

## **Segregation in the city of Groningen**

An explorative study into the developments in housing, income and segregation based on  
 income in the city of Groningen

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## Abstract

In the last decade, more and more attention is being paid to income inequality at global, European and national level. This income inequality has increased in many European countries since the 1970's. An increasing income inequality means that the gap between the rich and the poor is becoming bigger. One way to study this inequality, is to look at how this inequality expresses itself spatially. In terms of income inequality, this means that different groups, earning different incomes, live in different parts of a geographical area, for example a city. This spatial inequality, which can be called segregation, is generally higher in larger cities. Segregation is affected by the geography and the availability of housing. In this way, changes in the housing stock might lead to more or less segregation. One way to change the existing housing stock is by urban restructuring. This includes the renovations of old housing and the building of new housing. When focusing on The Netherlands, striving for an 'unsegregated' or 'undivided city' is something that has been anchored in Dutch policy for decades. Already since the 1970s, plans are made to reduce income and ethnic segregation in Dutch cities. Also the municipality of Groningen has been aiming to 'work against' segregation for decades.

The aim of this research is to explore the developments in housing, income and, in the end, segregation, and to explore to what extent these relate to urban restructuring plans and segregation in the city of Groningen. This is done by using a quantitative research method, in which secondary administrative data is used. The research focuses on segregation between income groups. The households are divided in five different income groups.

The results show that there has been a high increase in the housing stock between the years 2000-2019. However, there are large differences between the growth in the districts. On the other hand, the share of social housing per district has become more equal; the social housing is more evenly spread across the districts in the city. When looking at the distribution of the lowest and the highest income group, no substantial differences between the years are found. What does stand out, is that the lowest income group seems to live predominantly in the Northern part of the city, while the highest income groups lives predominantly in the Southern part of the city.

The lowest and the highest income group are also the most segregated ones. This is the case for two geographical levels, namely the segregation between districts in the city and within these districts. The segregation within the districts also seems to be the highest in districts where the share of the specific income group is low to average. When comparing the developments of the share in social housing and the share of the lowest income group, a significant positive correlation between the share of social housing in a neighbourhood compared to the share of social housing in a district and the share of the lowest income group compared to the share of the lowest income group in a district is found. This indicates that developments in the share of social housing affect the segregation of the lowest income group within a district.

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## Chapter 1. Introduction

In the last decade, more and more attention is being paid to income inequality at global, European and national level. According to the International Monetary Fund (2015), widening income inequality is the defining challenge of our time. Another example illustrating the interest in income inequality is the huge attention given to Piketty's (2013) book 'Capital in the Twenty-First Century' in which he argues that inequality, in terms of wealth and income, is increasing in many countries. In addition, the fact that one of the UN Sustainable development goals established in 2015, is 'Reduced Inequalities' within and between countries (United Nations, 2016), is showing today's importance of this topic.

In this research, income inequality is defined by using the definition of Tammaru et al. (2020) who define income inequality as "*the uneven distribution of income between people and households*" (p. 450).

Income inequality has increased in many European countries since the 1970's; the rich have become richer and existing policies and institutions have not been able to tackle the existing poverty. But, why does this matter? It matters because in most societies, irrespective of ideology, culture, and religion, people care about inequality. Increasing inequality might be a signal of a lack of opportunities for particular groups in society. This widening inequality, which also might be inequality in terms of income, has implications for growth and macroeconomic stability. Besides, it might cause concentration of political power for only a few, and might lead to a sub-optimal distribution and use of human capital (International Monetary Fund, 2015).

When speaking about inequality, the interest in the inequality is also partly driven by the way it expresses itself spatially (Musterd et al., 2017). In terms of income inequality, this means that different groups, earning different heights of income, live in different parts of a geographical area, for example a city. This spatial inequality, which can be called segregation, is generally higher in larger cities than in small towns and smaller cities (Behrens & Robert-Nicoud, 2014). A lot of the earlier research on segregation is based on the segregation in the United States (Bolt et al. 1998). However, a recent study of Tammaru et al. (2020) focusing on European cities, shows that also in these cities not only income inequality is increasing, but that also the spatial distribution of different socioeconomic groups is becoming more unequal. In other words, the residential segregation between socioeconomic groups, which can be defined as "*an uneven distribution of different occupational or income groups across residential neighbourhoods of an urban region*" (Tammaru et al, 2020, p. 450), is also increasing.

### 1.1. Impacts of segregation

One of the most important reasons for paying attention to residential segregation are the impacts of residential segregation. Previous research suggests that spatially separated concentrations of socioeconomic groups due to residential segregation might lead to social unrest, more crime, less trust between socioeconomic groups (Malmberg et al., 2013), and a low sense of safety (Bolt et al., 2009). However, a case study done in the Netherlands, suggests that the consequences of segregation might differ per situation. Residents living in neighbourhoods that are separated from other types of neighbourhoods do not necessarily see this as undesirable. In some cases, the residents are satisfied about living in that neighbourhood and do feel at home there. Nevertheless, other specific situations, such as a concentration of people with a low social mobility and a concentration of physical and social problems, might still lead to more problems, such as crime (Leidelmeijer et al. 2015).

## **1.2. How to affect segregation: Urban restructuring and gentrification**

Getting grip on the mechanisms that influence residential segregation is not an easy task. Many mechanisms that influence inequality in general, like a withdrawing government, an increase in global connectedness and liberalization in general, and the differences in ‘atmosphere of living’ do influence the socio-spatial inequality in cities (Musterd & Slot, 2016).

One way to affect segregation in a certain area, is to change the available housing. In terms of changes in housing, urban restructuring projects mostly counteract segregation, while building new neighbourhoods increases the segregation in many cases. Hereby, the type of houses built and their location are crucial. New single-family homes in already existing poorer neighbourhoods attract families with higher incomes, whereas similar type of houses in neighbourhoods on the edges of cities might lead to these families leaving the city and moving to the edges. Logically, the first situation might lead to less residential segregation whereas the second actually facilitates this segregation (PBL, 2010). The phenomena that housing and the geography of housing might influence residential segregation, is something that has already been used in urban development policies. These housing policies aim for less segregated neighbourhoods resulting from building different and new types of housing in a neighbourhood (Van Kempen & Priemus, 2002).

A much discussed issue that relates to residential segregation is gentrification. Gentrification can be described as *“the process where a neighbourhood undergoes social upgrading so that the residents over time do have more resources in terms of education and income”* (Lees, Slater, & Wyly (2010) in Andersson and Turner, 2014, p. 6). In many cases, gentrification relates to urban restructuring. Urban restructuring plans might lead to, or might even strive for, the process of gentrification. This gentrification process might lead to a decrease in socioeconomic inequality, and might therefore initially result in less segregation (Musterd & Slot, 2016). People from middle to high income groups tend to locate to the relatively weaker neighbourhoods, which makes the neighbourhoods more diverse in terms of income, education and ethnicity. However, recent research suggests that this process of gentrification often stops increasing the diversification, or might even decrease the diversification in neighbourhoods after a certain time when original residents tend to be ‘pushed out’ of their neighbourhood (Musterd & Slot, 2016). Anderson and Turner (2014) did research on the longer-term effects of gentrification due to tenure conversion, which in their case means the conversion of public rental housing into market-based (cooperative) housing. They find that after a while, the gentrification leads to an inflow of younger, higher educated and higher income households. Meanwhile, the households moving out of the neighbourhood, do mostly earn less money and do have a lower level of education. In this case, there can be spoken of the ‘displacement’ of lower-income groups who are displaced by the higher-income groups. Debates on the phenomenon of displacement are widespread and there has been done research on this topic in many big cities around the globe (Helbrecht, 2017).

## **1.3. Residential segregation in The Netherlands**

Recent newspaper articles do mention that residential segregation also seems to become visible in Dutch metropolitan areas like Amsterdam (Van Gent & Hochstenbach, 2019). In the Netherlands, striving for an ‘undivided city’ is something that has been anchored in Dutch policy for decades. Already since the 1970s, plans have been made to reduce income and ethnic segregation in Dutch cities (Van Kempen & Priemus, 2002). These plans follow up on the idea that inequality is mainly a problem in the larger cities (Behrens & Robert-Nicoud, 2014).

Plans to reduce this segregation are also significantly important for the city of Groningen. In housing plans from 20 years ago, it was already mentioned that the city strives to be a city for residents with different characteristics, needs and lifestyles. The aim is to build different types of housing both in neighbourhoods within and around city. This might also counteract the segregation of different income groups in the city (Gemeente Groningen, 1998). Even though the city its policy is focusing on, and

aiming for, creating an undivided city, some recent news articles doubt whether the previous interventions have been successful. For example, the article about the city of Groningen of Borst in Dagblad van het Noorden (2017) named ‘Gescheiden werelden in een bruisende stad’, in English: ‘Separated worlds in a vibrant city’ and the article of De Vries & Sitalsing (2018) in Trouw about the segregation in primary schools in among others the city of Groningen. Reading these articles raises the question whether there might also be residential segregation in the city of Groningen. Another fact which makes Groningen an interesting case is the recent news that, in the Dutch context, the housing prices are rising the fastest in the province and the city of Groningen. The average housing price in the municipality increased by 11,3 percent and the average housing price increased even with 11,6 percent (Business Insider, 2020). This might suggest that the area becomes more attractive and popular.

#### **1.4. Aim and research questions**

Taking the previous paragraphs into account, it seems relevant to have a look at the residential segregation in Groningen. As this segregation is partly dependent on the availability and geography of housing, and in this way the urban restructuring, this research will also look at the developments in housing. Because the focus is on residential segregation between different income groups, it will also look at the income distribution within the city. These developments are connected with existing knowledge about previously executed urban renewal and urban restructuring plans, which might make it possible to evaluate the outcomes of the plans. The aim of this research is to explore the developments in housing, income and, in the end, segregation, and to explore to what extent these relate to urban restructuring plans in the city of Groningen. To meet the goals of the research, the following questions have to be answered:

**‘How has segregation evolved between and within districts in the city of Groningen from the year 2000?’**

- What are the developments in housing stock in the city of Groningen from the year 2000?
- What are the developments in household composition in terms of the income distribution in the city of Groningen from the year 2000?
- What are the developments in segregation in the city of Groningen from the year 2000?
- To what extent relate the developments in housing, income and segregation, and the urban restructuring plans to each other?

#### **1.5. Reading Guide**

In the following chapter, theory regarding the topics segregation, urban restructuring and development in housing and income will be discussed. Thereafter, in chapter three, the data collection, methods and analyses used in this research will be discussed and explained. In chapter four, a general overview of the city of Groningen is given. Subsequently, the results of the research will be discussed in the fifth chapter. In chapter six, the conclusions are drawn and the research done will be reflected critically upon.

## **Chapter 2. Theoretical Framework**

### **2.1 Defining segregation**

Segregation in general is the unequal spatial elaboration of differences in society. When speaking about segregation, different types of segregation can be distinguished. People can be for example segregated in the activities in their free time: different groups of people do different types of activities at different locations and, because of this, do not meet each other often. Segregation can also take place in education: children from different socioeconomic groups go to different primary schools. (Tammaru et al., 2020)

In this research the focus will be on different socioeconomic groups living separated in different districts. This can be called residential segregation between socioeconomic groups. Residential segregation can be seen as a form of spatial segregation, since different groups, in this case socioeconomic groups, are unequal divided over space. Van Eijk (2010) argues that in many western cities, neighbourhoods are segregated in terms of socioeconomic and ethnic characteristics.

Residential segregation between socioeconomic groups refers to the uneven distribution of different occupational or income groups across residential neighbourhoods of an urban region or another spatial dimension. This means that different socioeconomic groups of people, live in different areas within a city and are separated from each other in terms of their residence. In this way, specific socioeconomic groups are overrepresented in a certain neighbourhood, whereas these groups are underrepresented in another neighbourhood (Tammaru et al., 2020).

In the previous sections the term ‘socioeconomic groups’ has been used. This ‘socioeconomic’ refers to both occupation and income (Tammaru et al., 2020). In this research, the focus will be mainly on income to distinguish different groups. Thus, this research particularly looks at residential segregation based on income. In this way, the aim is to investigate to what extent on groups earning different incomes live separated from each other.

### **2.2 The effects of segregation**

A lot of academic and policy literature emphasize the negative effects of the enduring spatial concentration of households from particular socio-economic groups in Western societies (Bolt et al., 2010). Previous research suggests that residential segregation might lead to constraining interaction between different groups of people, and thus the formation of relationship. This might have an effect on the quality of people’s personal networks (Van Eijk, 2010). Other research even states that residential segregation between different socioeconomic groups seems to exacerbate the poverty and the social problems in areas (Feitosa et al., 2004). Examples of these social problems caused by residential segregation are social unrest, more crime and, less trust between different socioeconomic groups (Malmberg et al., 2013). This process, in the U.S. often named ‘ghettoization’, refers to the failure of social and economic integration, and counteracts equality in housing and job opportunities (Bolt et al., 2010).

Based on the research named above, one might say that residential segregation has at least some negative effects. The question is, if these negative effects are always clearly present, and who are affected by these negative effects. When further exploring the topic of residential segregation, it becomes clear that there not seems to be a consensus about the usefulness and the benefits of socioeconomically mixed neighbourhoods. Miltenburg (2017), for example, did research on the relocation of individuals who were forced to relocate to another dwelling in the Dutch context. The expectations based on the previous literature would be that individuals benefit from living next to a neighbour from a higher socioeconomic group by means of better access to resources, role models and job information. However, her research concludes that living next to a neighbour from a higher

socioeconomic group, does not necessarily lead to clear benefits for people from a lower socioeconomic group. Both forced relocatees that moved within the neighbourhood of origin and relocatees who were forced to move to other, sometimes more affluent, neighbourhoods did not see an improvement in their economic prospects. In other words, their economic prospects did not improve when they moved to a less segregated area. When keeping this finding in mind, one might question whether the segregation between different socioeconomic groups is indeed that problematic.

The opinion paper of Pinkster (2017), in which she reacts to the work of Miltenburg (2017), once again displays the ongoing discussion about the usefulness of diverse neighbourhoods and the effects of segregation. She argues that quantitative research, among which previous mentioned research, might not have proven the usefulness of the diverse neighbourhoods, but that qualitative research did. Qualitative research has shown that residents in neighbourhoods where poverty is concentrated actually are restricted in opportunities due to the fact that they are almost entirely surrounded by people from lower socioeconomic groups and the fact that they see many problems in this neighbourhood. On the other side, this concentration of the same type of people also results in a strong support of the created networks in these neighbourhoods. The experiences of the effects in the neighbourhoods can be both positive and negative.

Apart from the networks and relationships which might or might not arise in more diverse neighbourhoods, the research of Van der Meer & Tolsma (2014) shows that in general social mixing of groups even leads to more recognition and tolerance towards 'others', even without strong contacts between different groups. This might mean that living next to a neighbour from another socioeconomic groups might contribute to the tolerance in general, even when the relationship with a neighbourhood is not that strong. Only the fact that different people live close to each other already increases tolerance towards other groups.

### **2.3. Causes of residential segregation**

To understand how cities can 'act' against segregation, it is required to know how this segregation arises. First of all, it has to be emphasized that segregation is a complex issue that does not lend itself for simple analyses and easy solutions (Carr, 1999). Still, various processes are supposed to relate to socioeconomic segregation.

The most critical cause relating to residential segregation between socioeconomic groups is income inequality. Income inequality started to grow globally from the 1980s due the rapid globalization, economic liberalization, marketization and deindustrialization. An increasing inequality in terms of income might lead to a higher residential segregation (Tammaru, 2020). An explanation for this change is that the widening income distribution makes high- and low-income households less likely to choose to live in the same neighbourhoods (Watson, 2009). This distribution of different income groups living in different places, often leads to a concentration of poverty in disadvantaged neighbourhoods, due to the lack of choice and the lack of accessible and affordable housing in other areas in the city. However, this concentrating does not only apply to the lower income groups, but it also applies to the groups with a high income. The difference here is that the concentration of high income groups seems to operate voluntary whereas the concentration of the low income groups seems to be forced (Musterd et al., 2017).

