



Understanding the sustainability of apartments over time

Renovation patterns in Swedish modern owner-occupier apartments

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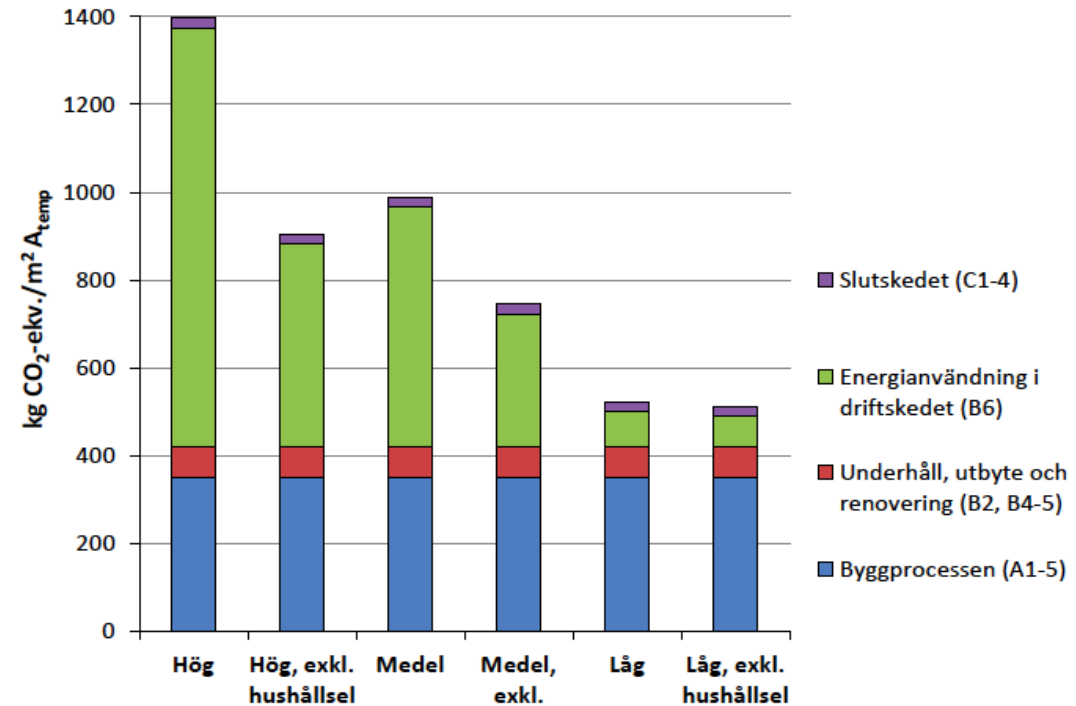
Tengbom Arkitekter – Cecilia Holmström

Bengt Dahlgrens – Henrik Jönsson




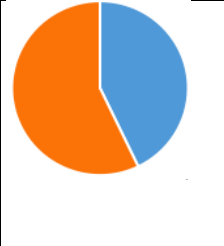
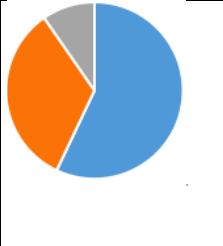
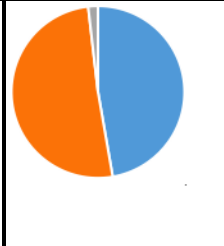
What happens after they're built?

- Little knowledge empirical knowledge of material flows over time
- Increased importance of the building phase in a life cycle perspective
- Focus on internal maintenance and renovation
- What motivates internal renovations?
- What environmental impact do these renovation have?



