

**ADAPTABILITY OF MASS HOUSING:
SIZE MODIFICATION OF FLATS AS A RESPONSE TO SEGREGATION**

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Abstract

Purpose

When dwellings fail to respond to residents' needs, housing will suffer from segregation and buildings will possibly be demolished ahead of their time. This paper focuses on the lack of variation in the sizes of dwellings as a factor in residential segregation. It examines this issue in the context of Finnish mass housing built in the 1960s and 1970s. The aim of the article is to review how mass housing layouts can be adapted to produce the currently absent flat sizes.

Design/methodology/approach

The paper operates at the intersection of human geography, building stock research and adaptability research. First, statistical data is utilised to investigate how dwellings and households of different sizes are distributed over the Finnish housing stock. Secondly, the building layouts of mass housing are examined in detail. Thirdly, the potential that flats in mass housing have for size modification is reviewed.

Findings

There is a disparity of available dwelling sizes between different housing types, and statistics show that the proportion of large households has decreased significantly in blocks of flats over the last decades. The lack of large dwellings in mass housing may contribute as one factor to the segregation of the neighbourhoods built in the 1960s and 1970s. The findings show how the variation of apartment sizes can be increased in mass housing.

Originality/value

The housing stock is rarely examined in detail in segregation research, even though it is a major determinant for a city's social structure. This paper argues that to address segregation sustainably, it is necessary to understand the housing stock better and to view it as an adaptable asset.

Keywords

Adaptability, apartment sizes, flexibility, housing stock, mass housing, residential segregation

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1 Introduction

The adaptive capacity of existing buildings is a crucial aspect of the resilience and sustainability of cities. Buildings are long-lasting objects that could technically outlast generations of people. As human populations' demographics change and people's way to live, dwell and work transform over time, buildings must adapt to those changes. And they do to some extent – some better, most not particularly well – even though they have not been designed for this in mind (Brand, 1994).

In the case of housing, obsolescence, i.e. the need for better adaptation, is often manifested through residential segregation. Segregation is usually regarded as a negative phenomenon because it typically occurs in relation to race, ethnicity and/or income. When the least desirable housing is left for the people with the least choice, it often leads to a geographical concentration of physical decay and social problems. In Europe, the phenomenon concerns post-war mass housing in particular. One popular policy response to the segregation of these estates is replacing the buildings (van Beckhoven et al., 2009). Alas, this results in them being demolished way before their potential life, which is neither ecologically nor socially sustainable.

The current paper deals with the housing stock and its adaptability in the context of segregation and vice versa. The investigation is focused on the European context and more specifically, on the Finnish housing stock and the quantitatively most significant part thereof: multi-storey mass housing built in the 1960s and 1970s. These estates, erected with precast concrete technology are usually situated on urban fringes. The paper is premised on an idea that these buildings can be helped to adapt better. In terms of adaptability, the research will zoom in on the possibility to change dwelling sizes by merging adjacent flats together.

The paper's approach operates at the interface of human geography, building stock studies and adaptability research. In human geography – the discipline traditionally concerned with segregation – the physical space is seen to underlie the social space (see e.g. Murdie, 1969). Human geographers observe residential segregation through the spatial analysis of the demographic variables of a city's inhabitants, so for them segregation is the result of the population fitting itself into the available housing stock. However, human geographers rarely analyse the housing stock itself in depth, let alone its adaptation potential.

This is where the analysis can be deepened with building stock research. This branch of research investigates the composition, properties, performance and dynamics of existing building stocks (see e.g. Kohler and Hassler, 2002). In addition, in building stock research buildings are not viewed as merely stationary assets, but as flexible ones whose value can be preserved on a long-term basis through adaptation. Housing adaptability and flexibility research, then again, already has long traditions in architectural research (see e.g. Schneider and Till, 2007 or Schmidt and Austin, 2016).

So, it follows that this paper, a case study for Finland, is a combination of three approaches, the first one influenced by human geography; the second one stemming from building stock studies; and the third one arising from housing adaptability research. This is also where the novelty and originality of the paper lies in terms of methodologies. It not only examines how people are distributed among different building types in the housing stock, as in human geography. It also looks closer at the dwelling sizes and layouts of a focal part of that stock (post-war mass housing), as in building stock research. Finally, the research delves further into how the dwelling sizes in that part of the stock can be adapted to accommodate changes in demographics and lifestyles, as in housing adaptability research. In terms of results, the paper first finds out that the post-war mass housing stock lacks spacious homes and, subsequently, large households (families). Secondly, the paper reviews how the mass housing layouts can be adapted to produce the large flats that are currently absent. To sum up, the paper considers the lack of variation in dwelling sizes as a factor that can contribute to segregation, and introduces the size adaptation of dwellings as one policy response.

2 Theoretical background

2.1 Modernist mass housing, its critique and segregation

Today, massive urban growth is a global phenomenon that concerns both the developed and the developing countries. In Europe, the mass production of housing in the 20th century stemmed from urbanization as well as the enormous housing shortages following the Word Wars. The main aim of the modernist housing design was to secure adequate living conditions for an increasing urban population, which was made possible by the development of new building materials, such as prefabricated concrete. This lead to building industrially-produced blocks of flats in large housing estates at the outskirts of cities.

European mass housing started off as being more or less socio-economically neutral, but the proportion of middle-class residents in it began soon to decline. In segregation theory, a neighbourhood's initial social status is usually seen to be connected to its original physical quality and the design of housing. Thenceforth, a process of downgrading takes place, which is related to both the buildings' physical decline over time and their relative depreciation in value as new housing options become available. (van Beckhoven et al., 2009). As higher-income households have spatially more options than lower-income households due to their higher financial resources (van Kempen and Özüekren, 1998), neighbourhoods will filter from higher-status socioeconomic groups to lower-status ones (van Beckhoven et al., 2009).

The usual explanation for the depreciation process of European mass housing is that it represented relatively low initial quality in both technical and aesthetic terms. Then, the filtering process lead to 'a spiral of decline' encompassing intertwined social, economic and physical problems. The socio-economic segregation of many mass housing neighbourhoods took first place within native European populations, and an ethnic dimension was not introduced until the end of the 20th century. (van Beckhoven et al., 2009).

2.2 The Finnish context

Although the pattern of segregation in Finland largely follows in the footsteps of other northwestern European countries, there are some local traits to consider. Finland was one of the last of these countries to industrialize and urbanize. This took place as late as the 1960s and 1970s – an era known for the Great Migration of the Baby Boomers from the countryside – when mass housing estates were erected swiftly on the outskirts of cities and towns. Even today, about one-fifth of all Finns still live in these estates, which indicates their quantitative significance. The larger the community, the more likely mass housing will be the typical residence; in the largest cities, up to half the population live in this type of block. Unlike some other Nordic and North European countries, where social rented housing is more common, Finland is a classic homeowner nation. Even in mass housing, two-thirds of the flats are owner-occupied and only one-third are socially rented. Both types of tenure were subsidized by the government. In addition, the majority of the blocks were made mid-rise, so the scale of these areas is much smaller than that of mass housing in many other countries. (Tanninen, 2004).

Probably because of these local features, mass housing has not been subject to as extensive stigmatization in Finland as elsewhere in Western Europe. What is more, Finnish mass housing estates are not a coherent group but different neighbourhoods have differing trajectories (see e.g. Kemppainen 2017). However, because of their quantitative significance; the ageing of the buildings and subsequent repair needs; as well as the weakening socioeconomic position of some estates, this type of housing has long been a key issue in Finnish housing policies. The neighbourhoods came under public scrutiny after the severe economic recession of the early 1990s, as studies suggested that some of them covered persistent preponderance of precarious groups and a significant proportion of the elderly population (Tanninen, 2004; Stjernberg, 2017). When immigration into Finland really started to take off in the late 1990s and early 2000s, many of the newcomers settled in these very same neighbourhoods in the largest cities. Therefore, the question of ethnic segregation has emerged and dominated the discussion about mass housing since then.

