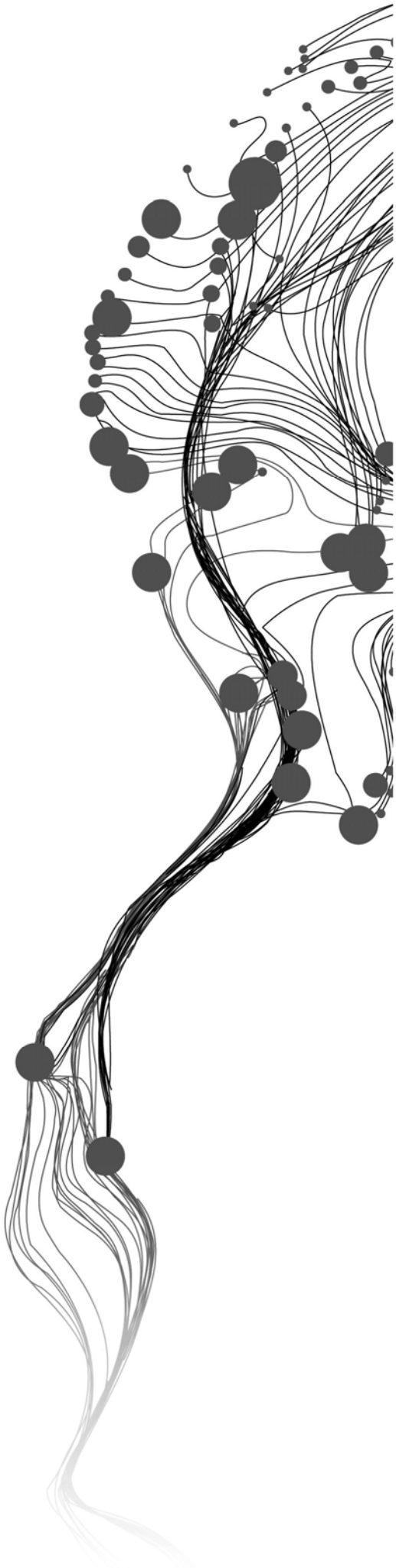
ASSESSING RESIDENTIAL SEGREGATION PROFILES FOR ETHNIC GROUPS IN ENSCHEDE, THE NETHERLANDS

RIAN WULAN DESRIANI

February, 2011

SUPERVISORS:
Dr. J.A Martinez
Dr. S. Amer



ASSESSING RESIDENTIAL SEGREGATION PROFILES FOR ETHNIC GROUPS IN ENSCHEDE, THE NETHERLANDS

RIAN WULAN DESRIANI

Enschede, the Netherlands, March, 2011

Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation.
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SUPERVISORS:
Dr. J.A Martinez
Dr. S. Amer

THESIS ASSESSMENT BOARD:
Prof.Dr.Ir. M.F.A.M. van Maarseveen (Chairman)
Dr. K. Pfeffer (External Examiner, University of Amsterdam)

ABSTRACT

Most of residential segregation studies have shown that each city and each ethnic group experience different pattern of segregation. As the Netherland is now concerned about residential segregation, it is needful to understand the process of residential segregation by profiling it. In this study, such profiling of residential segregation is argued can reveal variability of segregation patterns for each ethnic group.

Using the 2009 population data of Enschede per postcode, this study investigated the spatial distribution and characteristics of residential segregation and changes on residential segregation for four ethnic groups: Turkish, Moroccan, Surinamese/Antilles and Indonesian. Residential segregation was measured incorporating the influence of neighbouring or surrounding postcodes at different scales of neighbourhood. The "scale of the neighbourhood" represents the extent of concentration influenced by population in neighbouring or surrounding postcodes. Residential characteristics at ethnic concentration areas were compared to residential characteristics at entire city. Using data of 1997 and 2009, changes on ethnic concentration areas were done to complement the residential segregation profile.

The result showed that variability of residential segregation exists for each ethnic group. Each ethnic group has different distribution pattern across the city. However, there are only few areas with concentration of certain ethnic group (below 15% of entire city). Most ethnic concentration areas are located at southern part of the city. Those postcode areas are part of a large concentration (up to 800 meters scale of neighbourhood). The results show that concentration areas are sensitive to housing mobility (e.g. because of urban renewal) and population growth (e.g. new born and new immigrants). Other result showed that even though ethnic members concentrated at certain location but not eventually they lived at areas which differ in term of housing and socioeconomic characteristics than the rest of city.

In general, this study suggests that spatial proximity to neighbouring postcodes has a large impact on variability of residential segregation. From this empirical study, it can be concluded that ethnic distribution, ethnic concentration and changes of residential segregation in Enschede differ for each ethnic group.

Keywords: residential segregation, ethnic concentration, different scale, residential characteristic

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Enschede, February 2011

Rian Wulan Desriani

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1. INTRODUCTION

This chapter starts with background and justification of the research field. Included in it are also the reasons for selecting the case city. It further continues with defining the research problems, the aim and the research objectives of the research. Research questions are presented for each research objective in the following section. At the end of chapter, a conceptual framework structuring the ideas of the research is explained.

1.1. Background & Justification

Continuous international migration has occurred in many countries for centuries. International immigrants travelled with different causes, such as labour migration, former colonial countries, or family reunification. Many countries in Western Europe began to attract workers from abroad to satisfy its labour needs. Since 1945 labour immigrants have travelled from Southern Europe to Western Europe. A few years later, the number of immigrants increased because of decolonization. A multiethnic country such as Great Britain is a reflection of the colonial history of Britain Empire, where many immigrants came from colonial countries. Another example is Suriname ethnic migration to the Netherlands that began with the independence of Suriname in 1975. The growth still continues because of family reunification with previous immigrants.

The growth of racial or ethnic group in urban area is becoming multi ethnic. Number of ethnic group's increase which mostly came from developing countries in Africa, Asia, the Caribbean, and Middle East to Western Europe. They settled in different parts of the urban area but the tendency is that they tend to be located in just a few neighbourhoods. When a certain (ethnic) group occupies a space of residential to some degree separate from the rest of population, it is called residential segregation (Pacione, 1987).

Residential segregation has been seen as a negative phenomenon. From the USA studies, segregation is related to a negative image among urban population. The most distinctive area is called Ghetto, inhabited predominantly by members of an ethnic or other minority group, separated from the majority. The existence of ghettos will lead to increasing social problems in the integration of ethnic groups in urban areas. Another effect is that the minority ethnic group becomes marginalized in many aspects. For example, services to support good health such as exercise facilities and grocery stores for healthy products are less provided in segregated areas (Williams & Collins, 2001).

Residential segregation has been an issue for a long time in the USA, with a decreasing trend of black and white segregation along the years (Reardon, 2006). One of the causes is the contractual agreements among property owners which prohibit African American from owning or occupying homes in white neighbourhoods. This discrimination in the housing market has decreased since 1989 but residential segregation still remains.

Even though Europe has a moderate level of segregation compared to the USA (Musterd, 2005), since the 1990s social and ethnic differentiation has started to increase (Bolt, 2009). Spatial concentration of some ethnic groups has emerged in Amsterdam, where in 1994-1996 over 63 per cent of all Turks and of all Moroccans can be found in urban concentration areas of at most 0.5 hectares (5000 m^2) (Deurloo & Musterd, 2001). Many European countries are now concerned about residential segregation and try to develop desegregation policies (Bolt, 2009).

The Netherlands has long been concerned with spatial segregation. In several studies, segregation in big cities in The Netherlands is shown to be increasing (Deurloo & Musterd, 1998; Kempen & Weesep, 1997, 1998). The Dutch government believes that ethnic segregation will reduce integration and social interaction between native Dutch and ethnic immigrants. But the controversy about the importance of reducing segregation remains (see section 2.6). The Dutch government has a strong influence on the housing market and pursues housing diversification as the main policy response to segregation. Many researchers on the other hand argued that creating mixed neighbourhoods will not increase integration and social interaction (Ostendorf, Musterd, & Vos, 2001; Van Eijk, 2010). Study showed that many native Dutch are reluctant to live in a mixed neighbourhood and researches believe that in the end it will emerge social problem (Bolt, Kempen, & Ham, 2008).

In this study, residential segregation in Enschede is measured to see how ethnic groups are spatially distributed across the city. Enschede as a former industrial city experienced an influx of labour immigrants. Today Enschede has seven different ethnic groups and some of them are still growing (see section 3.5.1). As desegregation policies are a subject of controversy, it is needful to understand the process of residential segregation by profiling it. Such profiling of residential segregation will help to reveal segregation patterns for each ethnic group.

1.2. Research Problem

Different concepts of residential segregation

The Netherlands is a multiethnic country that has had a steady flow of international immigration for over 35 years. Turks and Moroccans are the two largest population groups of non-western origin. The population growth of Turks from 1996 to 2009 was 52% and the growth of Moroccans over the same period 39%, which is higher than the 6% growth of native Dutch. Kempen and van Weesep (1997) reported that the four big Dutch cities did not show a trend of decreasing segregation. They argued that changes in the population are positively correlated with changes of segregation between ethnic groups. However, in their approach, changes in residential segregation are caused only by changes in the composition of people within a region: they did not research whether this segregations occurs due to changes in the extent of housing and neighbourhood characteristics, spatial distribution in ethnic composition, or changes in the size of ethnic concentrations.

To measure residential segregation, it is important first to define a concept of residential segregation because there are different views of the phenomenon. Concentration of the same ethnic groups may characterize (consciously or unconsciously) their residential area, clearly differentiating it from other residential areas. The terming of 'Ghetto' is an example of how the residential area of a certain group is characterized by such an extent of social problems and deprivation that this is the main characteristic that distinguishes it from other areas. The most common concept of residential segregation is the distribution of ethnic groups across a region. If the ethnic minority lives dispersed in an entire region then they are not segregated. On the other hand, when ethnic minorities live in large concentrations, this does not mean they are not segregated, as this concentration will reduce the chance of having members from different ethnic groups in their neighbourhood.

Capturing variability in residential segregation

Measuring residential segregation started by measuring at city level (Cortese, Falk, & Cohen, 1976; Duncan & Duncan, 1955; Massey & Denton, 1987). It is useful for comparing segregation between cities or examining trends of residential segregation (Grbic, Ishizawa, & Crothers, 2010; Massey & Denton, 1987). Recently studies of trends of residential segregation in America revealed that the degree of segregation for each city region has different results at disaggregated level (e.g. district, neighbourhood or postcode level).

Instead of segregation at city level, a segregation index at the areal unit level has been developed to be able to capture the variability within a city. Each areal unit was calculated using size and location of neighbouring units as parameters.

In addition, analyzing residential segregation at the disaggregated level can provide understanding of residential segregation processes. This is done by defining a neighbourhood at different scales of proximity from one areal unit to neighbouring units to represent the extent of influence of ethnic composition to residential segregation. But few researches have focused directly on ethnic differences in scale and its determinant factors. Reardon et al. (2009) explain that segregation measured in large scale will only capture the phenomenon at that scale or larger. Black-white segregation declined at a micro-scale, but was unchanged at a macro-scale. They imply that decline black-white segregation in smaller area is the result of local processes of residential integration rather than redistribution of black and white populations over an entire city. Deurloo & Musterd (2001) describe another segregation process at disaggregated level in the Netherlands. By 1995, about 75% of Turks and Moroccans lived in the public housing sector, not being segregated from each other at the neighbourhood level, but frequently segregated from each other at micro (postcode) level. This indicates that using distance or scale as parameter to calculate segregation index potentially has a big influence on conclusions regarding the process of residential segregation.

Limited effectiveness of housing policy in reducing residential segregation

In Western Europe, two types of desegregation policies are commonly used: rental subsidies and housing diversification (Bolt, 2009). Rental subsidies are not intended to eliminate segregation but are able to suppress it. Housing diversification only has a small effect on the level of ethnic and income segregation. This may come from lack of information on the forces driving spatial segregation. Many studies reveal which factors are related to the change of spatial segregation. Results from Reardon et al. (2009) in the USA showed an increase in the percentage of foreign-born residents in a metropolitan area are associated with increases in Hispanic-white micro-environment segregation, but not macro-environment segregation. Results from Deurloo and Musterd (2001) in Amsterdam suggested that tenure is not the key to understanding ethnic segregation because ethnic groups are generally not allocated to similar public rental dwellings. This shows that the driving forces of spatial segregation changes are different in different scales and different places.

1.3. Research Objectives

The aim of this thesis is to assess residential segregation profiles among ethnic groups, with the objective:

1. To conceptualize residential segregation in relation to housing and ethnic distribution
2. To measure residential segregation
3. To identify residential characteristics of segregated areas
4. To describe changes in residential segregation

1.4. Research Questions

For each sub-objective research questions have been defined:

1. To conceptualize residential segregation in relation to housing and ethnic distribution
    - 1.1 To what extent do housing characteristics conceptualize residential segregation?
    - 1.2 To what extent does ethnic distribution conceptualize residential segregation?
2. To measure residential segregation
    - 2.1 Which ethnic group is most segregated at city level?
    - 2.2 Where are the concentration areas of each ethnic group located?
    - 2.3 How are these concentration areas affected from different scales?

3. To identify residential characteristic in segregated area
    3.2 Which housing characteristics are related to residential segregation?
    3.3 Which socioeconomic characteristics are related to residential segregation?
4. To describe the change of residential segregation
    4.1 Is there any change in residential segregation at the city level?
    4.2 Does the change vary at different scale of neighbourhood?

1.5. Conceptual Framework

Referring to the definition from Pacione (1987), residential segregation occurs when a certain (ethnic) group occupies a space of residential (housing location) to some degree separate from the rest of the population. Occupying a certain space in a region relates to spatial distribution of housing across the region (Figure 1-1). Distribution of housing can be conceptualized by evenness/clustering dimension (see section 0). Distribution of housing can be conceptualized by evenness/clustering dimension (see section 0). Evenness/clustering dimension is differential distribution of two social groups among areal units in a city (Massey & Denton, 1988). Measuring at city level using evenness/clustering will only show degree of residential segregation whether ethnic groups is evenly distributed across the city. While measuring at disaggregated level using evenness/clustering dimension will show spatial concentration and variability of segregated areas. Concentration is an overrepresentation of a certain ethnic group per areal unit (PBL, 2010). Using the concept of spatial measurement, where population in neighbouring areas and proximity to those areas influence the degree of segregation (Feitosa, Camara, Monteiro, Koschitzki, & Silva, 2007), postcode areas which have overrepresentation of a certain ethnic group are measured. The concentration of ethnic groups might have different characteristics in term of housing and socioeconomic characteristic. For example, in Rotterdam, concentration of ethnic minorities were found living in the neighbourhoods with inexpensive housing built during the beginning of the 20th century (Kempen & Weesep, 1998). Those characteristics might be because they are constrained in their housing choices by their low income. However, ethnic characteristics could determine housing preferences for ethnic groups due to a desire to find a housing location where there are many members of the same ethnic group (Kempen & Weesep, 1997). Many other aspects characterize ethnic concentration areas. The residential characteristic of segregated area, including housing and socioeconomic characteristics will be reflected upon in . The conceptual framework of the study serves to address the residential segregation profile in a region while also capturing the variability and characteristic of individual neighbourhoods.

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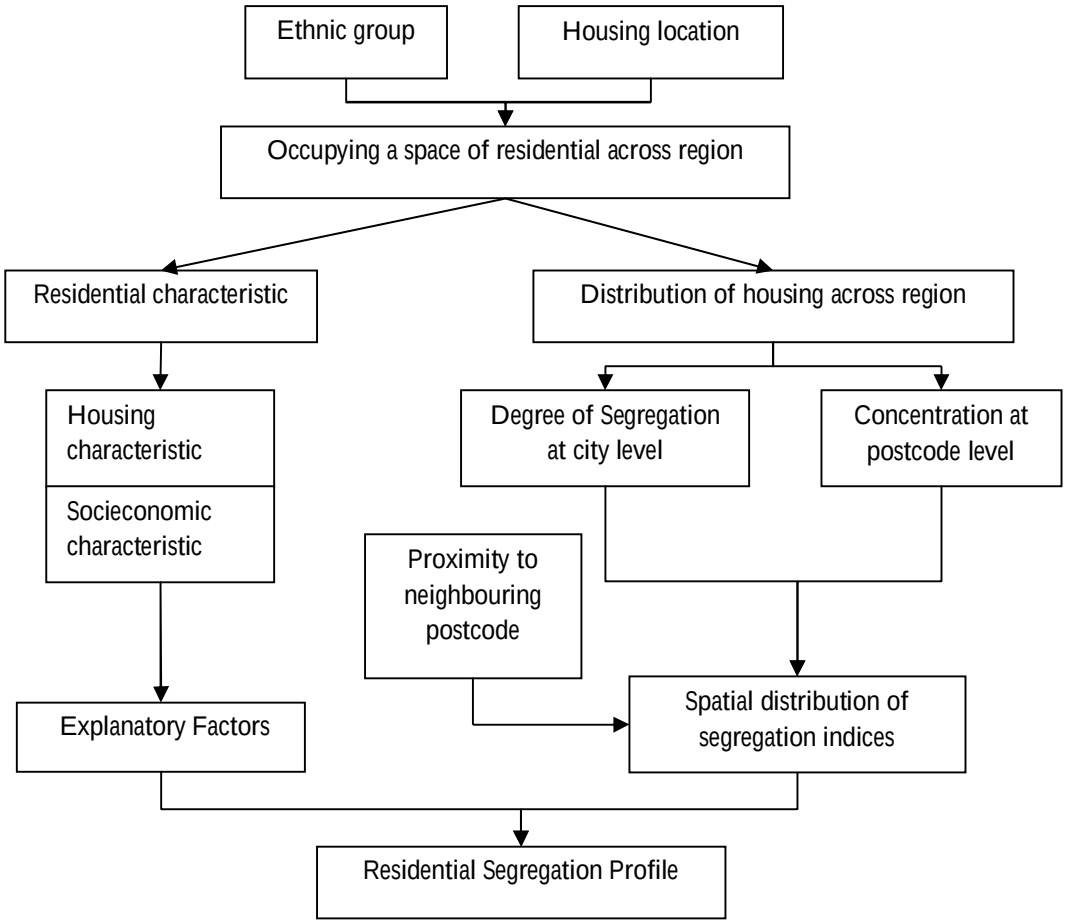


Figure 1-1: Conceptual Framework

2. CONCEPTUALIZATION OF RESIDENTIAL SEGREGATION

This chapter comprises of a review on definitions and concepts of residential segregation. Explanatory factors, housing and location choices of ethnic groups and impact of residential segregation are discussed to explain residential characteristic in segregated areas. Exploring different dimensions of residential segregation helps in clarifying the concept of residential segregation. It also gives clear connections between how residential segregation was defined, and which measurement is best to explain it. This chapter also discusses the Dutch experience in residential segregation, including the government's view on residential characteristics and how they tried to deal with it. At last, conclusion summarizes how residential characteristic and ethnic distribution conceptualizing residential segregation.