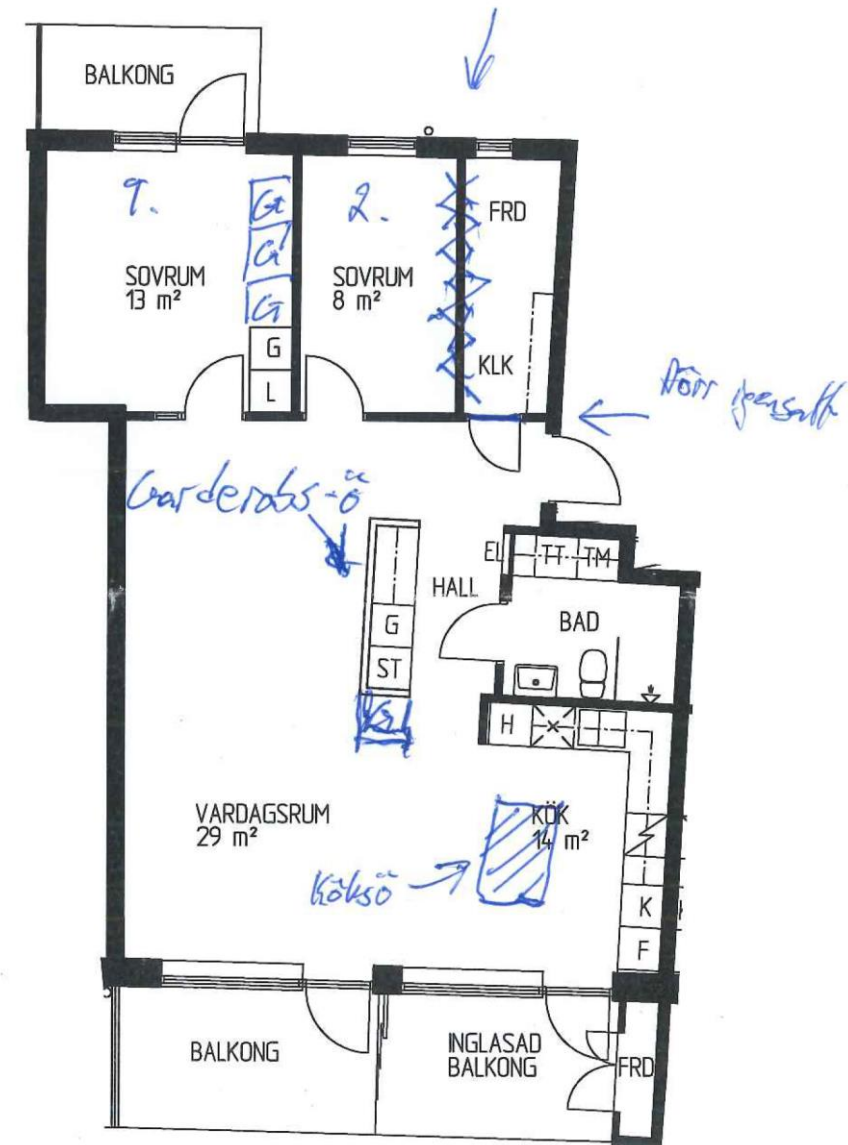
Study of 315 apartments

- Empirical studies
- How the inhabitants renovate and alter their homes
- Five case studies in Gothenburg and Stockholm
- Mixed methods
- 462 questionnaires and 68% response rate
- Possibilities for the respondents to draw changes in the attached original plan – spatial narratives
- 11 in-depth interviews

