

MINIMERING AF PERFORMANCE GAP VED INDRAGELSE AF BRUGERADFÆRD I BYGNINGSREGULERING

INNOVATIONSNETVÆRKET SMART ENERGY
ODENSE CONGRESS CENTER 10 MAJ 2016

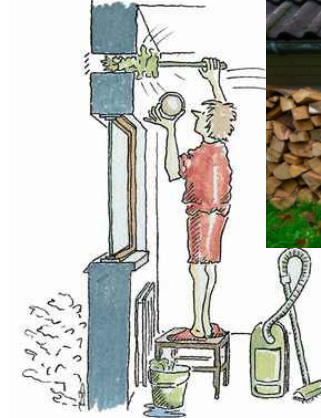
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AALBORG UNIVERSITET KØBENHAVN

Hvad jeg vil sige....

- Hovedparten af vores energitiltag er rettet mod energi effektivisering af apparater og bygninger
- ... og energi effektivisering er ikke det samme som energibesparelser
- Energieffektivisering er en effektiv adfærdskampagne – den forkerte vej
- Brugeradfærd hænger sammen med teknologien og det skal tænkes mere ind i reguleringen for at opnå reelle besparelser



1.

Brugerpraksis betyder mindst lige så
meget som effektiv teknologi

Brugerpraksis VS effektiv teknologi



Energi effektive bygninger

- Fremtidens parcelhus i Køge: Bruger reelt ca. halvt så meget energi som gennemsnitlige parcelhuse
- "Teknologi" betyder en faktor 2 i forskel for energiforbrug

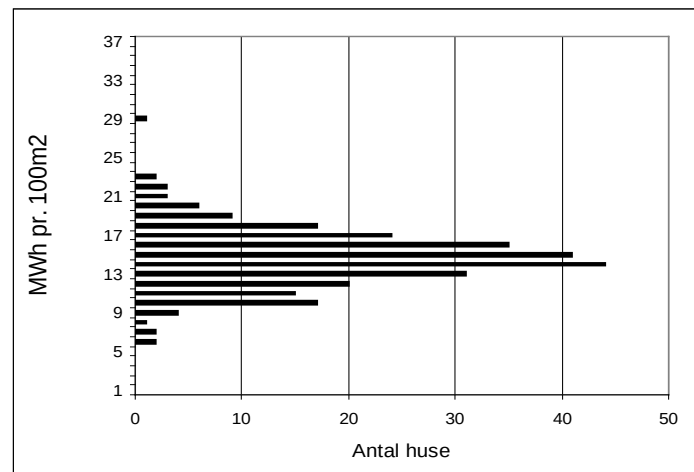


Brugerpraksis VS effektiv teknologi



Ens huse – forskelligt forbrug

- Faktor 2-3 i forskel mellem varmeforbrug afhængig af brugerpraksis



2.

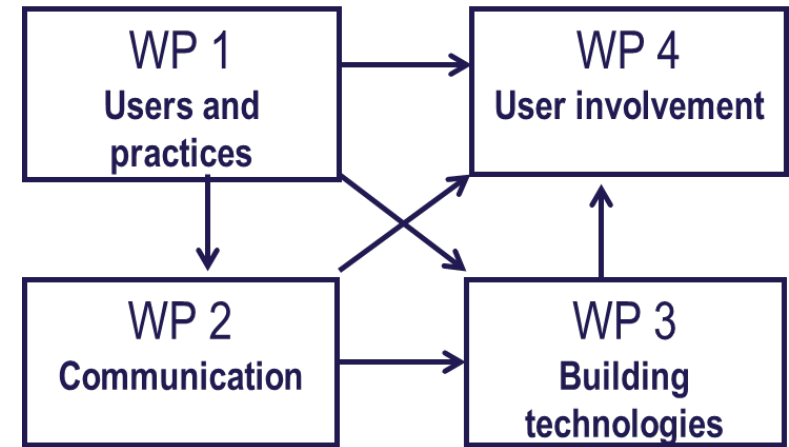
Brugerpraksis hænger sammen med
teknologien

UserTEC project – a five year strategic research project

User practices, technologies and residential energy consumption

- 6 PhD projects
- 12 business partners
- 4 international university partners

How to realise more *real* energy savings by incorporating knowledge of users in technology design and energy policy?