Next to this income inequality, there are other factors that might affect residential segregation in some way. First of all, the changes in the number of households, due to for example population shrinkage or growth, or immigration, affect the spatial distribution of different socioeconomic groups over neighbourhoods. Second, the mobility of the residents within urban regions does also have an effect on the residential segregation. In other words, people change residential neighbourhoods, for example, because their income increases or decreases. The third mechanism is the geography and the differentiation in housing. In other words, it matters what types of houses are available, and where

these houses are available. Different types of housing attract different income groups. Where these types of houses are built might influence the distribution of these income groups. Some groups might be attracted to particular neighbourhoods, whereas other groups, because of money constraints, might be forced to other neighbourhoods (Tammaru, 2020).

When focusing on the geography and differentiation in housing, one could imagine that a change in the housing stock in a neighbourhood does also change the people living in that neighbourhood. Moreover, building new houses and restructuring neighbourhoods has an effect on the composition of the population in these neighbourhoods (PBL, 2010).

The available housing attracts, forces or constraints people with different income levels to move to a certain area. This might lead to selective residential mobility. Selective residential mobility occurs when specific income groups tend to move to or move out specific neighbourhoods. The extent and the speed with which selective residential mobility of different income groups leads to changes in the levels of residential segregation hinges, first, on the (un)evenness of the geography of housing. This means that, for the residential segregation, it matters how the urban neighbourhoods are planned in terms of their housing mix. For example, the more spatially clustered the low-cost housing is, the more likely it is that low-income households with little choice in terms of housing sort into those neighbourhoods, contributing to the rise of level of residential segregation (Tammaru, 2020).

The geography and availability of housing is partly related to the existing housing regime (Musterd et al., 2017). The housing regime can be defined as the fundamental principles according to the housing provision in a certain area. This housing regime covers among others institutional arrangements that relate to housing provision and the way politics addresses housing issues (Ruonavaara, 2020).

The housing regime and its views on the housing market highly influence the housing stock, and thus the availability of housing for different income groups. For example, a market-oriented housing regime mostly operates in the selling of social housing, its demolition, and replacement by owner-occupied housing and also the deregulation of the private rental sector. This deregulation might affect the access to affordable housing in a negative way (Musterd et al., 2017). Since the housing regime partly determines the available housing – what happens with the current housing, will housing be destroyed and will new houses be built? – one might argue that this housing regime is one of the key processes in influencing the distribution of housing and the availability of different types of housing. In this way, the housing regime might influence the developments in residential segregation.

#### **2.4. Existing housing and the differentiation in housing**

As mentioned earlier, the housing stock and the differentiation in housing in a certain area are essential factors in attracting, forcing, or constraining people with different income levels to move to another house. An uneven distribution of housing might lead to selective residential mobility. Selective residential mobility of different income groups can lead to changes in the levels of segregation. This is caused by the fact that, for example, groups with a higher income migrate to other neighbourhoods than groups with a lower income. This selective residential mobility is dependent on the unevenness of the geography of housing, the differentiation of housing and on how the urban neighbourhoods are planned in terms of their housing mix.

This can be illustrated by the following example regarding social housing. When social housing is spatially clustered and only available for low income groups, this supports residential segregation. However, this effect on residential segregation slows down, when this social housing also becomes available for the middle-income groups. This is because a larger group, in terms of income, is allowed to live in this type of housing. The residential segregation also slows down when the social housing is less clustered and better distributed across space and different neighbourhoods (Tammaru et al, 2020). What has happened in many European urban regions in the last years is a process called ‘residualization of social housing’. This means that market elements have been introduced to improve

the quality of social housing. This contraction of the social housing segment brings along the obligation to offer the access to social housing mainly to low-income households which results into a rising segregation level. The more the social housing is concentrated in specific parts or neighbourhoods of the city, the greater the change for increasing segregation because only a group with a relatively low income is allowed to live in this social housing (Hochstenbach, 2017). When working against income segregation, it would make sense to strive for social housing divided over different areas in cities.

## **2.5. Differences in the housing; new built housing and urban restructuring**

As discussed earlier, the differentiation and geography of housing influences the residential segregation in neighbourhoods (Tammaru, 2020). Subsequently, urban restructuring might lead to a change in the residential segregation. Key instruments in governing urban development and urban restructuring are housing policies. Housing policies can lead to a change in the differentiation and geography of housing (Hochstenbach, 2017). So, due to housing policies, a geographical area, such as a neighbourhood or a district, might be more diverse in terms of housing type. Housing policies might thus be able to support a more diverse population in a neighbourhood or district. The housing policies that strive for a more diverse population in living areas, can be seen as the so-called ‘social mixing policies’.

In the Dutch context, social mixing policies have been popular for decades. One of the reasons for this is that during the 1990s, the government saw that less households were able to move within their neighbourhood throughout their life because of the one-sided housing stock. Some neighbourhoods lacked the more expensive housing, which resulted in an outflow of the more affluent households. What remained were the less affluent households, and the composition of the neighbourhoods became more and more homogenous from a socioeconomic perspective. This has led to an increase of the social problems within these neighbourhoods.

To work against the homogenization of neighbourhoods, the government came up with different ideas that relate to urban restructuring. In 1997 for example, the Ministry of VROM introduced the *Nota Stedelijke Vernieuwing*. This consisted of urban restructuring plans and should serve as a solution for the neighbourhoods becoming more heterogeneous in cities (Beckhoven & Van Kempen, 2011). Examples of this include: urban regeneration measures that replace concentrations of social housing with more diverse housing stocks and social housing management and tenant allocation reform (Galster, 2010).

The idea of the ‘*Nota Stedelijke Vernieuwing*’ from the Ministry of VROM is not an exception. Recent reviews of policy documents indicate that the segregation of different population groups was and still is a central concern of governments across the EU. A wide range of programmatic mechanisms have been employed to counteract residential segregation between socio-economic groups and to prevent the formation of new clusters of homogenous neighbourhoods. On a more international scale, these programmes fall under the rubric of ‘social mix policies’ in Europe. Similar policies are present in the U.S., where they are called policies for ‘mixed income communities’ or ‘poverty de-concentration’ (Bolt et al., 2010).

## 2.6. Urban restructuring or ‘State-led’ Gentrification

The dominant way of urban restructuring and urban renewal in the Netherlands consists of upgrading of the housing stock in deprived areas with the goal to increase the share of middleclass households in these neighbourhoods (Van der Graaf & Veldboer, 2009). Since this overlaps with the idea of gentrification, which can be defined as: *“the process where a neighbourhood undergoes social upgrading so that the residents over time do have more resources in terms of education and income”* (Andersson and Turner, 2014, p.6), this type of urban restructuring and urban renewal that arises from housing policies, is often referred to as ‘State-led Gentrification’.

In the last 20 years, more and more young professionals prefer to live in central urban areas. This is accompanied by increasingly ‘suburbanized’ poverty, which means that low-income households increasingly live on the edges of cities because affordable housing becomes more difficult to access in inner cities. In England, concerns about the negative effects of gentrification for working class communities are obvious. Gentrifying areas that had previously been home to low-income, working-class residents became increasingly wealthier which is assumed to lead to low-income households being forced to leave their homes as a result of rising rental prices (Fransham, 2020).

Hochstenbach & Van Gent (2015) look into the gentrification in the Dutch cities Amsterdam and Rotterdam. They state that gentrification can happen in different ways and due to different processes. First, migration plays an essential role in shaping and defining the gentrification processes. When higher-income households increasingly move into an area, lower-income households can slowly be replaced or even displaced. This process of gentrification links the neighbourhood upgrading to multiple waves of in-movers. But, the migration might also go the other way due to the gentrification. It has often been found that lower-income residents migrate out an area as a result of displacement caused by the gentrification.

Next to migration, also ‘in situ’ upgrading processes can contribute to changes in socioeconomic composition. Upward social mobility of residents can allow gentrification to progress, even when in-migrating residents have a relatively low income. Teernstra (2014) shows that, in Dutch cities, in-movers into both upgrading and downgrading neighbourhoods acquire incomes below the neighbourhood average, but later experience comparatively steep income increases. This finding confirms the idea of households upgrading ‘within’ neighbourhoods instead of only the in- and out-migration of households from and to neighbourhoods that are upgraded. However, the previously named work shows that not all residents experience this upgrade in terms of an increasing income. Generally, mostly young highly educated people experience this substantial increase in their income after they move into a neighbourhood. This might be due to the fact that they seek an affordable place to start to live in the city. These relatively low-status neighbourhoods function as entry points to the city’s housing and labour markets. From here, their life in the city will start and it is likely that their income will increase in the coming years (Robson et al., 2008). It seems that this in situ change will therefore be mostly beneficial for the higher educated households.

## 2.7. Conceptual framework

The question is how housing, income distribution and segregation have developed and if they might relate to each other. When summarizing the previously discussed concepts and processes, three different blocks can be distinguished. These blocks are represented in this conceptual framework below. The first block is the housing. This housing, including the housing stock, the differentiation in housing, and the geography of housing, does affect the population composition. The second block is the population composition. this population composition includes a wide variety of characteristics of people living in a certain geographical area. In this research, the focus is on the income of these people. The composition of the groups will thus be determined in terms of their income. Whereas the housing affects the population composition, the population composition does also affect the housing: the two concepts do affect each other.

The last block, displayed below, is the residential segregation. This residential segregation is based on income. The first and second block, housing and population composition, together lead to a certain degree of residential segregation. As shown in the framework below, the focus in this research is on segregation based on income. This segregation is determined by measuring the dissimilarity index.

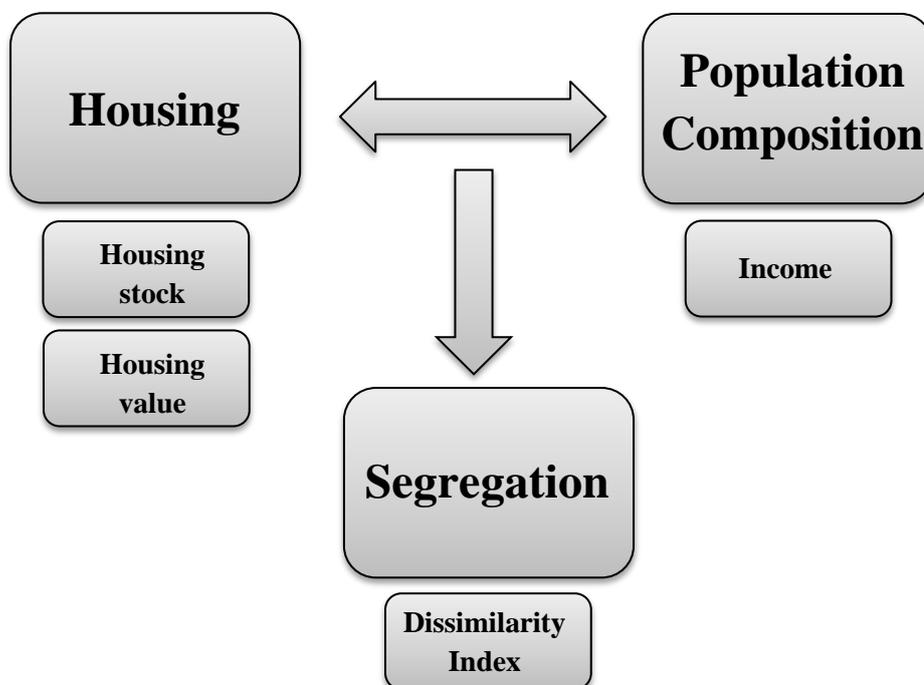


Figure 1: Conceptual Framework

## 2.8. Wrap up

In this chapter the concept of segregation has been discussed. It has become clear that this segregation is a complex process and is relating to, and can be affected by, many other processes. One way to affect this segregation is to change the type and the geography of housing. An example to do this is urban restructuring. Due to this urban restructuring the composition of the population might change, which might result in more or less segregation. In this research the focus will be on different types and locations of housing, population composition in terms of income and on segregation in the city of Groningen. Also, the relationship between those concepts will be examined. The next chapter will discuss the analyses and methods that will be used in this research.

## Chapter 3. Methodology

This chapter will explain the methodology that is used to answer the questions of this research. In addition, the variables and the background of the variables will be explained. In order to make sure the research can be replicated, the actions that are done to gain the final datasets for the analyses, will be discussed step by step.

### 3.1. The method

In this research a quantitative research method, using secondary administrative data, is used. Generally, secondary data can be used to provide a description of characteristics of a place, space or a group (Clifford et al., 2010). Since this research focuses on (groups of) households living in specific neighbourhoods and districts in Groningen, using secondary data serves as a suitable way to do the analysis. Besides, using a secondary dataset enables access to a huge amount of information about housing stock and households and their characteristics in Groningen. Another benefit of such a quantitative research method is that this method makes it possible to analyse the data over time. This makes it possible to investigate if trends over time do exist and to have a look at the effects in the short- and longer-run.

The data that is used, is provided by the municipality of Groningen. The datasets contain information about housing, household composition, and income in different districts in Groningen. More details about the datasets will be described further in this chapter.

Important to mention is that, in this research, both the definitions ‘district’ and ‘neighbourhood’ are used. Since the databases, the information and the spatial levels that are used are Dutch, it makes sense to name the Dutch spatial levels to which these English definitions address. In this report ‘district’ refers to the Dutch definitions ‘wijk’ whereas ‘neighbourhood’ refers to the Dutch definition ‘buurt’. In this grouping, the district is the larger area which, in most cases, consists of three to ten neighbourhoods. My dataset of Groningen consists of 14 districts and 105 neighbourhoods. The district layout used can be found in appendix 1.

The final goals of this research are as follows: 1) to gain insight in the housing stock and population composition in terms of income in the districts in Groningen over the years 2000-2018 and 2) to gain insight in the developments in residential segregation between and within districts in Groningen over the years 2000-2018 and 3) to what extent the developments in housing stock (also due to urban restructuring) and income distribution are linked to the developments in residential segregation.

To meet these goals, in short, the following steps have to be taken:

1. Exploring the development in housing stock in the Groningen in the years 2000-2019
2. Exploring the development in income distribution in Groningen in the years 2000-2019.
3. Exploring the development in segregation based on income in Groningen in the years 2000-2018. The segregation is determined by calculating the dissimilarity index.
4. Exploring if there are indications that developments in housing stock and income distribution relate to the developments in residential segregation to some extent.

### 3.2. Measuring segregation

There are many ways to measure residential segregation. The first studies regarding measuring segregation date back to the late 1940s till early 1950s, when several indices were proposed and discussed in the United States. The most popular and mostly used index is the dissimilarity index (D) by Duncan and Duncan (1955), which is sometimes also called the 'segregation index'. The dissimilarity index represents the proportion of the population from a specific social group that would have to relocate within the city to make the distribution over the city equal. Even though this index is still used a lot in research nowadays, the index still has its limitations. For example, the index is only able to measure the segregation between two groups (Feitosa et al. 2004). This means that, when one is looking at for example income, it is only possible to distinguish between 'high income', 'middle income', 'low income' and 'the rest'. Since this index is widely used, widely known and relatively easy to calculate and to interpret, this research will still make use of this index. The dissimilarity index has a value between 0 and 1.

The value displays how even or uneven the specific population group is distributed over the geographical area. Here, the value 0 implies even spreading of the specific group, whereas the value 1 implies complete segregation of the group. The exact interpretation of the outcome of the dissimilarity index is as follows: 'the value D shows the percentage of specific population group that has to move to another neighborhood or district in order to distribute the population group evenly over the city under the condition that the available housing is always sufficient' (Ponds et al., 2015).