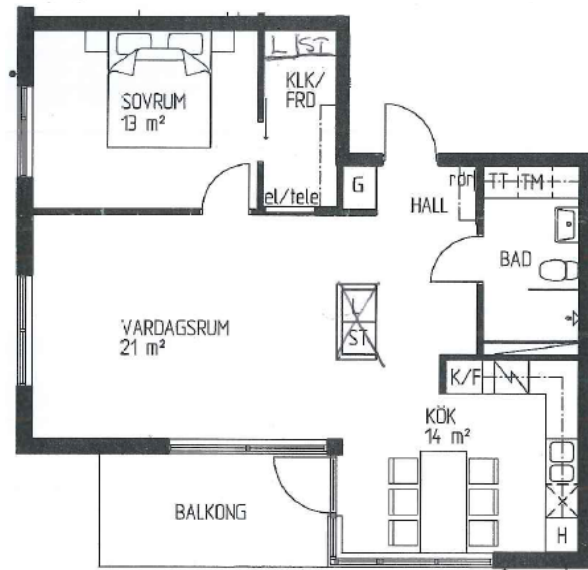
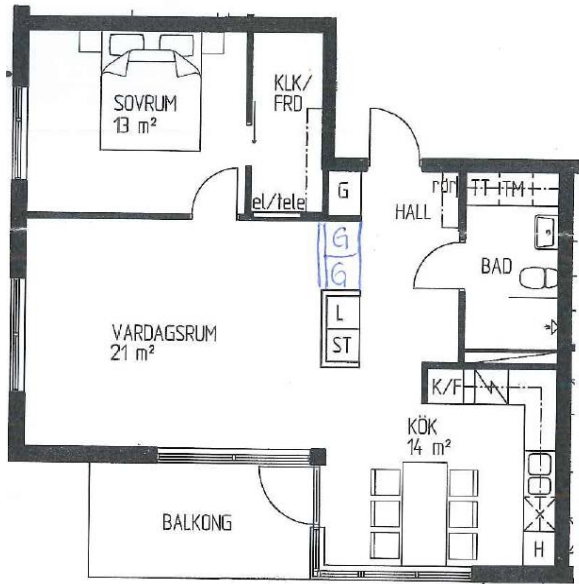
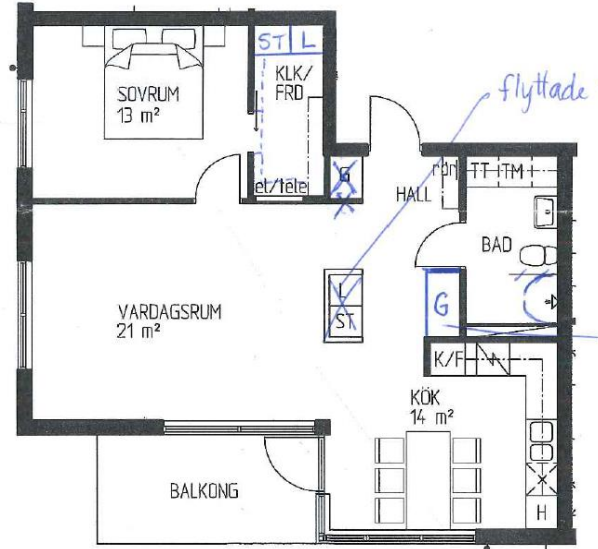
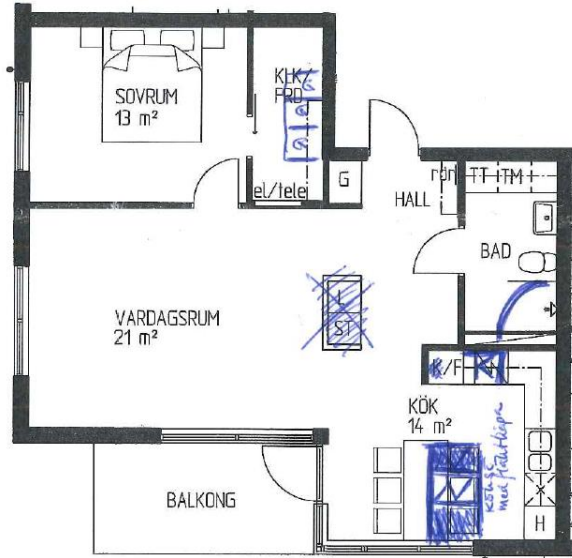
	Case 1, Stockholm	Case 2, Gbg	Case 3, Gbg	Case 4, Gbg	Case 5, Gbg
Year built	2001	2002	2004	2006	2008
No. of apartments	110	95	70	135	55
Response frequency	63%	84%	70%	46%	51%
Resident turnover/year*	7%	6%	9%	11%	12%
Type of building	2 tower blocks + 1 courtyard building (incl. services)	2 tower blocks + 2 courtyard buildings	1 lamella building + 1 tower block	5 tower blocks	1 tower block
Levels	Up to 6	4	7	7	9
Distribution of apartment sizes: number of living rooms and bedrooms & kitchen (r&k)					
					
Apartment size (m ²)	48,5-163,5	44-148,5	33-93	40-107	56,8-136,6
Character of apartments	Large and spacious that facilitate the division of more bedrooms. Generally the same kitchen size and standard regardless size.	Varied configuration and design often with several balconies and/or terrace. Most have the possibility to separate another bedroom and close the kitchen.	Compact with very 'open' layout with cupboards marking separation between living room and kitchen.	Compact with very 'open' layout with cupboards marking separation between living room and kitchen.	Rather compact and designed for adaptability. Many have the possibility to separate another bedroom or close the kitchen.