Supported by:



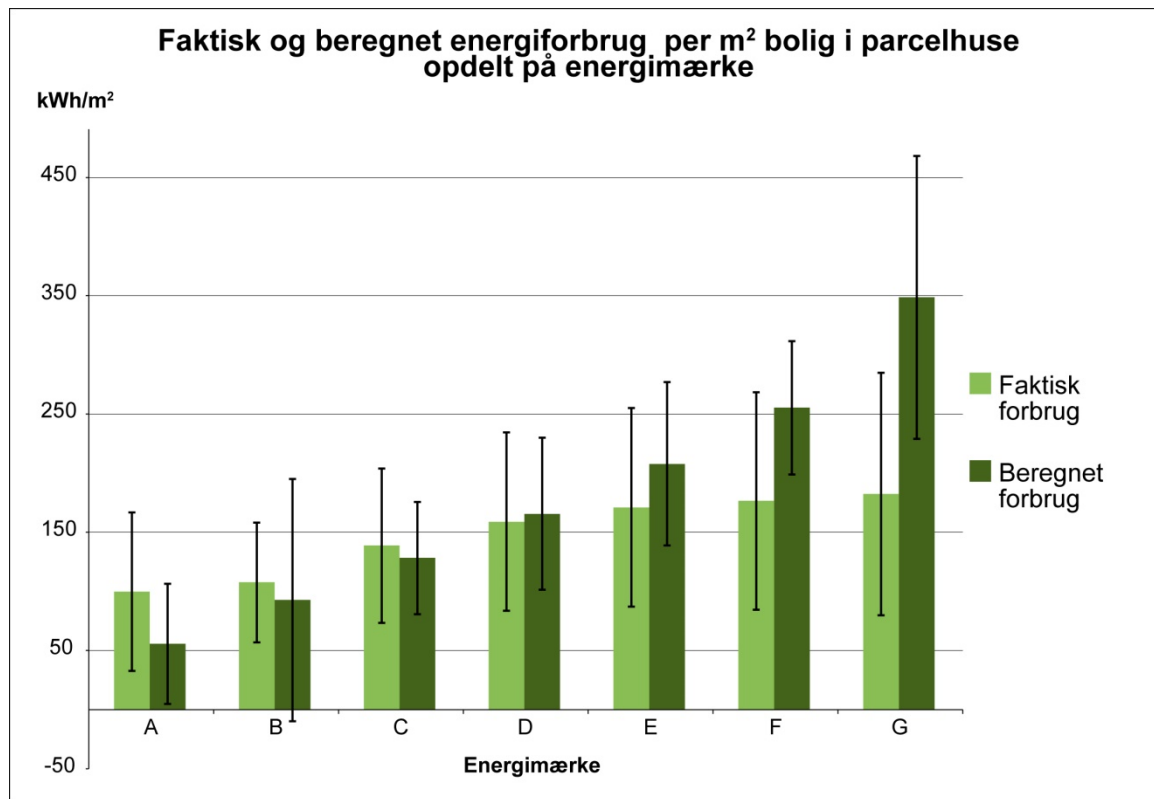
Innovation Fund Denmark

RESEARCH, TECHNOLOGY & GROWTH



DANISH BUILDING RESEARCH INSTITUTE
AALBORG UNIVERSITY COPENHAGEN

Beregnete og faktiske forbrug i boliger

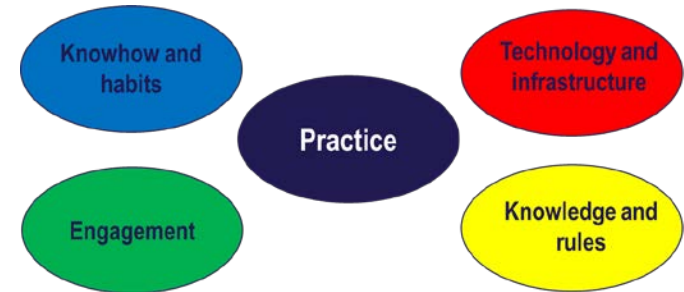
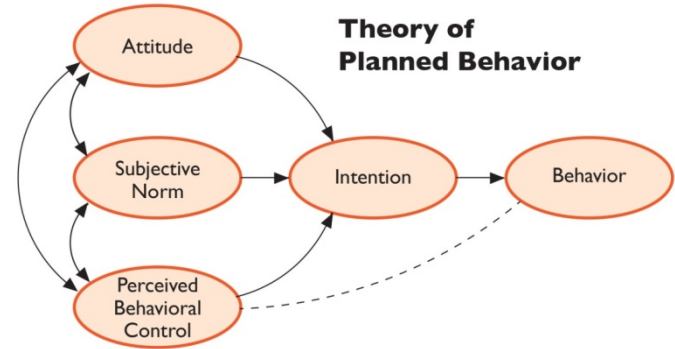


