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**Ageing population in Danish single-family houses:
Energy efficiency and other challenges illustrated by
the “Single-family housing atlas” and home research**

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Abstract

Background

- Globally, the number of elderly in single-family houses is an overlooked energy challenge and Denmark has one of Europe's highest shares of single-family houses
- Increasing urbanisation and demographic changes have made the single-family houses a place for singles and empty-nesters as the dominant segment in single-family houses. The prognosis shows that this development will continue in coming years
- Denmark has an ambitious policy for becoming CO₂-neutral by 2050, and to reduce the energy consumption in buildings

Problem

1. Traditionally, energy policies focus on energy efficiency, and less on housing consumption, although research shows this the main driver for energy consumption
2. The demographic agenda and the energy agenda has largely been running as two separate policy domains

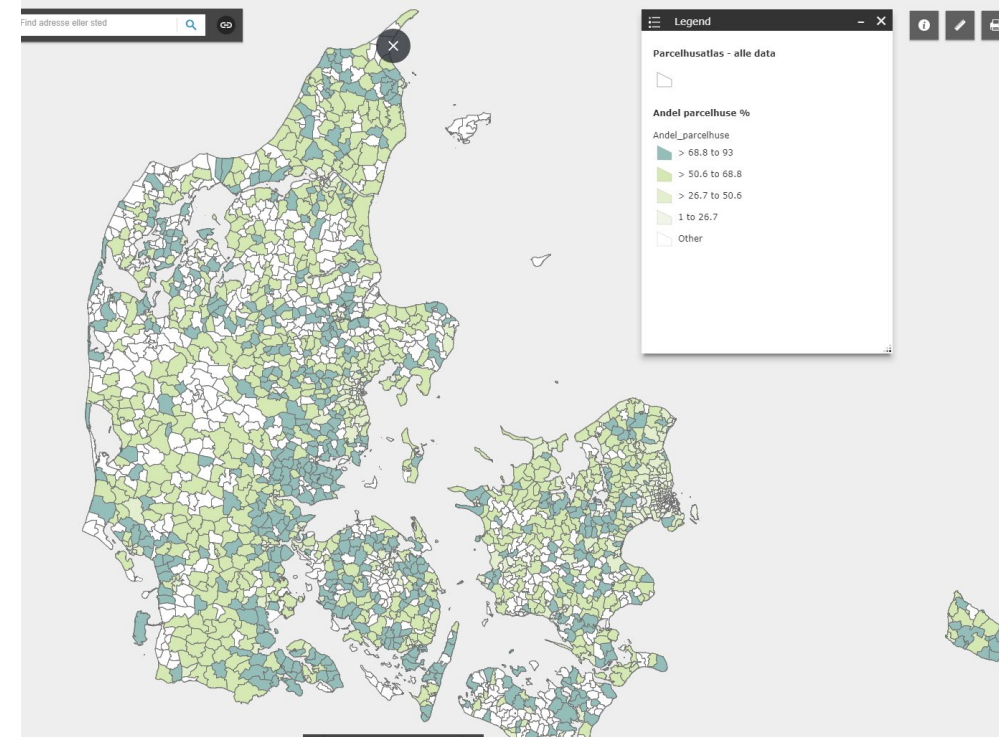
This paper will address the two aspects in combination, demonstrating the challenges with demographic changes, especially in the peripheral regions

Methods

By using the "[Single-family house Atlas](#)" we shows examples on the variations on a geographical micro-scale, and discuss the consequences for future housing policies, by introducing three types of single-house owners.