Results in short

- The apartments have undergone larger changes than anticipated
- 32% of the respondents have altered the layout
- 11% have recreated an extra room (46% in Stockholm)
- Large apartments are more often altered (most alterations in Stockholm)
- Smaller apartments are space efficient, restricted in use and less altered
- As many as 30-50% of the apartments do no longer fulfil regulation regarding accessibility after the alterations



One renovation leads to another



A usual solution driven by regulation for standard and accessibility

User dissatisfaction with solution

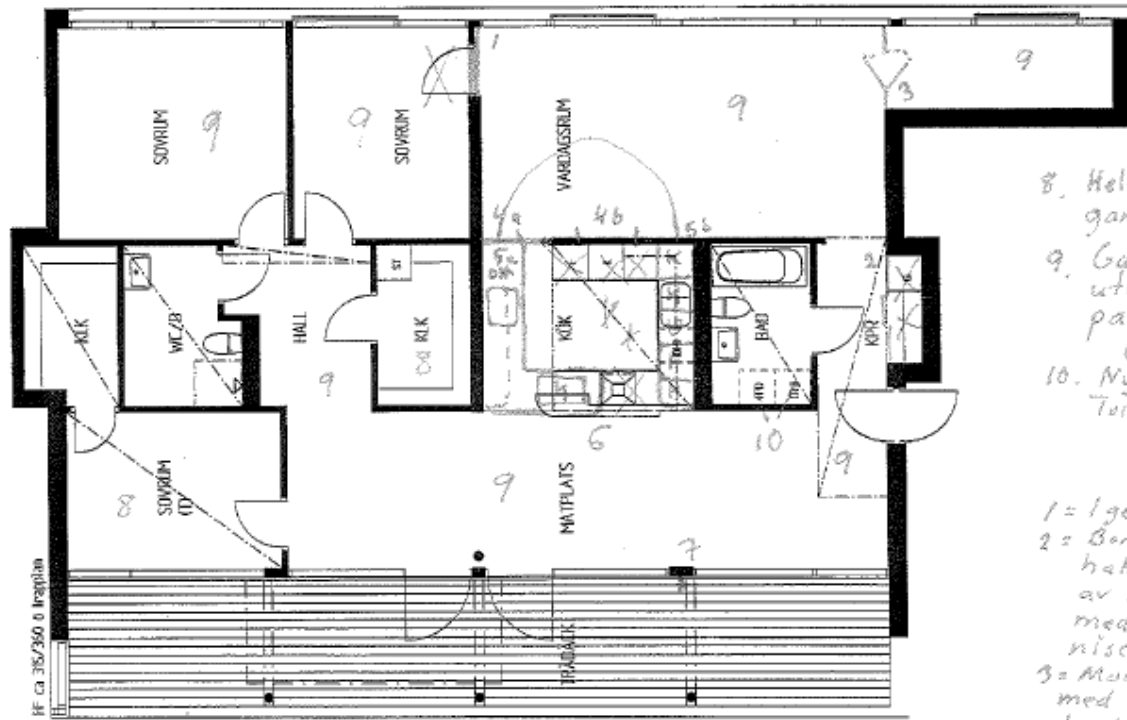
Removing the wardrobes means changing the floor in most of the apartments

Could wardrobes be considered a furniture possible to move?



Kitchens that are often rebuilt

Small U-shaped kitchens



- 8. Helt gam
- 9. Går uter på
- 10. Ny Turk
- 1 = Iger
- 2 = Bort hall av is med nisch
- 3 = Mått med bädg
- 4 & 5 E.L.U



Worktop shape:

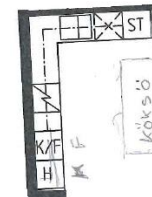
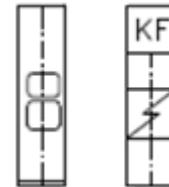
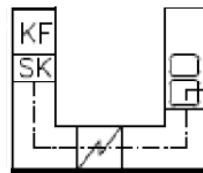
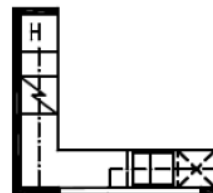
STRAIGHT

"L"

"U"