Previous research has shown that the spatial scale on which segregation is measured, can have a huge influence on the degree of segregation that has been measured. The effect is that choices regarding the scale of measuring that are made by coincidence might indirectly play a big role in decision-making in the policy field (Ponds et al., 2015). Besides, the question can be raised on which spatial level has to be strived for social mixing to improve livability and social cohesion and which dimensions need to be taken into account. Is this for example on district, neighbourhood or on living block level? And should there be looked at income, household composition, ethnicity, age or at all dimensions together? (PBL, 2010). These questions stress the importance of considering the type of research that is done to achieve the available data and to consider which type of data one wants to use for measuring segregation. In essence, when measuring segregation, four choices have to be made:

1) The feature of the population (e.g. income, ethnicity, education), 2) the degree of segregation; which index to use?/ how to measure the segregation?, 3) the unit of measuring (the spatial scale; neighbourhood, part of the city, etc.) and 4) the unit the research want to say something about (city, region, etc.) (Ponds et al., 2015).

The questions above can be answered as follows: the feature of the population in this research is income segregation. This income segregation will be measured by using the dissimilarity index. Since there will be looked at residential segregation both between and within districts, there are two units of measuring and two units of research in this research. To explore the residential segregation between districts within the city, the units of measurement are districts and the unit of research is the city of Groningen. To explore the residential segregation within districts, the units of measurement are neighbourhoods and the units of research are districts.

### 3.3. The datasets

The variables that are used can be divided in two blocks: ‘housing’ and ‘income’. They consist information of five years in total; 2000, 2005, 2010, 2015 and 2019. The datasets that are used for the final analyses are unique datasets. This means that the datasets are composed specifically for this research by making use of other databases from the municipality of Groningen.

To gain information about housing and income, the data from these already existing databases is combined. By combining this data, suitable datasets for this research are formed. The first dataset consists of data regarding the housing stock and the households/population composition, and is on household-level. The housing stock is based on the addresses. In this dataset a building is seen as a house when it has its own address and there a people living in the building. The dataset contains information over five years and the variables used, originate from the WOZ (Waarde Onroerende Zaken)-database for housing, and the BRP (Basis Registratie Personen)-database for households/population composition.

The second dataset contains information about the income distribution in neighbourhoods in Groningen. It contains the distribution of the income of private households, excluding student households. All households are divided in groups of 20%, which means that there are five different groups which together sum up to the total amount of households. The income groups are based on the standardized income of The Netherlands in total. In total, the number of households has increased with almost 15000 households from the year 2000 to 2018. Table 1 below shows the distribution over the five 20% income groups over the years 2000-2018 of the whole city of Groningen. In the table, the groups are represented from low to high. The lowest income group is described as the ‘first’ income group and the highest income group is described as the ‘fifth’ income group.

|               | 2000         |              | 2005         |              | 2010         |              | 2015         |              | 2018         |              |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|               | Absolut      | %            |
| <b>First</b>  | 23218        | 29,6         | 21060        | 27,5         | 23610        | 28,9         | 27500        | 30,5         | 29000        | 31,1         |
| <b>Second</b> | 15934        | 20,3         | 16390        | 21,4         | 16800        | 20,5         | 18600        | 20,6         | 19700        | 21,1         |
| <b>Third</b>  | 15118        | 19,3         | 14960        | 19,5         | 15350        | 18,8         | 15900        | 17,6         | 16381        | 17,6         |
| <b>Fourth</b> | 13478        | 17,2         | 13240        | 17,3         | 13680        | 16,7         | 14700        | 16,3         | 14945        | 16,0         |
| <b>Fifth</b>  | 10753        | 13,7         | 11020        | 14,4         | 12390        | 15,1         | 13400        | 14,9         | 13274        | 14,2         |
| <b>Total</b>  | <b>78501</b> | <b>100,0</b> | <b>76670</b> | <b>100,0</b> | <b>81790</b> | <b>100,0</b> | <b>90100</b> | <b>100,0</b> | <b>93299</b> | <b>100,0</b> |

Table 1: Income distribution – The five income groups over the year 2000-2018 – The table goes from the lowest (first) to the highest (fifth) income group

### 3.4. Preparing the datasets before data analysis

First, the dataset that combines the housing stock and the population composition is structured for analysis. The aim is to compare average housing stock, the income and income segregation in districts. To make this possible, a clear overview of the values of useful variables in the districts in Groningen are made. To make the dataset workable, a selection on the years is made in Excel. This results in five datasets which all contain data of one of the previously mentioned years.

After making five separate datasets, the data is structured by collecting frequencies and averages per year per district. To do this, the datasets are imported into SPSS. By using ‘Analyzing’ methods for descriptive statistics such as ‘Crosstabs’, ‘Frequencies’ and ‘Averages’, the data is structured per district per year. The reason for structuring the data on district level is because this is a suitable level for measuring and comparing segregation. Another suitable level might be the lower spatial level

neighbourhood, but it is chosen to use the district level because of the huge dataset, the limited amount of time and the changes that have taken place in the neighbourhood and district layout in the city of Groningen.

The second dataset that has to be prepared, is the dataset for the income distribution of households of the five years. These distributions are derived from the data collected by Statistics Netherlands (CBS). The aim for the income data is to measure the segregation/dissimilarity index for several groups in districts with respect to the whole city of Groningen and the dissimilarity index for within these districts. The formula for the dissimilarity index is as follows:

$$\text{Segregation} = \frac{1}{2} \sum \text{Abs} \left[ \frac{A \text{ district}}{A \text{ city}} - \frac{O \text{ district}}{O \text{ city}} \right]$$

Figure 2: Dissimilarity Index

In the formula the following abbreviations stand for:

- A district = Number of people or households of a specific group in an area, in this case a district or neighbourhood
- A city = Number of people or households of a specific group in the whole region of comparison, in this case the city of Groningen or a district
- O district = Number of other people (not from the specific group) in an area, in this case a district or neighbourhood
- O city = Number of other people (not from the specific group) in the whole region of comparison, in this case the city of Groningen or district

Since the index works with groups and absolute numbers, it is important to collect data in absolute numbers to make sure the data can be used to calculate this index. Whereas CBS has calculated the 20% income groups in absolute numbers in 2000, 2005, 2010 and 2015, the income groups are calculated in percentages for the year 2018. In the case of the last year, the total amount of households in a neighbourhood or a district is used to calculate the absolute number.

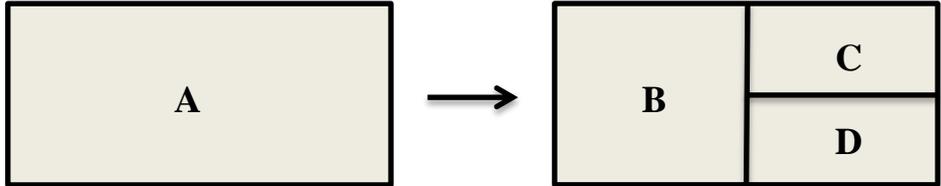
To explore the segregation between districts in the whole city and within these districts, the dissimilarity index is calculated for the city as a whole first. After this, the dissimilarity index is measured for all 14 districts. To calculate this index within the districts, there will be looked at the differences in income distribution between neighbourhoods within these districts.

**3.5. Differences in the neighbourhood and district layout**

One problem that appeared during collecting the data on income distribution on district level, is the fact that the layout of the neighbourhoods and districts has changed through the years. The layout of the neighbourhoods and districts of the municipality, and in this way also the city, of Groningen has changed in 2014 (OIS Groningen, 2020). This means that for the years 2000, 2005 and 2010 the income data is only available in the old neighbourhood layout. For this problem the municipality of Groningen has a table and a map available to see out of which old neighbourhoods the new neighbourhoods are made. And, out of which new neighbourhoods the new districts consist.

By using this conversion table, the new neighbourhoods and districts can be constructed, and the income data on the old neighbourhoods can be used to calculate the income data for the new neighbourhoods and districts. In five cases, an old neighbourhood has been split up in, for example, three new neighbourhoods. In that case the income data of the old neighbourhoods has been divided over the three new neighbourhoods.

The exact division of the data is determined by the geographical size of the new neighbourhoods as a percentage of the old neighbourhood. To illustrate this step, an example is given. Imagine the old neighbourhood 'A' which has been split up in the three new neighbourhoods 'B', 'C' and 'D'. Since the income data is available on the scale of the old neighbourhood 'A', it has to be split up to gain information on the income in the new neighbourhoods. In this case, neighbourhood B takes up around 50% and neighbourhood C and D take up around 25% of neighbourhood 'A', when looking at the geographical size. This means that neighbourhood 'B' will get a value of 50% of the income data from neighbourhood A and neighbourhoods 'C' and 'D' will get a value of 25%. The table shows an example of the final numbers.



| Neighborhood                              | A   | B   | C  | D  |
|---|-----|-----|----|----|
| Households low income (absolute numbers)  | 100 | 50  | 25 | 25 |
| Households high income (absolute numbers) | 200 | 100 | 50 | 50 |

Table 2: Example for the conversion of the neighbourhoods

Unfortunately, this way of dividing the income data has the disadvantage that it does not take into account that the income distribution in the old neighbourhood itself might also be unequal. When the income data is only based on the geographical size, it is not included when, for example, a relative high amount of rich people live in the left part of the old neighbourhood A. However, since it is not possible to collect exact information about which households fall under the new neighbourhoods, there is chosen to still use this method. Besides, there are some neighbourhoods which contain no data in the income distribution. This is because there are too few, less than 10, households living in these neighbourhoods. In this case, the information about the amount of households earning a specific income is not given because of privacy reasons. The neighbourhoods without any information on the income distribution are excluded from the dataset when measuring the dissimilarity index. These are 20 neighbourhoods in total. Examples of neighbourhoods without income data are 'the Zernike complex', 'Selwerderhof (cemetery)', 'Noorderplantsoen', 'UMCG (hospital)', 'De Kring' and some neighbourhoods in district 'Zuidoost' where a lot of industry is located. Because there are living only a few people in these neighbourhoods it is supposed that these few households will not have a large impact on the dissimilarity index. Therefore, the expectation is that this will not have a big impact on the reliability of this research.

**3.6 Analyses to measure the relationships between social housing and segregation**

As discussed in the previous chapter, the distribution of social housing might have an effect on the households living within an area. Because of this, the share of social housing might affect the segregation. In order to explore if there is relationship, a correlation test between the share of social housing in a neighbourhood compared to the average share in the district and the share of the lowest income group in a neighbourhood compared to the average share of this group in the district has been done.

## **Chapter 4. General overview of the study area: The city of Groningen**

This chapter gives a general overview of the city of Groningen. There also will be argued why this city is a suitable area for studying income segregation.

### **4.1. A general overview of the city**

To do a research on the city of Groningen, delving into general information about the city has to be done first. The city of Groningen has grown rapidly in the last years and is expected to continue to grow further in the coming years. Whereas the city had around 200.000 inhabitants in 2015, it is expected to grow up to 226.000 inhabitants in 2030. Groningen has, with its relatively large number of students, a very young population (Onderzoek, Informatie, Statistiek Groningen, 2018).

Another interesting fact in the development in the population composition, is that the number of households is growing faster than the population in total. In the previous ten years, the number of households grew with more than 15.000, of which 80% are single-person households. These developments in the composition of the population, and the change in types of households have implications for the spatial structure and the housing stock in the city. The growing population and number of households do not only pose a challenge for the housing stock, but also for the livability of the city, and the composition of the city in terms of how this population is distributed over the city (Onderzoek, Informatie, Statistiek Groningen, 2018).

### **4.2. Economy, Income and work**

In terms of the economy and employment opportunities, the situation in Groningen has improved fast in the last years. In 2017, the availability of jobs increased with 3,1% compared to the year 2016, which is clearly above the national average. Important sectors for the labour market are education, research, the government, health and youth care (Onderzoek, Informatie, Statistiek Groningen, 2018).

Despite the fact that Groningen is doing well in terms of its economy, the purchasing power of the residents of Groningen is still low in comparison to other cities in the Netherlands. The average gross income per person who receives an income in the municipality of Groningen is €25.000-30.000. This is relatively low compared to the average gross income per person of the Netherlands, which is €32.000 in 2017 (CBS in uw buurt, 2020; Statline, 2020). Other data from the CBS (2020) shows that the number of people in the lowest 20% group in terms of income in Groningen, has not decreased a lot in the last years. This gives the idea that the lower part of the society does not really benefit from the increasing economy in Groningen.

The low income of this particular group also means that almost 10% of the residents in Groningen are having a hard time getting by financially. This results in a relatively high number of people living in 'poverty'. Despite the increase in employment opportunities and the decreasing unemployment in Groningen, the number of people living in poverty and the number of social benefits has not decreased. The new jobs are mainly fulfilled by people who were unemployed for only a short time or by commuters (Onderzoek, Informatie, Statistiek, 2018).

### 4.3. Income inequality

Whereas the average income is relatively low in Groningen, the municipality scores quite high on the income inequality (RTV Noord, 2019). Table 3 shows the gini-coefficient of the municipality of Groningen and the Dutch average. This gini-coefficient includes all private households, including students. The gini-coefficient displays the income inequality in a region, country or another group. The index runs from 0 to 1, where 0 means complete equality and 1 means complete inequality. Whereas the average gini-coefficient for the standardized income in 2017 in The Netherlands is 0,29, this gini-coefficient is 0,37 in Groningen. This gini-coefficient is not only high compared to the Dutch average, but also compared to other municipalities nearby such as Ten Boer and Winsum, and the other large city in the North, Leeuwarden. In these municipalities the gini indexes in 2017 are respectively 0,23, 0,25 and 0,28. An explanation for this high income inequality might be that Groningen is home to many students and people with social benefits, but also to many more affluent people.

What strikes, is the fact that the average Dutch gini-coefficient stayed the same, but the gini-coefficient of Groningen increased; it increased from 0,30 – 0,35 in 2008 to 0,37 in 2027. The exact gini-coefficient of 2008 is not known because of data limitations. However, it is clear that the income inequality within Groningen increased while the income inequality stayed the same on average Dutch level (CBS, 2010; CBS, 2017).

|                                  | 2008      | 2017 |
|----------------------------------|-----------|------|
| <b>Groningen (municipality)</b>  | 0,30-0,35 | 0,37 |
| <b>The Netherlands (average)</b> | 0,29      | 0,29 |

Table 3 :Gini coefficients.

Source: CBS (2010) and CBS (2017)

### 4.4. Housing in Groningen

During the financial crisis that started in 2008, the construction of residences has declined in The Netherlands. Also in Groningen, not many new houses have been built during this time. Since 2012, the building of houses has started again. Despite this increase in building of housing, the pressure on the housing market is still increasing. One of the reasons for this, is the increasing number of the one-person households. The pressure on the housing markets stimulates the increase in the housing prices and the decline of the change to find a house for living. Whereas a house on average was on sale for 50 days in 2015, this decreased to 24 days in 2018. The housing prices were 20% higher in the end of 2017 than in the end of 2015 (Onderzoek, Informatie & Statistiek, 2018).

### 4.5. The geographical division of Groningen

To have a good impression of what is happening where in the city, it is important to know how a city is organized in terms of its spatial structure. The municipality of Groningen has different entities on different spatial scales. From large to smaller they are as follows (Dutch names): Stadsdelen, WIJ-wijken, wijken, Kompaswijken, en buurten (Onderzoek, Informatie & Statistiek Groningen, 2020). In figure 3, the ‘Stadsdelen’, ‘wijken’ and ‘buurten’ are shown. In English these are the ‘parts of the city’, ‘districts’ and ‘neighbourhoods’. There has to be said that this figure does also show the district ‘Haren’, which is the most Southern district. However, in this research this district is excluded because this district is only a part of Groningen from the year 2019. The exact division of the districts that is used for this research can be found in the appendix.