2.1. Ethnic Residential Segregation

One basic problem arises from the different terms concerning segregation-related terminology in the literature. The term 'spatial segregation', 'ethnic segregation', 'residential segregation', 'social segregation' are often mixed, sometimes used in one and the same sense but sometimes also with different meanings without being defined exactly. In this subsection, I will elaborate the terms which related to definition that I use in this study.

Segregation has been used in many different contexts in urban studies. Sometimes it has been used to characterize only general differences in the social composition of residents. Social segregation deals with social composition such as income group or ethnic group which is being segregated for example in housing tenure (Murie & Musterd, 1996; Turner & Ross, 1992). Those studies in social segregation rarely exposed spatial patterns of segregation. When segregation refers to the spatial context of social composition, it is called spatial segregation (Bolt, Burgers, & Kempen, 1998; Bolt, et al., 2008; Fahey & Fanning, 2010; Hårsman & Quigley, 1995).

For decades, segregation studies have been focused on ethnic groups (Duncan & Duncan, 1955; Hårsman & Quigley, 1995; Massey & Denton, 1987). An ethnic group is defined as a group that is socially distinguished, by others or by themselves, on the basis of their unique culture, national origin or racial characteristic (Yang, 2000). The most common issue researched is Blacks and Hispanic being segregated in the USA. They experienced discrimination in access to housing in different tenure type (Turner & Ross, 1992). Research shows that they have different experience than white when they inquire about the availability of advertised housing units. This leads to residential segregation where some ethnic groups could not access certain tenure type or certain location. Moreover, both ethnic groups experience segregation in public school (Clotfelter, 1999). From all ethnic segregation studies, Yang (2000) summarized ethnic segregation into four dimensions:

1. Residential segregation, member of different ethnic groups are separated into different residential neighbourhood
2. School segregation, members of different ethnic groups attend different school
3. Occupational segregation, members of different ethnic groups are concentrated in different occupations
4. Public segregation, separation of the members of ethnic groups in public places such as buses, trains, stores, recreation, etc.

Ethnic residential segregation is part of spatial segregation. The distance and the distribution between ethnic groups is important to understand segregation. A city has a large or small degree of residential segregation. That means certain ethnic group occupies certain residential areas to some degree separate from the rest of the population. We might be concerned with whether a group is distributed evenly in all neighbourhoods or interested in the extent of interaction between groups. These spatial distributions of ethnic residential are further explored in section 2.4.

2.2. Explanatory Factors for Residential Segregation

In general, residential segregation is a consequence of complex interactions of different aspects and different levels. In the next subsection, literatures about how different aspects contribute to residential segregation are discussed. At household level, housing and location choice of ethnic groups is discussed because many researches distinguish characteristics of each ethnic group and find very subtle differences.

2.2.1. Explanatory Factors

To understand residential segregation, there are four factors at city level affecting residential segregation and their importance over time, which are general economic restructuring process of recent decades, organization and structure of welfare state, the history of urban development and housing policy (Deurloo & Musterd, 2001). Each factor actually could not alone explain residential segregation because they affect each other. Using this concept, I explore different factors at city level that had been used in several segregation studies.

Economic restructuring will have a different effect in many cities. For example, manufacturing decline affected low-skilled workers without real prospects for climbing the social ladder. This results in increasing ethnic polarization and segregation (Deurloo & Musterd, 2001). It is because immigrants who still work as low-skilled labourers in manufacturing industries decreased while in same time the proportion of highly-skilled labour increased. An immigrant has a weaker position in the housing market. As a result, division occurs in spatial pattern between residential concentration of wealthy people and poorer households (many of whom are immigrants). It should be noted that the housing subsidies, applied in the 1990s, significantly increased the housing mobility options of ethnic groups.

The welfare state in Europe and the USA is different in the level of attention given to access to the labour market, the quality of and access to social benefit systems, income redistribution systems. This explains, in part, different extents and characteristics of spatial inequalities for both areas: European cities have a lower degree of residential segregation than the USA (Deurloo & Musterd, 2001).

The history of development of cities can also influence the degree of ethnic concentration, for example, that of the Algerian in Paris (Blanc, 1991). For some parts of Paris, the degree of residential segregation has been high, but they argued that urban renewal may be lowering it. In America, historic development of cities also influenced residential patterns. Over the last century, majority of African-Americans in America have been forced to live in racially isolated neighbourhoods, with limited mobility options. Urban renewal in inner city and new residential area in suburban have enforced separation between African-Americans and caucasians (Saltman, 1991).

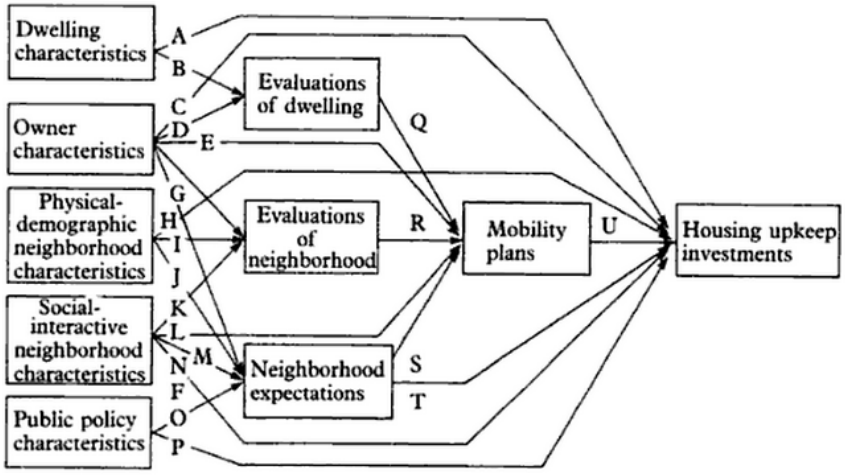
The last factor affecting residential segregation is housing policy. In America, residential segregation is a social manifestation of institutional racism and discrimination (Grady, 2006). Decades ago housing policy discriminated housing allocation for African-American. With the abolishment of discrimination in housing policy, the trend of residential segregation is reducing. In Europe, the housing market has been divided into different tenures with different economic and legal conditions. As a result, different groups are

separated according to certain tenures (Andersen, 2003). But some countries such as the Netherlands are trying to influence the housing market, controlling the number of social rented dwellings so that different income groups have the opportunity to live in decent housing. This policy makes that Dutch cities have a moderate level of segregation compared to other cities in Europe. More studies about housing policy in the Netherlands will be discussed in section 2.6.

2.2.2. Housing and Location Choice of Ethnic Groups

In another level, spatial segregation is affected by individual and households behaviour. Kempen & Özüekren (1998b) argued that segregation can be explained by using a behavioural approach which is an explanation of segregation using preferences, perception, and decision making of individuals in housing and residential mobility of a minority ethnic group. The aspects of explanation are levels of satisfaction or dissatisfaction with a certain location or dwelling, household characteristic, ideas of what constitutes a desirable housing situation and the opinion of the inhabitants themselves. It is in line with other studies which try to correlate the level of segregation and residential characteristic, suburbanization, acculturation and socioeconomic factors(Andersen, 2003; Deurloo & Musterd, 2001; Massey & Denton, 1987; Reardon, et al., 2009; South & Deane, 1993).

Saltman (1991) explained that residential segregation can be explained by preferences and location choice of both ethnic groups. He implied that white-Americans prefer living in the same neighbourhood whereas African-Americans prefer neighbourhoods with more equal mixing. Using the framework of housing upkeep investment by Galster (1987), there are elements that correlate with mobility plan to move. He explained that characteristic of individual, the dwelling, the neighbourhood and any relevant public policies are consider are predictors for evaluation of dwelling and neighbourhood and expectation about the future of the neighbourhood to be manifested by homeowner. Those determine the homeowner's decision to remain in the current location or to move (Figure 2-1).



Source: (Galster, 1987)
Figure 2-1: Elements of the Homeowner's House Upkeep Decision

Using Galster's framework, ethnic groups as owner characteristic can have different evaluations and expectations to choose whether or not to live in areas of concentration of the same ethnicity. Studies show that present day segregation in America can be explained by the legacy of segregation and discrimination of the past and by current decisions of white households to avoid moving to racially integrated and largely minority communities(Carr & Kutty, 2008). In the European case, discrimination of the past especially in housing market was never discussed in many studies. Yet, the mobility plan is the same (at least) in the Dutch case where in cities the level of segregation is fairly stable. One of the factors that could explain

segregation by native Dutch and Western mobility is that they tend to move out from concentrated neighbourhoods and more often move into neighbourhoods with a low proportion of minorities (Bolt, et al., 2008; Zorlu & Latten, 2009).

Characteristic of ethnic members could give affect on housing and location choice. New immigrants often utilize their social networks to decide their first residential location, which may increase segregation from other ethnic groups. And if existing ethnic neighbourhoods are unable to accommodate new immigrants, then they will choose into areas adjacent to those neighbourhoods. As a result, a higher growth rate may increase segregation. But it will be different for the second generation. The mobility pattern of the second-generation Non-Western immigrants is similar to that of natives (Zorlu & Latten, 2009). They tend to choose neighbourhoods with a higher share of native Dutch.

South & Deane (South & Deane, 1993) revealed that magnitude of some determinant factors in housing decision does appear to differ between ethnic groups. They found in America that racial mobility is influenced by housing characteristic. Home ownership is less important to mobility among blacks than white. Some studies showed that housing tenure can be associated with minority ethnic households (Deurloo & Musterd, 2001; Phillips & Unsworth, 2002). Deurloo found that Surinamese and Turkish concentration areas in Amsterdam are characterized by public rented housing association. Owner-occupied houses remain underrepresented in those areas. However, they still could not find the evidence whether it is because their limited housing choice. Among all three housing tenure, the proportion of privately rented had the largest effect on ethnic diversity and immigrant– Irish segregation(Vang, 2010). Areas with higher proportions of privately rented houses were more ethnically diverse, had greater presences of Africans, Asians and eastern Europeans (as opposed to high concentrations of Irish nationals).

The relationship between housing condition and immigrant in Europe has been studied. They found that by comparing housing type at the time of arrival with current type of accommodation confirm the upward direction of mobility, a tendency towards less temporary and more satisfactory accommodation (Edgar, Doherty, & Meert, 2004). But Kempen's opinion that housing type may not be the highest priority for every household because they have financial constrains. In high concentration of Turkish and Moroccan, neighbourhoods contain a large share of inexpensive rental dwellings in blocks of walk-up apartments (up to four floors). He added that the increasing of residential segregation coincided with ethnic mobility to newer areas and the improvement of their housing conditions.

Preferences of residential takes account not only characteristic of housing unit, but suitability of the neighbourhood. According to Galster (1987), neighbourhood characteristic is categorized into two, social and physical characteristic. Social neighbourhood characteristic is related social cohesion. Residents who are more attached to their neighbourhood by strong familial or ethnic ties are less inclined to cut these relationships by moving out of neighbourhood. Physical characteristic includes distance to school; distance to workplace, distance to relatives, environment and other general attributes of the resident.

Turkish and Moroccan have number of household members larger than native Dutch which might make the difference in unit size and room number that they prefer. Blauw (1991) found that one of factors that influence concentration of Turkish and Moroccan in Amsterdam is size of households, needing for larger units. But Deurloo & Musterd (2001) found that concentration of Moroccan lived in area where have relatively high proportion of smaller units. Both studies reflected that due to the time change, when children left out the house, there is probability of preferences change.

The last element of Homeowner's House Upkeep Decision is public policy characteristic which has been discussed in section 2.2.1. This element might contribute involuntary segregation because of institutional racism in the entire housing system (Grady, 2006).

2.3. Impact of Residential Segregation

Several authors have identified both advantages and disadvantages of residential segregation of ethnic groups.

Negative impact

Scholars argue that without residential integration, it would be difficult for immigrants to achieve full incorporation into the host society. Spatial integration is particularly important in immigrant-receiving countries where resources and amenities are unequally distributed across geographic space. Housing location of immigrants is crucial for the process of individual assimilation.

Conversely, residential segregated leads to prejudice and stereotyping (Friedrichs & Alpheis, 1991; Kempen & Weesep, 1998). Social cohesion and social mobility are low. Individual or household does not have much interaction with different ethnic groups. They tend to interact with same background. Children with foreign background will have limited choice in getting better education. That is because when they live in concentration of their ethnic groups, most of them will speak in their native language and rarely using majority language (Kempen & Özüekren, 1998b).

Highly segregated cities suffer from crime and social problem. This comes from inequality in many aspects such as economy, education or labour market. And because all social problems exist exclusively in an ethnic group neighbourhood, the resident will have a negative image among other groups. In times, they will be more concentrated and isolated in a region. This will emerge the hyper-segregation (Wilkes & Iceland, 2004). In America, hyper-segregation is experienced in Ghetto area.

There is a tendency that ethnic and income segregation are related to each other. Poverty concentration emerges when immigrant came as cheap labours or unemployment (see 2.2.1). However, Harsman & Quigley (1995) found for Stockholm and San Francisco that there was no relation between residential segregation and income segregation.

Several studies showed that residential segregation is causing ethnic disparities in health (Subramanian, Acevedo-Garcia, & Osypuk, 2005; Williams & Collins, 2001). Services to support good health such as exercise field are less provided in segregated area including grocery stores where they provide healthful products. It affected that they must pay higher costs than native for nutritious food. Thus lead to poorer nutrition in segregated neighbourhood.

Positive impact

In other contexts, place of residence has potentially important consequences for the life chances of immigrants and their progeny. In a concentration area of a group, it will be easier to provide service because they tend to have same behaviour. They will go to shops which provide their cultural food. In Britain, South Asian concentrated in certain area which causing specialized shops spring up (Phillips & Karn, 1991).

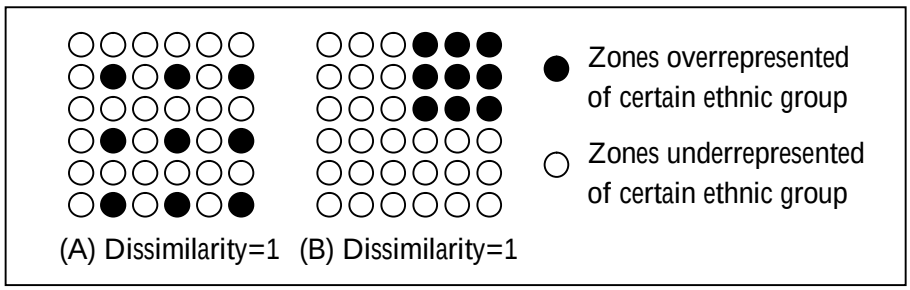
Another positive impact of residential segregation is safety from conflict between minority and native. Conflicts frequently arise between the newcomers and native who lived in residents much longer (Phillips & Karn, 1991).

2.4. Dimensions of Residential Segregation

To measure residential segregation, it is important first to determine dimension of residential segregation because there are different views of residential segregation. Massey and Denton (1988) describe that segregation into five different dimensions:

1. Evenness, degree to which members of different groups are over- and underrepresented in different subareas relative to their overall proportions in the population
2. Exposure, a similar concept that considers the likelihood of intra neighbourhood interaction among minority and majority groups within a given metropolitan area (measures potential contact)
3. Concentration is inversely related to the total area occupied by minority groups within the metropolitan area.
4. Centralization, proximity of the minority racial group to the region's central business district.
5. Clustering, the extent to which areal units inhabited by minority members adjoin one another, or cluster, in space.

Residential segregation is a spatial measurement, which means population in neighbouring areas and proximity to those areas influence the degree of segregation. According to Reardon & O'Sullivan (2004), evenness from Massey and Denton are non-spatial dimensions because the relative locations of each neighbourhood are not considered. Non-spatial measurement could not be able to capture the checkerboard problem. One of non-spatial index is Dissimilarity Index (D) which described as the proportion of each group that would have to move in order that two groups were spread equally over a region (Massey & Denton, 1988). Dissimilarity index is not sensitive to ethnic mobility among areal units. Only transfers of ethnic members from areas where they are overrepresented to areas where they are underrepresented affect segregation as measured by the dissimilarity index. In Figure 2-2, even though distribution for certain ethnic group in A would seem intuitively to be less segregated than B, Dissimilarity Index could not distinguish between the two, both regions considered as complete segregation (Dissimilarity=1).



Source: (Wong, 2003)

Figure 2-2: Ethnic Distributions Identical by Non-Spatial Index

Then Reardon & O'Sullivan (2004) revised those dimensions into two spatial dimensions, evenness/clustering and isolation/exposure and developed spatial indices. Centralization and concentration were considered part of evenness/clustering dimension. Each dimension is trying to capture a different kind of distribution. Figure 2-3consists of four distribution maps which show the different dimensions of spatial segregation. These dimensions will be explored in the next section.