PARALLEL

L + kitchen island



Beginning
After interventions

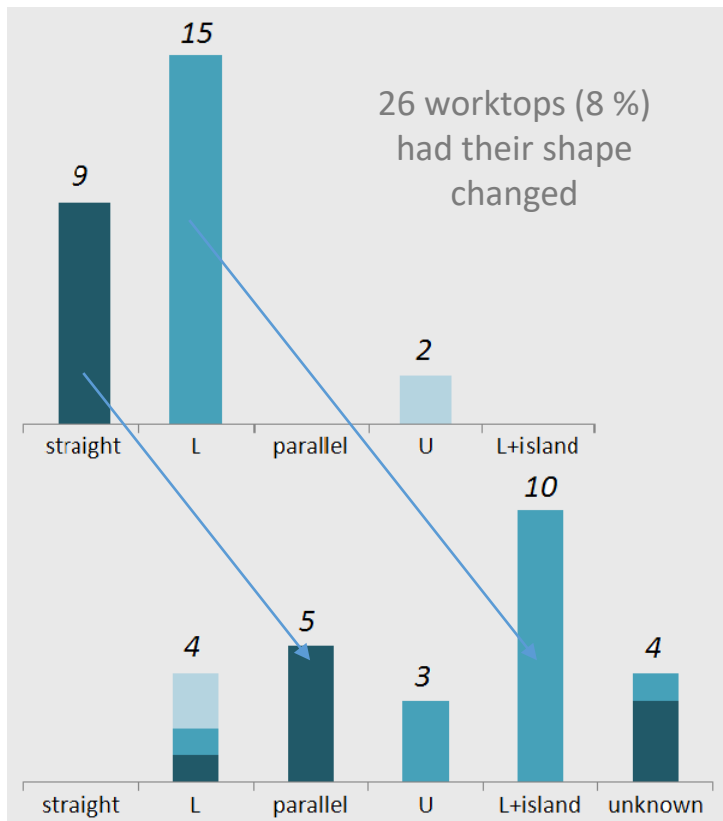
37 %
34 %

48 %
45 %

11 %
11 %

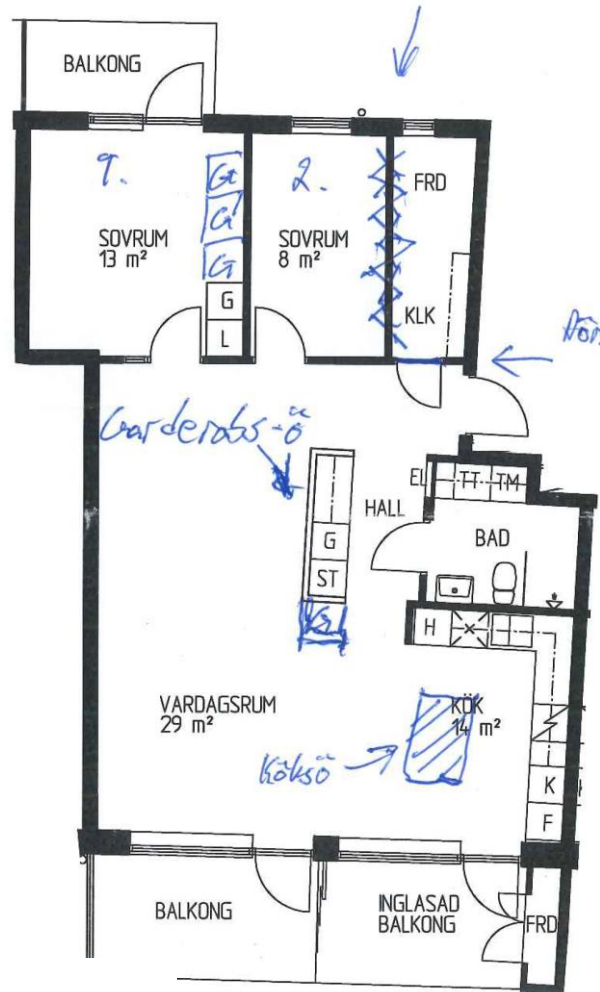
4 %
6 %

0 %
3 %



17 kitchen islands

More worktop area – kitchen islands

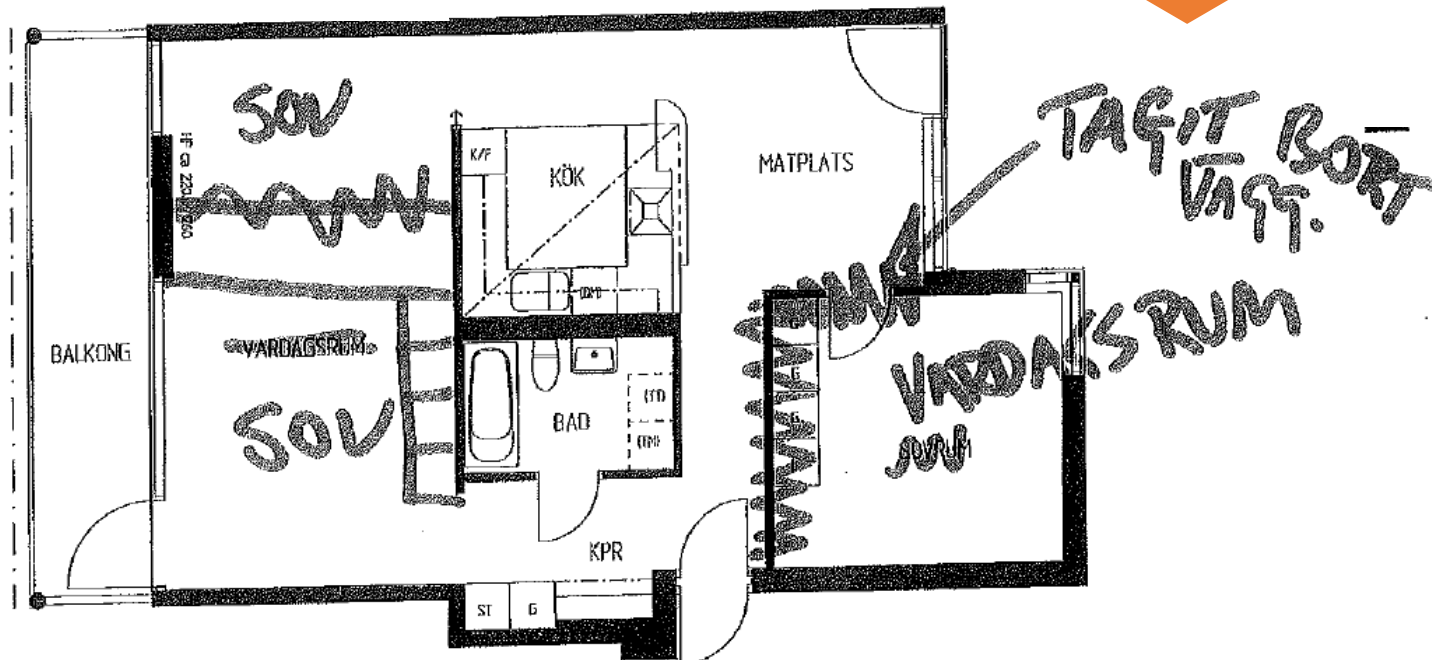


17 households had
built a kitchen island



Reconstruction driven by regulation