Figure 3 : Layout of the city of Groningen: Parts of the city, Districts and neighbourhoods. Source: OIS Groningen

#### **4.6. Housing policy in Groningen - Policy documents**

One can imagine that the increase in population and households and the increasing income inequality, pose a real challenge for the housing market in Groningen. Next to building new houses, the city is also investing in neighbourhood renewal and in restructuring neighbourhoods to make sure there is not only enough, but also suitable housing for the population.

Since the city is doing its best to build enough and suitable housing for its population, it is relevant to evaluate if the urban restructuring that has already been done has really paid off in terms of the composition and distribution of the population. Previous numbers, such as the gini-index show that the city of Groningen is quite unequal in terms of income. Also, previous literature suggests that this also has its effect on how this inequality is distributed over space. Since the municipality is trying to 'built against' this segregation, it is interesting to evaluate the results of this restructuring. Has it led to more diverse neighbourhoods and has it contributed to a less segregated Groningen?

General documents on the ideas of the municipality regarding to housing are analyzed to get an impression of the vision of the municipality on housing during the last two decades. The documents used are 'Structuurvisies' and 'Volkshuisvestingplannen' of the municipality of Groningen, which can be described as the backbones for the policies regarding housing. Besides, other documents zooming in on and evaluating urban restructuring in Groningen are consulted. Through the years, different views and goals on housing can be distinguished.

The first document, dating from 1996, is the document 'Stad van Straks' (Gemeente Groningen, 1996). One of the main goals and ideas is to build new housing on the edges of the city, also known as the so-called 'Vinex'-neighbourhoods. This was to make sure people would still want to live in the city. These newly built neighbourhoods were meant to ensure that the city offered different types of living environments for different types of households.

The next structuurvisie 'Thuis in de Stad 1998 – 2010' (Gemeente Groningen, 1998), was also aimed at keeping the city attractive for different types of households favoring a various different living environments. The big difference in the approach is that the focus was mainly on improving the already existing neighbourhoods instead of building new ones. People became more and more aware of what type of housing and living environment they wanted to live in. Many older housing, and neighbourhoods in general, did not fit the preferences of the current houseseekers anymore. When these preferences were not present in the city, households became more likely to move out of the city. To make sure the city itself offered attractive housing, the municipality decided that urban restructuring in older neighbourhoods could be a solution. In fact the idea was: many older, non-suitable houses needed to be demolished, and new, more market-oriented housing needed to be built. These actions resulted in more diverse housing and made the neighbourhoods more suitable and more attractive for different types of households. This idea is supported by Van der Wal (2004) who also states that some older neighbourhoods were lacking larger housing for sale, ground bound housing are attractive, larger apartments. The neighbourhoods which were lacking these types housing become less and less attractive. He states that the unattractiveness leads to a high percentage of underprivileged living in these neighbourhoods, which goes hand in hand with the segregation of different socioeconomic groups. In this way, making these neighbourhoods more attractive for the broader group of residents due to restructuring, might discourage the segregation of socioeconomic groups in the city.

In the third structuurvisie 'Stad op scherp (2008), the municipality indicates that they want to continue with the further diversification of housing in and around the city center. They do not go into this topic very broadly.

The most recent structuurvisie 'Kwaliteit van Wonen' (Gemeente Groningen, 2010) is focusing mostly on a good quality of the housing in Groningen. It states that it is not only the quality of the housing that matters, but that also the quality of and amenities in the neighbourhood, such as parking,

recreation and stores, are important. The aim is to focus on newly built, high quality housing, but also on the renovation of currently available pre- and postwar housing. The idea is to invest in sustainable housing which is aimed at the flow of different types of households in one house.

| Year | Document/Structuurvisie   | Author/ Written by:  | Main goals/ Key points   |
|------|---|--|--|
| 1996 | De Stad van Straks – Stadsvisie   | Municipality of Groningen  | Building new housing on the edges of the city (Vinex-neighbourhoods)   |
| 1998 | Thuis in de Stad – Volkshuisvestingsplan gemeente Groningen 1998 – 2010 | Municipality of Groningen  | Keeping the city attractive for different types of households. Improving existing neighbourhoods due to restructuring.                     |
| 2004 | Nieuw Cement – Een tussenstand van de wijkvernieuwing in Groningen      | Van der Wal. This book is made in cooperation with the housing corporations LN, Nijestee, De Huismeesters, Patrimonium, Woonstade Hoogkerk-Noorddijk and the Municipality of Groningen | Evaluate urban restructuring. Urban restructuring is needed to keep neighbourhoods attractive and suitable, and to discourage segregation. |
| 2008 | Groningen, Stad op Scherp – Structuurvisie 2008 – 2020                  | Municipality of Groningen  | Further investment in the diversification of housing and living environments in Groningen.   |
| 2010 | Kwaliteit van Wonen – Structuurvisie 2010 – 2020                        | Municipality of Groningen  | Investment in good quality housing; Built new suitable and sustainable housing and renovate existing housing.                              |

Table 4: Summary of Policy documents and its key goals

Table 4 shows the most important goals and points of the documents that are discussed. When summarizing the information about Groningen and their policies regarding housing, there can be said that the city in general seems to improve its economic position at first. However, it becomes clear that this improved economic position is not for everyone. There seems to be a growing income inequality and there are also indications that this inequality also expresses itself spatially.

After reading different policy documents, there can be concluded that the municipality is committed to provide suitable and enough housing for all its citizens for decades. This also includes the stimulation of diverse living environments and counteracting segregation through urban restructuring and the building of new housing.

The features of the city and the policy regarding housing and segregation from the municipality of Groningen make the city an interesting and relevant area for studying the relationship between urban restructuring and residential segregation based on income.

## Chapter 5: Results

### 5.1. Housing

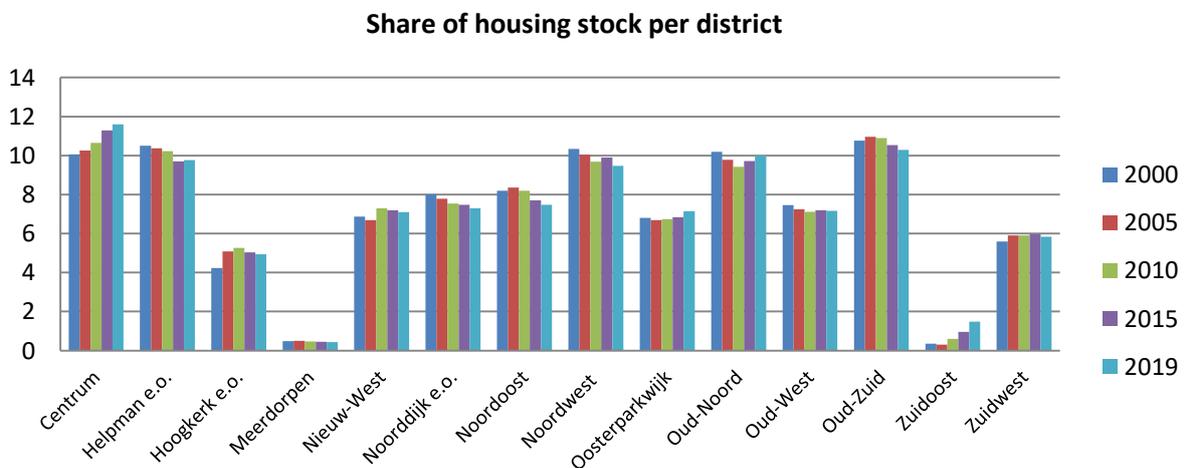
#### 5.1.1. Housing Stock

To get a clear general overview of the housing in the city, there has been looked at the development of the total housing stock first. Table 5 shows the development of the total number of housing in Groningen per housing type. The total housing stock has increased with around 18,7% between the years 2000-2019. The housing types with the largest increase are semidetached housing, detached housing and studios. The first studios are only visible from the year 2015. The start of building of studios might be explained by the increase in single-person households which is discussed in the previous chapter (Onderzoek, Informatie, Statistiek, 2018). The semidetached and detached housing might be the housing that is built on the edges of the city in order to keep the city also attractive for families which is mentioned in the structure visions of the municipality discussed in chapter four.

Graph 1 shows the total amount of housing per district as a percentage of the total housing stock in Groningen. This shows how the housing stock is distributed over the city. The first thing that stands out, is that the housing is not evenly distributed over the city of Groningen. Districts like 'Centrum', 'Helpman e.o.', 'Noordwest', 'Oud-Noord' and 'Oud-Zuid' do all contain a lot of housing with approximately 10% of the housing in Groningen. Other districts, such as 'Zuidoost' and 'Meerddorpen', contain only a small amount of the total housing in Groningen. This might be explained by the fact that these are relatively new districts.

|   | 2000         | 2005         | 2010         | 2015         | 2019         | Growth between 2000-2019 |
|---|--------------|--------------|--------------|--------------|--------------|--------------------------|
| <b>Apartment</b>  | 27079        | 27189        | 28246        | 30897        | 33765        | 24,7%                    |
| <b>Up- or downstairs residence</b>                            | 19439        | 19600        | 19411        | 19928        | 20239        | 4,1%                     |
| <b>Terraced house</b>   | 23088        | 23898        | 25703        | 26611        | 27435        | 18,8%                    |
| <b>Semidetached house</b>                                     | 3094         | 3713         | 4357         | 4495         | 4555         | 47,2%                    |
| <b>Detached house</b>   | 2424         | 2696         | 3043         | 3054         | 3117         | 28,6%                    |
| <b>Special residential object</b>                             | 116          | 143          | 157          | 165          | 158          | 36,2%                    |
| <b>Other residences</b>                                       | 510          | 568          | 548          | 610          | 572          | 12,2%                    |
| <b>Other residences without official residential function</b> | 718          | 794          | 709          | 619          | 476          | -33,7%                   |
| <b>Studio</b>   | 0            | 0            | 0            | 342          | 431          | 431%                     |
| <b>Total</b>  | <b>76469</b> | <b>78601</b> | <b>82174</b> | <b>86721</b> | <b>90784</b> | <b>18,7%</b>             |

Table 5: Total development in housing in Groningen per housing type

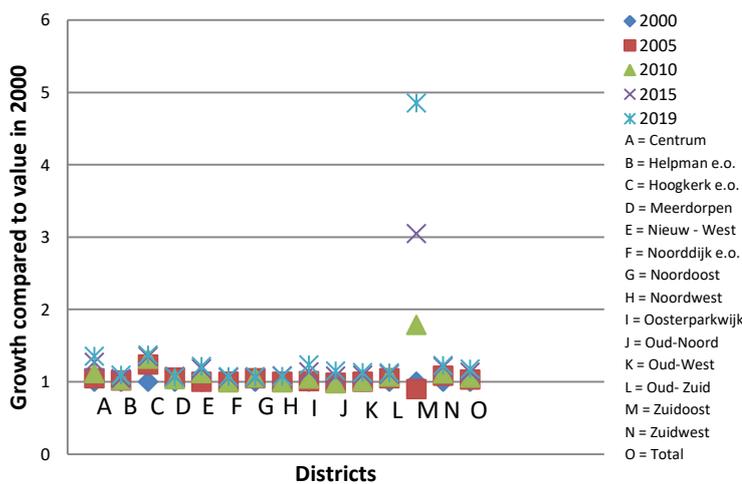


Graph 1: Percentage of total housing per district

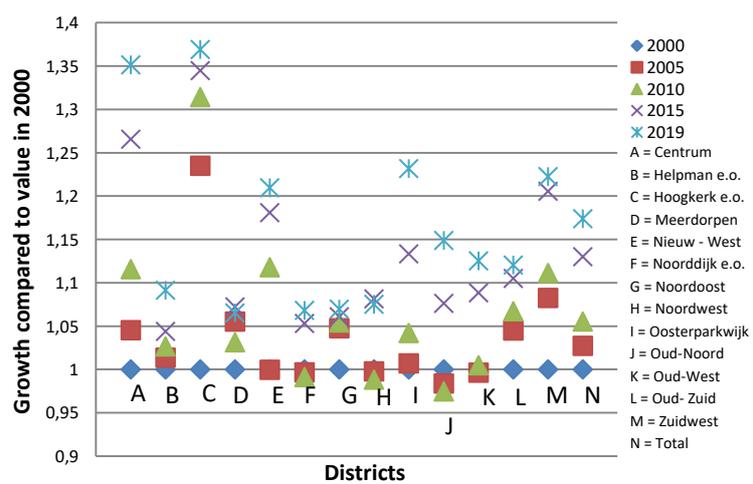
To get a better insight in the development of the housing, the Growth Index is calculated. This makes it possible to see how fast the housing stock has increased in the districts. Graphs 2 and 3, which are shown below, show the Growth Index of the housing stock in all districts. In this case, the value of the year 2000 is seen as the starting point and counts as 100%. The values of the years 2005, 2010, 2015 and 2019 show how much the housing stock in grown in the districts with respect to the number of housing in 2000. Overall, the total number of housing in Groningen has increased. This is shown by the total Growth index ‘N’ which is around 1,18. This indicates that the amount of housing stock in Groningen has increased by around 18,7% between the years 2000 – 2019. This increase is also supported by the numbers in table 5.

Graph 2 shows all the districts, and graph 3 shows all the districts except the outlier (Zuidoost). The reason for the high Growth Index in ‘Zuidoost’ is that the housing stock has increased rapidly over the last 20 years. Almost completely new neighbourhoods have been built in this district, such as ‘De Linie’ (between 2000-2010), ‘Kop van Oost’ (between 2000-2020) and ‘Europapark’ (between 2010-2020) (Allecijfers, 2021a,b,c). In the year 2000, there were only 308 houses, whereas in 2019 there were 1494. The same goes for district C, ‘Hoogkerk e.o’. This can be explained by the completely new neighbourhood ‘Gravenburg’ that has been built within this district. The buildings in this neighbourhoods are mainly built between 2000-2010 (Allecijfers, 2021d). Other districts where the housing stock has increased relatively fast are: ‘Centrum’, , ‘Nieuw-West’, ‘Oosterparkwijk’ and ‘Zuidwest’. These districts do all have a growth index above 1,2 in total over the years.

**Growth Index housing stock all districts**



**Growth Index housing stock without outlier**



Graph 2 and 3: Growth index housing stock

In some districts, such as ‘Oud-Noord’ and ‘Noord-West’, the housing stock has decreased in the years 2005 and 2010, but increases from the year 2015. This might indicate that first, old housing has been demolished and later, new housing has been built, which corresponds with the ideas and plans from the municipality of Groningen for these districts.