It must be noted, though, that the proportion of immigrants – in Finland in general, as well as in the mass housing estates – is small compared to the rest of Europe.

Due to the aforementioned reasons, Finnish mass housing areas often suffer from an unfavorable status in comparison to other neighbourhoods. The inhabitants' opinion does not fully support the negative conclusions: according to a recent study (Kempainen 2017), the perceived disorders were only slightly higher in mass housing areas than in other comparable neighbourhoods. Overall, the problems with mass-housing neighbourhoods in Finland are much smaller than they are in many other European countries. Having said this, though, it should be noted that despite the ever-increasing urbanization, Finnish inhabitants' dreams of a house still remain strong – two-thirds of Finns would prefer to live in low-rise housing, and only one-third in block of flats (Strandell, 2017).

2.3 The case for adaptability and flexibility

Adaptability and flexibility discussions have been important in the context of mass housing from the very beginning. Because the functionalist housing design was in many ways related to the efficient use of space, manifested in an extreme form in the 'minimum dwelling', the adaptable and flexible capacities of that space became also important (Leupen, 2006: 9). Open spatial solutions, enabled by the reinforced concrete technology, gave birth to many successful examples of flexible housing (see e.g. Schneider and Till, 2007). In true mass production, however, these qualitative goals often had to yield to the technical and quantitative aims. In Finland, for instance, the development of the mass housing system incorporated the targets of flexibility, extendibility and even movability. Alas, these aims were greatly abated during the process. (Hankonen, 1994: 207–215).

So, a second wave of this discourse stemmed from a critique towards the 'tight-fit functionalism' (Rabeneck, Sheppard and Town, 1973: 698) and Modernist mass housing (e.g. Habraken 1972). Habraken (1972) was one of the first theorists to criticize the lack of flexibility and residents ability to influence their homes in mass housing. He emphasized that housing is not static

but a process that alters in time, so he highlighted that residents should be able to adapt the dwelling to their changing needs.

The concepts of adaptability and flexibility are vast, and they can be considered as umbrella terms for an array of subtopics. Generally, they incorporate the idea of accommodating change in time. Two main approaches to the main topic can be recognized. The first approach focuses on a building's potential for a versatile usage (often labelled as 'adaptability', 'multi-functionality' or 'polyvalence'). The second approach emphasizes a building's potential to be physically transformed or changed (often titled 'flexibility', 'convertibility', 'modifiability' or 'transformability'). Habraken (2008: 290) points out that,

'Words like "adaptability", "flexibility", and "polyvalence" have multiple and often overlapping meanings that make it virtually impossible to come up with a vocabulary acceptable to everybody.'

This paper uses the term 'adaptability' for the various ways buildings or their sub-parts can respond to the changing circumstances. Referring to the latest literature, Schmidt and Austin (2016) have identified six basic types of adaptability. These are adjustable, versatile, refitable, scalable, convertible and movable spaces. The current study is mainly linked to the scalability of spaces, which stands for the capacity to change the size of a spatial unit (a building, a dwelling, etc.). According to Pinder et al. (2017: 13), scalable housing can *'[a]llow for expansion/shrinkage to accommodate changes in family demographics / lifestyles'*.

The changes in family demographics are what constitute 'a dwelling career'. The size and composition of households normally follow foreseeable patterns according to a person's age. Relationships are formed, families are founded, and eventually, new smaller households are formed due to family contraction. Therefore, many people's preferences for a particular type and size of dwelling can be explained by a person's dwelling career phase. (van Kempen and Özüken, 1998). For instance, a study in Finland (Vilkama et al., 2013) found that the principal reason for households to leave 'ethnicized' mass housing neighbourhoods is not related to their alleged deprived state, but

rather to the fact that a suitable home is not available there. Therefore, it makes sense to study the scalability of the dwellings in this type of housing.

2.4 Emerging changes in housing

As for lifestyles, the second topic mentioned by Pinder et al. (2017), many of the challenges that housing is facing in the 21st century are indeed related to the diversification of the population and subsequently, housing cultures. It is just that the looming global ecological crisis denotes that housing needs can no longer be fulfilled by simply building new housing, as in the 20th century, but rather by adapting existing housing. Some of the current trends in housing that may influence the need for more varied and adaptable apartment sizes are discussed in the following sections.

The growth of small and one-person households, often in connection with ageing, is a global phenomenon that focuses particularly on urban areas. As in the rest of Europe, in Finland the number of people living permanently in the same dwelling has been steadily declining, from 3.34 people in 1960 to 2.03 people in 2016 (OSF, 2016). Especially the amount of one-person-households is continually growing, and a large proportion of them are elderly people (OSF, 2016). Although the median age of the Finnish population currently equals the EU average, Finns are one of the most rapidly ageing populations in Europe (Eurostat, 2017a).

Simultaneously, there is an increasing awareness of the disadvantages of living alone (see e.g. Kauppinen et al., 2014). Emerging housing concepts and services built around a culture of sharing assets and facilitating social bonds can be expected to place novel requirements on existing housing, too. Living arrangements that encourage sharing resources and space might create welcomed chances for people of different ages and life situations (see e.g. Tummers, 2015). However, they also require a different kind of configuration from the dwelling in comparison to conventional housing. Not only is a large size required, but also the room structure has to be less hierarchical to accommodate different users demanding an equal amount of space.

The plurality of today's family structures is a widely considered theme in the European context. Also the Finnish family of the 21st century has been identified as more diverse, pluralistic and multicultural than before (Keurulainen, 2014). Because of this, the existing housing stock should also offer options for the diverse needs of diverse families, including multi-generational and extended families, reconstituted families, and families with members living in different places. Compared to the traditional nuclear family, these family types usually have a larger or more fluctuating number of members, which can result in an increased need for space.

The ways to dwell also change because new innovations create novel opportunities. The evolution of information and communication technologies has allowed people to work, shop and learn irrespective of time and place. Telecommuting has become increasingly popular in Europe (see e.g. Picu and Dinu, 2016). As the boundaries between work, home, family and leisure blur in the post-industrial society (e.g. Desrochers et al., 2005), needs for more integrated work-family arrangements emerge. This also presents new challenges for residential environments. These can include co-working bases for the neighborhood's remote workers or a housing solution where the workplace, possibly with a separate entrance, may be a part of the dwelling or to have a close connection to it.

Despite the decreasing household size, studies (e.g. Vuolanto and Manninen, 2006; Lankinen and Lönnqvist, 2010) usually recommend increasing the number of larger homes in Finland. This is because their demand is only partly explained by the size of households but increasingly by their expectation for a higher living standard (Vuolanto and Manninen, 2006). For instance, Stjernberg (2017) has shown that the mass housing neighbourhoods that have the highest socio-economic status also have an above-average proportion of large dwellings. Even though there is no overcrowding issue in Finland in an international comparison (Eurostat, 2017b), and there has been a significant decrease of housing density over time (Lankinen and Lönnqvist, 2010), the living area per person is still noticeably smaller here than in comparable regions, such as other Nordic countries or West European cities (Tanninen, 2004; Lankinen and Lönnqvist, 2010). The average size of a

Finnish dwelling is below the EU average, primarily because of rented dwellings, which are 30% (ca. 20 m²) smaller than the EU average (Eurostat, 2017b).

3 Material and methods

As follows from the interdisciplinary ethos of the paper, the paper employs a multi-method approach: a statistical study, a typological study, and finally, an adaptability study.

3.1 Statistical study

The research begins with a study of how Finnish households are distributed over the housing stock (a human geography informed approach). The motivation is first to understand 1960s and 1970s mass housing better in the larger context of the Finnish housing market, and only then to see how mass housing could be adapted to meet current needs and expectations. The data covers a total of 2.62 million households, the entire Finnish population. It includes all types of people, and all sizes and types of dwellings in Finland, 2.55 million homes, which represents Finland's entire housing stock.

The investigation is spatial at a very high aggregate level of the community type, but a finer spatial level is revealed because different forms of housing are usually located in distinct areas. This assumption, which underpins this study, is also supported by many authors (e.g. van Kempen and Özüekren, 1998; Vuolanto and Manninen, 2006).