Fra SBI rapport 2016:09
(Figur baseret på data om
ca. 135.000 parcelhuse)



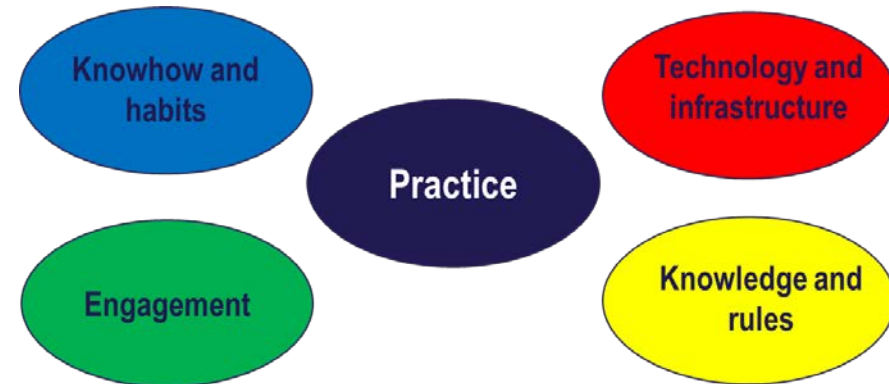
3. Forskellige teorier om brugerpraksis

- Er brugerpraksis individuelt
ELLER kollektivt?
- Er brugerpraksis rationelt styret
ELLER rutine præget?
- Er brugerpraksis baseret på
individuelle værdier og normer
ELLER styret af sociale og
tekniske strukturer?



Basics of practice theory

- Practices are at the centre of the social
- Practices are collective across time and space
- Practices are carried by practitioners
- Practices consist of “doings” and “sayings” held together by different elements