2.4.1. Evenness/Clustering Dimension

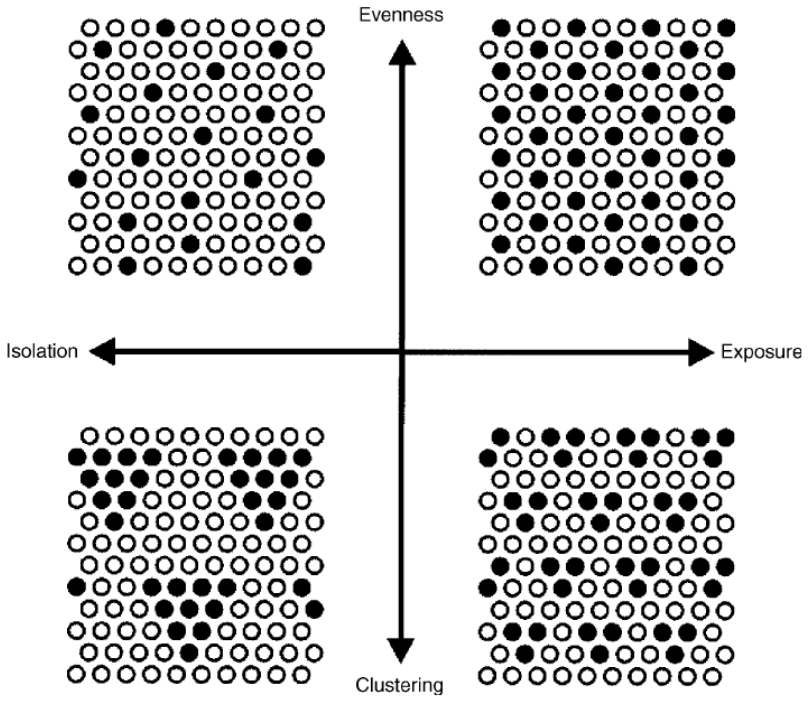
According to Reardon & O'Sullivan (2004) evenness and clustering is related spatially since at each areal unit (e.g. postcode) where a minority group is overrepresented will tend to be clusters of block groups. In Figure 2-3, they are four patterns of ethnic residential location (e.g. black circles indicate Turkish and white circles indicate Dutch). In the upper half of the diagram, there are two patterns where Turkish members are evenly distributed. When an individual moves from a location where his or her group is

underrepresented to one where it is overrepresented (lowering evenness) it would also increase clustering (lower half diagram).

Wong (2008) differentiates between evenness and concentration because concentration concerns only one group while evenness involves at least two groups. The concept of concentration is usually used at disaggregated data (e.g. postcode), when an areal unit has an overrepresentation of a certain ethnic group (PBL, 2010). Such overrepresentation particularly is in relation to the rest of the city. Deurloo & Musterd (1998) use the concept of ethnic concentration to show ethnic cluster in Amsterdam. They defined a postcode is overrepresentation of Moroccan when the proportion of Moroccan in that area is higher than proportion of Moroccan in the city plus 2 standard deviation of all proportion. From this perspective they could envisage two maps of overrepresented area at postcode level for Turkish and Moroccan that showed ethnic concentration.

2.4.2. Isolation/Exposure Dimension

The Isolation/Exposure dimension refers to the chance of having member from different groups or the same group living side by side. The isolation expresses the probability that a randomly selected member of an ethnic group will meet a member of its own group anywhere in the city. In Figure 2-3, the upper left diagram shows that there are less minority groups than upper right diagram. It means that the group in the upper right diagram experience less isolation. The exposure measures exposure of minority group to majority group as the average percentage of majority group. In the bottom right-hand grid, although the two communities are clustered there is more of a chance that the two communities are exposed to each other compared to the bottom left-hand grid. Isolation/exposure depends on overall ethnic composition of the population in the region. Thus, the interaction probabilities respond effectively to variations in spatial arrangements of areas with high concentrations of ethnic group.



Source: (Reardon & O'Sullivan, 2004)
Figure 2-3: Spatial Dimension of Residential Segregation

2.5. Residential Segregation Indices

For each dimension there are many indices to measured residential segregation. In this study, I limit myself only to the evenness/clustering dimension. At city level, evenness/clustering dimension is applied to measure level of segregation by degree of distribution of ethnic residential across the city. It is important to mention that in other studies, they called global index as measurement at city level and local index as measurement at disaggregated level (Brown & Chung, 2006; Feitosa, et al., 2007; Wong, 2002). In this study, local index is discussed as segregation at disaggregated level (i.e. postcode, neighbourhood, district level). At disaggregated level, concentration was used to express the residential segregation.

2.5.1. Residential Segregation at City Level

Many studies have examined the changing and comparison of residential segregation at city level (Grbic, et al., 2010; Kempen & Weesep, 1997; Massey & Denton, 1987; South & Deane, 1993; Wilkes & Iceland, 2004). They measured level of segregation in a city which is a value to summarize the overall phenomena of segregation in the study area even though certain neighbourhood may experience very different situation.

The index of dissimilarity is the most widely used measure of evenness for city level. It represents the proportion of minority members that would have to change their area of residence to achieve an even distribution. Jakubs (1981) recognized that the strength for this index is general and straightforward. He explained that dissimilarity index is for a population of two groups conceptualized by: (1) uniformity, where population proportions by group are constant across area units; and (2) exclusivity, where each areal unit is occupied by members of one and only one group.

Because the Dissimilarity index is signally non-spatial, Wong (1993) modified the index of Dissimilarity into several spatial Dissimilarity indices. They are able to capture the information about the shape or geometry of areas, which has significant impact on ethnic segregation pattern and limits the chance of interaction across unit boundaries. Modification was conceptualized by the fact that there are inter-zone interactions as a process of individuals competing with each other for the access to the boundary.

The modified D is sensitive to size or scale differences among areal units. The proportion of ethnic minority is D(s). The method calculates compactness of concentration area based upon the perimeter-area ratio. The perimeter-area ratio for areal unit i is Pi/Ai, and MAX(P=A) is the maximum perimeter-area ratio among all the areal units in the study region (Figure 2-4). The proportions of two groups are expressed by zi and zj between areal units i and j.

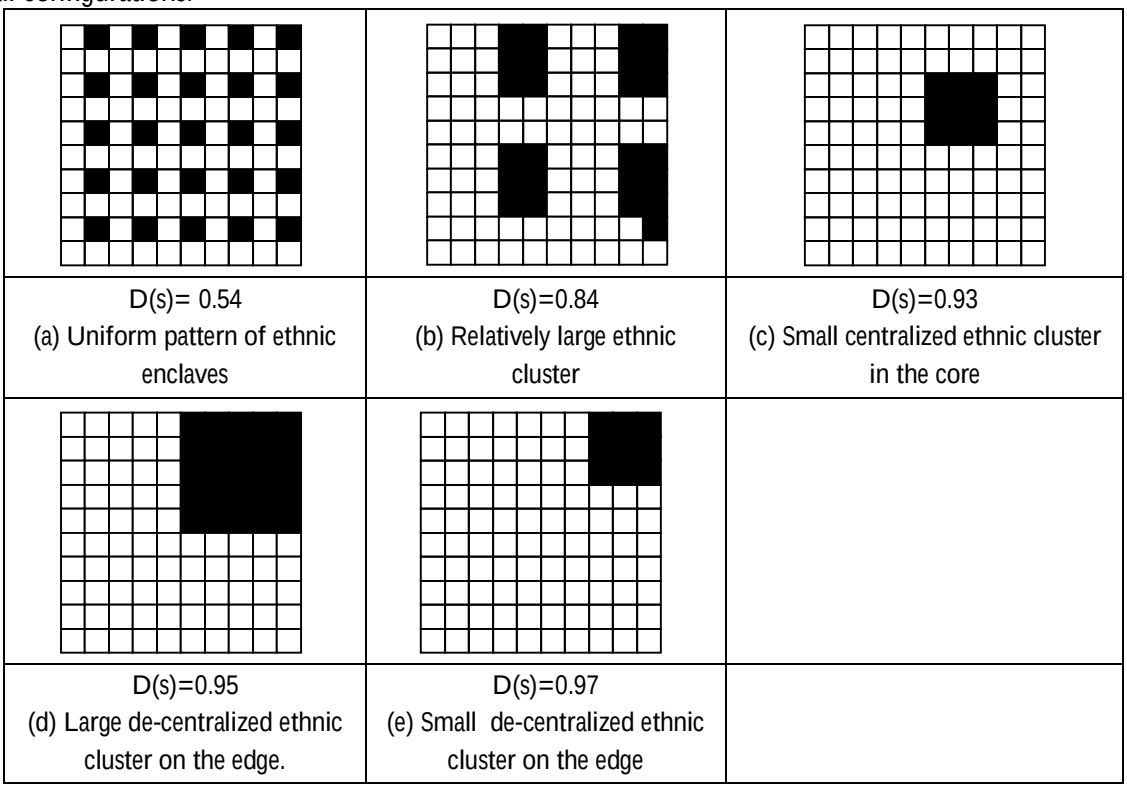
$$D(s) = D - \frac{1}{2}\sum_{i}\sum_{j} w_{ij}\left|z_i - z_j\right| \times \frac{1/2\left[\left(P_i/A_i\right) + \left(P_j/A_j\right)\right]}{\mathrm{MAX}(P/A)}$$

Source: (Wong, 1993)
Figure 2-4: Spatial Dissimilarity Index

It is expected that the more compact the areal units are (i.e. low perimeter-area ratio), the lower the chance for the members to interact with members of other units. However, the degree of interaction also depends upon the opportunity of contact. Thus, interaction intensity is weighted by wij the length of the common boundary of the two adjacent units i and j.

Figure 2-5 shows five hypothetical spatial configurations of two ethnic groups calculated using spatial Dissimilarity index. Each square block is represented areal unit in a region. The degree of segregation could summarize distribution of ethnic group across the area. Using Dissimilarity index, those five pattern

have complete segregation (D=1). Using D(s), checkerboard problem can be solved. Configuration a and e have different degree of segregation. Moreover, the clustering can be recognized shown by configuration b, c, d and e. Configuration e has the lowest perimeter-area ration which means it is the most compactness of all configurations.



Source: (Wong, 1993)
Figure 2-5: Interpretation of Spatial Dissimilarity Index

2.5.2. Residential Segregation at Disaggregated Level

Currently, indices at disaggregated level are developed to solve the shortcoming of indices at city level. Measuring residential segregation at postcode level help to recognize variation of segregation among areal units, particularly in areas where have significant segregation. There are several levels to calculate segregation index, which are blocks, census tract, postcode, or district. Wong (2008) added that by comparing levels of local segregation between years, we can identify areas experiencing declines or increases in segregation. He demonstrated that the proposed approach can highlight local dynamics even if changes at the regional level were small.

He developed the spatial version of the Dissimilarity index at disaggregated level. *SDi*, can be derived using the composite population. The composite population counts the population of the unit itself plus the population counts of neighbouring units. It is based upon the conceptualization that enumeration unit boundaries are not legitimate features prohibiting or hindering population interaction. Unless there are physical barriers to prohibit interaction of population across unit boundaries, otherwise, different groups in neighbouring units are not segregated and should be counted as if they are in the same unit. He used binary form to differentiate neighbourhood that adjacent while nonadjacent units are not counted. But using adjacent unit in region with very different size of census tract will reduce the uniformity of interaction. There will be area with very large and very small of neighbouring area. Still using the same concept, it will be better to use proximity to neighbouring unit since size of neighbouring area varies. It assumes that in some radius distance there still is potential interaction. Distance decay is often used to weight the influence of neighbours (Feitosa, et al., 2007; Reardon, et al., 2009). The concept is that the population at nearby locations will contribute more to the

concentration of ethnic groups than will more distant locations. The difference between these spatial measurements at disaggregated level can bee seen in Annex 1.

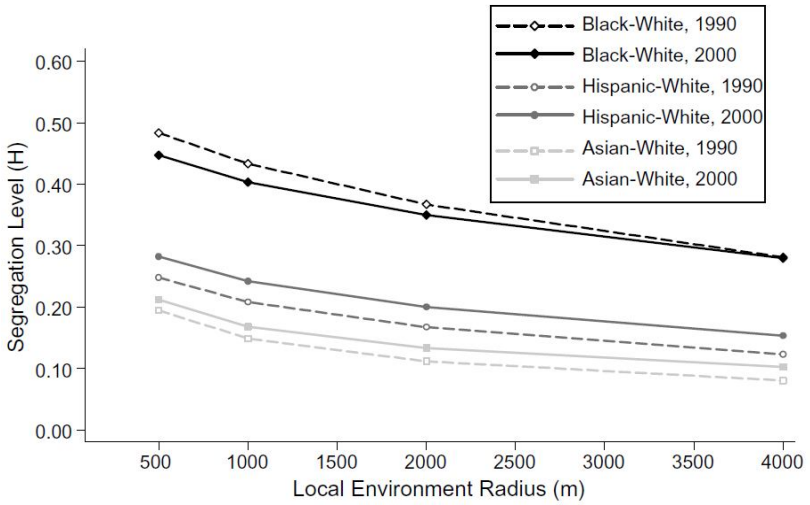
Another index to measure residential segregation at disaggregated level is using proportion at each census tract compare to proportion at city level. As explained in section 2.4.1, Deurloo & Musterd (1998) measured overrepresentation of an ethnic group when the proportion of an ethnic group in that area is higher than proportion in the city plus 2 standard deviation of all proportion. But this measurement suffers from non-spatial index. They do not consider population in neighbouring units.

With the combination of composite population and overrepresented area, it is more feasible to capture the variability of segregation at disaggregated level. Overrepresented areas will be measured by including ethnic composition in neighbouring areas. The hypothesis is that the change of ethnic composition of surrounding neighbourhood will give effect on concentration of its areal unit.

2.5.3. Residential Segregation at Different Scale of Neighbourhood

When considering influence of population in neighbouring unit, the distance to neighbouring units serves as the parameter. The scale of neighbourhood is therefore associated with the extent of the population neighbourhood influence each areal unit (i.e. postcode). Feitosa et al. (2007) argued that it allows researchers to specify their own definition of neighbourhood. Wong (2008) only calculated neighbouring which adjacent to each areal unit (i.e. postcode). Other authors used different scale of neighbourhood to see the effect of ethnic composition in surrounding areas. Reardon et al. (2009) and Feitosa et al. (2007) used several bandwidth to used in Kernel Estimator. They argued that ethnic composition within nearby neighbourhood may be quite different than the composition within larger region around one areal unit.

That concept of different scale was used by Reardon et al. (2009) to see the changes in different scale among metropolitan areas using Spatial Information Theory Index. In Figure 2-6, it shows for example, average black-white segregation declined at small geographic scales (500 m) but remained stable at the 4000 m radius scale. This indicates that the declines in black-white segregation were the result of local processes of residential integration (nearby neighborhoods became more racially similar to one another during the 1990s) rather than any large-scale redistribution of black and white populations. The study showed that there is no single 'right' scale of neighbourhood at which to measure segregation because effects of segregation may depend on scale.



Source: (Reardon, et al., 2009)
Figure 2-6: Average Segregation by Ethnic and Year for 100 Metropolitan Areas

At disaggregated level, Feitosa et al. (2007) experimented using artificial data set to see the differences of indices at different scale. She used 200, 400, 800, 1200, 1600, 2000, 3200 and 4400 meters and showed that each group have unique pattern of segregation in different scale. Moreover, she compared local index between two years to see the changes of the pattern. She concluded that by using different scale of neighbourhood, we could reveal patterns of segregation.

2.6. The Dutch Experience in Residential Segregation

According to data from cbs.nl, during the period 1996 - 2010, the population of The Netherlands increased from 15.493.889 to 16.574.989. The number of non-Dutch origin grows faster than the native population. Non-Dutch origin is defined as which country someone actually is closely related given their own country of birth and that of their parents. Turkish origin, one of the highest population for non-Dutch origin, increased 41% while Dutch origin 1.7%. In Amsterdam level of segregation increase but in The Hague level segregation is decreasing (Bolt & Kempen, 2000).

2.6.1. Mixed Neighbourhood

In the second half of the 1990s, The Netherlands put social mix in agenda. The goal is to create mixed neighbourhoods by tenure and housing diversification. This policy is proposed for income class but gradually defined into more ethnic terms. Government believes that ethnic segregation will reduce integration and social interaction. As a consequence of limited interaction with native Dutch, ethnic minorities will preserve their own language and culture, resulting in limited possibilities for education attainment and labour market success (Laan Bouma-Doff, 2007).

Countering urban segregation was translated in terms of attracting wealthier residents by demolishing old houses and building more expensive new ones in deprived neighbourhoods. By constructing owner-occupied houses in neighbourhoods with mainly social housing, a mixture of different income-groups will be created. Moreover, it is anticipated that social mixing will not only increase social cohesion, safety and liveability in the neighbourhood, but will also contribute to the social capital of the local residents. Smets & den Uyl (2008) argued that the physical transformation of deprived neighbourhoods goes hand-in-hand with the mixing of low- and middle-income households, which are generally associated with non-Western migrants and natives respectively. They added that in the Netherlands, the mixing of income-groups in deprived neighbourhoods often goes hand-in-hand with the mixing of different ethnic groups, including the 'White' natives.

The Netherlands has a strong influence on the housing market with housing diversification as the main policy response to segregation in the Netherlands. The policy was created to provide more social mix and also to spread migrant households more evenly so that reducing the stigmatization and social exclusion from the environment (Ireland, 2008; Musterd & Andersson, 2005). Housing diversification started around 1996, when the white paper on the "differentiated city" appeared. By providing social housing, the state ensures that low income group has more choice to live in decent housing. Two type of diversifying the housing stock: 1) mixing different tenures and price levels within the same development and 2) houses have to be demolished to be replaced by houses of different tenure and price level. Another action is new, larger-scale residential developments must set a side a minimum share of the dwelling units for social housing (Galster, 2007). In the same time, cities introduced an individual rent subsidy, part of a national trend that make ethnic minority have more access to the public market (Ireland, 2008). But it affect ethnic minority continue to experience severe difficulties in the private market and remained underrepresented in the owner-occupied sector (Kempen & Özüekren, 1998b).