The research questions are: How are dwellings of different sizes distributed among different building types? How are Finnish households of different sizes distributed among them? Has the distribution of these households changed in the last 30 years? To answer, the research uses descriptive statistics, most of the data for which were downloaded from the StatFin online service (OSF, 2012 and 2014) and supplemented with a mass-housing database (Asumisen rahoitus- ja kehittämiskeskus, 2014).

3.2 Typological study

Having shown the scarcity of large homes in blocks of flats, particularly in mass housing, the paper then zooms in on the building layouts in mass housing, to understand them better. The investigation is based on a typological approach, and the results will act as the basis for the final part of the paper, i.e. the adaptability study. The research questions is: What kind of building layouts does mass housing encompass?

The study is based on previous typological research on Finnish mass housing. The original data consists of the plans of 320 randomly selected mass-housing blocks of flats in 51 Finnish cities and towns, built by several construction companies, but with highly similar techniques and requirements. The same data has previously been used to identify recurring flat types (Kaasalainen and Huuhka, 2016a; Kaasalainen, 2015), and staircase unit types (Achrén, 2015). The recognized types are considered to represent the entire mass housing stock in Finland. The methodological approach for their identification is described in detail in the aforementioned papers. The current study combines the findings of the two previous studies, i.e. matches the flat types with staircase unit types, to create a typology of layouts for whole buildings.

3.3 Adaptability study

In architectural research, typologies are usually used for classifying the built heritage from a historical perspective, as it has been used above. Kaasalainen and Huuhka (2016a and 2016b), however, also suggest that typologies can also be useful in mapping the future modification potential of contemporary buildings. The last part of the study takes advantage of this approach. It is based on a design-aided method.

The research question is: How can the identified typical layouts be modified to produce larger homes (now missing) by merging adjacent flats? The potential for mergers is evaluated by examining the numbers of interfaces between flats. Studying the opportunities for mergers results in the creation of a new typology, this time about the flats' scalability potential.

4 Statistical study: Forms of housing in Finland and their evolution

4.1 Housing stock: housing types and dwelling sizes

Figure 1 shows how dwellings of different sizes are distributed among different housing types in the Finnish housing stock. The average size of a home is 3.0 rooms, but the distribution of dwelling sizes is clearly divergent for different building types. There is an average difference of about two rooms between houses (4.0 rooms) and flats (2.2 rooms), with row-houses (2.8 rooms) coming in between. In mass housing, the average size is even slightly smaller than it is in the rest of the stock of flats.

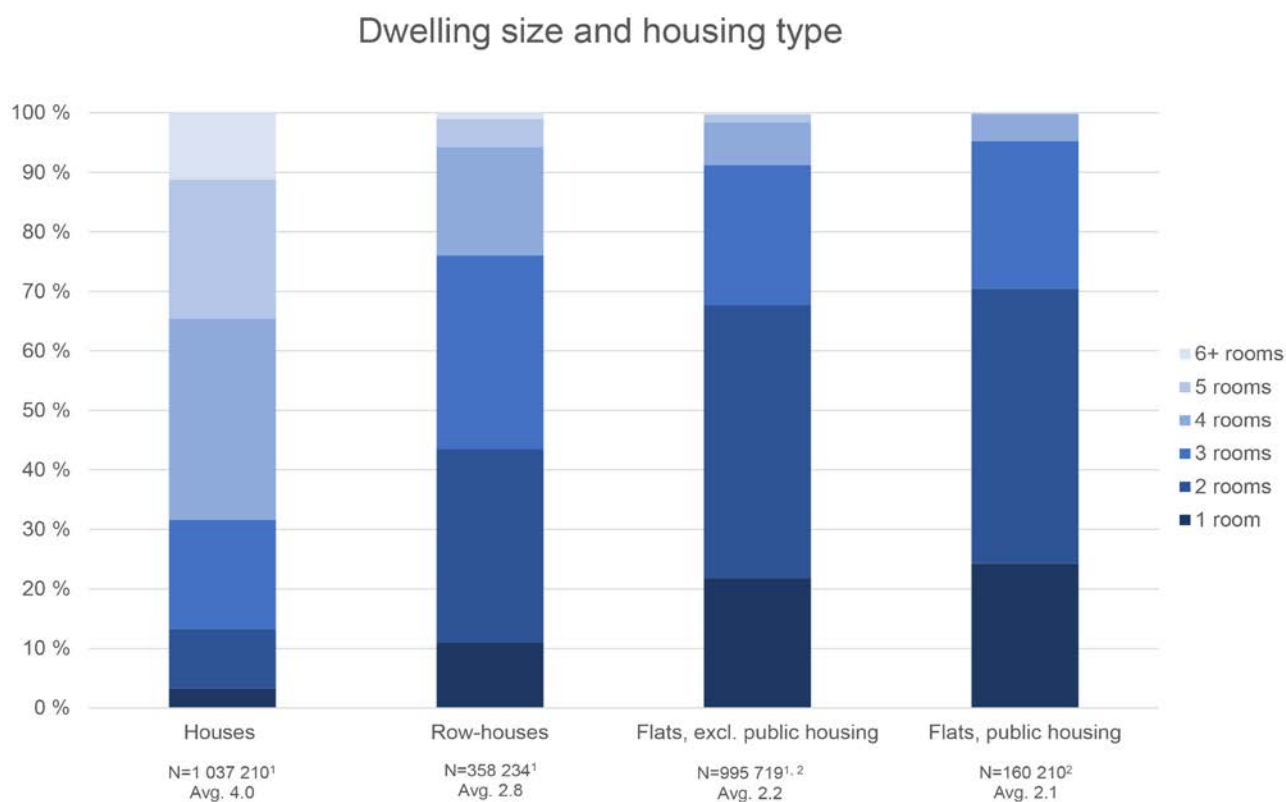


Figure 1. Distribution of dwelling units of different sizes according to the housing type. N.B. Kitchen does not count as a room. Sources: (1) OSF, 2014; (2) Asumisen rahoitus- ja kehittämiskeskus, 2014.

4.2 Households: distribution over the housing stock

Figure 2 shows how households of different sizes are currently distributed in the housing stock, both in terms of the form of the housing and the size of the dwelling. Only one-person households reside primarily in flats, while houses are the dominant form of housing for all larger household groups. A clear difference in housing density can be also observed according to the housing form: households of the same size have, on average, 1.0–1.6 fewer rooms at their disposal if they live in flats rather than houses. This is a logical consequence of the dwelling size distribution of the housing stock (i.e. Figure 1).