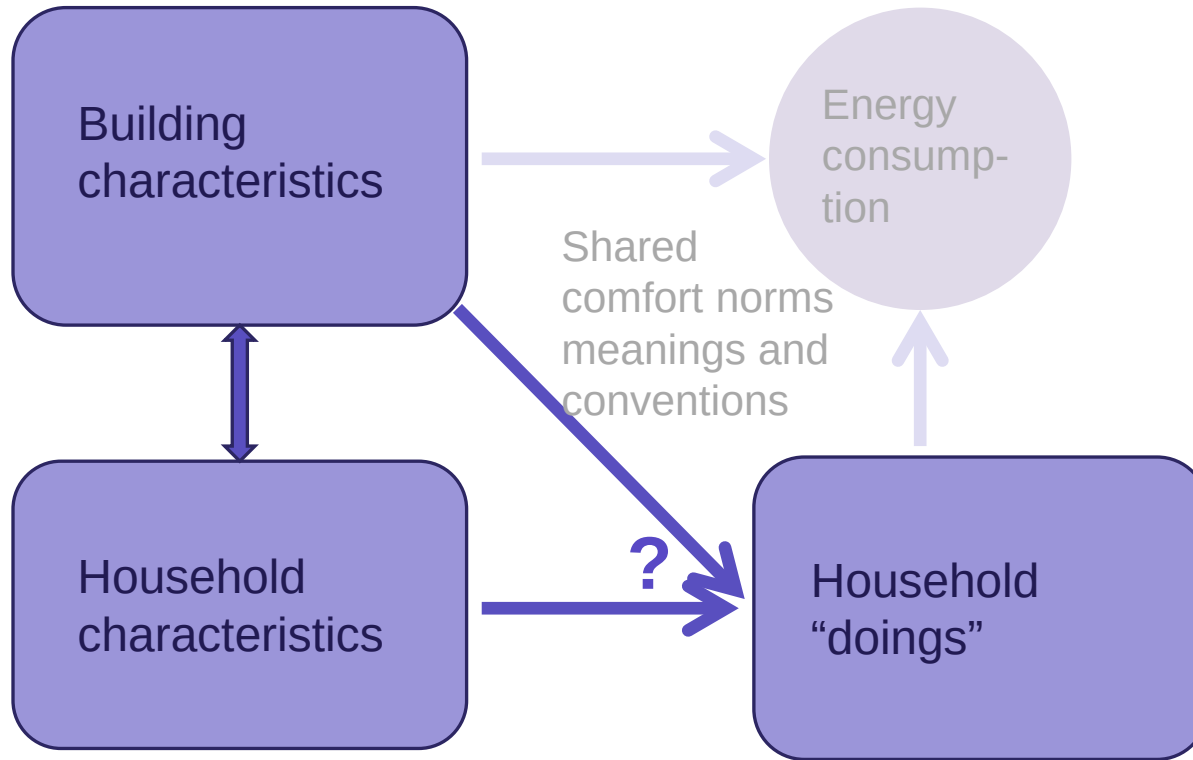


Praksisteori og energiforbrug

- Vi forbruger energi fordi vi udfolder og tager del i forskellige sociale praksisser
- Materielle strukturer former de sociale normer, meninger og konventioner der ligger bag praksisserne, og dermed former de også den måde vi bruger energi på
- Tidligere har der mest været kvalitative studier af dette
- Tidligere praksisteori studier har primært fokuseret på, hvordan tekniske strukturer former praksisser og ikke så meget hvordan de sociale strukturer også er en del af dette



4. Analyse af survey: kollektive strukturer bag praksis



Methods and data

Based on **survey data**:

- Questions formulated in the UserTEC group
- Data collection by Statistics Denmark during winter 2015
- Respondents delivered by a district heating company in Aarhus
- Number of responses: 1.216 persons (response rate = 69.5 %)
- Combined with registerdata (from Statistics Denmark)

Methods:

- Different **regression techniques** according to the type of dependent variable (household doings).



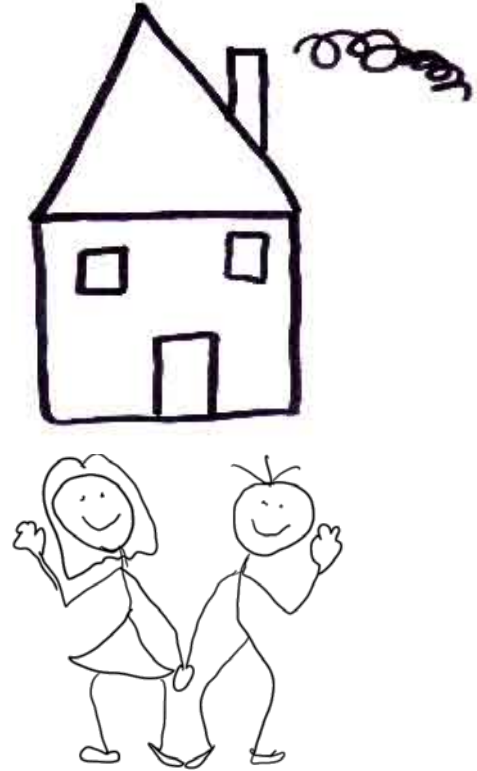
Building and household characteristics

Building characteristics:

- Building year (energy efficiency and building types)
- Building Size
- Heating and ventilation technologies

Household characteristics

- Size and composition of households related to income, education, age, immigrant status



“Doings” related to indoor comfort and energy

Airing:

- Frequency of opening of doors and windows



Temperature:

- Frequency of adjusting thermostats
- Temperature level



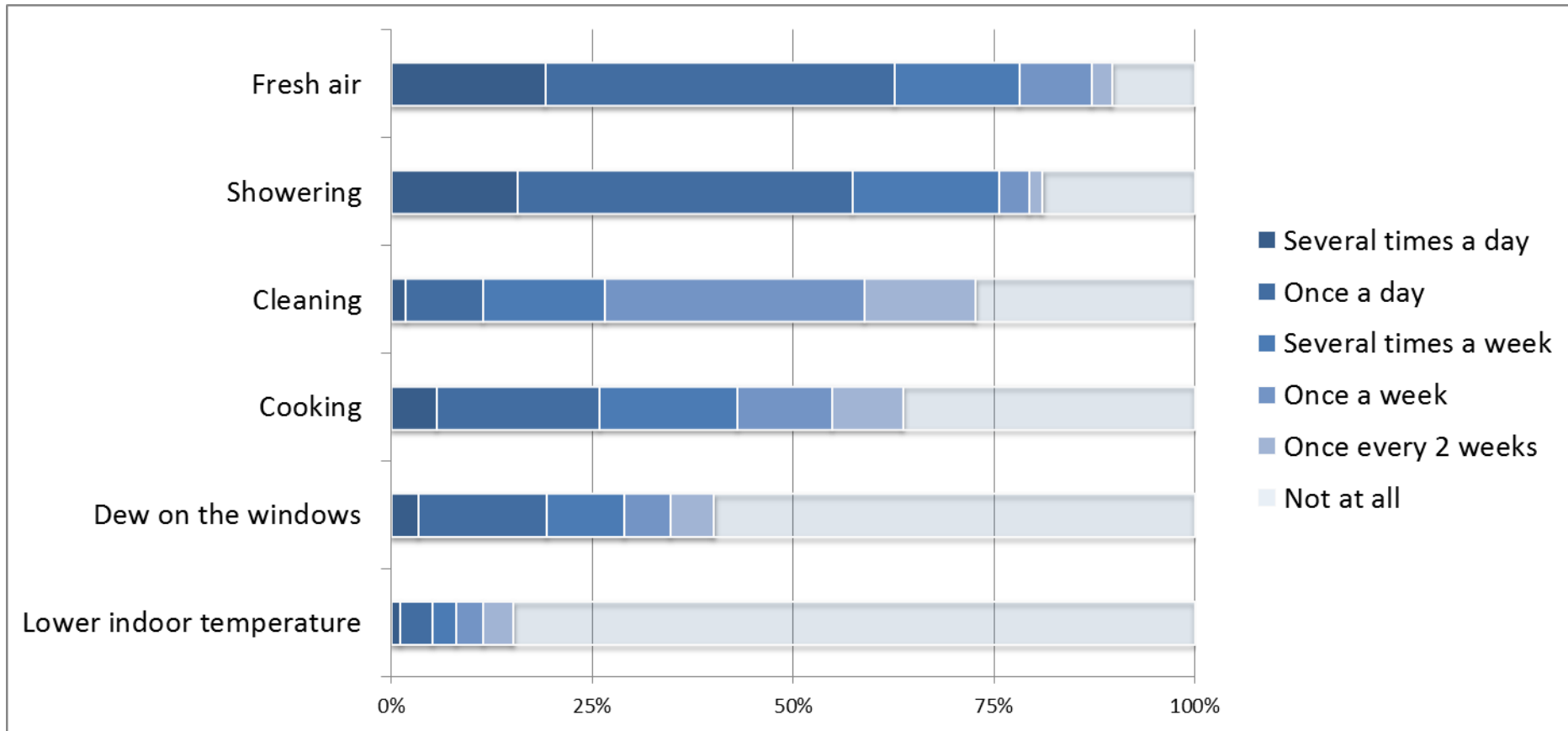
Clothing:

- Clothing on body, socks/shoes and use of blanket



	Adjusting thermostats freq.	Airing freq.	Clothing	Colder temperature (compared)
Before 1962	Ref.	Ref.	Ref.	Ref.
From 1962 to1979			—**	—**
From 1980 to1999			—*	—***
After 1999			—***	—***
Underfloor heating in living room				—***
Underfloor heating in bedroom	—***			
Underfloor heating in bathroom	—***			—*
Mechanical ventilation with heat recovery	—*	—***		
Basement		—*		
Smallest area	Ref.	Ref.	Ref.	Ref.
Middle area				+*
Largest area				+***
Rooms: 4 or less	Ref.	Ref.	Ref.	Ref.
Rooms: 5		—**		
Rooms: 6 or more		—*		
Number of observations	1.170	1.170	1.170	1.105
note: *** p<0.01, ** p<0.05, * p<0.1				

How often have you aired (in the past two weeks)?



	Adjusting thermostats freq.	Airing freq.	Clothing	Colder temperature (compared)
Income				
Elementary school or no education	Ref.	Ref.	Ref.	Ref.
High school level				
Bachelor's level			+***	
Master's level and PhD	+***		+***	+**
Immigrant or descendant	+***	+**		+*
Male			—***	
<45	Ref.	Ref.	Ref.	Ref.
45 to 64				
64<		+*	+*	
Child in household		+***		
Partner	+***			
Number of observations	1.170	1.170	1.170	1.105
note: *** p<0.01, ** p<0.05, * p<0.1				

Results summarized

Doings relate to building characteristics, for example...

- People dress warmer in older buildings
- People keep higher temperatures in newer buildings
- People regulate thermostats less if they have underfloor heating

Surprisingly, airing habits do not depend on building types. Maybe because they depend on other social practices like bathing and cooking.

But doings also relate to household characteristics, for example...

- Higher educated dress warmer and heat less
- Older, and families with children, air more

Both social and technical structures take part in structuring especially comfort norms and habits related to indoor climate

Doings as related to structures rather than individual norms.