Only Rotterdam tried to develop local policy in reducing segregation. In 1972, Rotterdam introduced the "5% regulation" to balance the composition of ethnic groups in the neighbourhood (Bolt, 2009; Bolt, et

al., 2008). The policy described that neighbourhoods were not allowed to have more than 5% of minority ethnic groups. But the policy was abolished because conflict with the constitution. In the second half of the 1990s, The Netherlands put again social mix in the agenda since the last time in 1950s. At first time social mix was for income segregation where income composition is related to the housing composition to have more mixed housing. In 2004, Rotterdam came back with new policy the "Rotterdam law" which not allows people who receive unemployment or social welfare benefits to settle in certain designated deprived neighbourhoods. But in the way, focus on income has changed to be more on ethnic composition.

2.6.2. Reaction to mixed neighbourhood policy

The purpose of mix neighbourhood has not been rigorously supported theoretically or empirically. Ostendorf et al. (2001) conclude in their study that mixing for income group does not in fact reduce spatial concentration of low-income people. They suggested that poverty is a personal characteristic and that it is therefore preferable to approach poverty directly instead of hoping for the results of a dubious 'neighbourhood effect'. Mixing for ethnic groups will be difficult when many native Dutch reluctant to live in a mix neighbourhood (Bolt, et al., 2008). Even they are force to live in a mix neighbourhood, Van Eijk (2010) confirms that it doesn't necessarily achieve integrated society which government tries to achieve. He found that people in mix neighbourhood are more likely to assess other ethnic in their neighbourhood as different from them resulting a relationship 'just neighbour' but not 'friend-like'. All arguments are for policy makers to be more precise on what problem should they solve in segregation.

2.7. Conclusion

In this section, the conceptualisation of residential segregation is concluded regarding residential characteristic and housing distribution for ethnic groups. Ethnic groups experience segregation by choices and constrains. Choices give ethnic groups opportunity to determine their housing preferences to find housing location while constraints come from their limitation or discrimination. Residential segregation occurs in terms of housing characteristics because many constrain appeared on their housing preferences. Discrimination of housing policy gave affect that ethnic groups are only able to access certain housing type or housing tenure. But many ethnic household are still experiencing low income which limit their choice only to low price housing unit. At the end, many ethnic members appeared to be concentrated at deprived areas. The choice of movement from ethnic and indigenous group conceptualizes residential segregation in term of spatial distribution across the city. Ethnic members want to live near their relatives to have bigger opportunity to find job. The language barrier often causes difficulties looking for job. On the other hand indigenous people are reluctant to live in same neighbourhood with ethnic group. They tend to move into areas where the proportion of indigenous people is high. Both movements are causing uneven distribution of housing locations of ethnic groups across the region.

For this study, the term 'residential segregation' is used as reference to ethnic residential segregation. Residential segregation is calculated at city and at disaggregated level (i.e. postcode level). Highlighted boxes in Table 2-1 shows that spatial measurement is used for this study. At city level, residential segregation is represented by degree of evenness/clustering for each ethnic group across the city. At postcode level, residential segregation is represented by concentration areas of ethnic groups.

Table 2-1: Measuring Ethnic Distribution at City and Disaggregated Level

Characteristics	City level		Disaggregated level	
	Non spatial	Spatial	Non spatial	Spatial
Measurement	Evenness	Evenness	Concentration	Concentration
Include composition at neighbouring units	No	Yes*	No**	Yes***
Visualized in map	No	No	Yes	Yes

*) Wong (1993) **) Deurloo & Musterd (2001) ***) Wong (2002) and Reardon (2009)

3. RESEARCH METHODOLOGY

This chapter contains the methodological approach to address the research questions of this study. Firstly, the research design is discussed, that was developed as a guideline for four phases of research and specifies all the required data, sources of data and methods that are used. Furthermore, the fieldwork is explained, consisting of expert and several ethnic member interviews. Next, data validation, the process of checking primary data for its consistency and error, is presented. Data analysis contains the explanation of requirement for measurements that used in this study. Finally, the study area is detailed in the last section.

3.1. Research Design

The research design for this study consists of four phases (Figure 3-1). The first phase is problem identification, in which the concept of residential segregation is explored to have a better understanding of the recent framework, measurement and policies regarding the phenomenon. The issue of segregation in the Dutch context is discussed as the context for the empirical case study of residential segregation in Enschede. Several interviews with key informants related to residential planning have been conducted: Those conclude the objectives of this research. Phase two is measuring residential segregation and analyze it using different time and scale. Using ethnic population in each postcode, ethnic concentration per postcode is calculated. Additionally, residential segregation per ethnic group is measured using a spatial concept where proximities to neighbouring areas are included. To be able to identify changes in pattern, two years of observation are analyzed. The third phase is an investigation of the correlation between segregated areas and residential characteristics, based on literature review and interviews with ethnic members. After determining factors in residential characteristics, they are correlated with segregated areas. This will result in a set of residential characteristics of segregated areas per ethnic group. Before the conclusion, verification of the result was done with several key informants. In the concluding fourth phase, the combination of all outputs to describe residential segregation profile is evaluated.

3.2. Fieldwork

The purpose of fieldwork is to collect data and information related to ethnic population, residential characteristics, housing choice and policies. The fieldwork was divided into three main tasks. The first is collecting secondary data, which was obtained from I & O Research. The second is interviewing key informants and the last is interviewing ethnic members.

3.2.1. Secondary Data Collection

The 2009 Enschede Census of Population and dwellings and social data per postcode was used in analyzing residential segregation. To analyze the change of residential segregation, ethnic distribution was compared the changes between 1997 and 2009. The input data was obtained from I & O Research. All the data is stored in a database file at the individual postcode level. Spatial data like the administrative boundary of the study area, districts, neighbourhoods, and postcode areas were also obtained from the same organization: some of the data can be publicly accessed from enschede.buurtmonitor.nl.

3.2.2. Key informant Interview

Input from interviews is needed for appropriate conceptualization of residential segregation and interpretation of results. The interview set is divided into three categories, where each has a different purpose of information (see Annex 2). The first category is interviewing two experts related to the issue of mixed neighbourhoods. In these interviews information about the concept of mixed neighbourhood,

effectiveness of desegregation policies, and explanatory factors of residential segregation were obtained. Secondly, I interviewed officers from the Enschede municipality and housing corporations. Here information about their experience dealing with segregation and mixed neighbourhood, and their opinion about the effectiveness of segregation policies were obtained. Thirdly, corresponding through meeting and email was done with a senior information specialist from I & O Research to gain information about data and information related to ethnic distribution. On 4th February 2011, a feedback discussion was done by presenting all results in front of three key informants. The output of the discussion gave more insight to interpret the result.

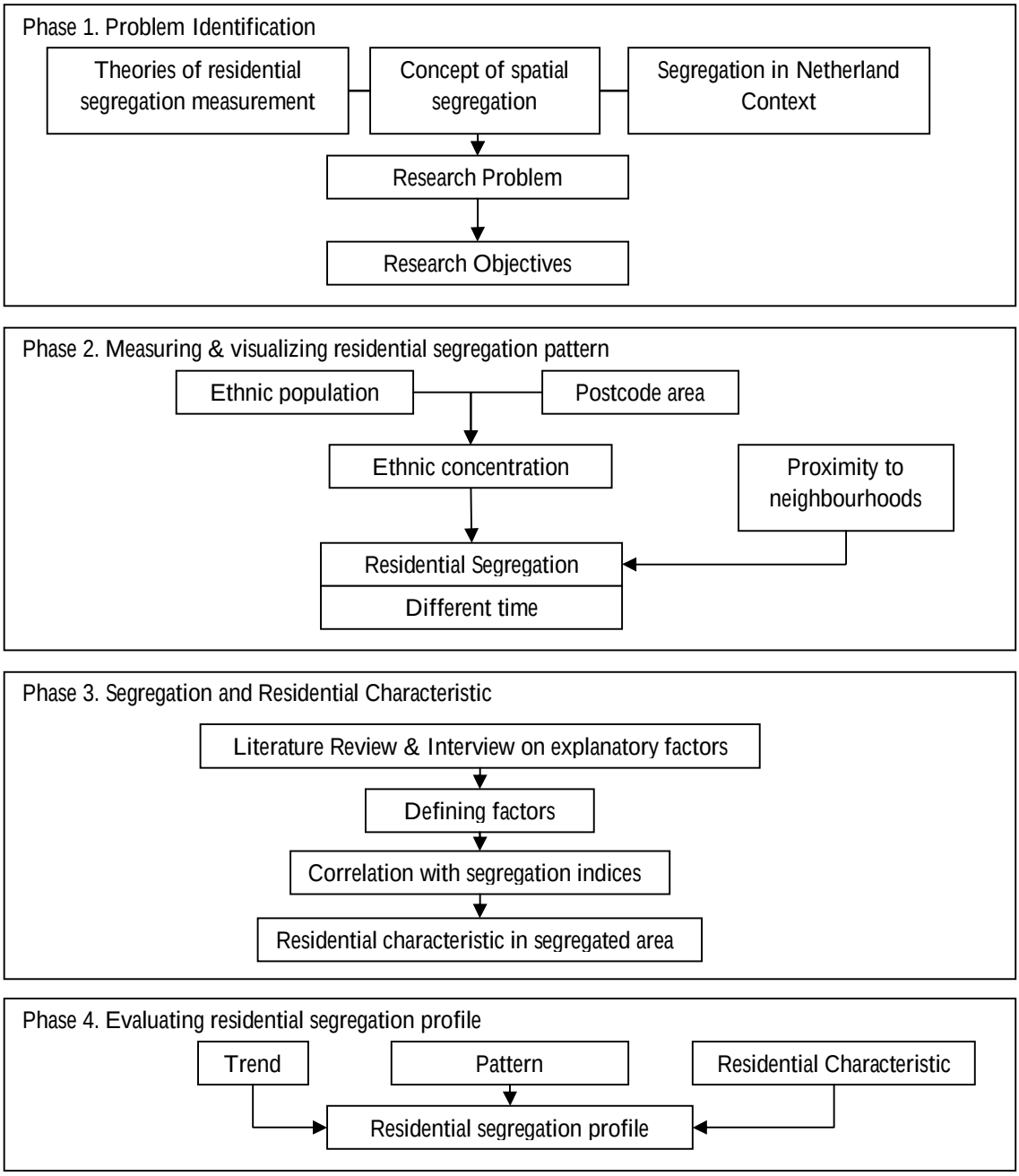


Figure 3-1: Research Design

3.2.3. Ethnic Interview

The purpose of the ethnic interviews was to gain information about views and experiences of housing choice among ethnic group members. This information is used as a framework for residential characteristics and to get local knowledge about housing choice. Due to time limitation, this interview was

done only for 6 Turkish and 4 Moroccans, whose presence in Enschede is for an indefinite period of time, excluding for example students from the interview. The interview method used was group discussion based on a questionnaire as guidance (see Annex 3). The main reason to choose this method was pragmatic and saving time. Another advantage of the group discussion approach is the freedom to argue because it allows participants to talk freely in the event, allowing new concepts into the research. The interviews were done in Turkish and Arabic language and took place in community gatherings, with an English interpreter present. The interviews were convened to generate three outputs: a comprehensive list of factors which influencing housing choice, limitations or constrains faced in housing choice and the importance of having mixed neighbourhoods.

3.3. Data Validation

Before using the two primary data sets for this study, postcodes map and attribute data in six digit postcodes are validated both files using ArcGIS tools (see Annex 4). The postcode map for 2009 consists of 4083 postcodes. The attribute data has 3948 postcodes but does not contain postcodes with zero inhabitants. In matching the two files, fifteen new postcodes in the attribute data were identified - with a total of 357 inhabitants - not yet in the postcode map. The total population figure of Enschede is used for validation. To add these postcodes to the map, a cross check was needed to identify the location of new postcodes. Using Google Earth, the new postcodes were identified by overlapping with existing postcode. To validate the findings, several ground checks were done. For seven new postcodes at Sleutelkamp new shape postcode are created in the postcode map (see Annex 5). Due to time limitation, the other eight new postcodes were only merged with existing postcodes. One postcode was merged with a postcode which had zero inhabitants.

Because residential segregation is conceptualized as certain ethnic groups inhabiting a certain area for a long time (see section 2.1), university students need to be excluded from the measurement. Students tend to occupy rooms for a fixed period of time and their place sometimes has been chosen by others. Therefore, rooms type for students were identified by combined analysis of the number of rooms per postcode and the proximity to higher education institutes. The average number of rooms is 0.77 per postcode but the maximum number is 160 rooms. It turned out, that 11 postcodes with the highest number of rooms (more than 65 rooms per postcode) are located around University of Twente and Saxion. In line with the definition of rooms, it means that within those postcodes there are many students living. And within those postcodes, the ownership of unit is public renting with correlation index 0.5. At city level, however there is no significant correlation between room and public renting (Spearman's index=0.1). The 11 postcode areas identified as student neighbourhoods were excluded from the study by changing the number of inhabitants to zero. This made that the total number of postcodes used for segregation measurement is 4090 with a total population of 154069 inhabitants.

To spatially analyse ethnic population in 1997, ethnic population data from 1997 was joined with a postcode map from 2000 (see Annex 6). Firstly, the 1997 database file was joined with the 2000 postcode map to identify missing postcodes in the map. 73 postcodes were found to be missing postcodes in the maps, which is less than the result of joining the 2000 database file with the 2000postcode map (yielding 109 missing postcodes). Because it was impossible to do a ground check, those 73 postcodes were excluded. The resulting join of ethnic population 1997 and postcode map 2000 consists of 3920 postcodes and a total population 147343.

3.4. Methods

In order to achieve the research objectives and to answer the research questions, several methods and data were used (Table 3-1). The methodology is divided into three main parts: literature review, segregation indices generation and statistical analysis. To support the literature review, interviews with researchers and

officers were conducted to gather input that matches the local context. Segregation indices were calculated at city and disaggregated level (see section 2.5). Statistical analysis supports the description of residential characteristics. Some characteristics need specific analysis through calculation of a diversity index, which is explained in next section.

Table 3-1: Methods

Research questions	Required Data	Analysis	Methods
1.1 To what extent do housing characteristics conceptualize residential segregation?	Literature	Qualitative	Literature review Interview
1.2 To what extent does ethnic distribution conceptualize residential segregation?	Literature	Qualitative	Literature review Interview
2.1 Which ethnic group is most segregated at city level?	Census Data	Ethnic distribution/evenness	Spatial Dissimilarity Index
2.2 Where are the concentration areas of each ethnic group located?	Census Data	Ethnic concentration	Proportion of composite population Binomial Standard Deviation
2.3 How are these concentration areas affected from different scales?	Census data	Comparing maps at different scale Number of overrepresented areas	Descriptive
3.1 Which housing characteristics are related to residential segregation?	Census data	Inductive Identifying ethnic mix Identifying difference between housing characteristic at segregated areas and entire city	Identifying factors from literature review and interview Diversity Index Cross tabulation
3.2 Which socioeconomic characteristics are related to residential segregation?	Census data	Inductive Identifying housing mix Identifying difference between socioeconomic characteristic at segregated areas and entire city	Identifying factors from literature review and interview Diversity Index Cross tabulation
4.1 Is there any change in residential segregation at city level?	Census data	Comparing overrepresented areas over two period of time	Spatial Dissimilarity Index in 1997 and 2009
4.2 Does the change vary at different scale of neighbourhood?	Census data	Comparing overrepresented areas over period of time	Proportion of composite population in 1997 and 2009

3.4.1. Residential Segregation Measurement

Residential segregation measurement in this study is limited to segregation of each ethnic group in relation to indigenous people, in this case native Dutch. There are four ethnic groups which are Turkish, Moroccan, Surinamese/Antilles and Indonesian. Segregation between Turkish and Moroccan, Surinamese/Antilles and Indonesian or other pairs of ethnic groups were not considered in this study.

A. City level

The definition of residential segregation refers to the evenness/clustering dimension (see section 2.4). To measure residential segregation in Enschede, the Index of Dissimilarity in its spatial version (Wong, 1993) is used. D(s) was calculated using Segregation Analyser developed by Apparicio & Petkevich (2006), a standalone application to calculate 42 segregation indices. Segregation Analyser was developed at the Spatial Analysis and Regional Economics Laboratory (SAREL) of the University of Quebec, Canada.

D(s) is calculated using the population at adjacent postcodes and the shape of adjacent postcodes as parameters. It shows that the more compact the ethnic clusters are, the more the more segregated the city is. The value of index is between 1 (complete segregation) and 0 (no segregation) at the city level (see section 2.5.1).

B. Postcode Level

In order to be able to compare the concentration of different ethnic groups, a relative measure was used to judge whether a category is overrepresented in a postcode area compared to the whole city. Overrepresented areas are those where the percentages of a certain ethnic group (e.g. Turkish) in that postcode is over 2 standard deviations above the city average (Deurloo & Musterd, 2001). The binomial standard deviation was used, because applied to events with two outcomes (i.e. native Dutch and certain ethnic group). For example, the average Turkish population per postcode in Enschede is 2.3 persons. As 7.51% of the Enschede population was of Turkish origin and 92.49% was of native Dutch, using the binomial standard deviation, I calculated:

$\sqrt{(p*q)/n} = \sqrt{(7.51*92.49)/2.3} = 17.37\%$

Therefore, an area with overrepresentation of Turkish is an area with a percentage of Turkish per postcode of 7.51 + 2(17.37) = 42.26 % or more. This means that every area which has Turkish composition of more than six times of city average is overrepresented of Turkish. An area with a percentage between zero and 7.51 is considered as underrepresented area while a percentage of zero is considered to be a non representation of Turkish. Classification is based on ethnic composition relative to city average. It is divided into five categories (modified from Deurloo & Musterd, 2001):

- No represented area (value 0);
- Underrepresented area (>0 and city average);
- Represented area (>=city average and <city average +1 standard deviation);
- More represented area (>=city average +1 standard deviation and <city average +2 standard deviations).
- Overrepresented area (>=city average +2 standard deviations).