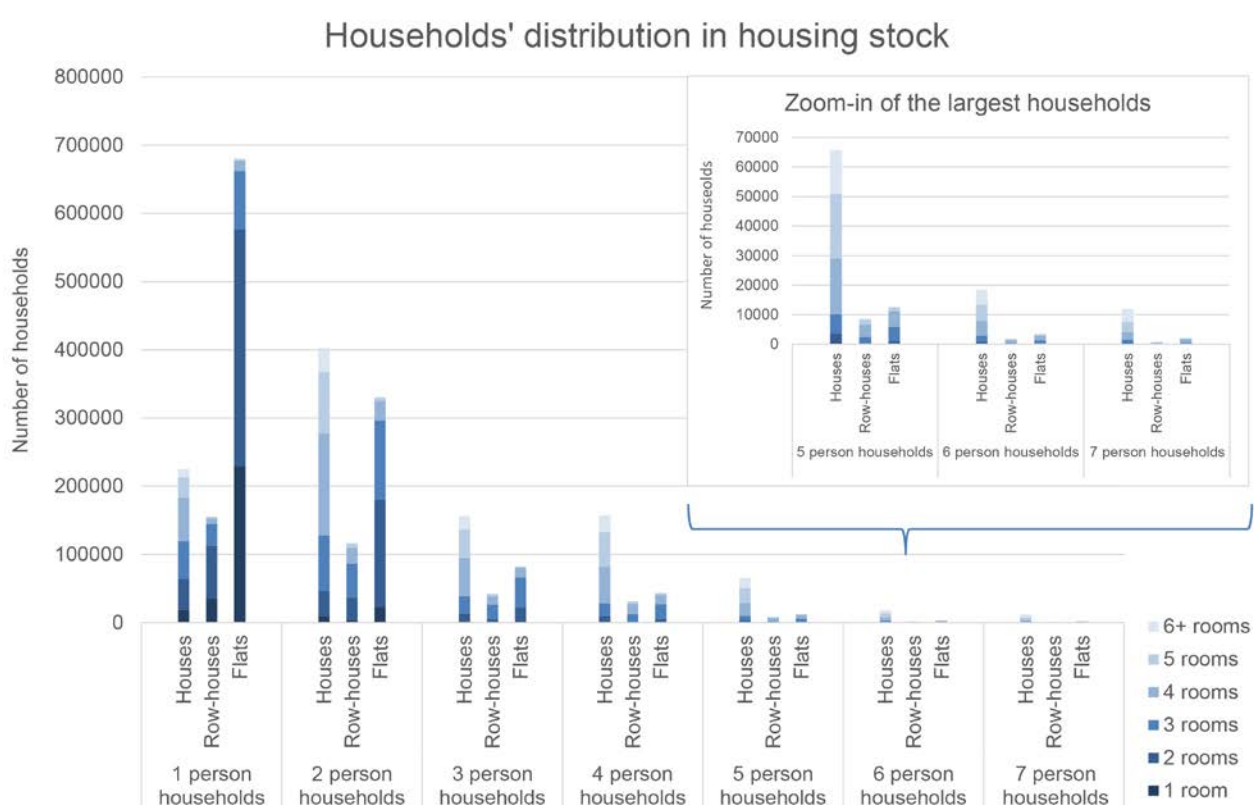


Figure 2. Distribution of households of different sizes in the housing stock according to the housing type and dwelling size.

Source: OSF, 2014.

4.3 Evolution of the distribution of households over 30 years

Figure 3 presents how households of different size are distributed between different housing types in different types of communities in two cross-section years (1985 and 2012). The distribution predictably reflects the housing stocks of the communities; the proportion of households living in flats is higher in more urban communities. The data reveals two distinctive patterns of change.

Firstly, while one-person households in urban settings usually live in flats, the proportion of such households living in row-houses has increased. Secondly, the proportion of households with two or more members has decreased in flats and increased in houses in all area types. Only the largest (7-person) households in the capital region buck this trend, as the proportion of such households in flats in urban areas has increased. In urban settings, some of this tendency to ‘leave’ flats is also directed into row-houses.

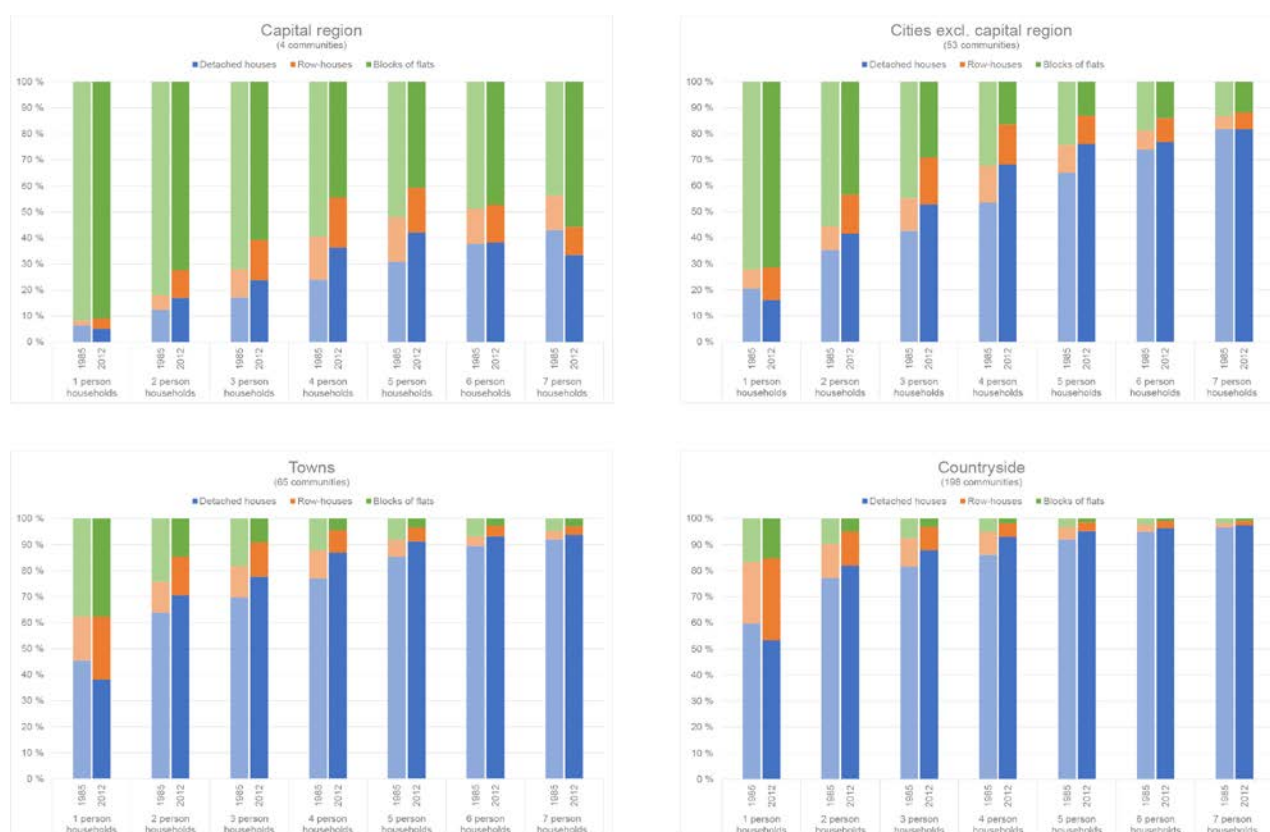


Figure 3. Shares of households of different size in different housing types in four types of communities in the end of 1985 and 2012. Source: OSF, 2012.

4.4 Discussion for the statistical study

If one accepts the assumption that different housing types are located in distinct areas, the observed disparity in the dwelling sizes of distinct building types could explain some aspects of the distribution of Finnish households of different size and wealth within the city structure. If housing is indeed a 'scarce resource' (Rex and Moore, 1967, as quoted in van Kempen and Özüekren, 1998: 1640), large flats are particularly rare gems (<9%), and even more so in mass housing (<5%). So, households looking for larger homes, be it due to their family size or their preference for spacious housing, are not very likely to find one in a block of flats.

The clearest trend over last 30 years has indeed been that the proportion of households larger than one person has decreased in blocks of flats. This can be assumed to reflect two parallel phenomena shown by previous research: firstly, the increase in households' wealth, which enables them to live more spaciously, and secondly, the increased supply of larger dwellings in low-rise housing estates, in parallel with the lack of those dwellings in blocks of flats, particularly mass housing. This may also mean that households that prefer or rely on the social rented sector have no access to larger homes even if their family size requires it. The increase in the proportion of the largest (7-person) households in flats in the capital region may very well be a symptom of this. Housing subsidies are scaled according to the household size, but social rented dwellings are almost solely situated in blocks of flats that have very few family-sized homes. So, in the next sections, the paper examines how the proportion of large dwellings could be increased in mass housing.

5 Typological study: Mass housing building layouts

5.1 Composition of the housing

First, there is a need to briefly review the results of the previous studies that this examination is based on. The left side of Figures 4 and 5 show staircase unit types and their prevalence that have been identified from mass housing (Achrén, 2015). The recognized flat types and their prevalence (Kaasalainen and Huuhka, 2016a) are shown on the right. Slab blocks are three times more

prevalent than point blocks, and they also have a greater number of staircase unit types and a higher occurrence of them (65%). Point blocks, on the other hand, only have one identified staircase unit type, which covers a much smaller proportion of the buildings (38%). In all, the identified types cover almost 60% of staircase units in mass housing, while the flat types cover even more – circa 80% of the flats. For all flats of different sizes, there is always one type (coded 'X-1A', where X stands for the number of rooms) that is clearly more prevalent than the others. These results provide the starting point for the examination of the adaptation possibilities.