Demand for a quiet bedroom placed on the "wrong" side of the apartment. Residents want combined eating place and living room and can add a second bedroom



2 RoK - 77,0 m²

Femenías, P - Chalmers ACE

Climate impact internal renovations/maintenance

40% higher than "normal" maintenance

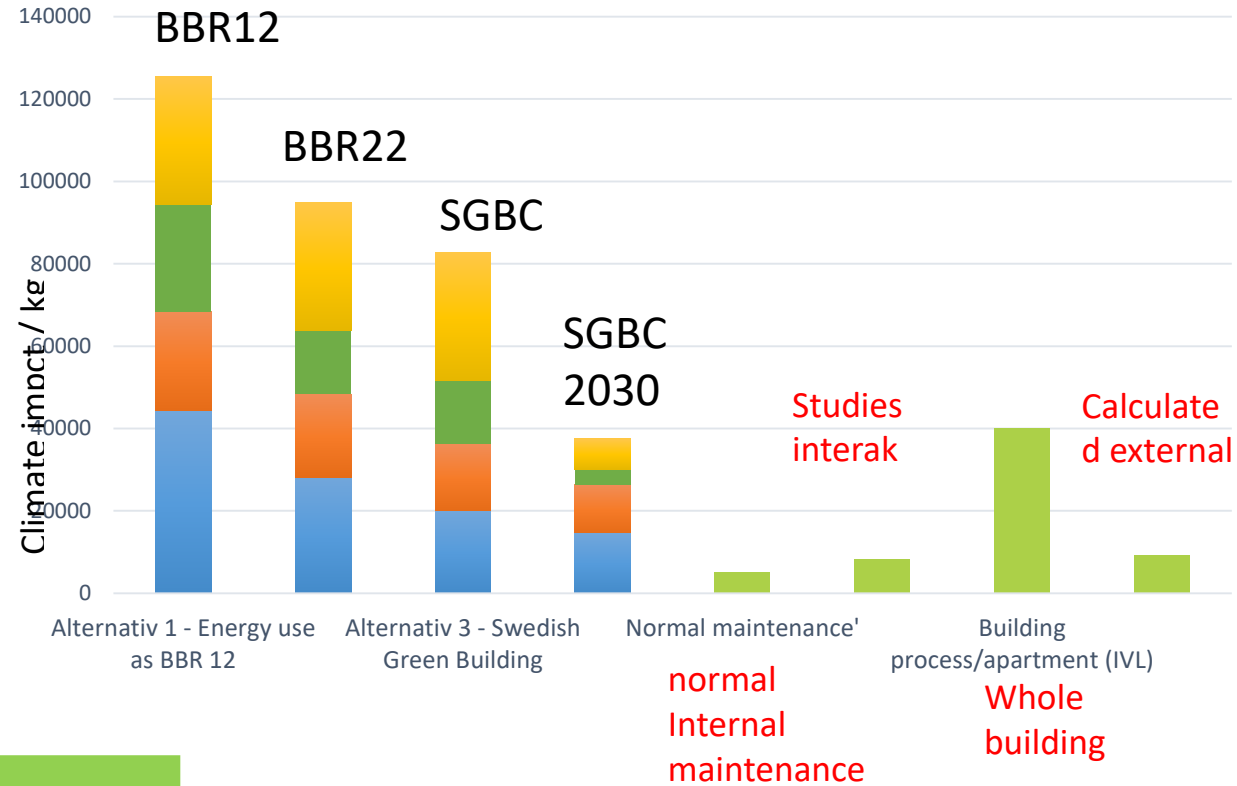
~ 50 % related to change of capital goods e.g. white goods, sanitary pcelain