Effektiv teknologi påvirker vores adfærd – den ”forkerte” vej



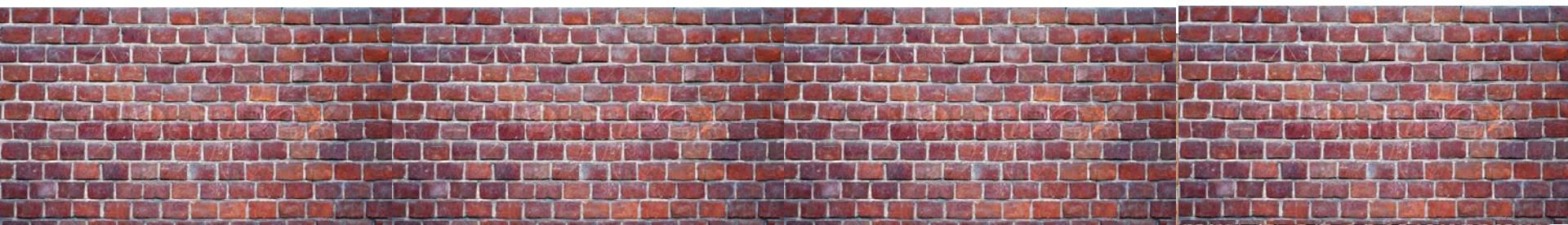
Energiforbrug før og efter renovering

Rebound effekt:

International og DK forskning viser, at ved energi renovering bliver 20-50 % af den potentielle energibesparelse af beboerne omsat til øget komfort.

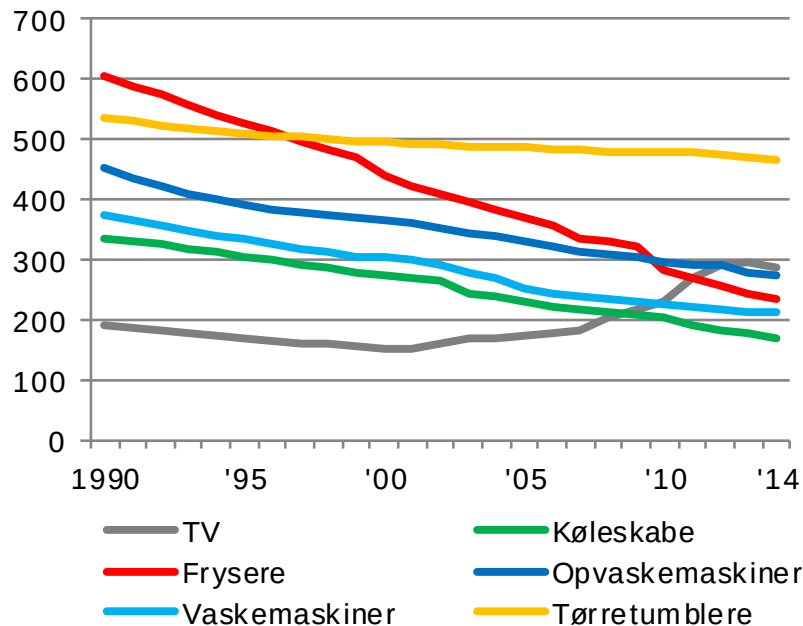
Prebound effect:

International forskning viser, at beboerne i dårligt isolerede bygninger har væsentligt lavere forbrug end beregnet .Besparelse kan derfor ikke blive så høj som beregnet