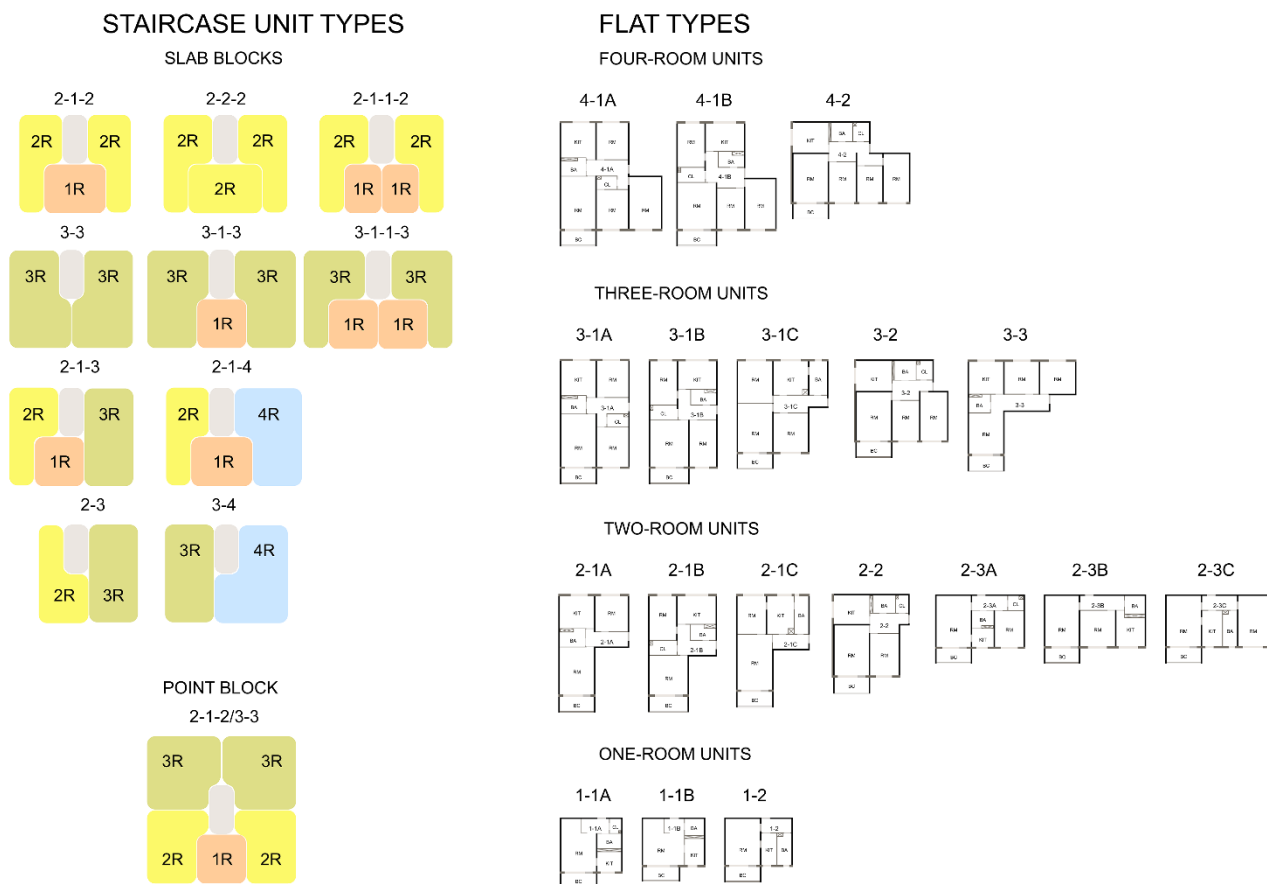


Figure 4. Staircase unit types (Achrén, 2015) and flat types (Kaasalainen and Huuhka, 2016a). N.B. For legibility reasons, the staircase unit types and the flat types are not on the same scale. The codes for staircase unit types differ from those used by Achrén (2015). Since most slab blocks consist of multiple staircase units, a building can have more than one staircase unit type.

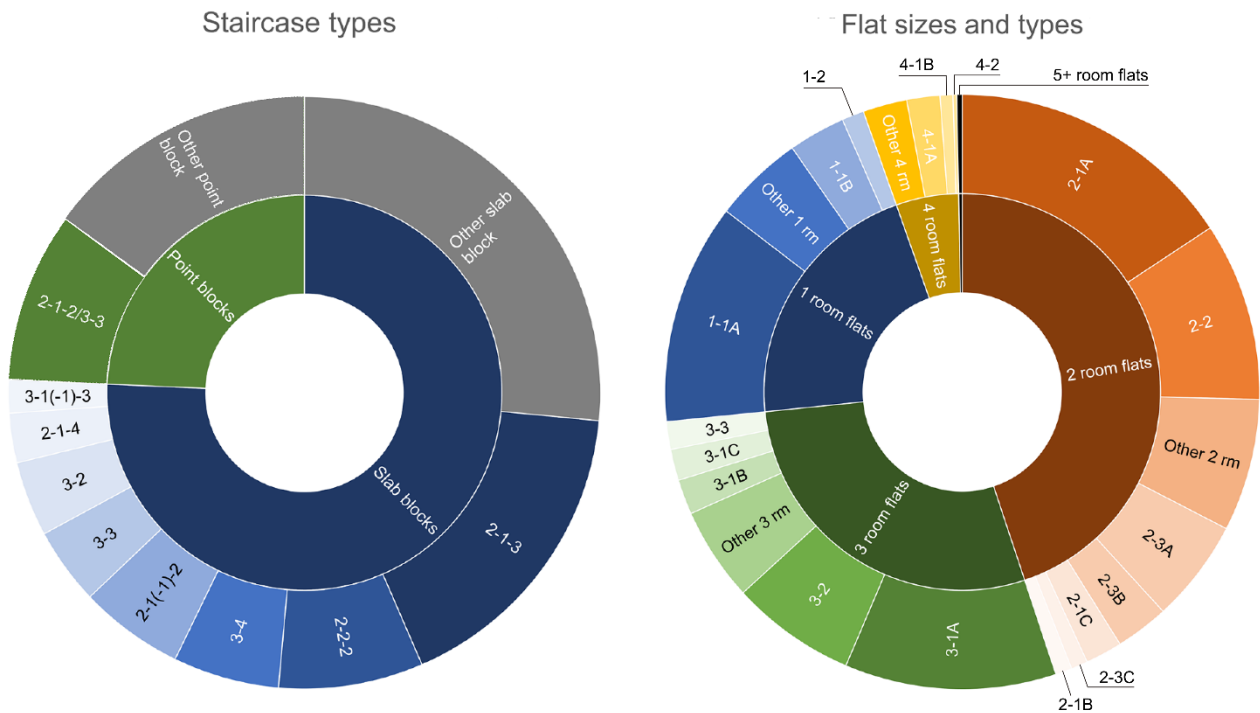


Figure 5. Shares of staircase unit types and flat types. Sources: Staircase unit types: Achrén (2015) and the background data; Flat types: Kaasalainen and Huuhka (2016a and 2016b).

Now, the original contribution of this paper starts from matching the staircase unit types with the flat types. Figure 6 and Table 1 present the results of this. When matched with staircase unit types, the prevalent flat types (the 'X-1As') are, with a few notable exceptions, also the most common types.