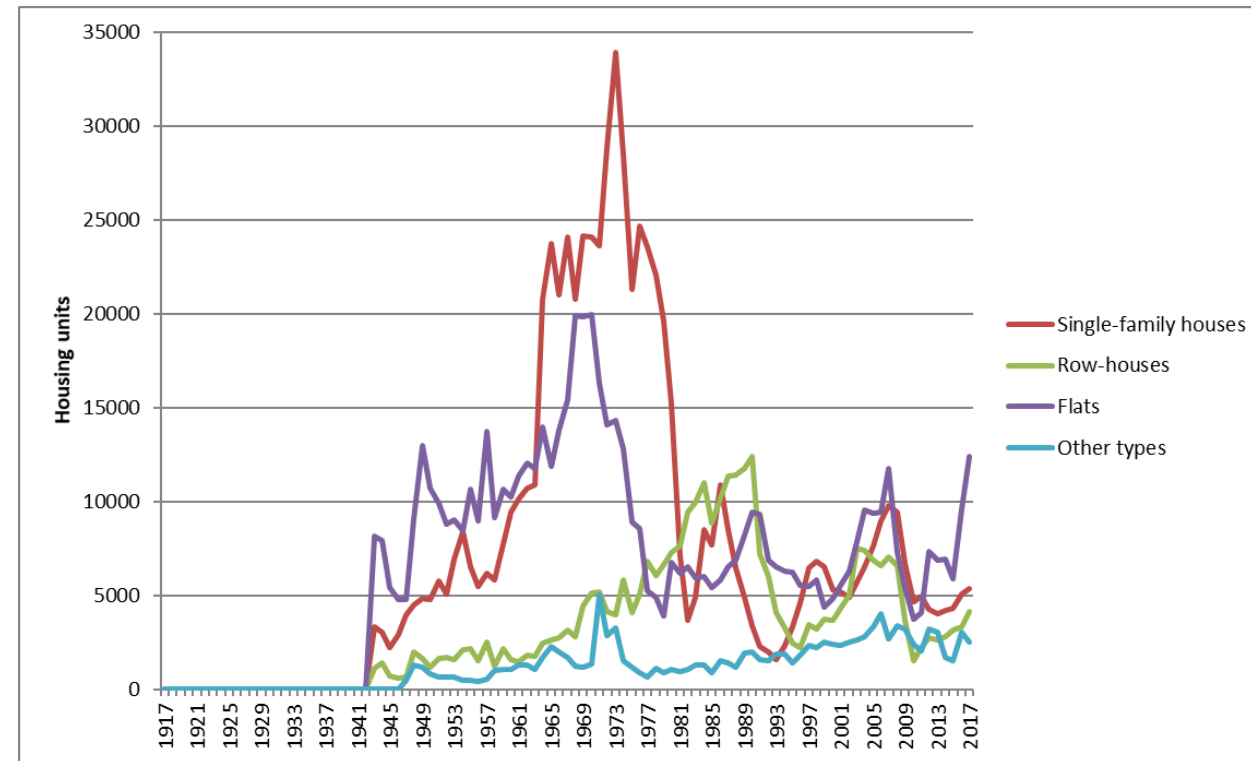
Thesis

We argue that new housing and energy policies should be established, in order to offer elderly people housing alternatives to their present single-family house, and discuss potentials and challenges for this



A historic view of housing construction

- ▶ Denmark has a share of 56% living in single-family houses
- ▶ The dominance of the single-family house was established through a relatively short period, from 1960 to 1980 where 25-35.000 single-family houses were built per year
- ▶ Before 1960, and after 1980, the building of new housing has been more equally distributed between different housing types (single-family houses, flats, row-houses and other types)



Ageing in the single-family house

- ▶ The right place to grow old? SFH built for the nuclear family, not for singles or empty-nesters
- ▶ Space consumption and per capital consumption high
- ▶ Increasing geographical differentiation
- ▶ Alternative housing options?
- ▶ Climate policy = housing policy