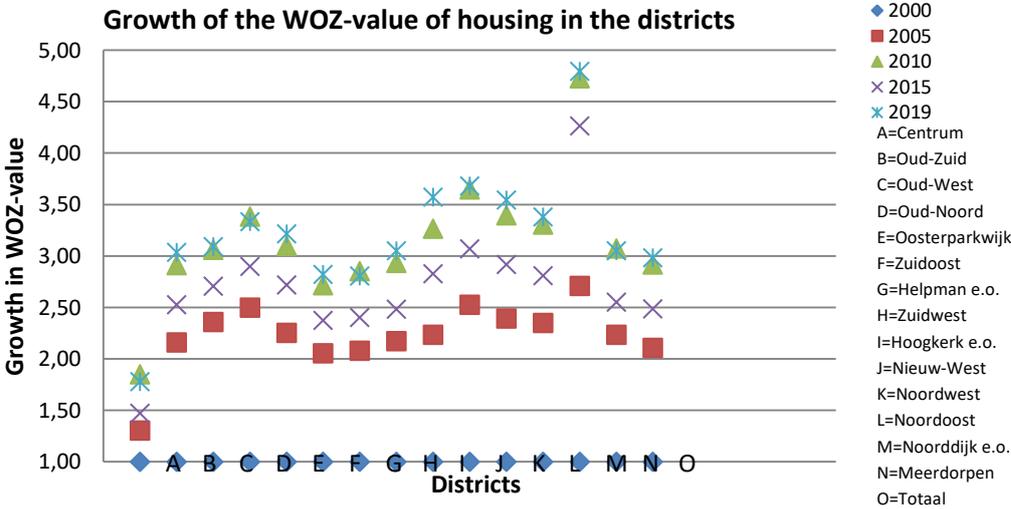
In the district ‘Oud-Noord’, already since the 80’s, redevelopment of housing found place. In 1998, a new redevelopment discussion started again, because of high feelings of unsafety in the district. This resulted in the policy note ‘De Stad vernieuwt’, which focused mainly on the renovation of currently existing housing in the ‘Oost-Indische buurt’ and replacement of new housing in the ‘West-Indische buurt’. In these neighbourhoods, huge interventions have been done. In total, around 400 buildings have been demolished and these buildings are replaced by around 300 new houses (Van der Wal, 2004).

Also in the district ‘Noord-West’, older housing has been demolished and new housing has been built. This happened in particular in the neighbourhood ‘Paddepoel’. The three main goals of the restructuring were as follows: 1) increasing the diversity of environments, 2) improving the housing and living conditions, and 3) improving the social and physical livability. First, around 300 housing flats were demolished (Bestemmingsplan Paddepoel, Selwerd, Tuinwijk, 2009).

These examples of demolishing housing and building new housing do match with the earlier discussed literature of urban restructuring, which states that urban restructuring could serve as a way to make neighbourhoods more diverse and to create more heterogeneous living environments (Beckhoven & Van Kempen, 2011). Also in the case of these neighbourhoods in Groningen, one of the important reasons for the urban restructuring is to create more diverse neighbourhoods and living environment.

**5.1.2. Housing value: The WOZ-value**

To get an idea of the value of the housing in Groningen during the years, the average WOZ-values of the housing per district are measured. Graph 4 again shows a growth index. This time it shows the growth in WOZ-value. The value of the year 2000 is taken as a starting point here. The other icons in the graph below show how much the WOZ-value has grown compared to the value of the year 2000.



Graph 4: Growth index WOZ-value

It becomes clear that the WOZ-values have increased a lot in the last two decades. This is not only for the city of Groningen, but the WOZ-value in the whole country has increased in the last two decades. Numbers from the CBS (2020) show that the average WOZ-value in the Netherlands has increased from 80.000 euros in 2000 to 248.000 euros in 2019. This is an increase from no less than 310%. What is striking is that the WOZ-value drops in all districts between the year 2010 and 2015. An explanation for this might be the financial crisis that started in 2008. This financial crisis has also led to a crisis on the housing market, and a decrease in the WOZ-values (Bhageloe-Datadin, 2008). The numbers of the average Dutch WOZ-value show a similar development in which a decline of the WOZ-value from 242.000-206.000 euros between the years 2011-2015 can be seen (CBS, 2020). After the decrease in the WOZ-value, the value in

| Districts      | 2000  | 2005  | 2010  | 2015  | 2019  |
|----------------|-------|-------|-------|-------|-------|
| Centrum        | 0,438 | 0,012 | 0,016 | 0,012 | 0,029 |
| Helpman e.o.   | 0,028 | 0,019 | 0,017 | 0,021 | 0,015 |
| Hoogkerk e.o.  | 0,010 | 0,007 | 0,007 | 0,007 | 0,008 |
| Meerddorpen    | 0,020 | 0,020 | 0,022 | 0,021 | 0,020 |
| Nieuw-West     | 0,044 | 0,045 | 0,035 | 0,032 | 0,022 |
| Noorddijk e.o. | 0,005 | 0,006 | 0,005 | 0,006 | 0,005 |
| Noordoost      | 0,027 | 0,015 | 0,007 | 0,005 | 0,005 |
| Noordwest      | 0,025 | 0,035 | 0,023 | 0,009 | 0,012 |
| Oosterparkwijk | 0,006 | 0,006 | 0,005 | 0,005 | 0,005 |
| Oud-Noord      | 0,006 | 0,007 | 0,006 | 0,004 | 0,004 |
| Oud-West       | 0,008 | 0,007 | 0,008 | 0,007 | 0,007 |
| Oud-Zuid       | 0,021 | 0,013 | 0,011 | 0,010 | 0,007 |
| Zuidoost       | 0,096 | 0,084 | 0,033 | 0,026 | 0,031 |
| Zuidwest       | 0,051 | 0,024 | 0,032 | 0,030 | 0,024 |

Table 6: Variance in the WOZ-value

Groningen has increased again from the year 2015-2019. The increase in the WOZ-value is relatively high. This large increase corresponds with other recent findings which state that the housing prices in the Netherlands are rising the fastest in the province and the city of Groningen (Business Insider, 2020).

Table 6 shows the coefficients of variance of the WOZ-values in the districts. This coefficient shows the level of dispersion of values within the districts. A high coefficient of variation indicates that there is a high level of dispersion. The colours of the table do also show if this coefficient has stayed the same (grey), increased (green) or decreased (red) with relation to the previous year. Most years, the coefficient decreases. This means that the dispersion of the WOZ-values within the districts have mostly decreased. For some districts, there is a year in which the dispersion has increased. However, when comparing the coefficients from the year 2000 to 2019, they have all decreased. This means that from the year 2000-2019 the dispersion of the WOZ-value within all districts has decreased. The decrease in this dispersion might be due to more diversification in housing. Another explanation might be the increase in housing values in general. This might raise the prices of the housing with lower WOZ-value, which results in a smaller difference between the WOZ-values in the end.

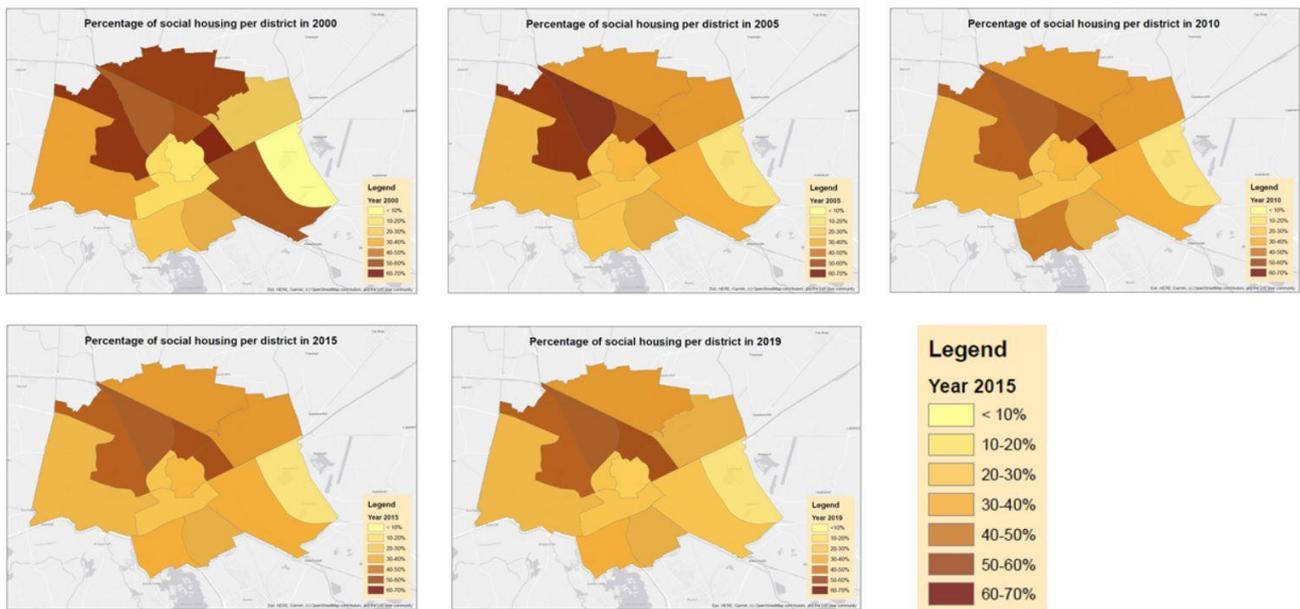
### **5.1.3 Social housing**

An interesting thing to look at when gaining insight in the distribution of housing in the city, is the total number of, and distribution of social housing. According to Tammaru et al. (2020), residential segregation might decline when social housing is more evenly spread across different parts of the city. This is because in particular low-income households are allowed to live in this social housing. By distributing the social housing more evenly across a city, also the lower income households are more evenly spread across the city.

Table 7 shows the share of social housing as a percentage of the total housing in a district. This share of social housing in different districts is also displayed on map 1. This gives a good impression of how the social housing is distributed across districts. What stands out, is that the distribution of social housing over the different districts has become more evenly distributed over the districts. Most districts containing relatively low shares of social housing in the year 2000, contain more social housing in the 2019. The opposite appears to happen in districts which contain a relatively high share of social housing in 2000; here the percentage of social housing is lower in 2019.

Map 1 also shows that the percentages of social housing within the districts are moving towards each other. This is also shown by the percentages in table 7 in which can be seen that the differences in percentages in 2019 are a lot smaller than in 2000.

One of the aims of the municipality of Groningen regarding social housing in housing plan ‘Thuis in de Stad – 1998-2010’ and the Structure Vision ‘Kwaliteit van Wonen 2010-2020’ is to carefully distribute the social housing over districts in order to create well-balanced and diverse districts. According to the information in map 1 and table 7 this plan indeed has been fulfilled.



Map 1: Social housing

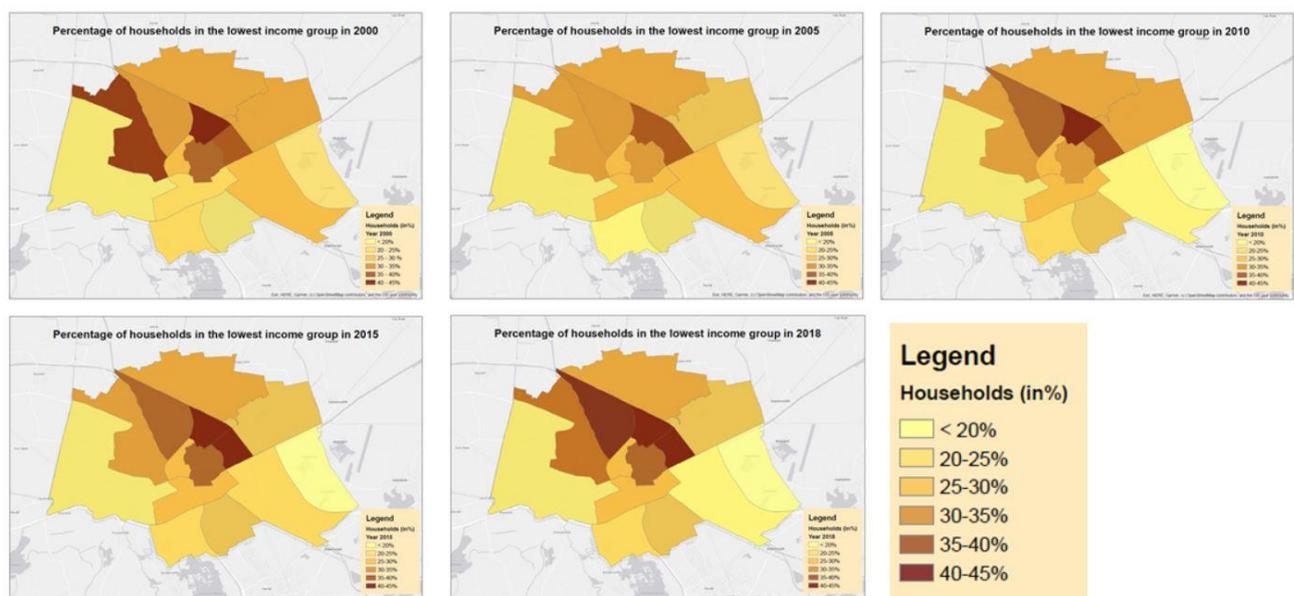
| District       | 2000         | 2005         | 2010         | 2015         | 2019         |
|----------------|--------------|--------------|--------------|--------------|--------------|
| Centrum        | 17,72        | 34,24        | 31,51        | 31,76        | 28,29        |
| Helpman e.o.   | 25,42        | 25,92        | 24,87        | 22,91        | 22,18        |
| Hoogkerk e.o.  | 31,65        | 26,37        | 24,97        | 24,29        | 22,72        |
| Meerdorpen     | 0,00         | 17,56        | 16,43        | 16,25        | 13,79        |
| Nieuw-West     | 42,71        | 56,42        | 47,75        | 46,12        | 44,31        |
| Noorddijk e.o. | 18,45        | 33,57        | 31,16        | 30,62        | 29,40        |
| Noordoost      | 46,48        | 37,75        | 35,47        | 35,10        | 34,49        |
| Noordwest      | 49,56        | 67,16        | 59,89        | 58,71        | 55,24        |
| Oosterparkwijk | 67,47        | 63,56        | 60,60        | 57,46        | 53,60        |
| Oud-Noord      | 58,70        | 55,68        | 54,45        | 53,26        | 50,39        |
| Oud-West       | 15,89        | 28,35        | 26,57        | 24,37        | 22,63        |
| Oud-Zuid       | 18,69        | 29,09        | 29,39        | 26,61        | 24,09        |
| Zuidoost       | 41,18        | 39,02        | 33,56        | 35,71        | 26,92        |
| Zuidwest       | 21,86        | 25,47        | 40,89        | 39,75        | 38,52        |
| <b>Total</b>   | <b>34,54</b> | <b>40,46</b> | <b>38,74</b> | <b>37,57</b> | <b>35,43</b> |

Table 7: Share in social housing per district

## 5.2. Income

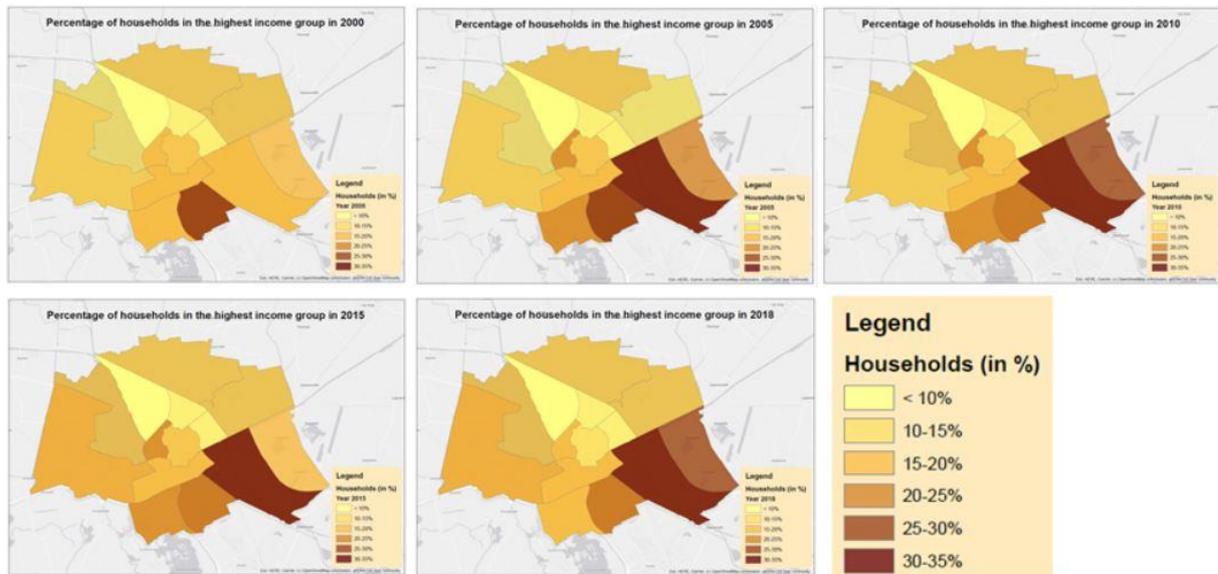
### 5.2.1. Income distribution between districts

The focus in this research is on segregation based on income. To give a short impression of how different income groups are distributed over the city, the income distribution is shown. In this case, the focus is on the groups earning the lowest income and the highest income. In total, the number of households living in the lowest income group is higher than the number of households living in the highest income group. This can also be seen in table 1 in the previous chapter, which shows the number of households in all income groups. A more detailed table including information of the distribution of the income groups over all districts can be found in the appendix. Since the lowest and highest income groups are most likely to be segregated, the focus from now on is on these two groups. Map 2 and 3 show how the lowest and highest income groups are distributed over the districts of the city of Groningen between the years 2000-2018. The different colours show different percentages of social housing within the districts. When looking at the maps displaying the lowest income, there seems to be a de-concentration of this income group over the years 2000-2018. For example, in the district 'Nieuw-West', the income group decreases. However, the income increases in districts nearby, such as 'Oud-Noord', 'Oosterparkwijk' and 'Noordwest'. The concentration of the lowest income group thus still seems to be in the Northern-middle part of the city.