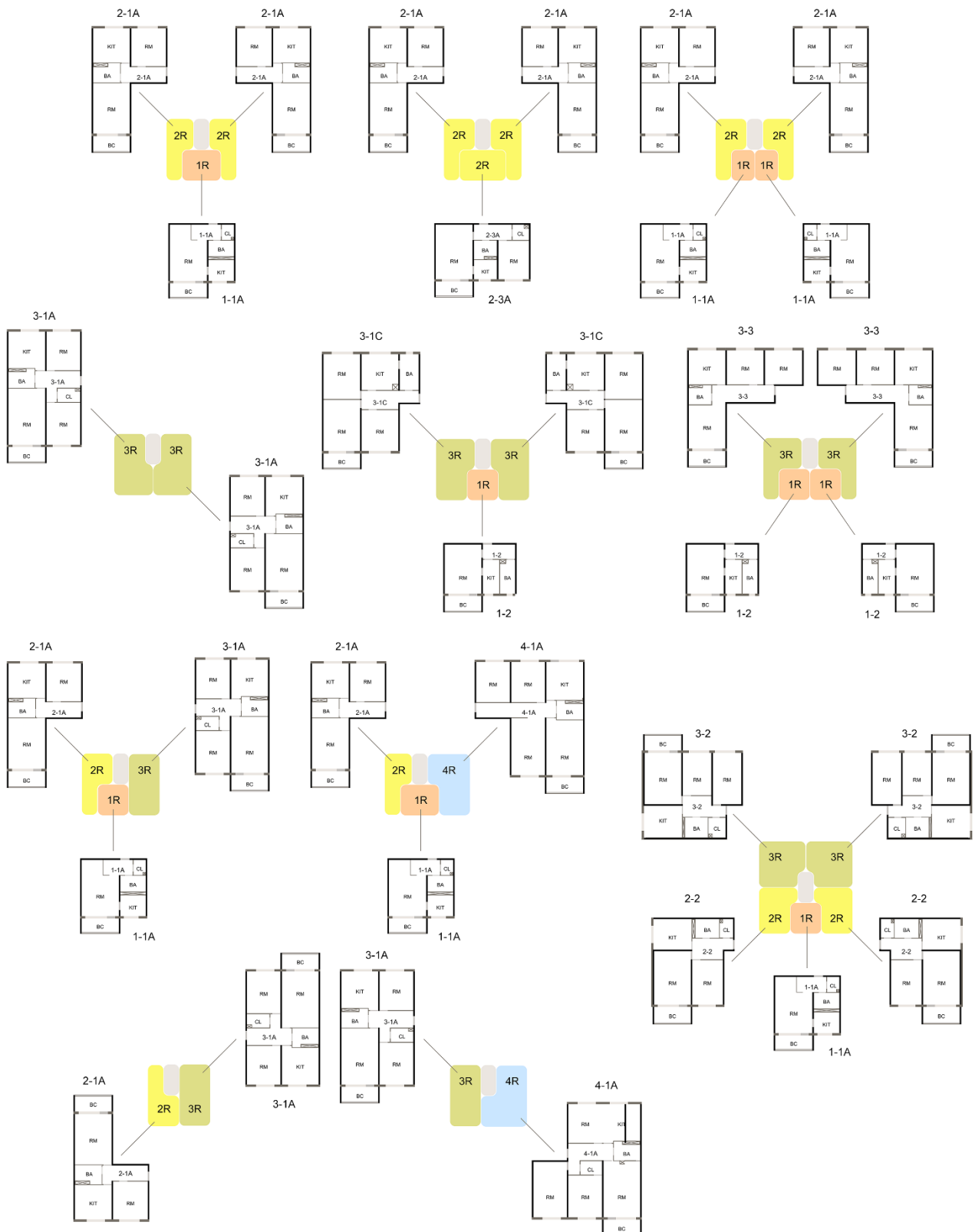


Figure 6. Synthesis of the staircase unit types and flat types, staircase units matched with the most commonly occurring flat type (*cf.* Figure 4).

Building type	Staircase unit type	Prevalent flat types	Share of staircase unit types in which the flat type occurs	Other occurring flat types
Slab blocks	2-1-2	1-1A 2-1A	65 % 88 %	1-1B
	2-1-1-2*	1-1A 2-1A	83 % 67 %	1-1B, 1-2 2-1B, 2-1C
	2-1-3	1-1A 2-1A 3-1A	68 % 81 % 75 %	1-1B, 1-2 2-1B, 2-1C 3-1B, 3-1C
	2-1-4	1-1A 2-1A 4-1A	76 % 65 % 65 %	1-1B 2-1B, 2-1C 4-1B
	2-2-2	2-1A 2-3A	86 % 61 %	2-1B, 2-1C 2-3B, 2-3C
	3-1-3	1-1A / 1-2 3-1C	43 % / 43 % 71 %	1-1B 3-1A, 3-3
	3-1-1-3*	1-2 3-3	75 % 100 %	1-1A
	3-2	2-1A 3-1A	89 % 89 %	
	3-3	3-1A	68 %	3-1B
	3-4	3-1A 4-1A	76 % 76 %	3-1B, 3-1C 4-1B
Point blocks	2-1-2/3-3	1-1A 2-2 3-2	52 % 97 % 97 %	1-1B

Table 1. Flat types occurring in the typical staircase unit types. (*) The staircase unit types with doubled one-room units (2-1-1-2; 3-1-1-3) are rare and considered a subtype of the single one-room unit type (2-1-2; 3-1-3). However, as the flat types of 3-1-1-3 differ from those of 3-1-3, the subtypes are included in this table.

5.2 Discussion for the typological study

The flat types created in the previous study are ‘idealized’ in that their measurements are the mean values, whereas the staircase unit types represent ‘sets’ of adjacent flat types, with no measured dimensional information. The measurements for actual flats and staircase units may differ from the dimensions derived from the idealized types in any dimension. The possibility to actually make a connection for a merger (e.g. install an internal stairway) between two real flats in a given building will inevitably depend on the specific dimensions of the flats in question, in addition to structural matters. The investigation on the possible mergers presented next will however provide a general understanding about the scalability potential of mass housing.

6 Adaptability study: Scalability by merging flats

6.1 Scalability potential of flats

Table 2 shows the interfaces between adjacent flats while Figure 7 illustrates the progression of possible combinations of flats in horizontal, vertical and horizontal-vertical directions. Because of the way the flats are positioned in the building, the interfaces are created at specific locations. Figure 8 highlights the possible locations of horizontal connections (new doorways) and Figure 9 shows the possible locations of vertical connections (new internal stairs).