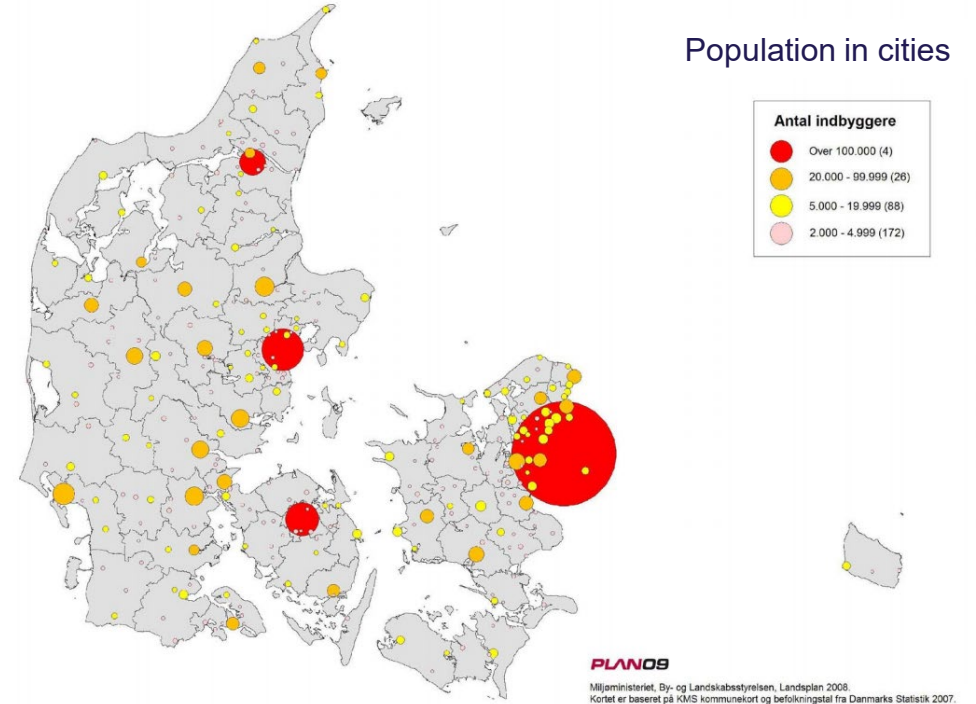


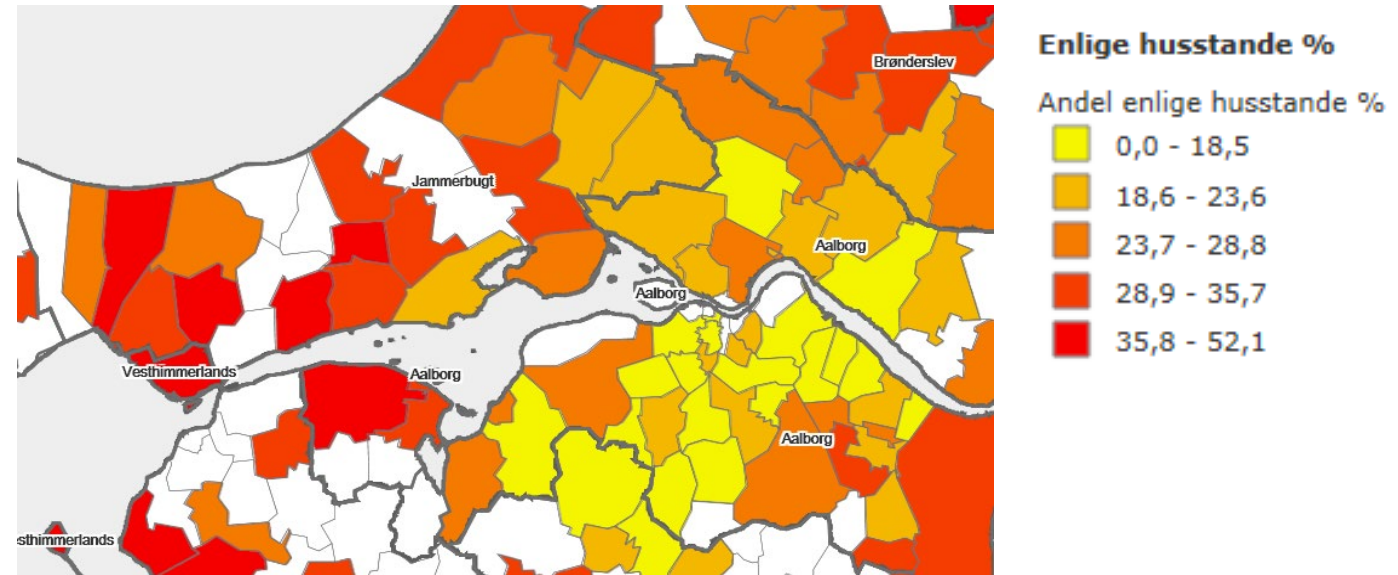
Figure 1: Urban pattern, Denmark



Figure 2: Average age in Danish parishes 2007 and 2019

Demography

- ▶ 61% of single-family houses without children
- ▶ Empty-nesters the dominating group in single-family houses today
- ▶ More single households living outside the cities
- ▶ In many areas the share of +80 years singles in 25% or more



Share of single person households in single-family houses in parts of the municipalities of Aalborg, Jammerbugt and Vesthimmerland. The map shows large differences with many singles living outside the city (Aalborg) and a high proportion in the vicinities.