Map 2: Distribution lowest income group

Map 3 shows the development in distribution of the highest income group over the districts. The highest income group seems to live mostly in the Southern part of the city. Also the edges of the city, such as ‘Hoogkerk’ seem to be home to many households in this income group. When looking at the development between years, there are not that many big differences. The two most striking development is the rapid increase of the group in the districts ‘Zuidoost’ and ‘Meerdorpen’. This can be explained by the fact that a lot of new housing has been built in these districts, such as ‘Die Linie’. The price of this new housing is relatively high when looking at the WOZ-values. This might lead to an influx of high income households. It is worth to mention that the district ‘Meerdorpen’ still does not has that many inhabitants when looking at absolute numbers.



Maps 3: Distribution highest income group

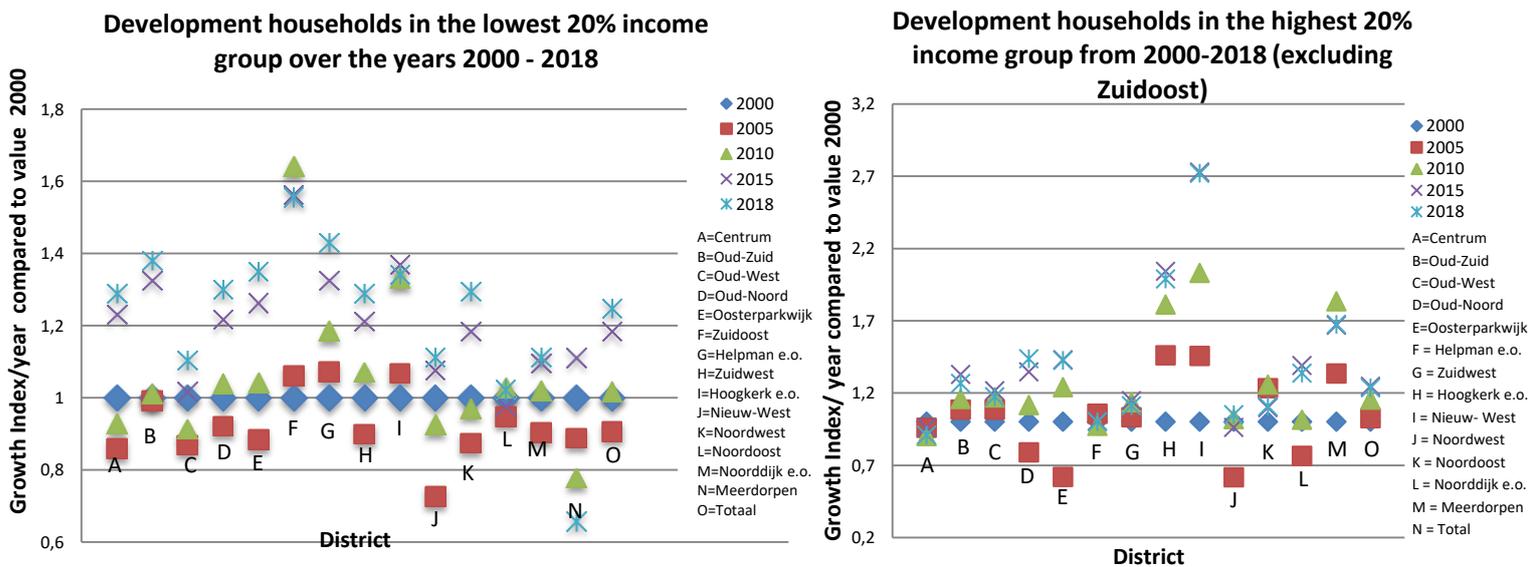
When comparing the distribution of the low- and high income groups, there is one thing that is especially striking: the lowest income group is mainly living in the Northern districts and the highest income group is mainly living in the Southern district. There might even be said that there seems to be a division between the Northern and Southern part of the city. The finding that mainly in the Northern part of the city corresponds with earlier findings from OIS Groningen (2020). When focusing on four Northern districts (Nieuw-West, Noordwest, Noordoost and Oud-Noord) and four Southern districts (Oud-Zuid, Zuidwest, Zuidoost and Helpman), it becomes clear that in 2019, no less than 40 percent of the households in the lowest income group lives in one of these four Northern districts and 42 percent of the households in the highest income group lives in one of these four Southern districts.

The Northern part of the city lags behind when comparing it to the rest of the city in many aspects, such as poverty, health, education, livability and safety. The problems are known by both the local and national government. This has led to the ‘Regio Deal Groningen Noord’, which goal is to improve the Northern part of the city in many ways, and to work towards a more inclusive and less divided city (Rijksoverheid, 2020). The division between the Northern and Southern part is also not unknown by the inhabitants of Groningen themselves. In a newspaper, a Groninger entrepreneur does also speak about the differences of the inhabitants of ‘Groningen-Noord’ and ‘Groningen-Zuid’ (Borst, 2017).

### 5.2.2. Development income distribution within districts

To gain more insight in how the distribution of the income groups has developed within the districts, the growth index of the income groups is calculated. This makes it possible to look further into the development of the income groups during the years. This index looks at absolute numbers, so not at percentages. Every icon represents a different year. Graph 5 shows the development of the households with the lowest income and graph 6 the development of the households with the highest income. The graphs show that, in absolute numbers, in almost all districts both groups increased. However, it becomes clear that the growth of the highest 20% group is more unequal between the districts.

There are three districts in which the group has grown very hard, whereas the increase in the other districts is way lower. Again, this might indicate that some districts tend to attract higher income households. This is a process that occurs in many cities. Here, households from the highest income group voluntarily split themselves from the rest of the society. They tend to concentrate in parts of the city where many middle and high income households live (Musterd et al., 2017; Kawachi, 2002). In the case of the city of Groningen these areas seem to be in particular in the Southern part of the city. This is also supported by the high growth indexes in the districts ‘Zuidwest’, ‘Noorddijk e.o.’ and ‘Zuidoost’. The district ‘Hoogkerk e.o.’ is an exception; it does attract many high income households, but it is not completely located in the Southern part.



Graph 5 and 6: Growth indexes of the development of the lowest and highest income group

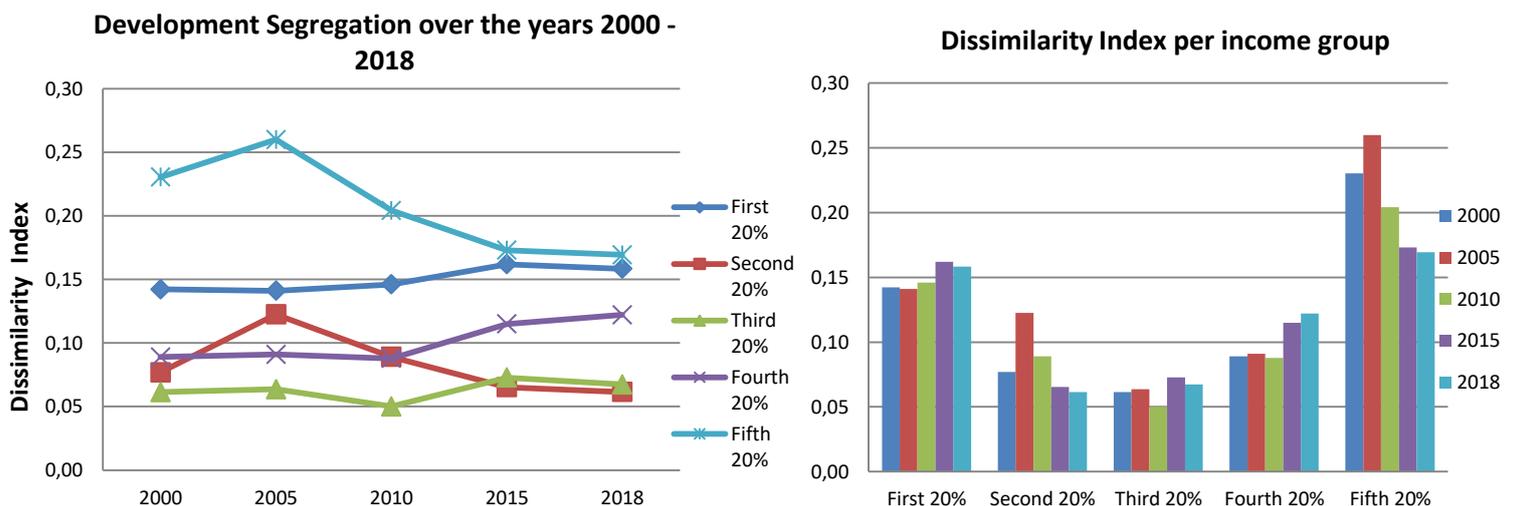
### 5.3. Segregation

#### 5.3.1. Segregation between districts

In order to investigate the development in segregation in the city, the dissimilarity index is calculated. This index shows how many percent of a particular income group has to move to another district to make sure this income group is evenly spread across the districts in the city. Graph 7 and 8 show the results of calculating the dissimilarity index when looking at how segregated the city is between districts.

The graphs below show that the two groups at the ends of the spectrum are the most segregated. In other words, the lowest and the highest income groups are segregated the most. This might be explained by the assumption that residential choice is affected by income. In this way, different income groups are likely to sort into different areas in the city. The model of Tiebout (1956) suggests that households base their residential location on choices over a collection of public goods, such as school quality, neighbours and the quality of the neighbourhood in general. This leads to a sorting to certain areas by a willingness to pay for these public goods. Following this model, the high-income households will be more likely to outbid low-income households for the higher-quality neighbourhoods, and they will be less likely to live in close proximity. In other words, the high-income households are more willing to pay, and more able to pay, for the neighbourhoods they want to live in. This makes that they sort into certain districts. For the low-income households this is the other way around. They might sort into certain districts because of the restrictions in willingness and being able to pay for their residential location (Watson, 2009).

When comparing the five income groups in terms of development over the years, there is not a clear trend in the segregation between the districts in Groningen. The second and fifth income group increase from 2000 to 2005, but slowly drop from 2005. On the other hand, the first and fourth group stay quite stable until 2010 and increase slowly from 2010. This shows that a clear line or trend in this segregation is missing.



Graph 7 and 8: The dissimilarity index of segregation between districts in the city of Groningen

### 5.3.2. Segregation within districts

In the previous paragraph, the segregation between districts has been addressed. Since there is not a clear trend visible in the development of the segregation, there is zoomed in on the lower geographical scale. Therefore, there focus in on segregation within districts instead of the segregation between districts. This is done by comparing the income distribution of neighbourhoods (in Dutch: buurten) within districts. The table below shows the dissimilarity indexes of all districts of the lowest and highest income group over the years 2000-2018. The values can be interpreted as follows: ‘the index shows the percentage of a specific income group that has to move to another neighbourhood within the district, in order to evenly distribute this income group over the whole district’. Therefore, a high dissimilarity index indicates that a specific income group is highly concentrated and segregated within a district. The colours give information about the development of the indexes relative to the previous year.

Table 8 shows that there are many differences in the dissimilarity indexes during the years. What is also interesting is that in many districts the segregation decreases until 2010, but in almost all districts the segregation increases between the years 2010 – 2015. After this increase, in most cases the index starts to decrease again from 2015 – 2018. Interesting is that the opposite seems to happen for the WOZ-value. As mentioned earlier, the decrease in the WOZ-values can partly be explained by the financial crisis in 2008. It could be that this financial crisis also had an impact on the segregation. Next to a decrease in the WOZ-value, the financial crisis has also led to a decrease in the building of housing and a decrease in the relocations of households (PBL, 2011). The decline in movements could have contributed to the fact that the lowest and highest income groups stayed where they were already living. In addition, the decline in building housing may have also resulted in less being able to build for a diverse environment at that time.

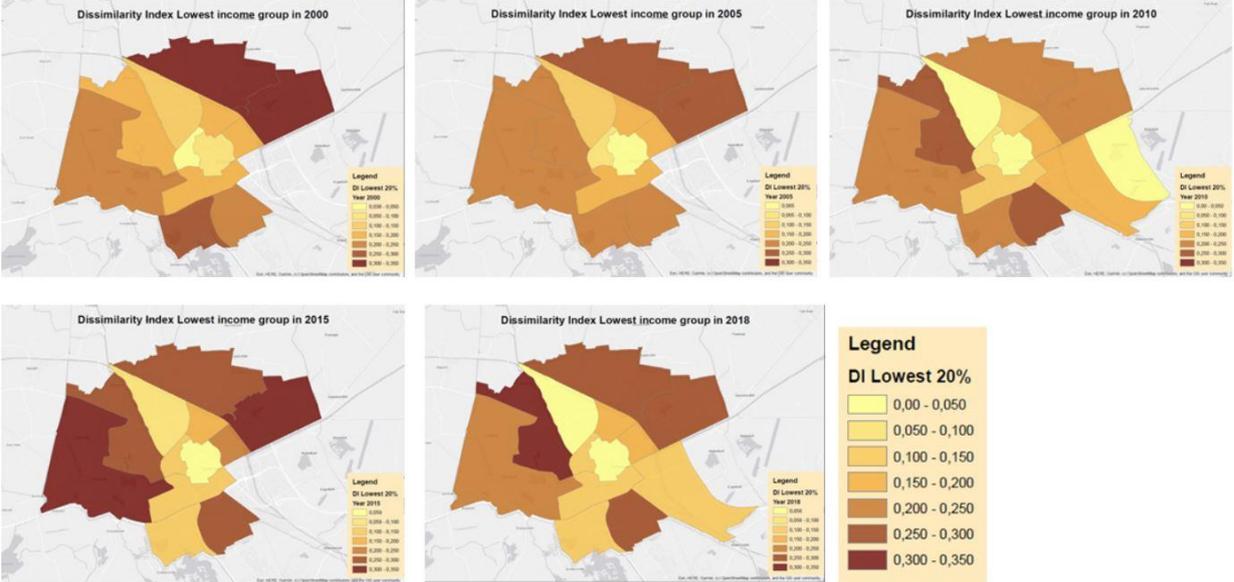
| Wijken         | Lowest income group |       |       |       |       | Highest income group |       |       |       |       |
|----------------|---------------------|-------|-------|-------|-------|----------------------|-------|-------|-------|-------|
|                | 2000                | 2005  | 2010  | 2015  | 2018  | 2000                 | 2005  | 2010  | 2015  | 2018  |
| Centrum        | 0,090               | 0,065 | 0,011 | 0,059 | 0,054 | 0,127                | 0,070 | 0,048 | 0,074 | 0,063 |
| Helpman e.o.   | 0,210               | 0,219 | 0,251 | 0,294 | 0,273 | 0,342                | 0,265 | 0,317 | 0,336 | 0,291 |
| Hoogkerk e.o.  | 0,237               | 0,240 | 0,222 | 0,333 | 0,249 | 0,250                | 0,515 | 0,321 | 0,420 | 0,433 |
| Meerdorpen     | 0,029               |       |       |       |       | 0,144                |       |       |       |       |
| Nieuw-West     | 0,151               | 0,213 | 0,261 | 0,270 | 0,328 | 0,346                | 0,470 | 0,432 | 0,567 | 0,501 |
| Noorddijk e.o. | 0,318               | 0,256 | 0,246 | 0,343 | 0,271 | 0,238                | 0,199 | 0,271 | 0,306 | 0,320 |
| Noordoost      | 0,332               | 0,256 | 0,237 | 0,265 | 0,256 | 0,326                | 0,350 | 0,364 | 0,260 | 0,369 |
| Noordwest      | 0,104               | 0,101 | 0,050 | 0,073 | 0,058 | 0,248                | 0,151 | 0,076 | 0,247 | 0,131 |
| Oosterparkwijk | 0,167               | 0,184 | 0,171 | 0,209 | 0,189 | 0,392                | 0,618 | 0,310 | 0,231 | 0,211 |
| Oud-Noord      | 0,164               | 0,154 | 0,137 | 0,168 | 0,158 | 0,213                | 0,156 | 0,231 | 0,247 | 0,249 |
| Oud-West       | 0,038               | 0,085 | 0,082 | 0,102 | 0,134 | 0,168                | 0,155 | 0,131 | 0,227 | 0,256 |
| Oud-Zuid       | 0,192               | 0,184 | 0,139 | 0,107 | 0,101 | 0,214                | 0,179 | 0,150 | 0,130 | 0,147 |
| Zuidoost       | 0,161               |       |       | 0,102 |       | 0,114                |       |       | 0,068 |       |
| Zuidwest       | 0,281               | 0,244 | 0,228 | 0,149 | 0,141 | 0,432                | 0,426 | 0,376 | 0,183 | 0,192 |