Inner wall relates to about 20 %

Internal maintenance the same size as external maintenance (caluclated over 50 years IVA)

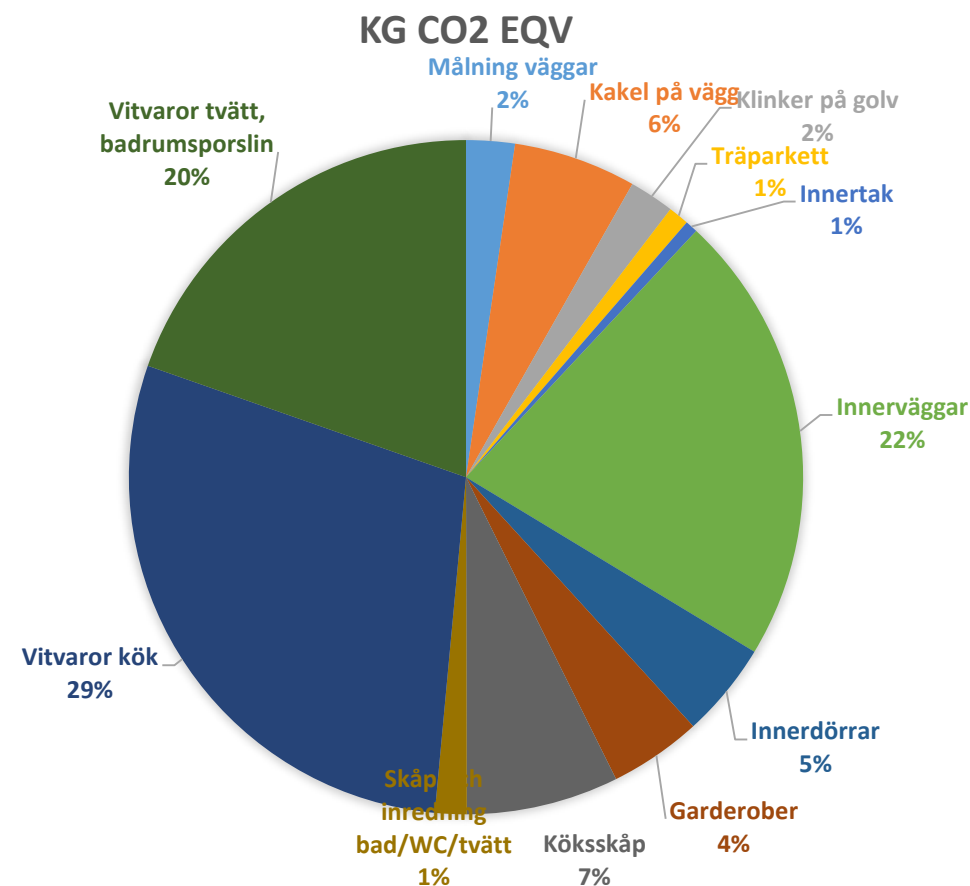
For a modern efficient multi-residential building the yearly climate impact from internal maintenance is about 1/5 of the total climate impact of the building