As non-spatial indices have several drawbacks (see section 2.5), ethnic concentration using composite population is used. Composite population allows calculating neighbours outside unit boundaries. It defines an overrepresented area is not treated as each postcode area independently, thus indicating single-unit concentration but indicates a concentration of ethnic within definable neighbourhood. To compute population in the neighbourhood, each centroid of postcode is measured the distance to nearby centroid of postcode within the specific airline distance. Figure 3-2 shows neighbouring postcodes whose composition is being included in measuring composite population within a radius of 200 meters. If the composite proportion is relatively similar in composition to the city average, that area is not overrepresented; conversely, if there is considerable deviation from the overall proportion (more than two

standard deviations), the area is considered overrepresented. An example: a postcode has 55 Turkish and 5 Dutch; its radial vicinity (within 200 meters radius from centroid to neighbour's centroid) has 30 Turkish and 10 Dutch. Then the composite proportion of the postcode is 55+30 (total Turkish) divided by 60+40 (total population), equalling 0.85. If the binomial standard deviation is 0.05 and the city average is 0.0751 then the postcode is overrepresentation of Turkish. This means that Turkish members in that postcode area are part of a Turkish concentration within 200 meter from their residence.

Moreover, composite population helps overcome the problem of two or more postcodes in one building block. Using the proportion per postcode there is possibility that an overrepresentation postcode will be adjacent with average representation where both of them is in the same building block. For example in Figure 3-3, a building in Boulevard 1945 has 4 postcodes. It will not make sense if one of them is overrepresented while others are not because they are in the same building. Using composite population, this problem is overcome because all residents in the building are counted as one neighbourhood.

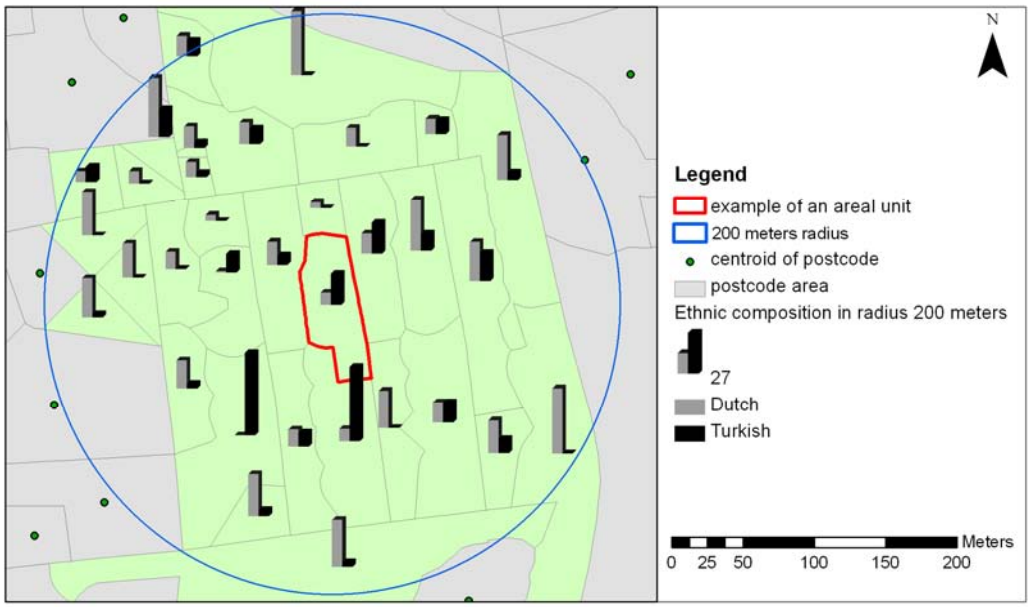


Figure 3-2: Composite Population at 200 meters scale

Figure 3-3: Four Postcodes in One Building

Felman et.al. (1997), explained that social interaction is a function of distance decay where there are differences of distance based on with whom interaction occurs. According to them, social interaction with neighbours is experiencing distance decay until 4000 meters (2.5 miles). Distance decay is applied for weighting the ethnic composition. The distance decay function shows the influence of neighbourhoods since the population at nearby locations will contribute more to the concentration of ethnic groups than will more distant locations (Figure 3-4).

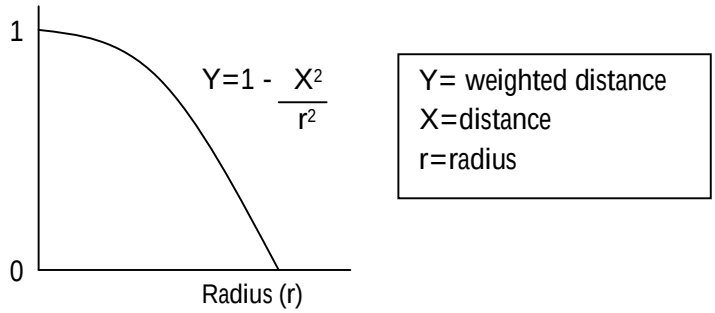


Figure 3-4: Weighted Distance Decay

Therefore, scale of neighbourhood is defined as the proximity from a postcode to neighbouring postcodes which represents the influence of population in neighbouring postcode into concentration of certain ethnic group in its area. To see the effect of segregation in different scale of neighbourhood, this study uses several radiuses; 0, 200, 400, 600, and 800 meters. Due to the large processing data and long processing time, this research did not compute more than 1000 meters radius. As Feitosa conclude that using different scale, we can identify pattern of segregation (see section 2.5.3).

Overall, to calculate composite population, ArcGIS is used for several steps (see Annex 7). Point distance is used to calculate the distance to neighbours within several radiuses. Weights of the distance were calculated using the distance decay function. Composite population for each postcode was calculated from distance weighted and total population of each neighbour. Having obtained the composite population per postcode, the binomial standard deviation is calculated. The base map for proportion for all scales is showed using the proportion of composite population at each scale.

3.4.2. Identifying Residential Characteristics in Overrepresented Areas

One of the objectives in this study is to identify residential characteristics in overrepresented areas. This section discusses the identification of overrepresented areas that used for identifying residential characteristics, attributes for two types of residential characteristics (housing and socioeconomic attributes), and the method for correlation between residential characteristic and overrepresented area.

This analysis used overrepresented area at 200 meters scale of neighbourhood because it represents that the postcode areas are part of concentration within 200 meters from its postcode. The scale is enough to include adjacent neighbours, because the average radius of postcode areas in Enschede is 100 meters. Secondly, within a 200 meters radius at least one building apartment will be included as one neighbourhood. Thirdly, it was assumed that within 200 meters radius the residential characteristics are homogeneous.

Deurloo & Musterd (2001) compared residential characteristics according to the level of differentiation between the types of area that were distinguished (overrepresentation, no clear overrepresentation and no representation). Using the same concept, I compare differences of residential characteristic in overrepresented area with the entire city. If there is a difference then the characteristic of segregated area exists.

Residential characteristics are divided into two categories: housing and socioeconomic characteristics (Table 3-2). The availability of data allowed me to use three attributes to study the housing characteristics of overrepresented areas. Housing tenure, housing type and housing tenure mix are used because they are related to desegregation policy in the Netherlands (see section 2.6.).

Socioeconomic characteristics include unemployment, number of household members and average duration of stay. Unemployment is used because it is assumed that ethnic minorities have low educational level and a language barrier which make them hard to find jobs. Moreover, there was high unemployment caused by the breakdown of the industrial era in Enschede and in The Netherlands as a whole in 1980, causing Turkish labour migrants to go back to their country of origin (see section 4.1.3).

As stated in earlier, this study only focuses on the segregation of four ethnic groups in relation to native Dutch. Nonetheless, to gain some sense of whether native Dutch-versus-four ethnic groups might be related to non-western ethnic groups, overrepresented areas are correlated with the diversity of non-western groups. Non-western group consists of East-European, Turkish, Moroccan, other Mediterranean, Surinamese/Antilles, Indonesian, and the rest of ethnic group.

Table 3-2: Description and Rational of Residential Characteristics

No	Attribute	Description	Rationale
Housing characteristics			
1	Housing tenure	Percentages of public rented houses, owner occupied houses, privately rented houses	Ethnic minority experiences differences in housing tenure (Kempen & Özüekren, 1998a), moreover public housing is often regarded as a cause of increasing segregation (Musterd & Deurloo, 1997). In this study, excluding cause & effect, housing tenure contributes to observe
2	Housing type	Percentages of row houses, semi-detached, detached houses, flat, rooms, other type of construction and collective houses	Ethnic groups are assumed having different preferences with native Dutch in housing type.
3	Housing mix	Diversity of housing tenure	Tenure diversification as a means to reach the ethnic mix is frequently applied (Musterd & Deurloo, 1997)
Socioeconomic characteristics			
3	Family member	Average number of family in segregated area who has >=6 members	Number of family member of ethnic groups is assumed to be large
4	Social Problem	Average number of report to police related social problem per 100 housing units in the last 12 months in segregated area	Certain ethnic groups are assumed to related with social problem
5	Average duration of stay	Postcodes which has 1) average duration of stay in that area below 10 years, 2) equal to 10 until below 20 years, and 3) equal or above 20 years	It contributes to differentiate area with a lot of first and second generation of immigrants before 1990 (since their housing mobility is very low) and new comers.
6	Unemployment	Percentages of unemployment over population	Language barrier and industrial down crisis are assumed to effect number of unemployment for ethnic groups
7	Ethnic mix	Diversity of non-western group	It was assumed that segregation between ethnic minorities is very low compare to indigenous.

3.4.3. Diversity Index for Housing and Ethnic Mix

This study used housing mix and ethnic mix as residential characteristics to show homogeneity and heterogeneity of housing tenure and non-Western ethnic groups in each postcode. Entropy index was used to represent diversity in each postcode area (Harsman, 2006; Musterd & Deurloo, 1997; Ostendorf, et al., 2001). Diversity index of housing mix was calculated using three type of housing tenure, public rented, owner-occupied and privately rented house. Diversity index of ethnic mix was calculated from non-Western groups because typically ethnic segregation occurs when the appearance is much different. It consists of Turkish, Moroccan, Indonesian, Surinamese/Antilles, other Mediterranean, east Western and other origins. The measure is defined as:

$$H = -\sum_i p_i \ln p_i$$

From this equation, pi is the probability of an observation belonging to category i of X. Because the maximum index is ln p_i then I standardized the H value become 0 to 1. Zero implies absolutely no diversity. Areas are therefore labelled absolutely homogeneous when they have only one type of category. The value 1 stands for absolute diversity; in other words for example there are different housing tenure types exist and they are well represented (the highest mix possible). Based on Ostendorf classification (2001), I classified diversity index into five categories:

- Absolutely homogeneous areas (value 0.00), just one type presents;
- Homogeneous (0.01-0.25);
- Average homogeneous (0.25-0.50);
- Average heterogeneous (0.50-0.75); and
- Heterogeneous (0.75-1.00), highly mixed areas.

3.5. Case Study of Enschede

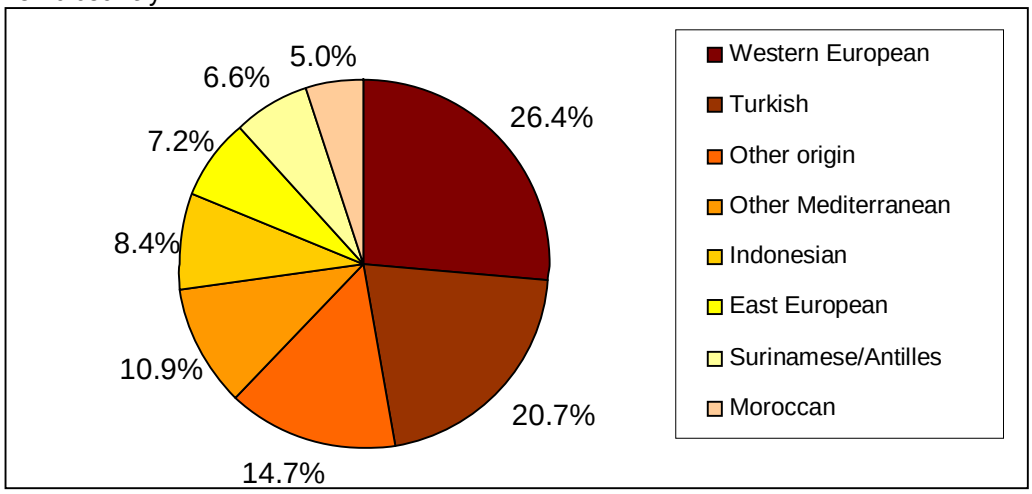
Enschede is a medium size city compared to 49 other municipalities in the Netherlands (Marlet & Woerkens, 2006). In 2009 the population reached 156089 people according to data from enschede.buurtmonitor.nl. With a total area of 142.76 km^2, the density is 1093 person per square kilometre. Enschede is located in the east of The Netherlands, near the border with Germany. This subsection describes the ethnic composition at city level, the economic position of Enschede at the national level, and Enschede's urban growth.

3.5.1. Ethnic Composition

Enschede is a multiethnic city with 7 differentiations (according to data from Enschede.buurtmonitor.nl), Dutch, West European, East European, Mediterranean (including Turkish, Moroccan and other Mediterranean), Suriname and Antillean, Indonesian and other origin. Enschede is the 16th highest municipality for percentages of non-Dutch origin population (Marlet & Woerkens, 2006). In 2009 the total percentage of non-Dutch origin was 28%. The highest ethnic origin is West European (Figure 3-5). Many people came as migrant labour for textile industry in the beginning of 19th century as textile production in Enschede became an export hit. Second highest for non-Dutch origin is Turkish. The percentage of Turkish (20.7%) is the highest in the Mediterranean group, more than Moroccan (5%) and other Mediterranean (10.9%). Turkish and Moroccan people came to Enschede as migrant labour in textile and manufacturing industries in late 1960. Indonesian and Surinamese/Antilles each constitute a small proportion of non-Dutch population (less than 10%). This can be explained because Enschede was attractive for labour immigrants but not for immigrants from former Dutch colonies.

Blauw (1991) argued that concentration of Turkish and Moroccan in older industrial cities of The Netherlands such as Enschede happened because of the need for unskilled work. While well-trained native Dutch refused to take the jobs, labour immigrant saw them as opportunities for well-paid jobs that were unavailable in their home countries. They were attracted to Dutch industrial cities such as Enschede, Drenthe and Friesland. Data from cbs.nl shows that they individually came in the late 1960s and early

1970s as labour. In the late 1970s, family reunification or inviting family member to The Netherlands became the major reason of the high growth. But in the 1980s at national level, as it happened at Enschede, many industries collapsed and unemployment began to rise. Later on, labour immigrants stopped coming to The Netherlands. Some who experienced unemployment or retired decided to go back to their home country.



Source: enschede.buurtmonitor.nl
Figure 3-5: Non-Dutch Population 2009

For Surinamese and Indonesian the migration experience is different than Turkish and Moroccans. As their country had been colonized by Dutch for years, after their independence, Dutch gave the choice of Dutch citizenship ("Multicultural Netherlands," 2010). The migration of Indonesians occurred from 1945 to 1964 with the total number of immigrants amassing more than 134000 people. For Surinamese, 40% of their population moved to the Netherlands after 1975.

Between 1997 and 2009, most of the ethnic growth rates in Enschede were higher than the growth rate of the Enschede population as a whole (Table 3-3). Turkish, Moroccan and Surinamese/Antilles have positive growth higher than Dutch growth (0.39%). Even though the number of Indonesians was higher than Moroccan and Surinamese/Antilles, Indonesian experienced negative growth.

The positive growth for Turkish, Moroccan, and Surinamese/Antilles might be due to the natural growth (new born) and migration growth. Data on new born is available per year between 1997 and 2009 from Enschede.buurtmonitor.nl. Using the data, total number of new born is 22696. Therefore, natural growth for Enschede between 1997 and 2009 is 22696/157210 equal to 14.44%. With the assumption that the growth rate for each ethnic group is the same, natural growth is compared to ethnic growth. It showed that natural growth is lower than Turkish, Moroccan and Surinamese/Antilles growth. That means the increasing of those ethnic groups is not only because natural growth but from migration too. Due to data limitation, there is no evidence that the migration come from within or outside the Netherlands.

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Table 3-3: Ethnic Population Changes in Enschede between 1997 and 2009

Ethnic group	1997	2009	Changes
Netherland	111999	112440	0.39%
Western Europe	11733	11538	-1.66%
East Europe	1829	3138	71.57%
Mediterranean	12609	15958	26.56%
Surinamese/Antilles	2404	2900	20.63%
Indonesian	3917	3685	-5.92%
Other	3564	6430	80.42%
Turkish	7373	9052	22.77%
Moroccan	1782	2165	21.49%
Enschede total	157210	167306	6.42%

Source: enschede.buurtmonitor.nl

3.5.2. Economic Status

In 2007, average personal income in Enschede (23600 euro per year) is lower than the average income in The Netherlands (I&O Research 2007). Non-Western groups have lower average personal income (17700 euro per year) than Western European and Dutch. There are 2.9% of non-Western households who have low income. Even though the absolute number of households with low income in the Dutch group is much higher than in non-Western groups, percentages of households with low income within the Dutch group is very low (5.6%). Inversely proportional to Dutch, absolute number of households with low income in non-Western group is lower than Dutch, but percentages of household with low income within non-Western is high (28.9%).

