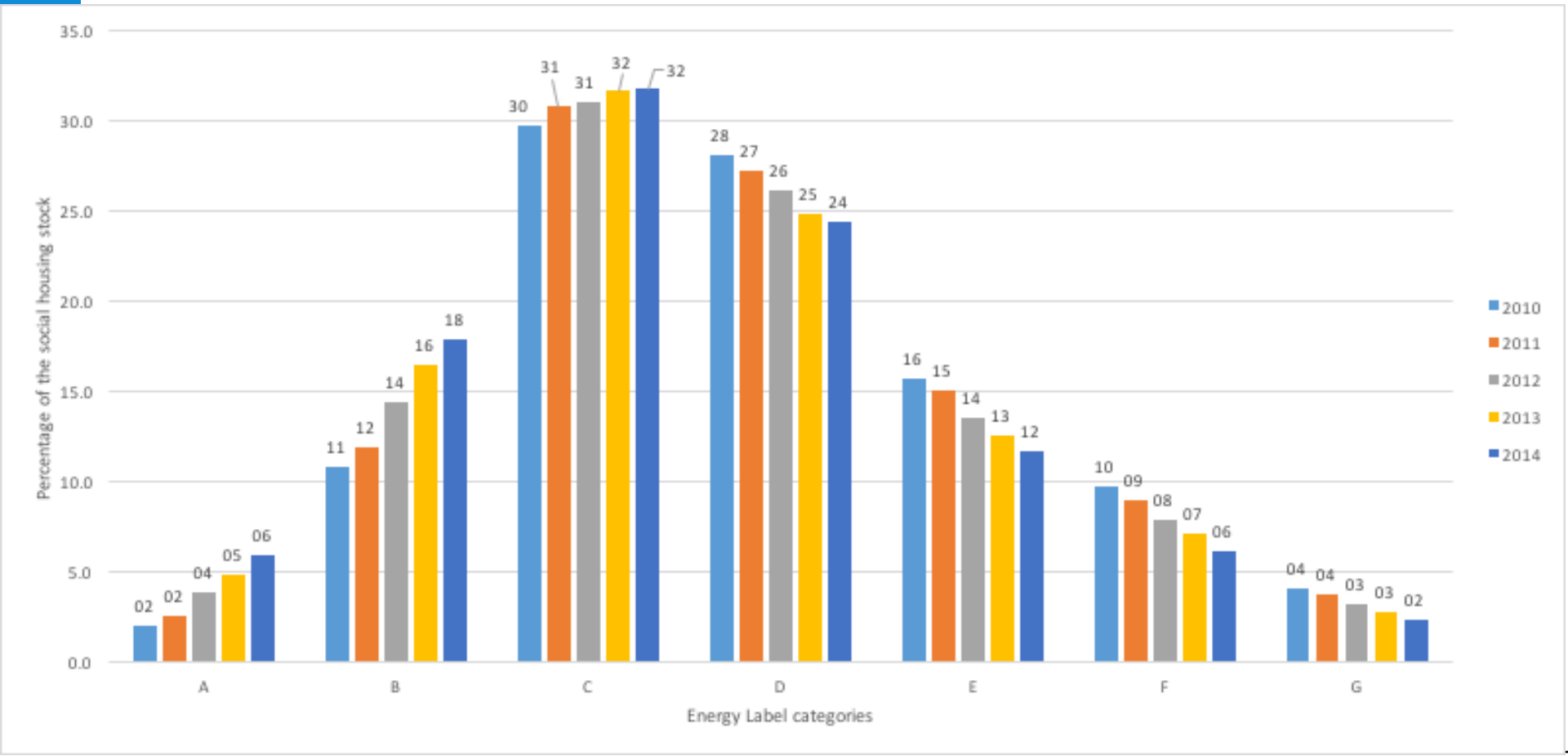
For existing buildings:
- Energy performance certificates (labels)
- Used in incentives policies