|  |   |
|--|---|
|  | Start value 2000                                      |
|  | Unclear or not enough data                            |
|  | Decrease in segregation relative to the previous year |
|  | Increase in segregation relative to the previous year |

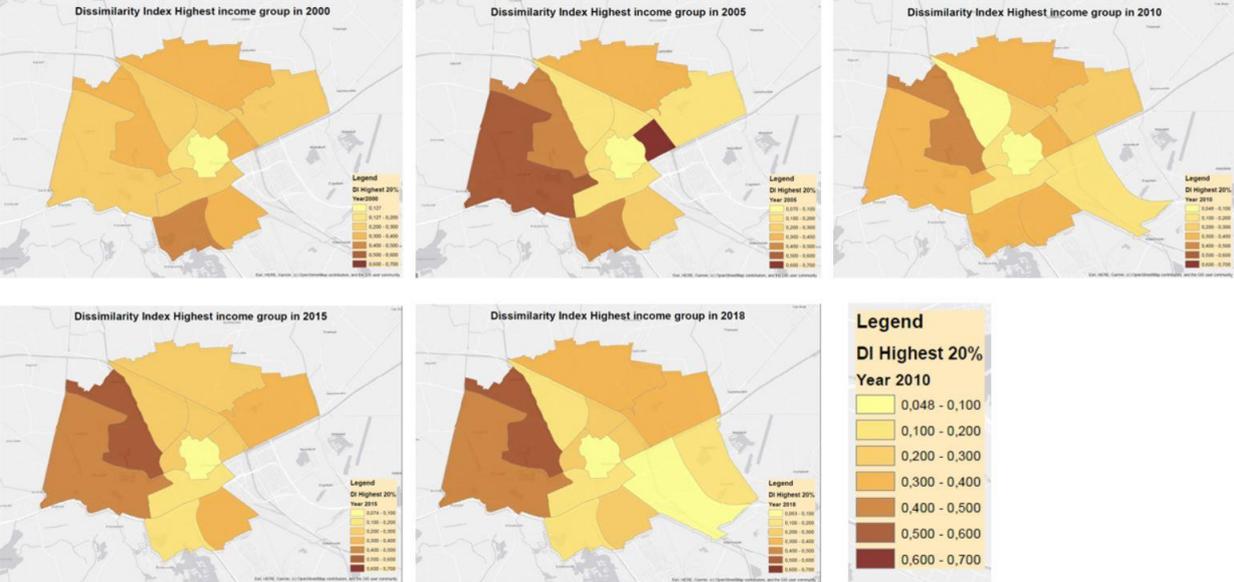
Table 8: The dissimilarity indexes of the segregation within all districts

Next to the graph, maps 4 and 5 show the development in the dissimilarity indexes of the lowest and highest income group, within the districts from the years 2000-2018. The first collection of maps show the lowest income group and the second collection of maps show the highest income group. When comparing the dissimilarity indexes of the lowest and the highest income groups, it becomes clear that, in general, the values of the dissimilarity indexes of the highest income group are higher than the dissimilarity index of the lowest income group. This means that the highest income group seems to be more segregated within districts than the lowest income group. This finding corresponds with the previous findings about the segregation between districts in the whole city.

Earlier research on national scale also shows that the highest income seems to be the most segregated and concentrated in The Netherlands. This is true for both the higher and lower spatial scale. The income group seems to be more concentrated in certain regions, certain cities, certain districts and even certain neighbourhoods. These dissimilarity indexes do also show this outcome. The highest income group seems to concentrate the most in certain districts within a city, but also to certain neighbourhoods within a district. Examples of these neighbourhoods could be areas containing a lot of villas or new built housing (Leidelmeijer et al., 2015).



Map 4: The dissimilarity Indexes of the lowest income group from the years 2000, 2005, 2010, 2015, 2018



Map 5: The dissimilarity Indexes of the highest income group from the years 2000, 2005, 2010, 2015, 2018

### 5.3.3. Segregation within districts in relation to social housing and income distribution

In the previous paragraph, the segregation of the lowest and highest income groups has been discussed. An interesting question here, is how these changes in the dissimilarity index relate to changes in the share of social housing in these districts.

As discussed in previous chapters, the share of housing might affect the segregation within districts (Tammaru et al., 2020). To explore the relationship between the share in social housing and the dissimilarity index of the lowest income group, a Pearson correlation test is done.

The relationship between the share of social housing and the dissimilarity index is complex. The effect of an increase or decrease in social housing depends on the share of social housing in the beginning. Whereas an increase in social housing in a district with a low share of social housing at the starting point might lead to a lower dissimilarity index, it might be reasonable to expect that this increase in the share of social housing might lead to a higher dissimilarity index in districts where the share of social housing was already high at the beginning. It is good to keep the complexity of this relationship in mind, when deciding which variables will be used for the correlation test.

Because of the complexity of the relationship between the share in social housing and the dissimilarity index, not just the shares of the social housing and the lowest income group are used. For this, only a part of the equation for calculating the dissimilarity index is used. To calculate the dissimilarity index, the share of a specific income group in a neighbourhood in relation to the share of this income group over the whole district is calculated first. This is calculated as follows:

*((Number of households income group in neighbourhood/Number of households income group in district) – (Number of other households in neighbourhood/Number of other households in district)).*

The part of the equation that is used, is marked green in the figure below.

$$\text{Segregation} = \frac{1}{2} \sum \text{Abs} \left[ \frac{\text{A district}}{\text{A city}} - \frac{\text{O district}}{\text{O city}} \right]$$

If this value in the green part is high, the share of the income group in the neighbourhood deviates a lot from the share of the whole district. If the value is low, the share of the income group in the neighbourhood is close to the share in the whole district. This calculation is also done with the values of the social housing.

When the share of social housing in a neighbourhood is high compared to the whole district, the share of the lowest income group in a neighbourhood compared to the rest of the district is also expected to be high. This is because in most cases the social housing is home to households within the lowest income group. To test if there is a relationship between the share of social housing in a neighbourhood compared to the whole district and the share of the lowest income group in a neighbourhood compared to the whole district, a Pearson correlation test is done. From now on there will be referred to the shares as ‘Index of the low-income group’ and ‘Index of social housing’.

The hypothesis is that there is a linear relationship between the share of social housing in a neighbourhood compared to the whole district and the share of the lowest income group in a neighbourhood compared to the whole district.

| <b>Variables</b>                         | <b>Index low-income group* &amp; Index social housing** 2000</b> | <b>Index low-income group &amp; Index* social housing** 2019</b> |
|--|--|--|
| <b>p-value</b>                           | 0,003  | 0,000  |
| <b>Significant correlation (yes/no)?</b> | Yes  | Yes  |
| <b>Pearson correlation value</b>         | 0,417  | 0,831  |
| <b>Type of relationship</b>              | Weak positive correlation  | High positive correlation  |

Table 9: Correlation between the share of social housing in a neighbourhood compared to the whole district and the share of the lowest income group in a neighbourhood compared to the whole district.

\*= ((Number of households lowest income group neighbourhood/Number of households lowest income group district) – (Number of other households in neighbourhood/Number of other households in district))

\*\*=((Number of social housing in neighbourhood/number of social housing district) – ( Number of other housing neighbourhood/number of other housing district))

Table 9 shows the outcomes of the correlation between the Index of the low-income group and the Index of social housing for the years 2000 and 2019. The table shows that there is a significant positive relationship between the two indexes for both years. For the year 2000, there is a weak positive relationship and for the year 2019 a strong positive relationship is found. This means that, when the share of social housing in a neighbourhood deviates a lot from the average share of social housing in the district, the share of the lowest income group in a neighbourhood is also likely to deviate a lot from the average share of the lowest income group in the district. The positive correlation that is found, means that the share of the lowest income group in a neighbourhood compared to the share of the lowest income group in the district, is likely to be high when the share of social housing in a neighbourhood compared to the share of social housing in the districts is also high.

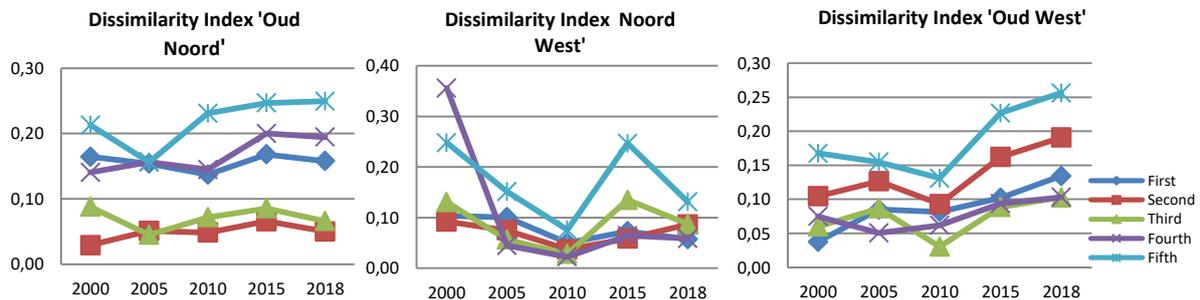
The previous correlation shows that there is a relationship between the Index of the low-income group and the Index of social housing. However, this correlation is not able to look at the development between different years. Because of the positive correlation, there might be expected that a relatively high increase in neighbourhoods with a small share of social housing in the beginning, might lead to a lower dissimilarity index of the lowest income group through the years.

When comparing the share of social housing and the dissimilarity index of the lowest income of the year 2000 and 2019, this can be confirmed for a few districts. In the districts ‘Centrum’, ‘Noorddijk e.o.’, ‘Oud-Zuid’ and ‘Zuidwest’ the share of social housing increased from respectively 18-28%, 18-29%, 19-24% and 22-38%. The dissimilarity indexes of the lowest income group here, decreased with respectively 40%, 15%, 47% and 50%. In these districts, the relatively large increase in the share of housing seems to result in a decrease of the segregation of the lowest income group. The table including the data on these topics can be found in appendix 5.

Apart from the relationship between the share in social housing and the dissimilarity index, there is also another relationship which is interesting to explore, namely how the share of the income groups relate to the segregation of these income groups within the districts. When comparing the share of the two income groups with the dissimilarity index of the income groups on maps 2, 3, 4 and 5, there can be seen that the groups are the most segregated in the districts where the share of this group is low to average. This is true for both the lowest and highest income group. This means that, apparently, in these districts the households live most concentrated. It suggests that in districts where a specific income group is obviously not overrepresented, the group seems to be likely to live close to each other within this district. This finding emphasizes the importance of looking at different geographical scales when doing research on distribution and segregation of groups which has been stressed earlier by Ponds et al. (2015). Probably, in these districts the share of the lowest or highest income group in a specific neighbourhood within the district is quite high, whereas the share of this income group when looking at districts in comparison to the rest of the city is low to average. In this way, the segregation might occur within the district instead of between districts.

#### 5.4. Zooming in on districts – Segregation in relation to urban restructuring

Graphs 9, 10 and 11 show the dissimilarity index of the five 20% income groups between neighbourhoods within three districts. For the two districts, ‘Oud-Noord’ and ‘Noord West’, clear urban restructuring plans have been made. These plans aim, among other things, to make the living environments in the districts more diverse in terms of its population (Gemeente Groningen, 1998). The third district, ‘Oud West’ lacks these specific urban restructuring plans. Due to the fact that there is no clear focus on making the living environment in this district more diverse, and the fact that there is a relative small growth in housing stock compared to the rest of the city of Groningen (see paragraph 5.1.1. Housing), there might be said that this district has undergone less differences in the housing stock over the last two decades. The graphs below make it possible to explore if there is a difference in development of the segregation between the districts where urban restructuring has taken place, and the district where this has not clearly has taken place.



Graph 9, 10 and 11: Dissimilarity indexes within districts

The segregation in the district ‘Oud Noord’ has not really decreased. The slopes in the graph show that for some groups the segregation has decreased a little and for other groups the segregation has increased a little. However, the changes are very small and in particular in the last ten years there have not been large differences. The second graph shows that the segregation in the district ‘Noord West’ has definitely decreased until 2010, started to grow until 2015, but decreases again after 2015. When looking at the third graph, there can be seen that the segregation started growing from 2010, and is still growing further.

So, in the districts where clear urban restructuring plans have been carried out, in one district there are no large differences in the segregation and in the other districts the segregation has decreased in the last five years. In the district without clear urban restructuring plans, the segregation has increased. It might be, that in the first two districts the urban restructuring plans have contributed to no further increase of the segregation. However, the developments in the segregation are not convincing and it is not possible to make clear statements about this based on only three districts and without any clear comparisons to other districts and developments.

## Chapter 6. Conclusion & Discussion

The aim of this research is to explore the developments in segregation in the city of Groningen, and to explore to what extent these relate to changes in housing and income distribution. To achieve this, the central question of this research is: **‘How has segregation evolved between and within districts in Groningen from the year 2000?’**. To answer this question, developments in housing and population composition in terms of income are explored first. Besides, relevant documents regarding urban restructuring in the city of Groningen are consulted. This chapter will discuss the conclusions of the sub-questions first. In the end, the main conclusion of this research will be discussed.