With future energimix 2030 the relation will be 1 to 2



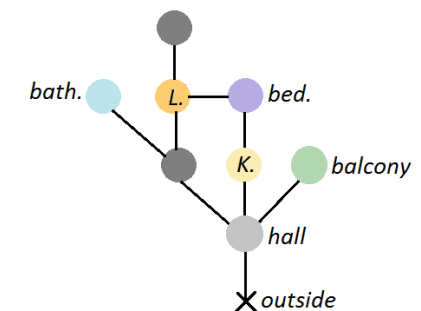
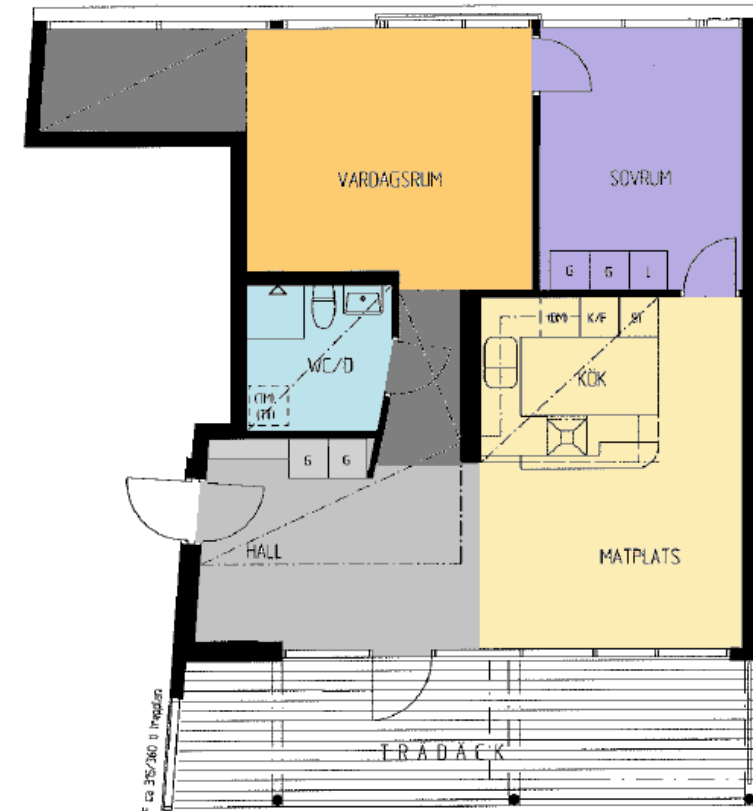
Key figures – material and components to focus on

	kg CO2 eqv
Paint walls	120
Tiles on walls	303
Tiles on floor	111
Wooden parquet	51
Inner roof	31
Inner walls	1117
Inner doors	235
Wardrobes	228
Kitchen cupboards	376
Fit out/cupboards bath/WC/laundry	78
Appliances kitchen	1487
Appliances laundry and sanitary porcelain	1011
Totalt 15 years	5148



Spatial narratives – the silenced user in modern housing

- Narrative of movement
- Spatial stories
- Temporal and spatial exist in the representation (map, layout)
- Space Syntax



Two categories of spatial stories:

Diachronic maps

- “Tour” maps
- Itineraries through space
- Aztec, Toltec
- Medieval maps (pilgrimage)
- Battle maps



Two categories of spatial stories:

Synchronic narratives

- “Tableau maps”
- 15th – 17th century
- “vessels for storing knowledge”
- “theater”/ “state”
- Elements of diverse origin
- Modern maps
- “thick description”



“Maps that show systems and relations within a given moment convey narrative and story as much as maps that show change through time”

(Sinton and Lund, 2007)

Concluding remarks

Challenge contemporary housing

- More than merely 'home-makover'
– *focus on the **housing supply!***
- Climate impact from internal maintenance can not be disregarded
- What is actually sustainable over time, socially and environmentally?
 - heterogeneous households
 - changing demographics?
- Challenge the idea of the compact apartment

Anthropological perspectives?

- The architects' or sectors narrative vs the users'
- Use vs building regulation
- People no longer live with badly conceived homes they alter them
- Conceptualisations of homes (ideals, norms, culture, status...)

Continued work

E2B2 continuation 2016 – 2018

- The climate smart apartment
- Further analysis
- Key figures for more climate smart solutions

The Circular kitchen 2018 - 2021

- Climate-KIC
- TU Delft
- HSB Living Lab & partners
- Prototypes and basic research
- User perspectives to kitchens – what is the future kitchen
- More circular solutions