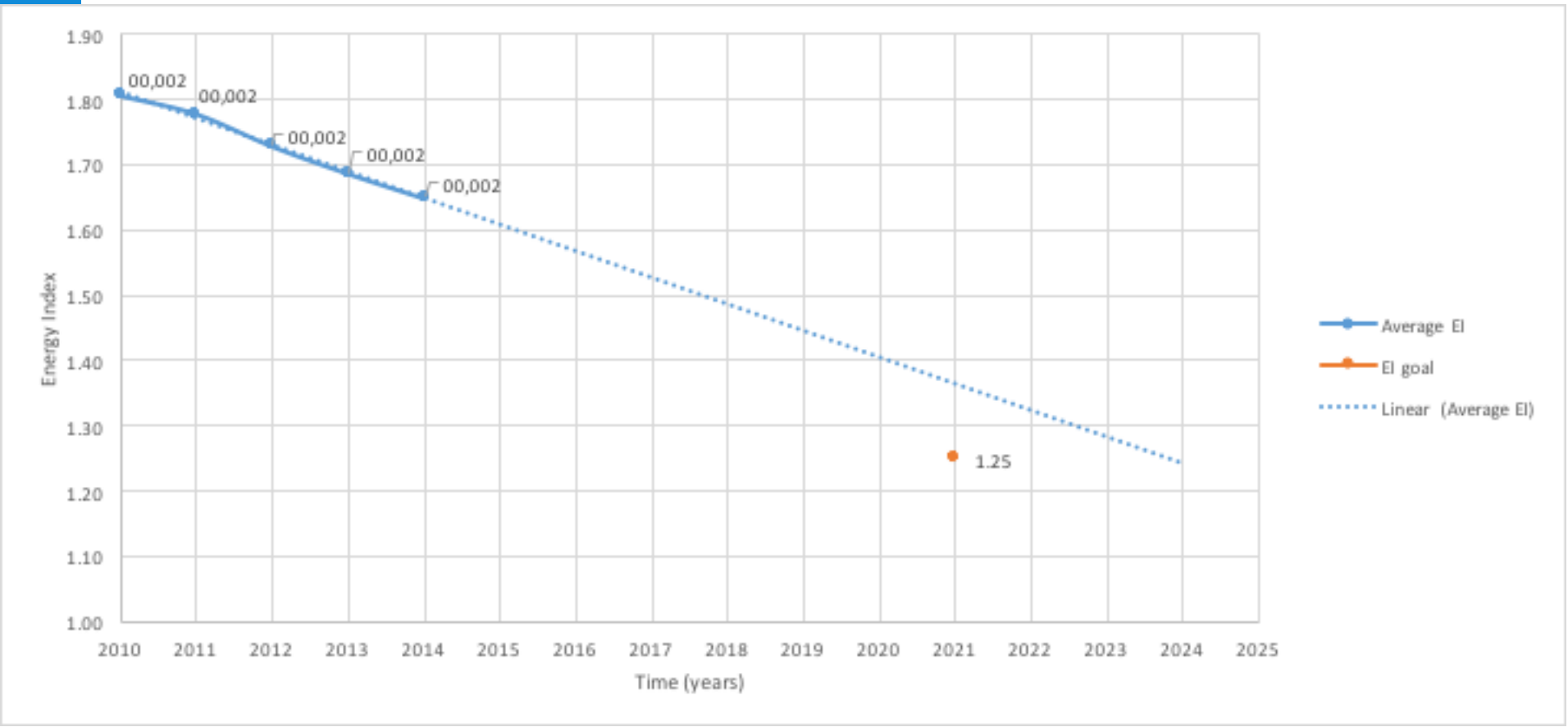
Energy performance certificates as tool for policies

- In 2008: Covenant rental housing sector: 35% of the stock
- Housing associations, tenants union, government
- 2020: average label B

Progress in energy labels of social housing 2010 to 2014



Development of Energy Index 2010 to 2014



Energy Performance Certificate - Actual energy use

PhD Dasa Majcen

Energielabel woning

Afgegeven conform de Regeling energieprestatie gebouwen.

Veel besparingsmogelijkheden

Weinig besparingsmogelijkheden

B
(zie toelichting in bijlage)

Uw woning

Labelklasse maakt vergelijking met woning(en) van het volgende type mogelijk.