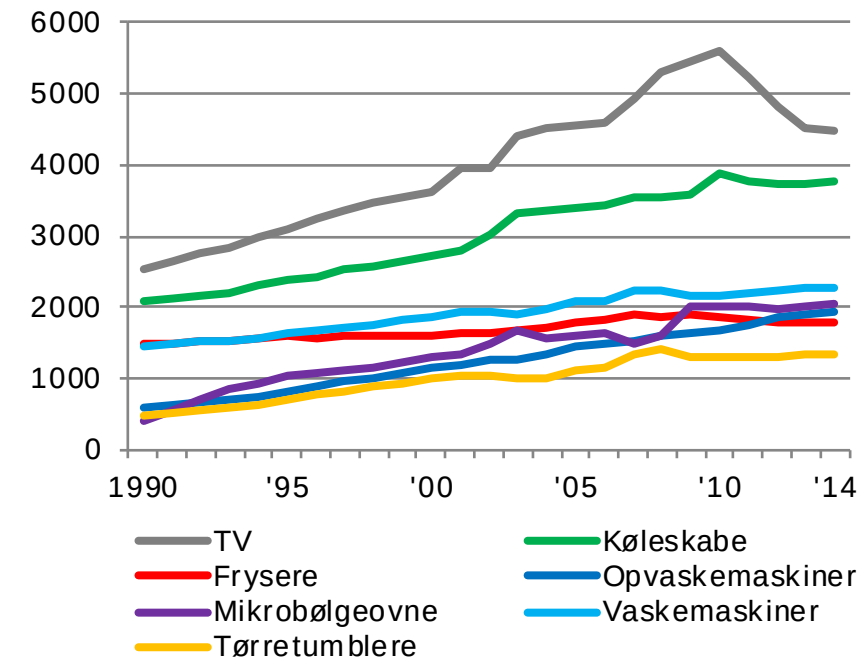


Effektivitet og antal af apparater

kWh/år

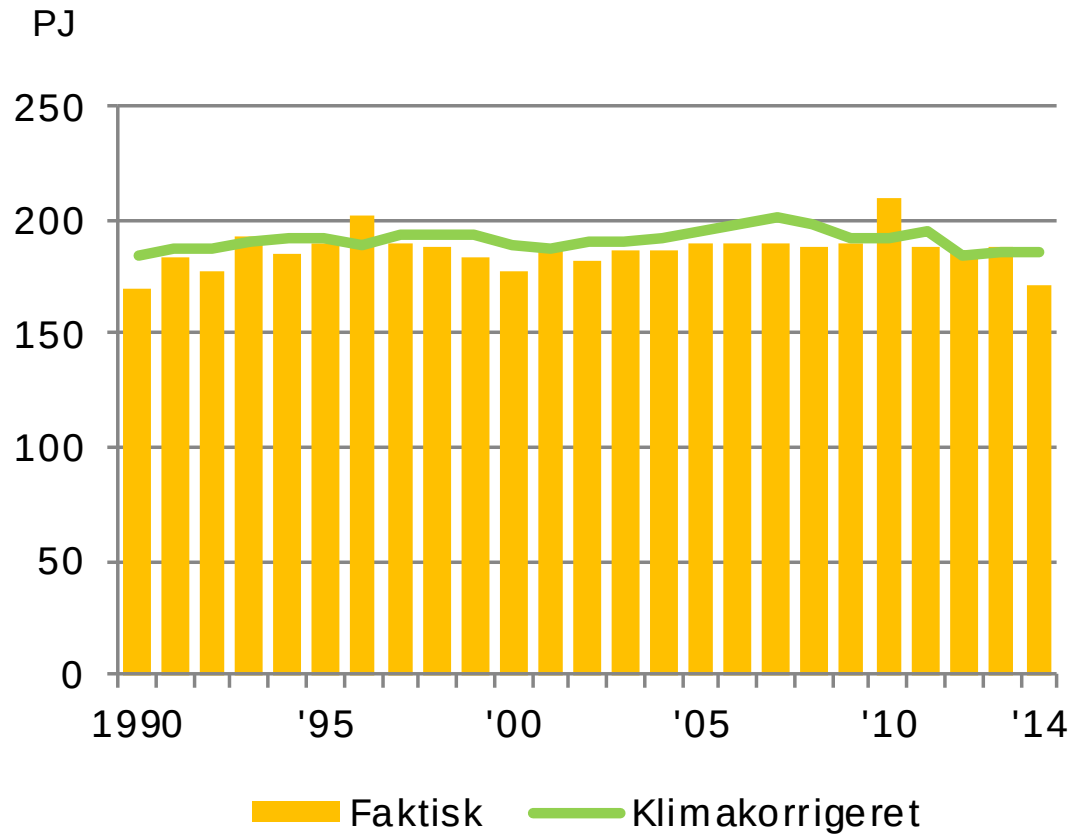


1000 stk.