And in line with average income, Enschede has high percentages of unemployment compared to the national percentage. Enschede has the 8th highest unemployment of the 50 municipalities (Marlet & Woerkens, 2006). Percentages of unemployment in productive age (15-64) was 11.7% in 2006 but decreased in 2009 became 7%.

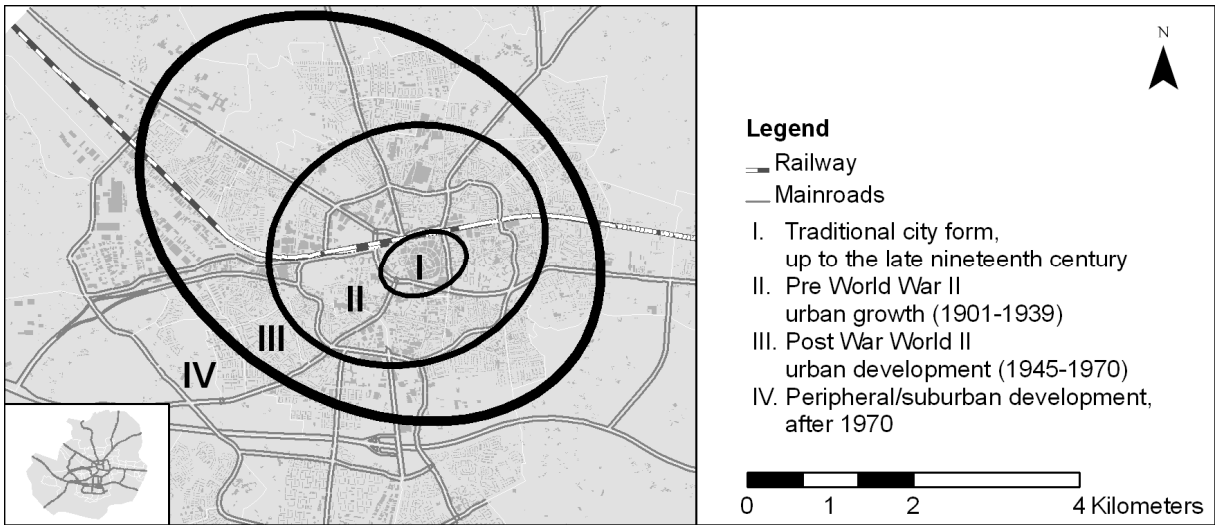
However, overall level of social-economic performance for Enschede is at 48th place at national level (Marlet & Woerkens, 2006). Enschede is lacking behind in income, education, women's participation, employment, and growth sector.

3.5.3. Urban Growth

According to Yücesoy (2006), there are four phases of Enschede urban growth that can be identified since the late nineteenth century to 1970. The first settlement existed around the Old Marketplace in early medieval times (Figure 3-6). It became the city centre of Enschede. When textile and manufacturing industries grew in Enschede, it caused major development around the city centre. Factories were located in or near the city centre and labourers' houses were built near factories. Between 1901 and 1939, The Netherlands introduced Housing Act policies to provide better social housing for labours by incentive to the construction and demolishing derelict buildings in the slum areas. After the World War II, Enschede was destroyed. Early 1950 new residential areas and rows of buildings were built with a mixture of high-rise and medium-rise apartments with single family houses. Those neighbourhoods were located in Deppenbroek, Twekkelerveld and Cromhoffsbleek/Kotman (Figure 3-7). The last period of urban growth is in early 1970 which led to its present-day form. In early phase, housing development mostly was directed towards suburban area in southern part of Enschede e.g. Wesselbrink. Then in 1970 neighbourhoods in northwest and northeast (e.g. Stokhorst) were developed for middle and high income class with a mixture of row houses, semi detached and detached houses. Recently, the city is divided into 9

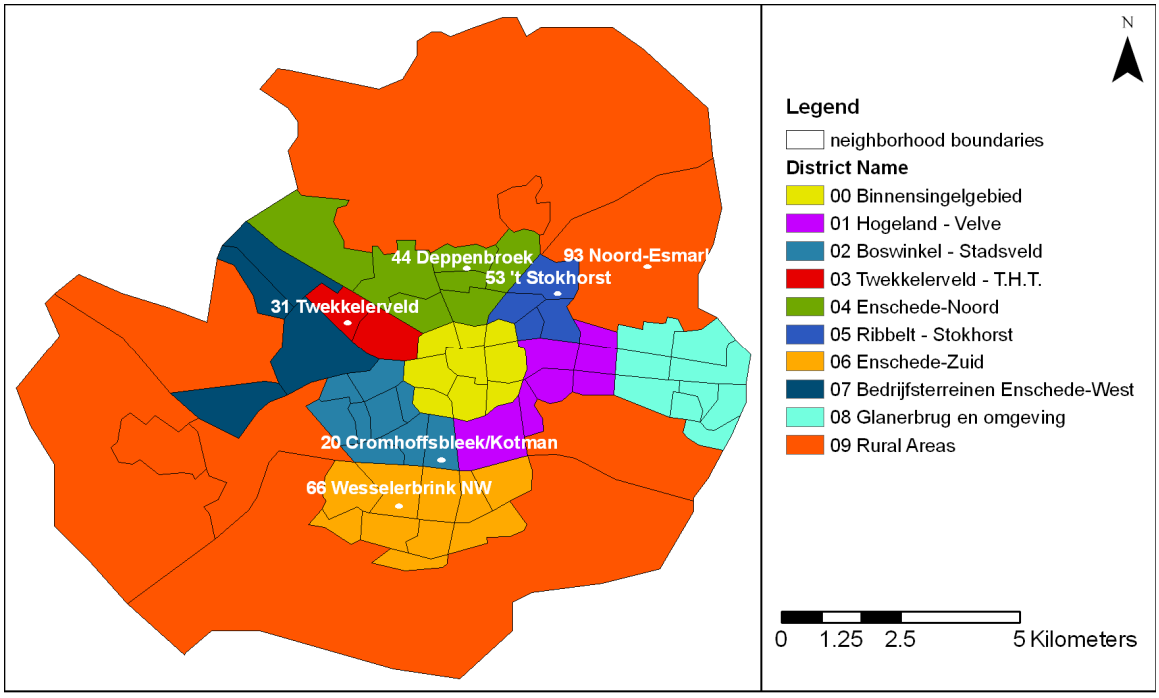
Districts and 70 neighbourhoods (Figure 11) which increased from 68 neighbourhoods in 2001. The city centre is located in Binnensingelgebied district.

The second wave of labour immigrants came from Turkey in the late 1960s and their reunification in late 1980 (after Italian and Spanish in 1950) might have influenced segregation. Turkish immigrants first lived in barracks or dormitories near the factories where they worked. The reunification with their family members coming from Turkey made them move to social housing. They tended to live in post war neighbourhoods which were left by social climbers who moved to newly planned neighbourhoods (Yücesoy, 2006). There are several areas with concentration of Turkish. According to Atlas 2006 for Gemeenten (Marlet & Woerkens, 2006) Enschede has a segregation index smaller than 29 municipalities in The Netherlands. But over the years 1995 to 2005, level of ethnic segregation increased slowly from 0.3 while overall cities in The Netherlands experienced decreasing.



Source: (Yücesoy, 2006)

Figure 3-6: Phases of Enschede Urban Growth



Source: cbs.nl

Figure 3-7: District and Neighbourhood Boundaries 2009

4. RESIDENTIAL SEGREGATION ASSESSMENT

This chapter presents the result of the analysis in four main sections. The first section includes the general characteristics of residential areas in Enschede. Measuring residential segregation is presented in the second section. It consists of level of residential segregation at city level, followed by ethnic concentration at postcode level. Comparison between non spatial and spatial measurement is needed to see how the concentration is effected from different measurement. The third section is further analysis from first and second section showing the results of correlation between residential characteristics and overrepresented areas. The last section contains the changes on segregation at city and postcode level.

4.1. Residential Characteristic in Enschede

In this section, residential characteristic is explored based on data at postcode level and interviews with residents of Turkish and Moroccan origin. This is used to get ideas of residential data collection to running further analysis.

4.1.1. Housing Characteristics

Housing characteristic is differentiated by housing type and housing tenure. Total housing units in Enschede is 76138 units which are distributed at 3930 postcode areas. Housing type consists of 7 types, row houses, semi detached houses (have two units in one roof), detached houses, flat (e.g. duplex or apartment), other type of construction (e.g. recreational houses, trailers), rooms (units within a building or a house which are used for e.g. students) and collective (e.g. nursing homes). High proportions for housing type in years are always on row houses, flat and semi detached house. In 2009, majority of housing type are row houses (35%) followed by flats and semi detached houses (Figure 4-1). High proportions of row houses are distributed near city centre as well as high proportion of flat and semi detached houses (see Annex 8). Inversely, detached houses are predominant in postcodes where located at rural areas. Other type of construction and collective housing unit are distributed randomly across the city. Housing tenure is characteristic of ownership whether the person lived in an owner-occupied house, privately rented house or public corporation rented house. Housing tenure is predominantly owner occupied houses (48%) then followed by public rented houses and privately rented houses (Figure 4-2). Owner occupied housing is distributed at almost entire city while public rented houses are only available in urban areas (see Annex 9).

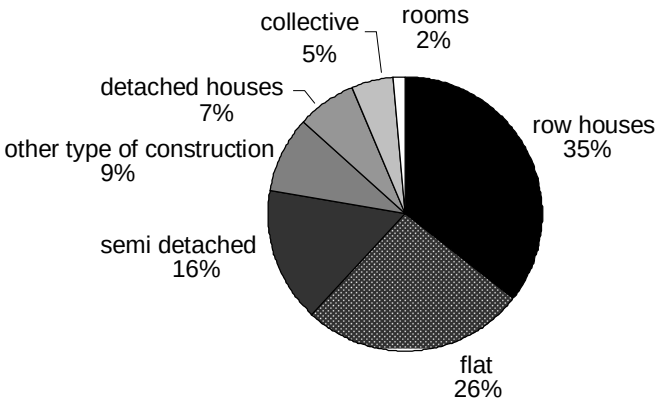


Figure 4-1: Percentages of Housing Type 2009

Using diversity index (see section **Error! Reference source not found.**), housing mix pattern shows distribution of housing tenure per postcode which is quite varied across the city (see Annex 10). There are 44.3% of all postcodes characterized by the fact they consist of just one housing tenure type. These are the most homogeneous areas. Half share of these areas can be found in sparsely populated parts of the city

centre which are characterized by high proportion of public rented houses. Another share of the homogeneous areas can be found at urban fringe which are characterized by owner occupied houses. Areas with highly mixed (heterogeneous) housing tenure are located around only at urban areas.

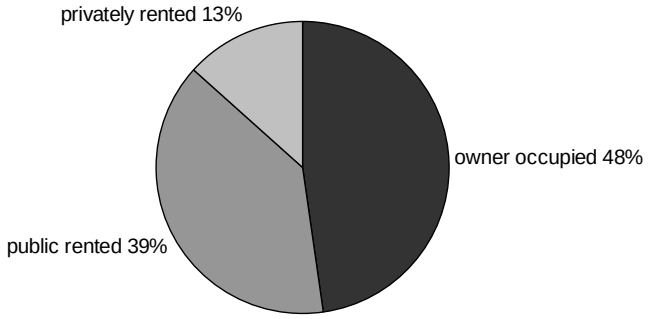


Figure 4-2: Percentages of Housing Tenure 2009

4.1.2. Socioeconomic Characteristics

Table 4-1 shows descriptive statistic for 5 socioeconomic characteristics at postcode level. First, there are 50% of postcodes where its residents have average duration of stay equal or below 10 years. Only 5% of postcodes have average duration more than 20 years with the highest average duration of 66 years. They are located mostly at rural areas. Secondly, average number of household which has equal or more than 6 members is 0.14 households per postcode. The maximum number of households in a postcode which has equal or more than 6 members is only 4 households in a postcode. This shows that there is no spatial concentration of large families in Enschede area. Thirdly, the average of social problem is very low (2.19 reports) and 75% of postcodes have equal or below two reports per 100 housing units. This shows that only few postcodes experienced social problem. The highest social problem is 175 reports per 100 housing unit located at Old Marketplace (city centre). Seventeen postcodes with over 30 social problems are located at city centre. Fourthly, average number of unemployment is two persons per postcodes. There are 25% of postcodes having more than three person's whore are unemployment. The highest number of unemployment is 38 persons. Lastly, average diversity index for non western mix is 0.33 or averagely the postcode is homogeneous.

Table 4-1: Descriptive Statistic for Socioeconomic Characteristics

Descriptive Analysis		Average duration of stay (years)	6Members* (households)	Social problem**	Unemployment	Non Western Mix***
Average		-	.14	2.19	1.90	0.33
Std. Deviation		6	.417	6.04	2.47	.29
Minimum		0	0	.00	0	0
Maximum		66	4	175.00	38	0.97
Percentiles	25	6.5	.00	.00	.00	.00
	50	10	.00	1.00	1.00	.40
	75	14	.00	2.00	3.00	.62

*. 6Members is number of family which has equal or more than 6 members

**. Social problem is number of reports to the police (previous 12 months) related to disputes between neighbours and other conflicts, or environmental nuisance in per 100 housing units.

***. Diversity index of non-western group (Turkish, Moroccan, Indonesian, Surinamese/Antilles, other Mediterranean, east Western and other origins)

Figure 4-3 shows map of non-western diversity index. The grey areas are postcodes with no representation of non western ethnic groups. Overall, non westerns live in 83% postcodes in Enschede. They are distributed scattered across the city. Most of the absolutely homogeneous non western ethnic areas (only one ethnic group from non western group exist) are located at rural areas. The more mixed of non western group the more centralized the distribution into city centre. Area with highly mixed of non western group are distributed in 6% of all postcodes which mostly located in District South Enschede.

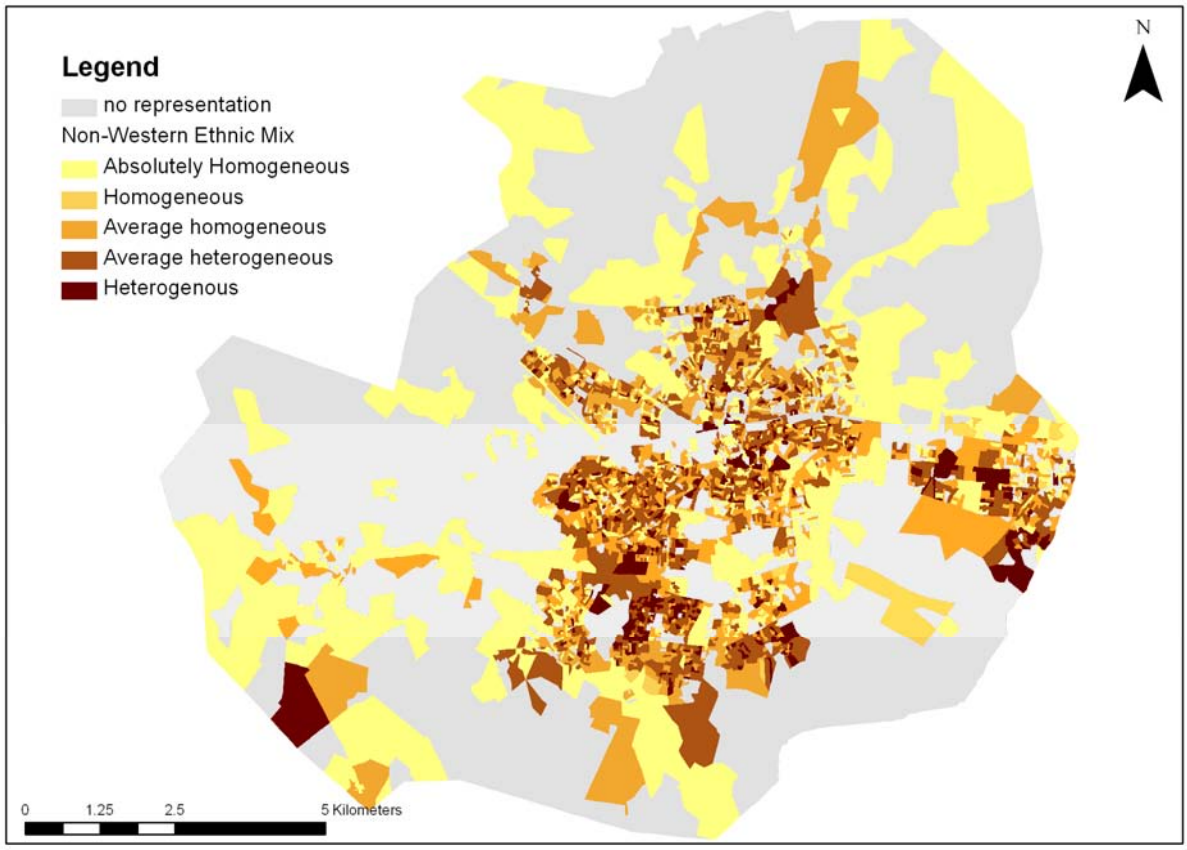


Figure 4-3: Distribution of Non-Western Ethnic mix

4.1.3. Housing and Location Choice

To gain view and experiences of housing and location choice from member of ethnic groups, I conducted group discussion with residents of Turkey and Morocco. There were 6 participants from Turkish origin and 4 participants from Moroccan origin.

Turkey Origin

Moving history

Most of Turkish participants came to the Netherlands between 1970 and 1980. After years, they invited their wife to live in Enschede. They can be recognized as second generation who came to the Netherlands, because they came after their father lived in Enschede as immigrant workers. Both generations, most of them were back to Turkey in the last 80s because of unemployment or retirement. The third generation was usually born in the Netherlands and only a few of them have left their parent's houses to study or work. Turkish participants have moved within Enschede more than two times because of the increase in the number of family members. Most of them have 5 family members. Even though their children had moved out from their house they tend not to move to smaller housing unit. It is because they become attached to the neighbourhood in which they live.