Vrijstaande woning

Gebruiksoppervlak	**Adviesbedrijf**
267,2 m²	BuildingLabel.com BV
Opnamedatum	**Inschrijfnummer**
14 december 2011	SKW 21.9500.002-1-2/07
Energielabel geldig tot	**Handtekening**
14 december 2021	
Afmeldnummer	
452962250	

Straat
Kornoelje
Nummer/toevoeging
Postcode
3892 XA
Woonplaats
Zeewolde

Energielabel op basis van een ander representatief gebouw of gebouwdeel? nee
Adres representatief gebouw of gebouwdeel:

Standaard energiegebruik voor uw woning

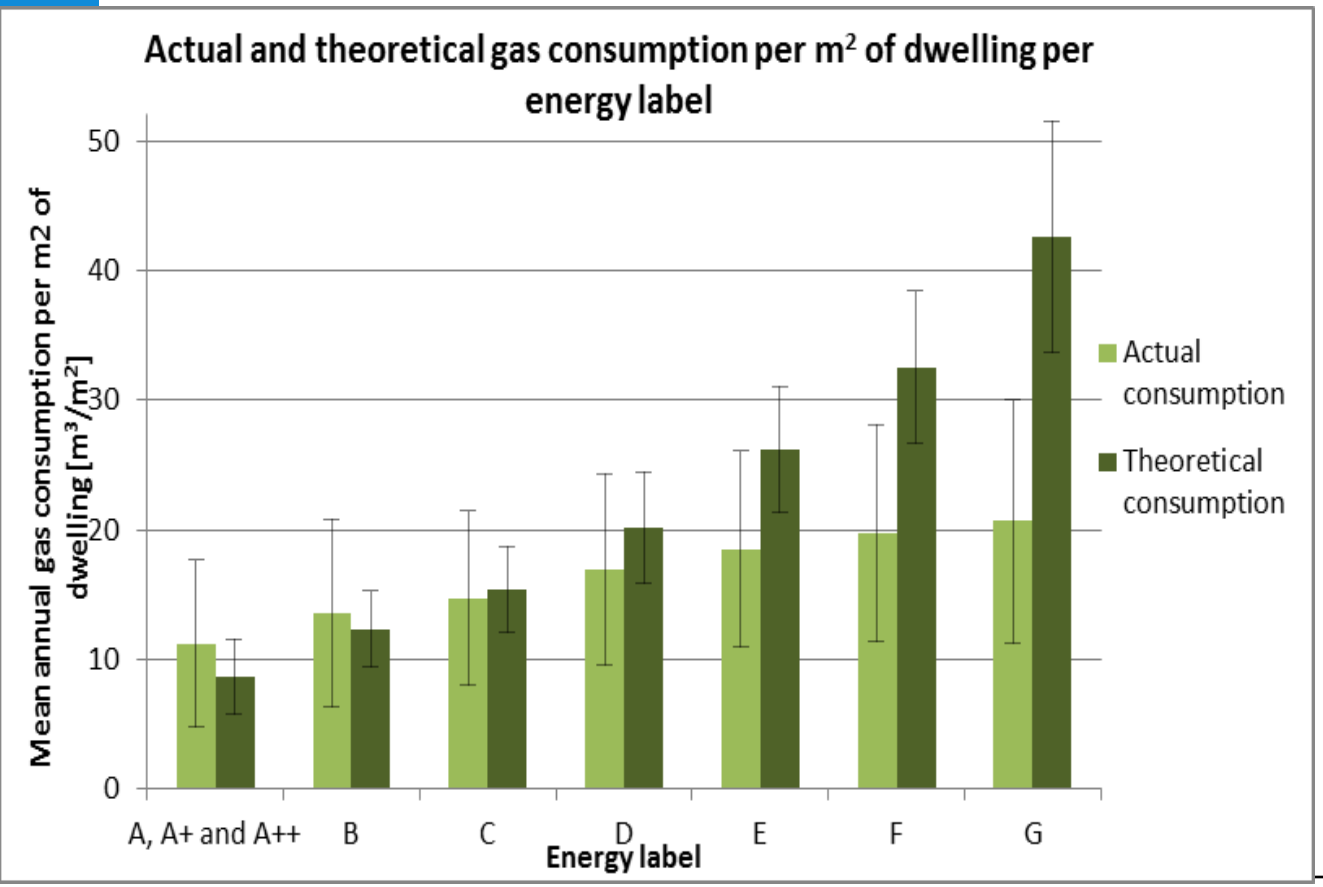
Energiegebruik maakt vergelijking met andere woning(en) mogelijk.

- Het standaard energiegebruik is de jaarlijkse hoeveelheid primaire energie die nodig is voor de verwarming van uw woning, de productie van warm water, ventilatie en verlichting.
- De eventuele opbrengst van een zonnepaneel wordt hiervan afgetrokken.
- Het energiegebruik wordt berekend op basis van de bouwkundige eigenschappen en de installaties van uw woning.
- Bij de berekening wordt uitgegaan van het gemiddelde Nederlandse klimaat, een gemiddeld aantal bewoners en gemiddeld bewonersgedrag.
- Het standaard energiegebruik wordt uitgedrukt in de eenheid 'megajoules', dit is gebaseerd op elektriciteit (kWh), gas (m³) en warmte (GJ).