Fra energistatistikken
2015, ens.dk

Energiforbrug i husholdninger



Fra energistatistikken
2015, ens.dk

Varmepumper: en effektiv teknologi

Skift fra el-panel til varmepumpe:

- I helårsbeboelser blev 20% af besparelsen omsat til øget komfort
- I sommerhuse var der i gennemsnit *ingen* besparelse – men meget komfort
- Ny teknologi fører til ændret adfærd – teknologi er ikke besparende i sig selv



(Gram-Hanssen, Christensen, Petersen, 2012)

Kampagne for varmepumpe

Spar kolde kontanter på varmeregningen

- og nyd et lunt sommerhus året rundt

5 års totalgaranti

Gevinst på elregning, indeklima og miljø:

- ✓ Spar op til 66 % på varmen
- ✓ Tørt og behageligt indeklima
- ✓ Forlæng sæsonen energivenligt
- ✓ Spar miljøet for CO2-udslip

De gode argumenter for at installere en Danmarkspumpe i sommerhuset står nærmest i kø. Spar op til 66 % på dine varmeudgifter sammenlignet med el-opvarmning. Få et behageligt indeklima uden lugt, fugt og risiko for skimmelsvamp. Vi giver 5 års totalgaranti på varmepumpe og installation.

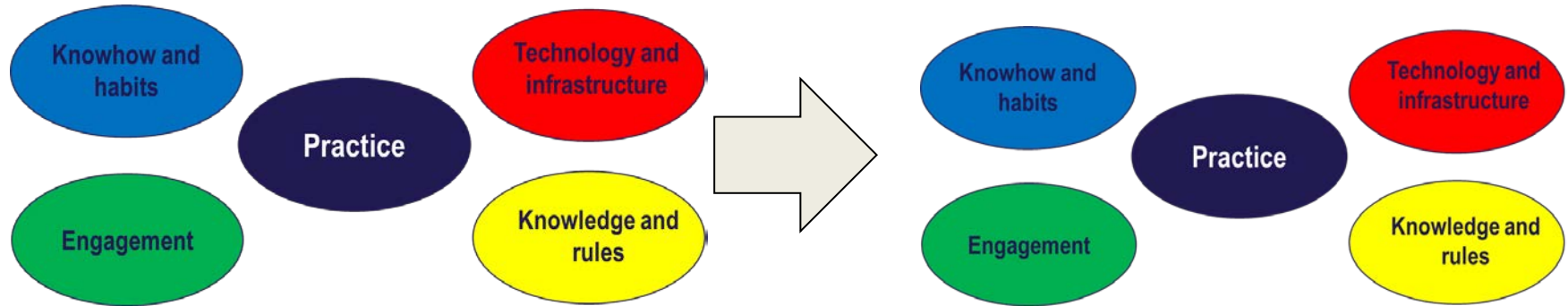
Salgs-annonce i
kunde-magasin

Skal vi påvirke adfærden? Kan vi lade være?

- Naivt at mene, at man ikke skal påvirke brugernes adfærd - for det gør man hele tiden – men den forkerte vej!
- Kan man gøre noget for at påvirke adfærden den anden vej – oplysningskampagner og feed back - til individer eller kollektivt – virker det?



Practice theory and sustainable transitions.....



Changing, developing or substituting practices

Policy on Knowledge and rules

- **E.G. Building regulations** have been strong in promoting low-energy buildings
 - What building regulations includes practices?
 - Buildings which sustain sustainable practices rather than just being efficient
 - Provide knowledge and feedback to end-users –
Is there a lack of knowledge? Is there an interest? Does information influence habits?

Policy on Technologies and infrastructure

- Public funding of technology R&D
- Now: focus is on energy efficiency.
- Change to technologies that support low consuming practices
- Include users in technology development
- Public planning of the build environment – think about what practices are shaped by...
- Urban planning and transport
- Infrastructures of provision



Policy on Know-how and habits

- Energy policy focus on habits, is often about changing “bad” habits. More relevant would be:
- Nudging: Technologies and material structures which guides habits: Make it easy to do the right!
- Learning processes developing know-how - trying out new practices through demo-project etc.
- Include the provision side as sustainable instructors when selling, installing etc.

Policy on Engagements,

- Public campaigns, taxis and subsidiaries, support of community projects and public learning projects etc.
- LA21: Is all this forgotten?
- Not focusing on buying efficient, but on buying less, living smaller, turning down

Public campaigns are often doing the opposite

- The actor perspective needs to be part of this



Vore hidtidige politiske tiltag

- Forsyningsselskabernes spareforpligtigelser og standardværdikataloget
- Bygningsreglementet og energimærkning
- Ecodesign direktiver
 - Driver teknologiudviklingen og dermed brugen i én retning
- ... og så måske lidt kampagner om at vi skal huske at slukke lyset og feedback



Hvordan kan vi bruge denne type viden?

- Hvordan får vi tænkt brugerne ind i bygningsreguleringen
- Hvordan får vi brugen tænkt ind i energiselskabernes spareforpligtigelser
- Hvad andet kan vi gøre for at få reelle besparelser?