Energy

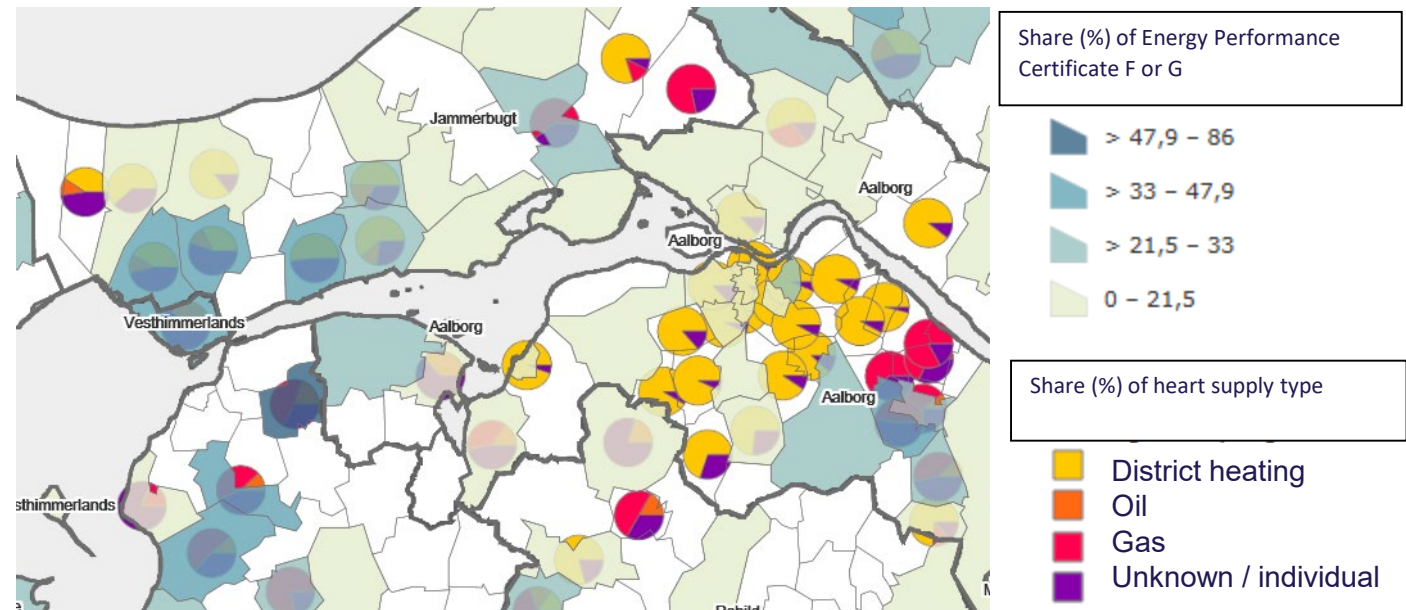
Family type	Size of house (m2)	Consumption of floor space (m2 / person)	Heat consumption , kWh/m2	Heat consumption per person, MWh / year
Singles	122	107,0	65,9	7.05
Empty-nesters	138	80,2	57,2	4.59
Nuclear families	150	37,8	56,0	2.11
Others (younger with no children + elderly +80)	142	51,4	59,3	3.05

Space consumption and energy consumption amongst households in single-family houses



Energy

- ▶ Poorer standard of Energy Performance Certificates (EPC) in SFH in peripheral regions
- ▶ Smaller share of district heating (collective supply) in peripheral regions



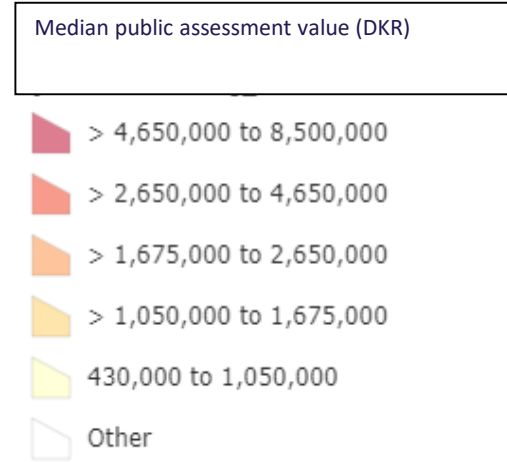
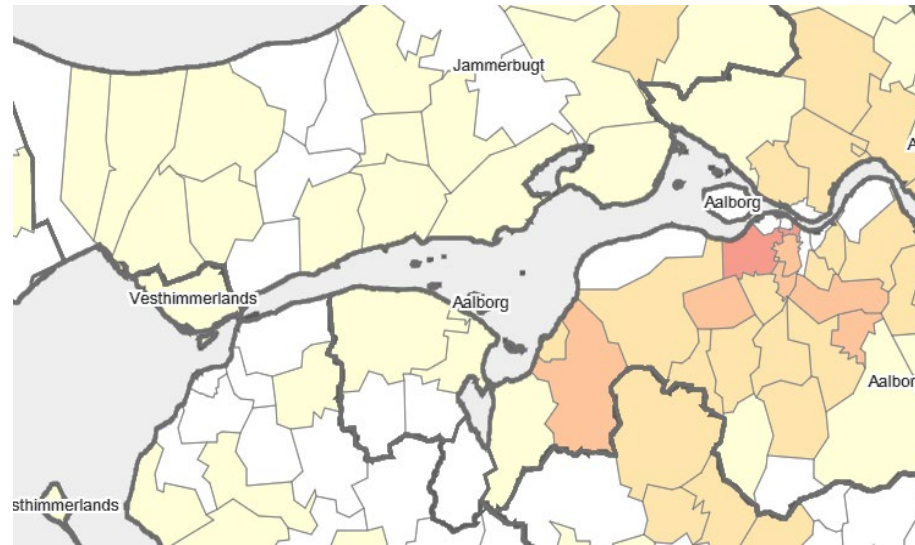
Economy