200.035 MJ
(megajoules)

3.943 kWh (elektriciteit)
4.653 m³ (gas)
0 GJ (warmte)

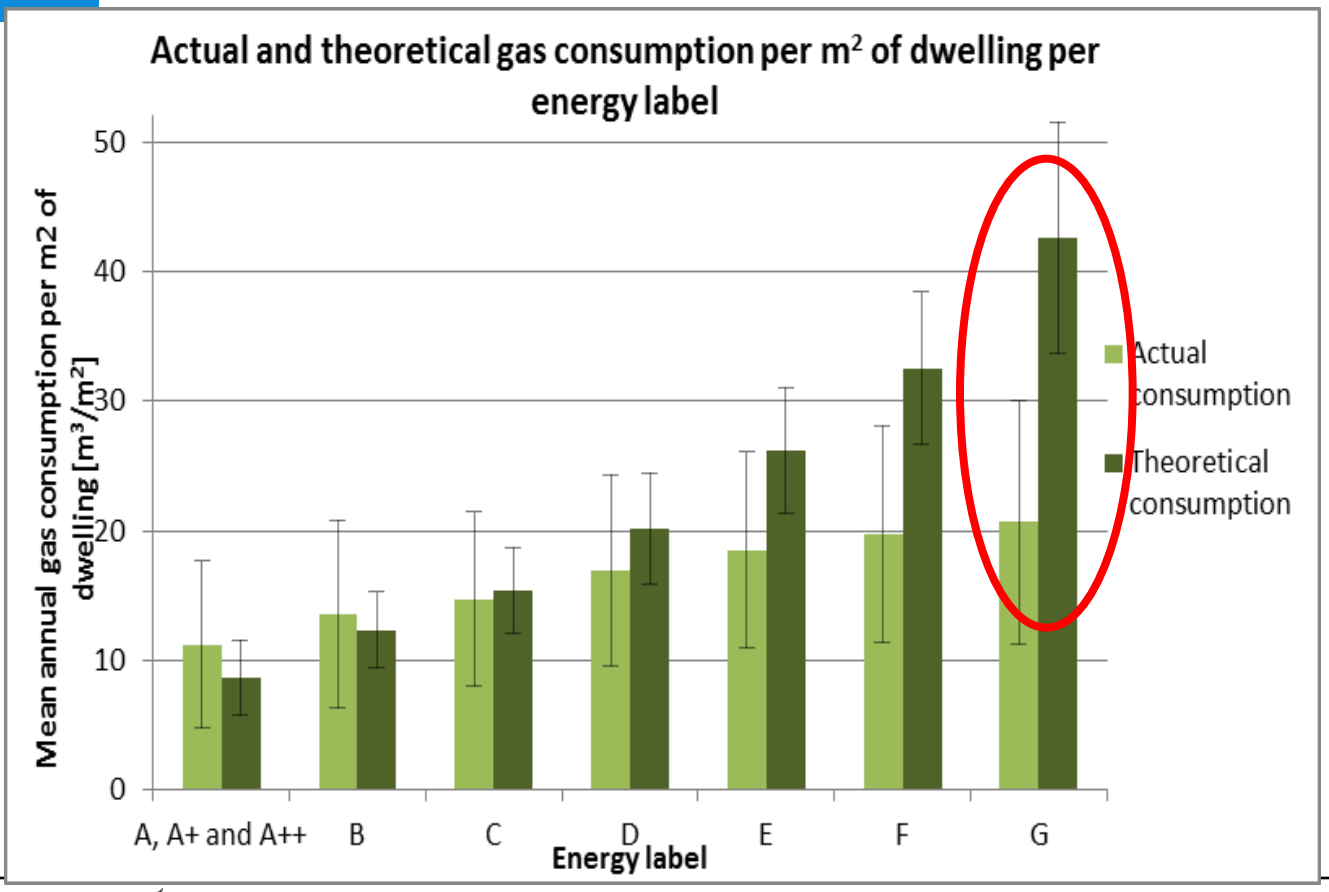
Results



Theory

Actual

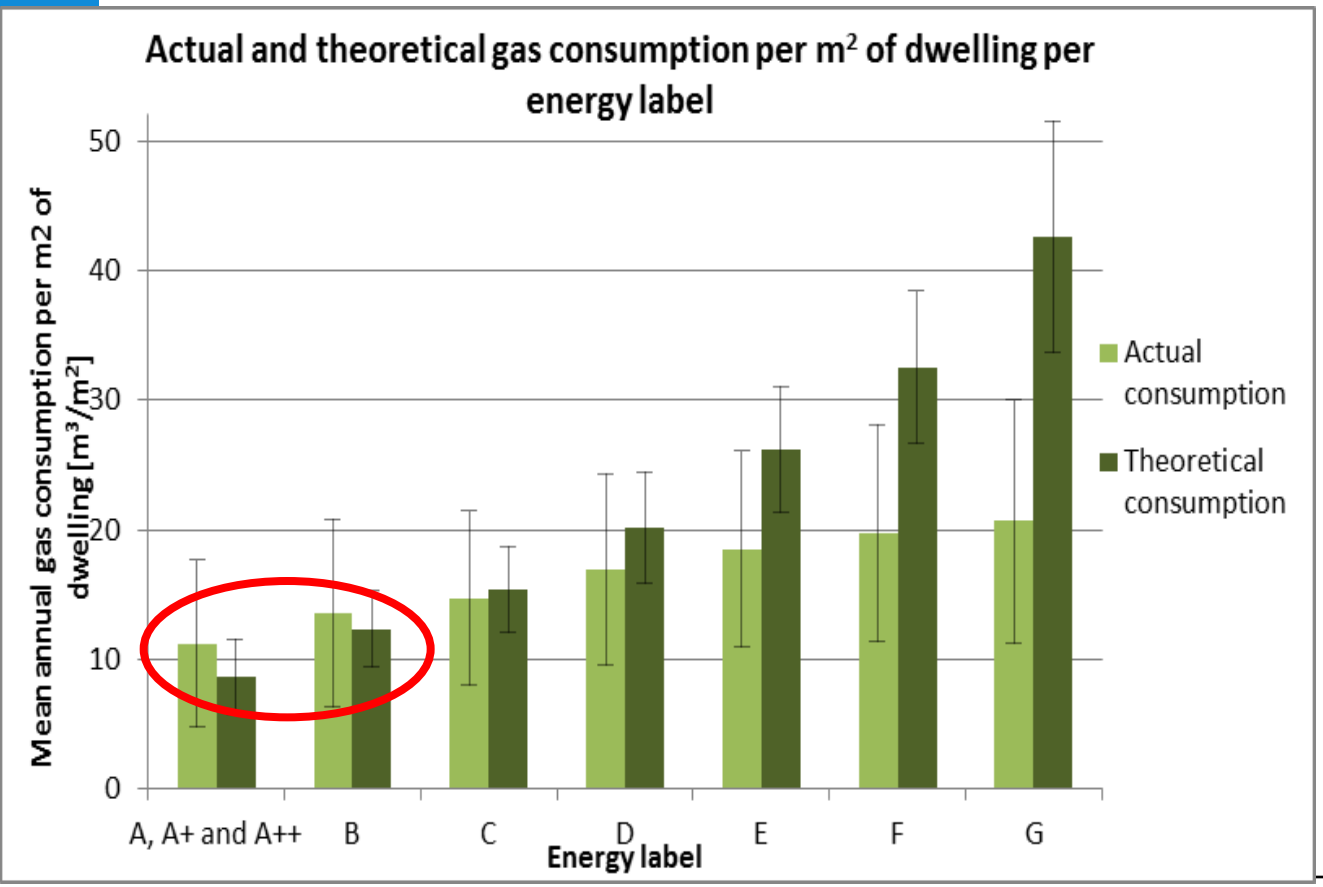
Results



G label:
50% less use than expected

Not all rooms are heated

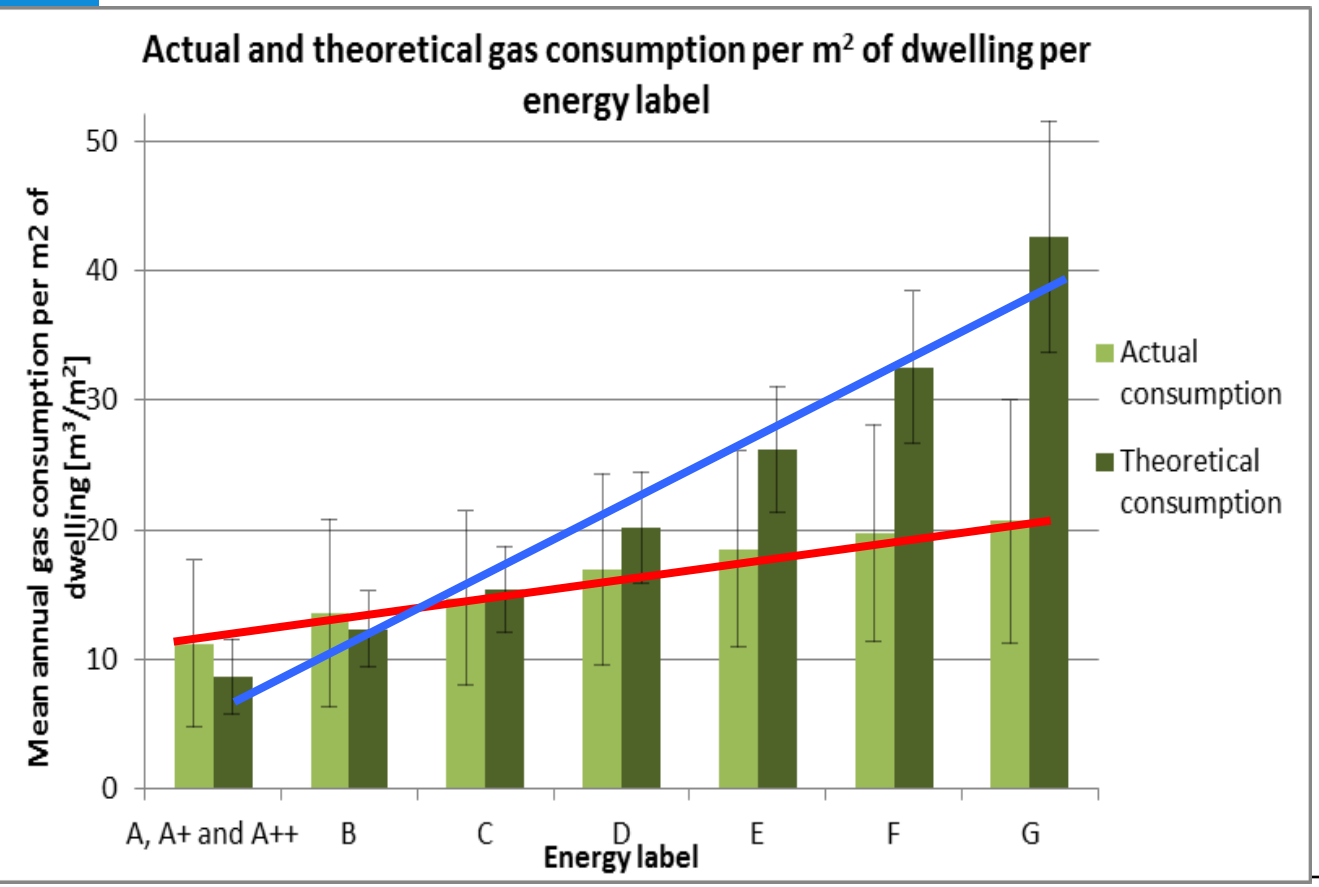
Results



A and B label:
10-20% more use than expected

Technical underperformance
Rebound effects

Results



Very little actual savings !!

Explanations for the Performance gap

For high label (A, B) dwellings:
- Underperformance of the buildings and installations
- Rebound effect – higher temps – sometimes due to the heating system

For low label (E, F, G) dwelings:
- Better performances of buildings (U-values) and installations
- Lower heating in fewer rooms – sometimes due to the heating system



Net zero energy renovation

- Energiesprong
- Innovative approach
- Prefab elements
- Short renovation process
- 0 energy bill; € 175 rent increase
- Investments yet about € 70.000; should be reduced to € 40.000.

- (So far) too high investments; too high rents; less savings



Challanges

- Zero energy renovations: (So far) too high investments; too high rents; less savings
- Mainly the social housing stock; mainly single family dwellings
- NOT: individual home owners
- Hardly not: multi apartment residential buildings
- Organisation of Associations of homeowners problematic
- Limited regulatory means: conflict with ownership rights



Zero energy renovation concepts for multifamily residential buildings

Energy renovation of individual flat units in NL

China

- Individual ownership
- State organised and payed energy renovation
- Too limited…
- PhD study: are home owners willing to invest?

China