Neighbourhood Choice

They agreed that distance to workplace and area with low social problem did not include in their consideration to choose a neighbourhood. It is because Enschede is not too large and has low social problem in city level (12 cases per 100 houses). With existing bus network, as long as live near bus stop people can travel within city easily. Moreover, Turkish shops in Enschede are quite a lot compare to other ethnic shops. For participant with children, they think that distance between houses to school is important to consider. Distance to same origin is part of consideration for some of Turkish participants. It is because more comfortable living with same origin.

Housing Choice

In choosing house, they preferred rent houses because of the lower price than buying house especially with subsidy scheme from municipality. But they did not consider type of housing (row houses, flat or detached houses) and building age. The important thing is the size of house including number of rooms.

Morocco Origin

Moving History

There are different reasons for Moroccan participants to come to Enschede. All participants are women who came because of reuniting with their husbands. Their husbands worked at the textile industry and other years before they came. They have lived more than 14 years and had moved minimum one times from first house to current house. It is because they did not choose their first house and then after one year they looked for better house.

Neighbourhood choice

Some of them it was not important to be near with same origin because they prefer to have a quiet and calm neighbourhood. The previous experience living in near city centre showed that noise was disturbing them. Therefore, other aspects such as distance to school; distance to workplace, and other neighbourhood characteristic became less important.

Housing choice

Compare to neighbourhood characteristic, Moroccan participants prefers housing characteristic to be consider in their moving plan. They looked for larger room from their children with garden and nice design. Nice design led them to consider building age which they prefer new construction. Some of them considered to own the house because they are able to pay higher than monthly payment for rent houses.

From this qualitative analysis and small interviews done, their housing and location choice can be summarized. Mostly they arrived at location where their ethnic community already existed or wherever housing unit was available. They looked for better housing and location within more than a year. They didn't face any problem in searching for new houses. It is because no policies discriminate them to choose specific house or location.

Their recent housing locations are reflected on the phase of Enschede urban growth (see section 3.5.3). All Turkish participants are located at areas which were built in early 1950s while two of four Moroccan participants are located at areas which were built in early 1970 (see Annex 11). They like to live in mix neighbourhood and did not have problem with other ethnic origin and Dutch as majority population.

4.2. Measuring Residential Segregation

In this section, residential segregation is measured at city and postcode level for each ethnic group in relation to native Dutch. At city level, it showed degree of residential segregation. At postcode level, ethnic concentration was assessed to identify areas which have overrepresentation of ethnic groups compared to city average.

4.2.1. Residential Segregation at City Level

To measure distribution of ethnic groups across the region, spatial Dissimilarity Index D(s) was calculated (see section 2.5.1). The highest degree of residential segregation is for Moroccan, followed by Surinamese/Antilles, Turkish and Indonesian. Moroccan has residential segregation index of 0.84 which means they are clustered and not distributed across the city.

To support this index, spatial distribution of ethnic proportion per postcode was shown in Figure 4-4. From the map, group of areas with overrepresentation of Moroccan (>=city average +2 standard deviations) indicate there is clustering of Moroccan in Enschede. Moreover, Moroccans are primarily distributed around city centre where in rural areas there is no representation of Moroccan (proportion=0). It caused Moroccan to have higher level of residential segregation compared to Indonesian. Indonesians were more distributed well across the city. Surinamese/Antilles has similar degree of residential segregation to Turkish. However Turkish has lower degree of residential segregation compare to Surinamese/Antilles. But if we looked at distribution map for proportion Surinamese/Antilles is more distributed to urban fringe, while Turkish is distributed around city centre. Moreover there are many areas which have overrepresentation of Turkish rather than areas which have overrepresentation of Surinamese/Antilles. These showed that degree of segregation at city level still could not summarize the variability of ethnic distribution.

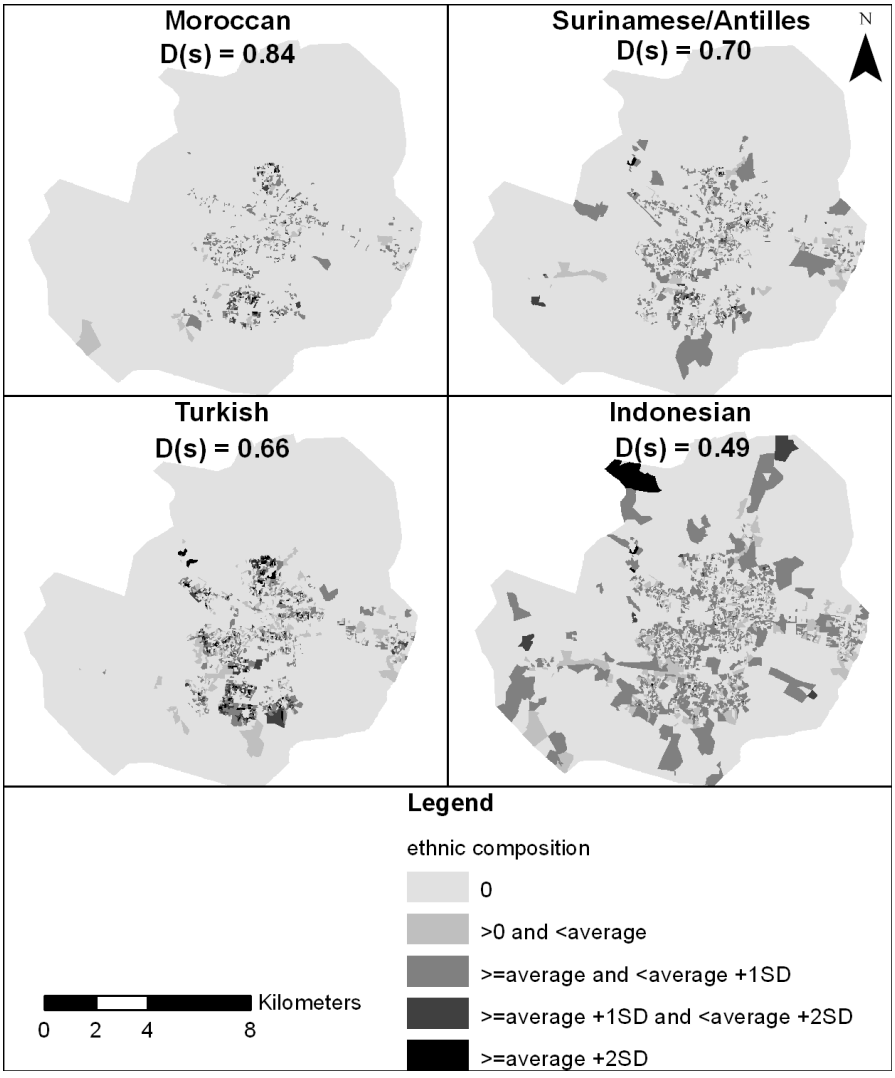


Figure 4-4: Level of Residential Segregation D(s) and Ethnic Composition

4.2.2. Residential Segregation at Postcode Level

As measurement at city level could not capture variability of ethnic distribution within the city, residential segregation at postcode level is measured using modifiable of ethnic concentration based on composite population (see 3.4.1). In this section, residential segregation pattern for four ethnic groups. To see the variability of residential segregation, at each postcode, ethnic population is calculated at different scale of neighbourhood. Explanations of how changes at different scale affected ethnic concentration is describes in the first section. Next sections are the result of residential segregation at postcode level for Turkish, Moroccan, and Surinamese/Antilles and Indonesian group.

4.2.2.1. Changes at Different Scale of Neighbourhood

In this section the effect of neighbourhood on overrepresented areas is identified. As explained in section 3.4.1, the "scale of neighbourhood" is defined as the proximity from a postcode to neighbouring postcodes which represents the influence of population in neighbouring postcode into concentration of certain ethnic group in its area.

Figure 4-5 shows that postcode boundaries are hindering interaction between its residents and neighbours which affected the concentration of certain ethnic group in that postcode area. The figure represents Turkish composition in relation to Dutch population using non spatial and spatial measurement. Non spatial measurement means neighbouring areas are not considered, in the other hand the proximity to neighbouring postcodes is zero meter.

Figure 4-5 (a) shows that non spatial measurement could not reveal areas which are part of a concentration of certain ethnic group in their neighbourhood. At zero meter scale, postcode 7523SK in Deppenbroek is represented area of Turkish. But at 200 meters scale, the area becomes an overrepresented area because the neighbouring postcodes have more Turkish. It means that Turkish members at 7523SK are part of Turkish concentration in their neighbourhood.

Figure 4-5 (b) shows that spatial measurement at postcode level is able to eliminate a postcode which has overrepresentation of certain ethnic group. It seems that postcode 7531CR at Ribbelt-Ribbelerbrink has an overrepresentation of Turkish but overrepresentation is bounded only within its postcode areas. When population at neighbouring postcodes (which is less Turkish and more Dutch) is considered, the percentage of Turkish becomes lower (underrepresentation of Turkish). Therefore, measuring concentration within neighbourhood area is better than measuring only within its postcode because neighbourhood area reflects social environment without bounded by administrative unit (i.e. postcode).

Looking at neighbourhood areas, different scales on neighbourhood can be used to represent the influence of neighbouring postcodes. Figure 4-6 shows the effect of conglomeration of Turkish concentration areas at larger scale of neighbourhood. An overrepresented postcode at 200 meter scale of neighbourhood is still overrepresented at 800 meters scale. It means that the postcode area is influenced by ethnic members that are located in more distant location and establish a larger homogeneous ethnicity area. When an overrepresented area becomes non overrepresented area at certain scale then it reaches the maximum scale of concentration. For example, a postcode area is overrepresentation of Turkish at 200 meters scale but becomes non overrepresentation of Turkish at 600 meters. It means that Turkish members who live in that area is only part of Turkish concentration areas up to 600 meters. The smaller the maximum scale of concentration implies the more isolated of Turkish concentration from other Turkish members.

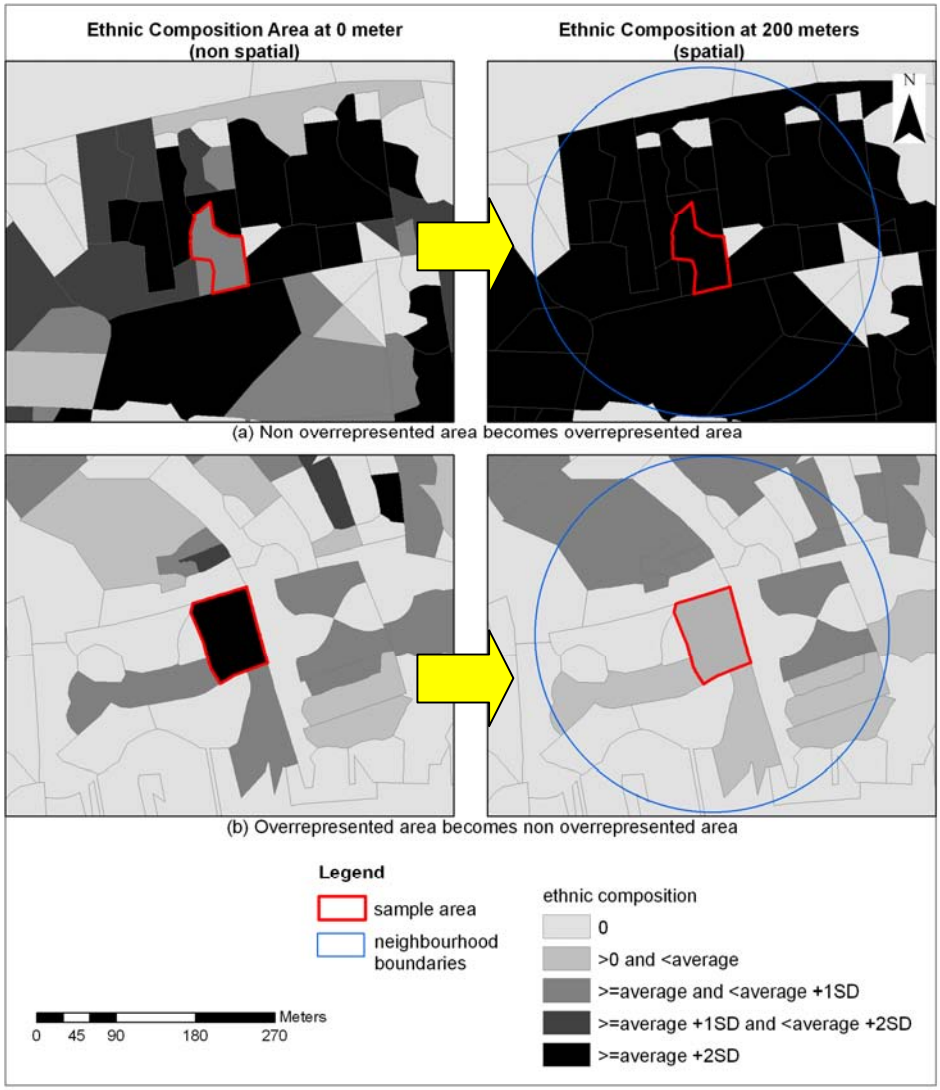


Figure 4-5: Comparison between Non Spatial and Spatial Measurement

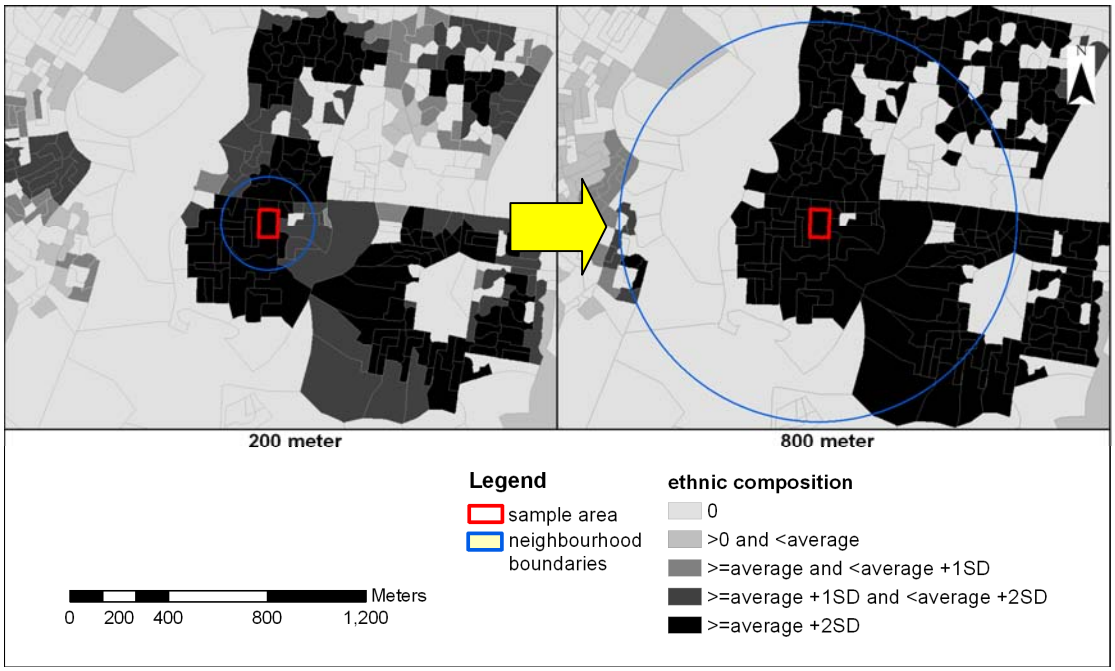


Figure 4-6: Effect Conglomeration at Larger Scale of Neighbourhood

Table 4-2 shows at which scale of neighbourhood certain ethnic group experiences the most concentrated and the maximum scale of concentration. The larger the scale of neighbourhood, number of overrepresented areas becomes higher. But at one scale, the number of overrepresented areas is decreasing and finally becomes no overrepresented area at larger scale. At zero meter scale, there are only 148 postcodes which have overrepresentation of Turkish. As the scale is getting higher, number of overrepresented areas is still getting higher (Table 4-2). It means there is concentration of Turkish up to 800 meters scale of neighbourhood. For Moroccan, maximum scale of concentration is 600 meters but mostly they are concentrated at 400 meters radius. Surinamese/Antilles and Indonesian are still concentrated at 800 meters. Mostly Surinamese/Antilles are concentrated at 600 meters while Indonesians are mostly concentrated at 400 meters. The increasing number of population live in overrepresented areas is not in line with the increasing number of overrepresented areas. It is because ethnic members in overrepresented areas might few but they are part of concentration in their neighbourhood.

However, measuring concentration at different scale is sensitive to the size of administrative units that are used. Size of postcode area in Enschede varies until 3.78 square km with average of 0.04 square km. Most of large postcodes are located at rural areas. Those postcodes become not sensitive from small scale of neighbourhood. For example, postcode 7522PN in Lonneker-West is overrepresentation of Indonesian and remains overrepresentation up to 800 meters scale (Figure 4-7). Using distance decay, neighbouring postcodes are counted only from 800 meters scale. While neighbouring postcodes have number small number of inhabitant and effect of distance decay makes it smaller, it causes the postcode area is still overrepresentation of Indonesian from zero until 800 meters.