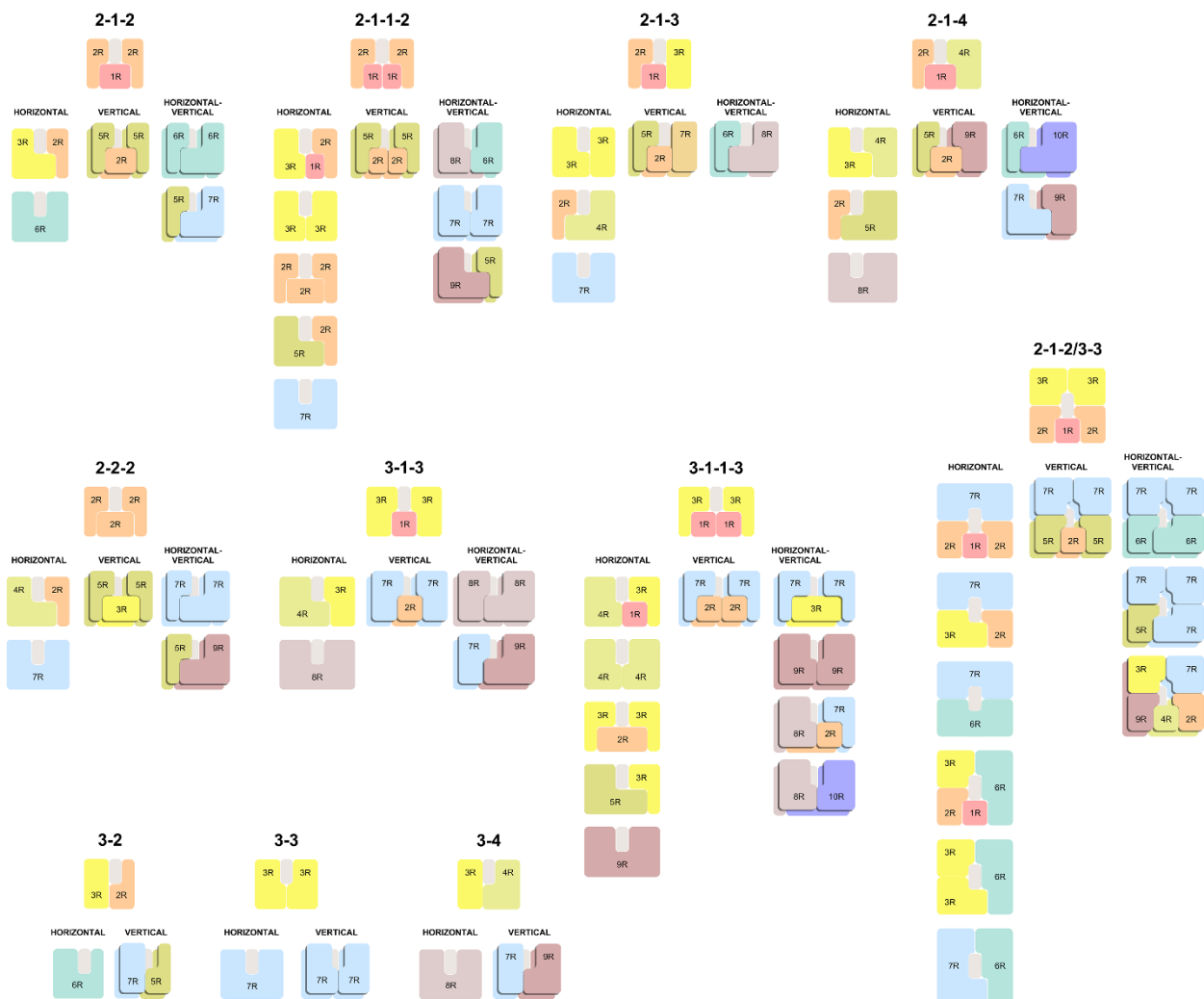


Figure 7. Possible flat combinations in slab block staircase units and point block staircase units. Note: Since most slab blocks consist of multiple staircase units, a building can have more than one staircase plan type.

Building type	Staircase unit type	Horizontal interfaces	New room count	Vertical interfaces	New room count	Horizontal-vertical interfaces	New room count
Slab blocks	2-1-2	1-2	3	1-1	2	2-2-1	6
		2-1-2	6	2-2	5	2-2-1-1	7
	2-1-1-2	1-1	2	1-1	2	2-2-1	6
		2-1	3	2-2	5	2-2-1-1	7
		2-1-1	5			2-2-1-1-1	8
		2-1-1-2	7			2-2-1-1-1-1	9
	2-1-3	1-2	3	1-1	2	2-2-1	6
		1-3	4	2-2	5	3-3-1	8
		2-1-3	7	3-3	7		
	2-1-4	1-2	3	1-1	2	2-2-1	6
		1-4	5	2-2	5	2-2-1-1	7
		2-1-4	8	4-4	9	4-4-1	10
	2-2-2	2-2 (L-S)	4	2-2 (S-S)	3	2-2-2	7
		2-2 (L-S)	4	2-2 (L-L)	5	2-2-2-2	9
		2-2-2	7				
	3-1-3	1-3	4	1-1	2	3-3-1	8
		3-1-3	8	3-3	7	3-3-1-1	9
	3-1-1-3	1-1	2	1-1	2	1-1-1	2
		3-1	4	3-3	7	1-1-1-1	3
		3-1-1	5			3-3-1	8
		3-1-1-3	9			3-3-1-1	9
						3-3-1-1-1	10
	3-2	2-3	6	2-2	5		
				3-3	7		
	3-3	3-3	7	3-3	7		
	3-4	3-4	8	3-3	7		
				4-4	9		
Point blocks	2-1-2/3-3	1-2	3	1-1	2	1-1-2	4
		2-3	6	2-2	5	2-1-2	6
		3-3	7	3-3	7	2-2-1-1	7
		1-2-3	7			2-2-3	9

Table 2. Interfaces of flats and room-counts resulting from combining flats. Note: When flats with two full kitchens are combined, one of the kitchens becomes redundant and can be converted into a bedroom. Therefore, the room number of the new flat exceeds the sum of the old room numbers by one (e.g. two two-room flats with kitchens make one five-room flat). On the other hand, when two-room flats with two kitchenettes are combined, the new flat becomes so large that a full kitchen is needed, so the number of rooms is one fewer than the sum of the old rooms. The combinations also result in two bathrooms, but that is considered as acceptable, or even necessary when the number of rooms is increased.

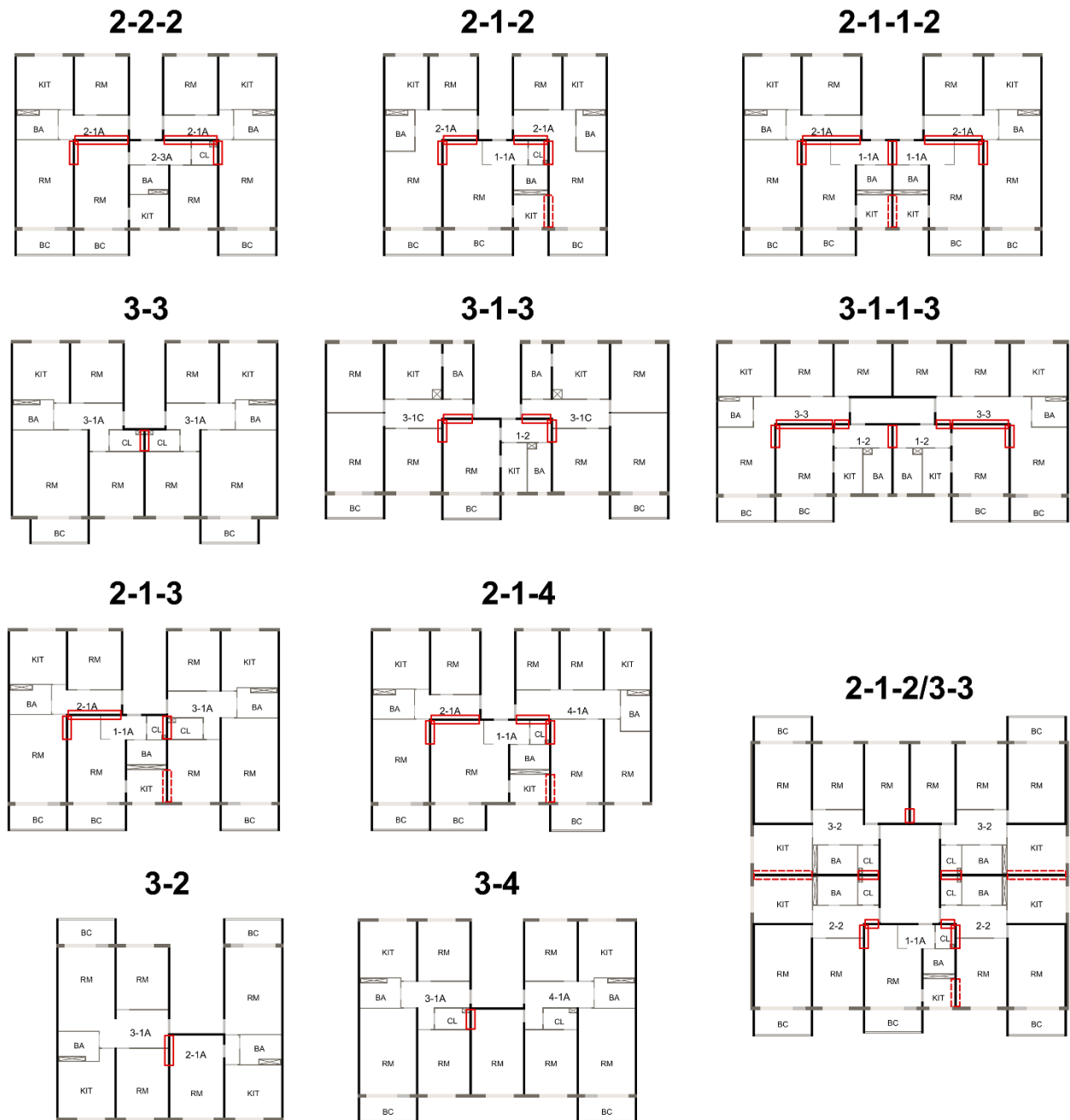


Figure 8. Possible locations of horizontal connections between flats. Primary connection points are circled with solid lines and secondary connection points with dashed lines.