The number of housing in Groningen has increased a lot from the year 2000. However, the housing stock in Groningen is not evenly distributed across the districts. Whereas some districts contain a relative high amount of housing, other districts contain only a small share of the total housing in the city. This inequality is also the case for the development in housing stock in the districts over the years. All districts show a growth in housing stock, but the growth of this housing stock differs a lot per district. This is mostly due to the building of complete new neighbourhoods in some districts. Despite the fact that all districts show a growth in housing from 2000-2019, there are some districts where the housing has made a small drop before the growth of housing started. This is probably due to urban restructuring plans which contain ideas to demolish old housing and built new housing in order to create more diverse and higher-quality living environments. When it comes to the value of housing, a large increase is seen when comparing to value of 2019 with the value of 2000.

One of the sectors in housing in which has been large developments, is the social housing sector. In the last decades, social housing has become more evenly distributed over the districts in Groningen. In districts containing a relatively small share of social housing in the beginning, the share in social housing has increased. The reverse is true for districts containing a large share of social housing at the start. In structure visions and housing plans the municipality discusses that they strive for a more equal distribution of social housing. This might be a way to promote a less divided city and more diverse living environments. There might be concluded that the ambition to distribute social housing more evenly over the city has been met.

The changes of the distribution of the income groups however, are smaller. A distinction between five income groups has been made. However, the focus has been on the lowest and highest income group. The income distribution shows that the lowest income group mainly lives in the Northern part of the city. In 2000, the concentration of this income group is especially high in the districts ‘Nieuw-West’ and ‘Oud-Noord’. During the years, the concentration in the district ‘Nieuw-West’ seems to decline slowly. However, the share of this income group becomes higher in the districts nearby. Because of this, the share of this income group remains in predominantly high in the Northern part of the city.

With the fact that the lowest income group mainly lives in the Northern part of the city in mind, the concentration of the highest income group is interesting. This income group seems to live mainly in the Southern part of the city. The development of the distribution of this income group over the years does not show any big indications of a shift to the other parts of the city. In fact, the share of the high income group grows relatively fast in the Southern districts. Mainly in the South-Eastern part of the city this is increasing fast. Altogether, there might be concluded that there is a distinction between the Northern and Southern part of the city. The Northern part is home to a large share of low income households and the Southern part is home to a large share in high income households.

The main thing to look at is the segregation. When it comes to the segregation between districts in the city of Groningen, there can be concluded that this segregation is the highest for the lowest and the highest income groups. Whereas the segregation of the highest income has decreased since 2005, the segregation of the lowest income group has slightly increased since 2005. Taking all income groups into account, a clear trend of the segregation between the districts in the city of Groningen is missing.

The segregation of income groups between neighbourhoods within the 14 districts, is also the highest for the lowest and highest income group. Therefore, also within districts these two groups seem to live the most concentrated and separated from other groups. Again, the highest income group shows higher numbers of segregation than the lowest income group.

For both the lowest and highest income group, the segregation within districts is likely to be high in districts where the share of the income group is low to average. This indicates that, even when an income groups seems to be represented moderately at first glance, this group can be highly concentrated on a lower geographical level within this district. This emphasizes the importance to explore different geographical levels when looking at segregation.

From the urban restructuring plans it becomes clear that the city strives for creating more diverse living environments. Nevertheless, the results do not show any big differences between the segregation in districts with and without urban restructuring plans.

When looking at the share of social housing and the lowest income group of the neighbourhood compared to the average share of the district, a significant positive relationship is found. This indicates that an increasing share of social housing a neighbourhood compared to the social housing in the district can lead to an increasing share of the lowest income group in that neighbourhood compared to the share in the district. A few examples do also show that a higher share of social housing might lead to a lower dissimilarity index for the lowest income group when the share of social housing was low at the beginning. Therefore, developments in the share of social housing in a neighbourhood might actually contribute to developments in segregation of the lowest income group. It might be useful to think about the numbers and shares of social housing when one wants to decrease segregation of the lowest income group.

## **Discussion**

This research has shown the developments in housing, income and segregation within and between districts in the city of Groningen. Notwithstanding the fact that the research has given a useful overview of the developments in the city, some critical notes can be made about it.

First, the geographical level of measuring. The district level is chosen as the geographical scale of measurement. However, during the research it became clear that a lower level of measurement might have been even more valuable. Since the segregation occurs on different levels, a similar research focusing on neighbourhoods would be very interesting as a further research.

Besides, this research has an explorative approach. This results in that some developments can be linked each other, but it is not possible to make any clear conclusions about all the exact relationships between developments in housing, income and segregation. For further research it would be interesting to focus on ways to measure if significant relationships can be found between the development in housing, development in income and development in segregation over different years.

Lastly, it is worth to discuss a few things about the data that is used. Because of the changes in neighbourhood layout during the years, the districts are constructed by making use of a conversion table. In some cases, old neighbourhoods are split up in more new neighbourhoods. In this case, the income numbers of old neighbourhoods are divided to obtain the numbers of new neighbourhoods. Due to this, the numbers are not based on the real geographical borders. For some other neighbourhoods, the income data is not available at all. The income data is lacking here, because there are too few households living in this district. Because of the small number of households, the data is not publically available due to privacy reasons. Since the number of households living in those neighbourhoods is very low, it is not expected that this will have large implications for the dissimilarity indexes. In spite of that, the research would have been more accurate if the data was available for all neighborhoods on the level of new neighbourhood and district layout. Something else regarding the layout of the districts is the fact that 'Haren' has been excluded from this research. The

expectation is that including 'Haren' might have led to a small increase in the segregation of the highest income group when looking at the segregation between districts over the city as a whole, because the expectation is that in 'Haren' a relatively high amount of households falls under the highest income group. If this expectation is true, the idea that the lowest income group mainly lives in the Northern part of the city and the highest income group mainly lives in the Southern part of the city would be strengthened by this.

Besides, the way of measurement of the income distribution differs over the years. The way of rounding differs per year and, whereas for some years the income distribution is measured in percentages, for other years it is measured in absolute numbers. Altogether, the data is adjusted and used carefully, but these characteristics of the data might have affected the outcome of the income distribution and segregation a bit and had an effect on the quality of the research as a whole.

### **Implications and recommendations**

All in all, the research has shown that a division between the lowest and the highest income group still exists. These lowest and highest income group do also seem to be the most segregated income groups, both between and within districts in the city of Groningen. However, the developments over time do not show any clear and disturbing developments.

According to the results of this research, the recommendation for future policy in city of Groningen would be to focus mainly on the highest and lowest income group in order to decrease segregation. In doing so, it is important that it is realized that the segregation occurs on different geographical levels. Besides, it might be valuable to look into the distinction between the Northern part and Southern part of the city can be decreased. For example, how to make the Northern part of the city more attractive for the highest income group? And how to make the Southern part of the city more attractive and accessible for the lowest income group? Hereby it would also be useful to explore to what extent the residents of Groningen are aware of this distinction. And, if they are, to what extent they notice this distinction in daily life and to what extent they see this as a problem.

The last recommendation would be to carry out such a research for similar cities. As far as known, not a lot of research has been done on the segregation of income groups between districts in other cities in the Northern part of the Netherlands. It might be interesting to do similar research for other Northern cities in order to compare the values of segregation.

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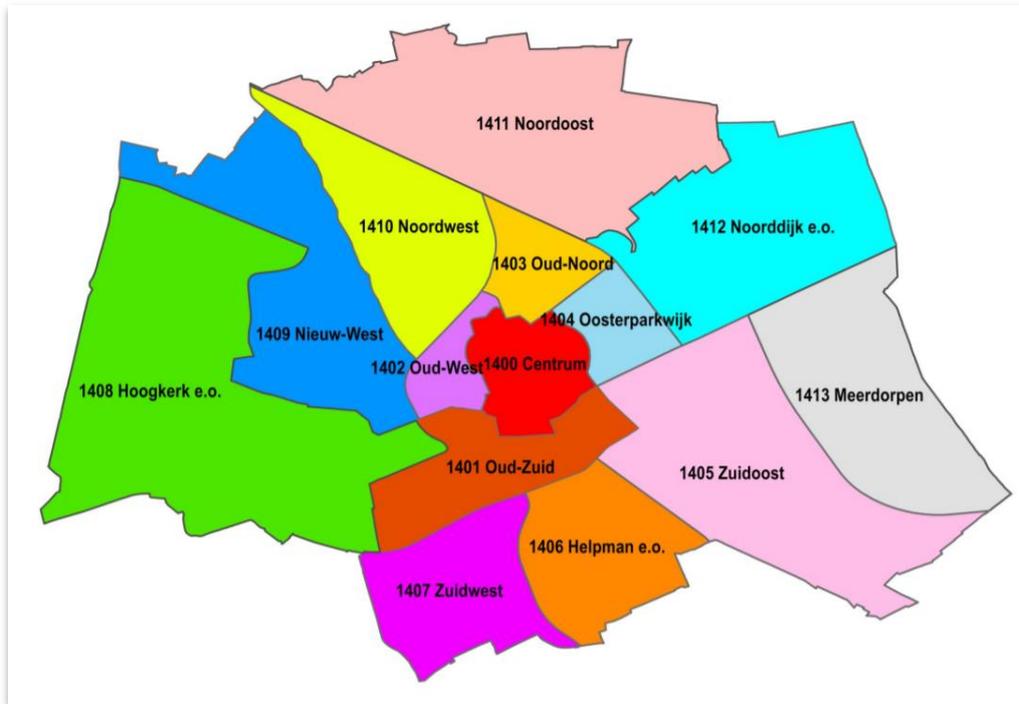
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# Appendices

## 1. The district layout



## 2. Income distribution lowest and highest income groups for all districts

| Districts      | Lowest income group |       |       |       |       | Highest income group |       |       |       |       |
|----------------|---------------------|-------|-------|-------|-------|----------------------|-------|-------|-------|-------|
|                | 2000                | 2005  | 2010  | 2015  | 2018  | 2000                 | 2005  | 2010  | 2015  | 2018  |
| Centrum        | 0,356               | 0,337 | 0,349 | 0,370 | 0,363 | 0,188                | 0,199 | 0,179 | 0,152 | 0,135 |
| Oud-Zuid       | 0,248               | 0,264 | 0,256 | 0,277 | 0,282 | 0,153                | 0,177 | 0,181 | 0,170 | 0,159 |
| Oud-West       | 0,299               | 0,277 | 0,284 | 0,286 | 0,296 | 0,181                | 0,209 | 0,220 | 0,206 | 0,190 |
| Oud-Noord      | 0,413               | 0,399 | 0,433 | 0,435 | 0,434 | 0,071                | 0,058 | 0,080 | 0,082 | 0,082 |
| Oosterparkwijk | 0,376               | 0,358 | 0,381 | 0,410 | 0,411 | 0,080                | 0,053 | 0,096 | 0,098 | 0,092 |
| Zuidoost       | 0,262               | 0,262 | 0,199 | 0,222 | 0,181 | 0,180                | 0,338 | 0,313 | 0,333 | 0,344 |
| Helpman e.o.   | 0,176               | 0,184 | 0,204 | 0,217 | 0,225 | 0,255                | 0,262 | 0,243 | 0,239 | 0,228 |
| Zuidwest       | 0,202               | 0,182 | 0,207 | 0,222 | 0,232 | 0,196                | 0,202 | 0,213 | 0,204 | 0,194 |
| Hoogkerk e.o.  | 0,198               | 0,171 | 0,195 | 0,200 | 0,200 | 0,106                | 0,126 | 0,143 | 0,160 | 0,159 |
| Nieuw-West     | 0,377               | 0,271 | 0,271 | 0,290 | 0,300 | 0,067                | 0,096 | 0,106 | 0,130 | 0,130 |
| Noordwest      | 0,331               | 0,334 | 0,350 | 0,400 | 0,416 | 0,064                | 0,045 | 0,071 | 0,063 | 0,065 |
| Noordoost      | 0,296               | 0,264 | 0,278 | 0,288 | 0,293 | 0,113                | 0,131 | 0,130 | 0,123 | 0,121 |
| Noorddijk e.o. | 0,262               | 0,237 | 0,253 | 0,230 | 0,233 | 0,122                | 0,093 | 0,117 | 0,135 | 0,130 |
| Meerdorpen     | 0,231               | 0,229 | 0,167 | 0,200 | 0,149 | 0,154                | 0,229 | 0,262 | 0,200 | 0,253 |

### 3. Numbers of households lowest and highest income group per district in 2019

| Distriet                                 | Lowest income group | Highest income group |
|--|---------------------|----------------------|
| Centrum                                  | 3557                | 1323                 |
| Oud-Zuid                                 | 2707                | 1526                 |
| Oud-West (Schilderswijk, Oranjewijk)     | 1954                | 1254                 |
| Oud-Noord (Korreweg- de Hoogte)          | 3949                | 746                  |
| Oosterparkwijk                           | 2672                | 598                  |
| Zuidoost                                 | 199                 | 378                  |
| Helpman e.o.                             | 2160                | 2189                 |
| Zuidwest (Hoornse wijken)                | 1276                | 1067                 |
| Hoogkerk e.o.                            | 980                 | 779                  |
| Nieuw-West (Vinkhuizen-de Held-Reitdiep) | 2070                | 897                  |
| Noordwest (SPT)                          | 3494                | 546                  |
| Noordoost (Beijum e.o.)                  | 2198                | 908                  |
| Noorddijk e.o.                           | 1724                | 962                  |
| Meerdorpen                               | 59                  | 100                  |
| <b>Totaal</b>                            | <b>29000</b>        | <b>13274</b>         |

### 4. Correlations between Index social housing and Index lowest income group

#### Year 2000

|          |                     | IndexSH | IndexDIL |
|----------|---------------------|---------|----------|
| IndexSH  | Pearson Correlation | 1       | ,417**   |
|          | Sig. (2-tailed)     |         | ,003     |
|          | N                   | 50      | 50       |
| IndexDIL | Pearson Correlation | ,417**  | 1        |
|          | Sig. (2-tailed)     | ,003    |          |
|          | N                   | 50      | 50       |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

#### Year 2019

|           |                     | Index_SH | Index_DIL |
|-----------|---------------------|----------|-----------|
| Index_SH  | Pearson Correlation | 1        | ,831**    |
|           | Sig. (2-tailed)     |          | ,000      |
|           | N                   | 54       | 54        |
| Index_DIL | Pearson Correlation | ,831**   | 1         |
|           | Sig. (2-tailed)     | ,000     |           |
|           | N                   | 54       | 54        |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

## 5. Shares of social housing, developments share of housing and development in the dissimilarity index

|                | Social housing<br>2000 | Social housing<br>2019 | % Increase<br>share social<br>housing<br>2000-2019 | % Development DI<br>lowest income group<br>2000-2019 |
|----------------|------------------------|------------------------|--|--|
| Centrum        | 17,72                  | 28,29                  | 59,64  | -40,00   |
| Helpman e.o.   | 25,42                  | 22,18                  | -12,74   | 30,00  |
| Hoogkerk e.o.  | 31,65                  | 22,72                  | -28,19   | 5,06   |
| Meerdorpen     | 0,00                   | 13,79                  | 13,79  | x  |
| Nieuw-West     | 42,71                  | 44,31                  | 3,76   | 117,22   |
| Noorddijk e.o. | 18,45                  | 29,40                  | 59,37  | -14,78   |
| Noordoost      | 46,48                  | 34,49                  | -25,79   | -22,89   |
| Noordwest      | 49,56                  | 55,24                  | 11,45  | -44,23   |
| Oosterparkwijk | 67,47                  | 53,60                  | -20,55   | 13,17  |
| Oud-Noord      | 58,70                  | 50,39                  | -14,16   | -3,66  |
| Oud-West       | 15,89                  | 22,63                  | 42,43  | 252,63   |
| Oud-Zuid       | 18,69                  | 24,09                  | 28,87  | -47,40   |
| Zuidoost       | 41,18                  | 26,92                  | -34,63   | 10,20  |
| Zuidwest       | 21,86                  | 38,52                  | 76,22  | -49,82   |