Family type	Value of house (public assessment), DKK (median value)	Households income after tax (median), DKK
Singles	1.100.000	233.016
Empty-nesters	2.200.000	370.689
Nuclear families	6.000.000	604.154
Others (younger with no children and elderly +80)	3.600.000	570.175
Total	3.200.000	471.046



Economy

- ▶ Large differences between cities and villages in peripheral regions: Houses in villages with long distance to the cities typically a factor 5-10 lower than in cities
- ▶ Many elderly end singles living in villages
- ▶ Households median income largely reflects value of houses



SFH in research on homefeeling and attachment

SFHs is a housing form with multiple elements said to promote the feeling of home:

- Ownership
- Access to your own "land"
- Family-oriented
- Control
- Subject to change
- Social status
- Identification
- Time



Three types of single-family house owners

1. The free homeowners:

- Have houses of high value, located near the cities. Are willing/or about to move, e.g. to co-housing other a apartment in the city if they want to, and have the resources in terms of economy, knowledge and physical and mental health.
- They perceive their dwelling as a functional unit that should fit their contemporary needs and dreams; their life situation.
- Similar to Zygmunt Bauman's tourist.



2. The homebound house owners:

- Have houses of varied values, but often these houses are well-maintained and they have lived in them for many years.
- Have the capacity to move, but are not willing to/do not consider moving as an option, as they have rooted in their home, which they consider to be permanent.
- Empty-nesters in character, keeping the house as a container of memories; as the childhood house of their children.



3. The unfree house owners

- Living in a house often in the periphery of Denmark, where prices have fallen and their houses are often in poor condition.
- They have limited resources to move, as debt may be higher than possible sales-price.
- Could be motivated for finding another dwelling, but have few resources, little knowledge on how to get rid of the house, and how to enter another housing segment (e.g. social housing).
- This group can be perceived as the aging members of the precariat of the housing market; the house owns them not the other way around.
- Similar to Zygmunt Bauman's vagabond.



Private renting of a derelict single-family house, municipality of Lolland. The municipality has condemned the house, but it is believed to be rented out still. Heat and electricity is disconnected. The owner bought just before GFC in 2006, has a debt on 30.000€ in the house, impossible to sell for this price today. Too expensive for the municipality to buy and demolish. Owner hope to get some of his money back by renting out the house to low-income families.



Policies and initiatives towards the single-family dwellers

Name	Local policy / initiative
The free house owners	Provide new types of housing to, e.g. co-housing for seniors
The homebound house owners	<p>Provide knowledge and information about options for alternative housing options</p> <p>Campaigns and support for energy optimization of the existing family house, as well as for alternative energy supply</p> <p>Local clustering or concentration of functions through planning, keeping local community alive</p>
The unfree houseowners	<p>Social out-reach to residents</p> <p>Help to sell house or to remove it, and to re-locate in more suitable home</p>

Stayers or go'ers?

➤ Initiatives for potential movers:

- Provide alternative housing
- Information and facilitation
- Out-reach to vulnerable residents
- Experiences shows surprisingly high interest amongst empty-nesters for moving when alternative housing solutions are presented

➤ Initiatives for stay'ers:

- Upgrading house for aging and energy efficiency
- Space management, densification, renting
- Consultation and support



Conclusions

- ▶ Ageing in single-family houses is an increasing problem for several reasons: Life quality, elderly care, mobility on the housing market, loneliness, space use, energy consumption
- ▶ Local authorities need to develop strategies and initiatives to adress challenges
- ▶ Many international examples to learn from
- ▶ Single-family residents very divers group, different structural outset, different attachment to place (at least three types).
- ▶ We need more knowledge about the different segments, to develop possible strategies on motivations for change