Figure 9. Possible locations of vertical connections between flats. Primary locations of stairways are drawn with solid lines and secondary locations with dashed lines.

6.2 Discussion for the adaptability study

Large dwellings of four- or five-rooms can be created in most of the staircase unit types of mass housing by merging flats. Generally there are more opportunities for creating five-room units than four-room ones, but the number of four-room units can be increased in the most common slab block types. Table 3 summarizes the opportunities for increasing the number of large flats, up to 7 rooms, in the order of the overall prevalence of the staircase unit types.

Staircase unit type	4-room dwellings	5-room dwellings	6-room dwellings	7-room dwellings
2-1-3	H	V	H-V	H, V
2-1-2/3-3	H-V	V	H	H, V, H-V
2-2-2	H	V		H, H-V
3-4				V
2-1(-1)-2		V, (H)	H, H-V	H-V (H)
3-3				H, V
3-2		V	H	V
2-1-4		H, V	H-V	H-V
3-1(-1)-3	H	(H)		V

Table 3. Opportunities to increase large flats in the known staircase unit types. H=horizontal connection; V=vertical connection, H-V=horizontal-vertical connection, (H) the combination is possible in the more rare version of the staircase unit type, e.g. 2-1-1-2. Note: Horizontal connections are technically the simplest to perform, while horizontal-vertical require the most effort.

The greater the number of dwellings in the staircase, the better are the opportunities for creating different combinations. In two-dwelling staircases (e.g. 3-3, 3-4, 2-3), the dwellings are already relatively large, and combining them typically results in overly large new dwellings with six rooms or more. Furthermore, if these large dwellings are created in a horizontal direction, the resulting layouts are inefficient, and can make it difficult for people to orient themselves. For example, the flats may have long corridors, or they may lack a clear internal hierarchy. If such dwellings are needed, it is often better to do it in a vertical direction, as this will result in more compact floor-plans.

Increasing the number of four-room flats typically involves consuming one-room flats, and increasing the number of five-room flats typically involves consuming the most common type of flat in these buildings, i.e. L-shaped two-room flats (types 2-1X). Four-room dwellings can be created fairly simply with horizontal joints in four staircase unit types: 2-1-3; 2-2-2; 3-1-3 and 3-1-1-3. Although the two latter types are rare, the first two are the most common types found in slab blocks. Vertical joints are no good for making four-room flats, but they can be used to create five-room dwellings in all but three of the staircase unit types. This usually requires a vertical connection (staircase types 2-1-2;

2-1-1-2; 2-2-2; 2-1-3; 2-1-4; 2-3; 3-3/2-1-2), although a horizontal connection is sometimes possible in rare staircase unit types.

Placing the internal stairway for the vertical connection is relatively easy in the majority of the flat types, although it does not work well with types 2-1A and 3-3 since placing the staircase in the living room may take up too much space. This is unfortunate, as the 2-1A type is the most common in the stock. Replacing walk-in closets with stairs is an especially convenient solution, but this can only be done in a few flat types.

Some flat types are harder to connect in the horizontal direction than others. These include types 1-1B, 2-3B, 2-2 and 3-2. Types 1-1B and 2-3B, which are relatively rare, have a bathroom and kitchenette at the side, so they are difficult to connect with the adjoining flat on that side. Types 2-2 and 3-2 are more common, although they only occur in point blocks and always face each other. If these flats have a walk-in closet they can be connected through it, but otherwise they must be connected through the kitchen, which disrupts the internal hierarchy.

The doubling up of bathrooms and kitchens can be an issue when flats are combined. In larger flats, the problem is minor: a second kitchen can be turned into a bedroom; a kitchenette into a sleeping alcove or walk-in closet; a bathroom can become a toilet, a shower or a utility room. Double bathrooms is more of a problem when small flats (one-room flats or small two-room flats) are combined together, since there is less need for two bathrooms in a smaller flat.

In emerging forms of living some of the aspects mentioned above as inconveniences may also become assets. In co-housing or multi-generational living, for instance, having more entrances, bathrooms and kitchens may not be an disadvantage at all. In these types of housing, the lack of a hierarchy characteristic to the dwelling of a nuclear family may also be a desirable feature. Families with backgrounds in non-Western cultures may also prefer different kinds of spatial hierarchies than what functionalist housing normally has to offer. In practice, what size and kind of dwellings are

needed naturally presupposes an analysis of the local housing market situation and the aims of the intervention.

7 Final discussion and conclusion

This paper has operated at the intersection of human geography (segregation research), building stock research and adaptability research. Segregation is broad and complex issue that generates a wide range of needs for mapping the characteristics of the housing stock. This paper has focused on the lack of variation in the sizes of dwellings as a factor in residential segregation and examined this issue in the context of adaptability of Finnish mass housing built in the 1960s and 1970s. Besides pointing out the problems caused by the unequal distribution of homes of different sizes in the Finnish housing stock, this paper also showed how the supply of large dwellings could be increased in mass housing – the part of the stock particularly short of them.

In terms of housing prices, mass housing – whether social-rented or owner-occupied – usually represents the most affordable part of the housing stock, in particular when situated in the stigmatized neighbourhoods. Therefore, increasing large dwellings in these areas by the means of flat mergers can be financially accessible for a larger number of households than the new construction of those dwellings, which is generally high-priced. The households that already live in the area but that are making a socio-economic climb could be a valuable asset in decreasing segregation. However, the absence of more spacious dwellings can be one influencing factor for those households' in deciding whether to stay or go. One may only ponder whether one reason behind many Finns' dream of living in a house is in fact a desire for a more spacious dwelling.

Moreover, when new homes are constructed in these areas as a socio-economic balancing measure, they are often for owner-occupied housing and to replace social-rented dwellings. Many low-income families that already live in these areas only have access to the social-rented sector, and based on the study's results it would seem that the shortage of large apartments in this type of housing may force many of such families to live in cramped conditions. Even though the housing

subsidies are designed to scale according to the household size, the subsidy does not enable the beneficiary families to live less crampedly if no large social-rented dwellings are provided.

Policies to mitigate residential segregation usually aim at diversifying the population structure in the disadvantages areas. This usually encompasses providing different types of tenure and ways of financing, typically in connection with replacing existing buildings with new ones. However, diversifying the sizes and typologies of dwellings can be seen as a measure that could contribute to this target, too. What is more, if even some of the emerging changes in housing, such as co-housing, multigenerational living and working from home become mainstream, the scalability of dwellings – both in the existing stock and in new buildings – gains further importance. Although this paper concentrated on the adaptation of existing buildings, it is not at all the only means to redress the balance, but rather one factor in a larger picture.

Many unresolved issues for future research still remain in the relation between segregation and housing – many to do with the quality of housing, the economic equation and not only the size of the dwelling. Nevertheless, this study suggests that planners, policy-makers and property owners concerned with segregation should at the very least ensure they are properly informed about the dwelling sizes in the existing stock before they make decisions for balancing measures. Even more importantly, if it is accepted that buildings can no longer be viewed as disposable commodities (for the sake of sustainability if nothing else) then it must also be acknowledged that older housing can – and should – be adapted to accommodate the ever-rotating changes in demographics and households' housing preferences.

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