Table 4-2: Number of Postcodes and Ethnic Population in Their Overrepresented Areas

Scale	Turkish areas		Moroccan areas		Surinamese / Antilles areas		Indonesian areas	
	Post*	Pop**	Post	Pop	Post	Pop	Post	Pop
0m	148	2242	24	230	16	98	7	48
200m	321	3445	7	74	1	1	10	51
400m	554	4690	13	100	5	36	11	21
600m	595	4885	6	31	8	38	9	22
800m	592	4798	0	0	2	6	8	20

*) number of postcodes which has overrepresentation of certain ethnic group

**) number of ethnic population in overrepresented areas

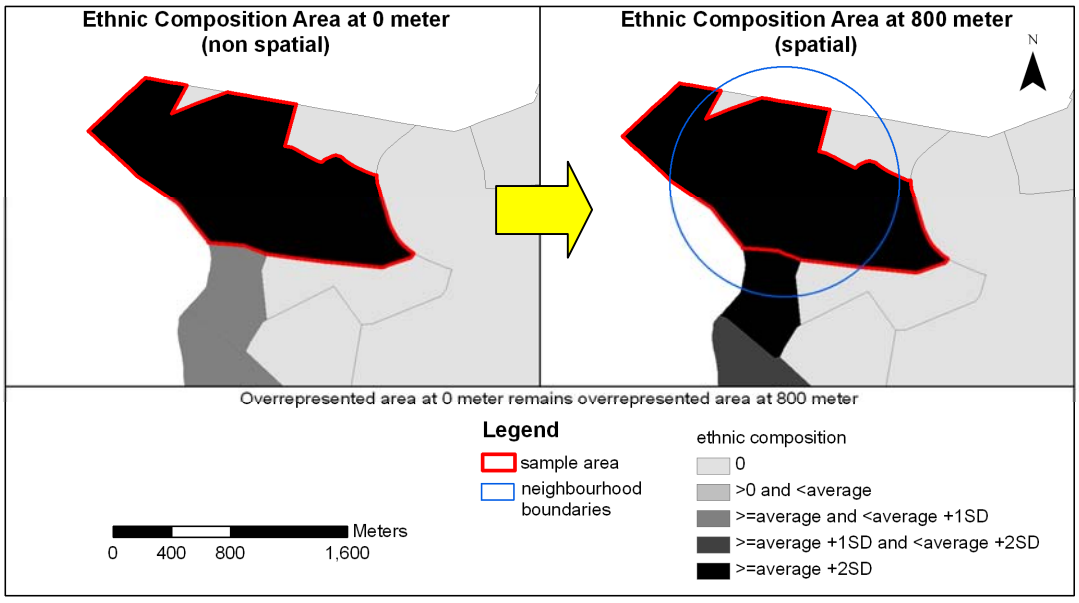


Figure 4-7: Overrepresented Area for Large Postcode Area

4.2.2.2. Overrepresentation of Turkish

Figure 4-8 shows spatial pattern of Turkish composition at different scale of neighbourhood. The city average of Turkish group is 7.15%. Therefore, overrepresented area for Turkish is postcode with Turkish composition over or equal 7.15% plus two standard deviations. Each scale has different standard deviation according to distribution of Turkish composite population (see Annex 12). At 200 meters scale of neighbourhood, Turkish composition for overrepresented area is 20.50% (almost 3 times from city average). At larger scale, overrepresented areas become more occur. It means that in many postcode areas Turkish compositions become higher than city average. Those areas concentrated in southern, western and northern part of Enschede.

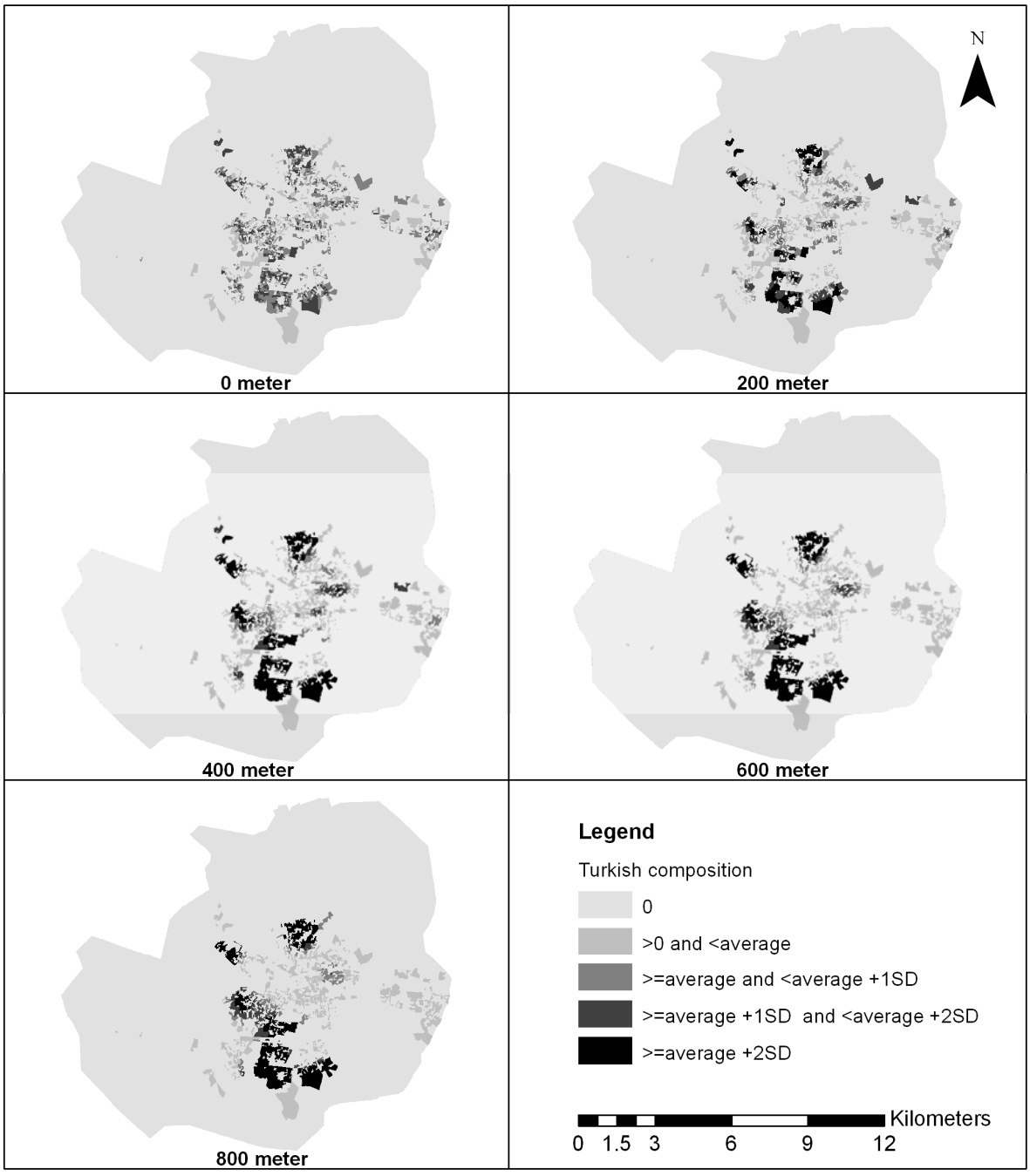


Figure 4-8: Turkish Composition at Different Scale of Neighbourhood

Figure 4-9 shows more clearly the difference between scale of neighbourhood and the changes of segregated area. There are 321 postcode areas which have overrepresentation of Turkish within 200 meters scale of neighbourhood. But only 12 postcode areas reached the maximum scale of Turkish overrepresented areas It is indicated by yellow colour in the map. It means their neighbouring postcodes have high number of Dutch or few Turkish influencing the postcode. However many overrepresented areas still occur as overrepresented areas up to 800 meters scale. There area 53% of Turkish who live in these areas. They live in areas with large concentration of Turkish. These are areas mostly located in neighbourhood Deppenbroek (82 postcodes), Wesselerbrink Zuid-Oost (70 postcodes) and Stroinkslanden-Zuid (66 postcodes).

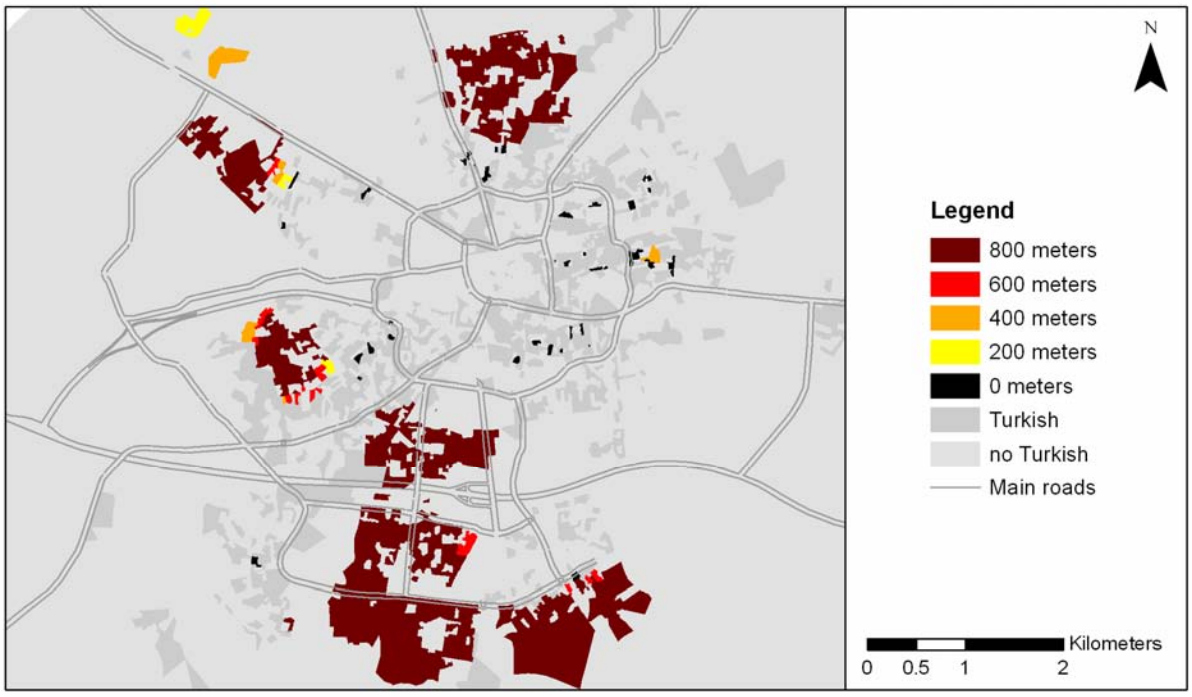


Figure 4-9: Maximum Scale of Turkish Overrepresented Areas

4.2.2.3. Overrepresentation of Moroccan

Figure 4-10 shows that only few Moroccan overrepresented areas occur at different scales. The city average of Moroccan group is 1.91%. Therefore, overrepresented area for Turkish is postcode with Turkish composition over or equal 1.91% plus two standard deviations. Each scale has different standard deviation according to distribution of Moroccan composite population (see Annex 12). At 200 meters scale of neighbourhood, Moroccan composition for overrepresented area is 19.53% (10 times higher than city average).

Figure 4-11 shows that few areas with overrepresentation of Moroccan which located at southern part of Enschede. Moroccans at Wesselerbrink Noord-Oost are only concentrated in a neighbourhood up to 600 meters from their residence. Even though there are still Moroccans in their larger neighbourhood but number of Dutch are getting much higher. It means the maximum scale of Moroccan concentration is at 600 meters. There are only 1.3% of Moroccan population livin in these overrepresented areas.

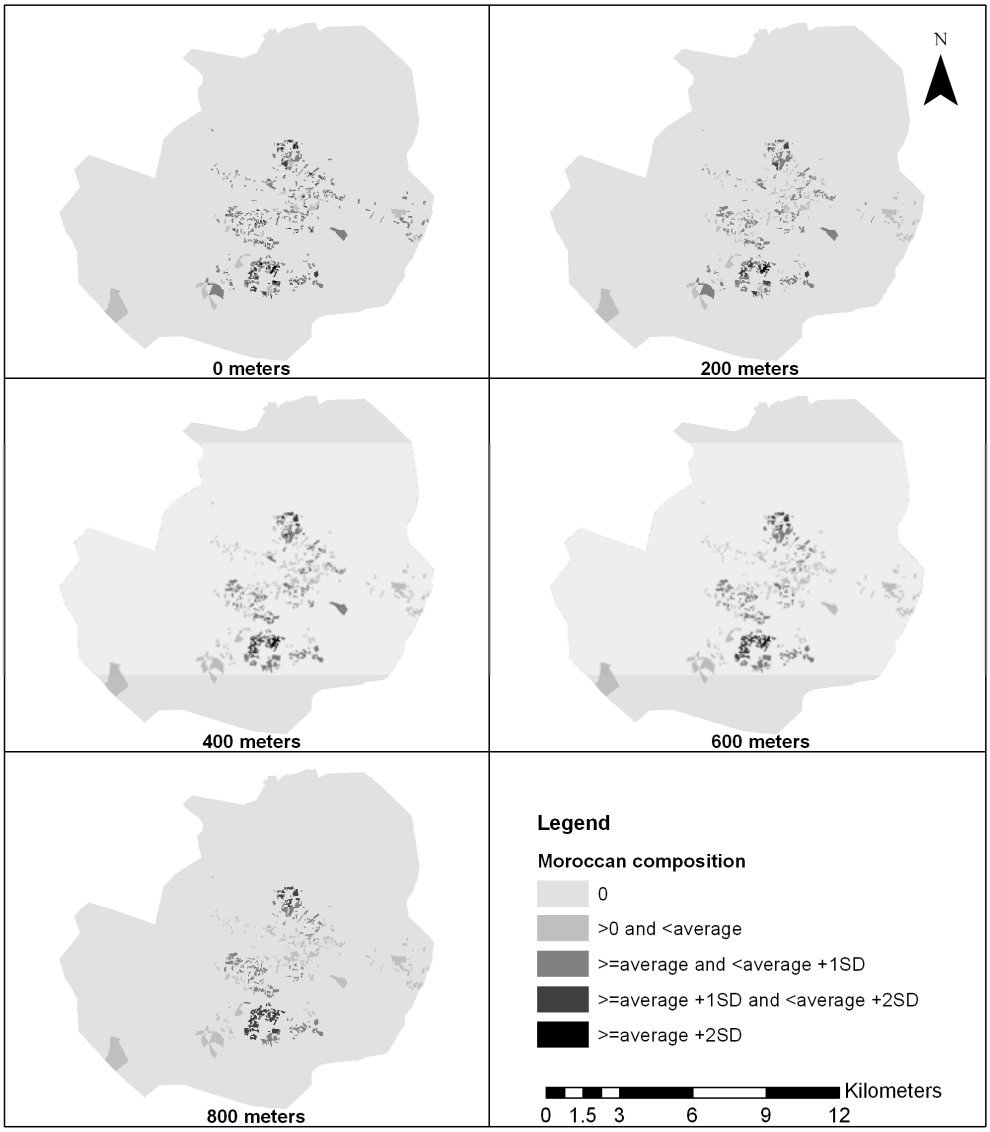


Figure 4-10: Moroccan Composition at Different Scale of Neighbourhood

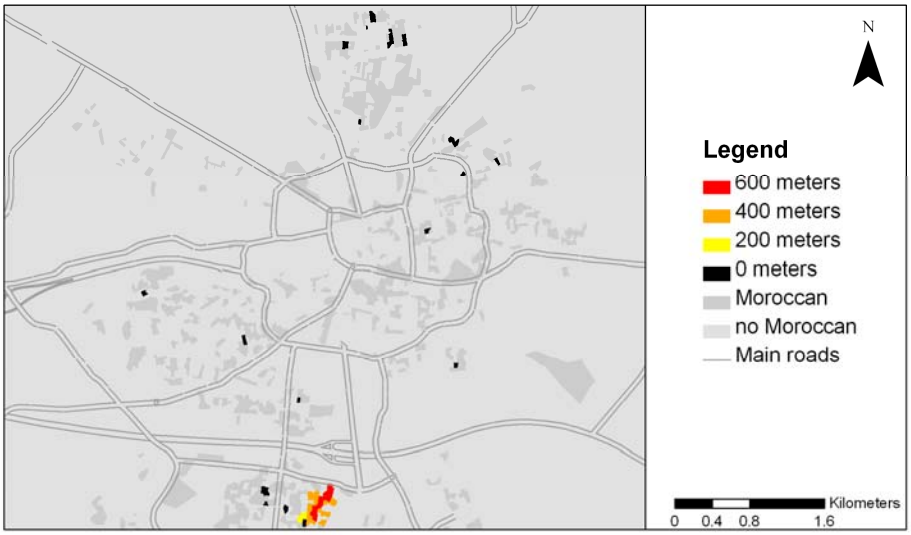


Figure 4-11: Maximum Scale of Moroccan Overrepresented Areas

4.2.2.4. Overrepresentation of Surinamese/Antilles

Figure 4-12 shows spatial pattern of Surinamese/Antilles composition at different scale of neighbourhood. The city average of Surinamese/Antilles group is 2.57%. Most of the areas have Surinamese/Antilles composition not different from than city average. Therefore, overrepresented area for Surinamese/Antilles is postcode with Turkish composition over or equal 2.57% plus two standard deviations. Each scale has different standard deviation according to distribution of Moroccan composite population (see Annex 12). At 200 meters scale of neighbourhood, Surinamese/Antilles composition for overrepresented area is 19.26% (7.5 times from city average). At larger scale, overrepresented areas become more occur at southern part of Enschede. It is because many Surinamese/Antilles members live in the neighbourhood and establish a larger concentration of Surinamese/Antilles. Nevertheless, percentage of Surinamese/Antilles live in those overrepresented areas is lower than 1.35%. One area has the maximum scale of neighbourhood at 200 meters scale (Figure 4-13). It means that the area are concentrated but isolated from other Indonesian member. Another area appears to be overrepresented only at 600 meters scale of neighbourhood. It located at Bruninkslaan/Wesselerwerg. Because of the large size of the postcode (0.7 km^2), population in neighbouring postcodes start to be considered at 400 meters scale.

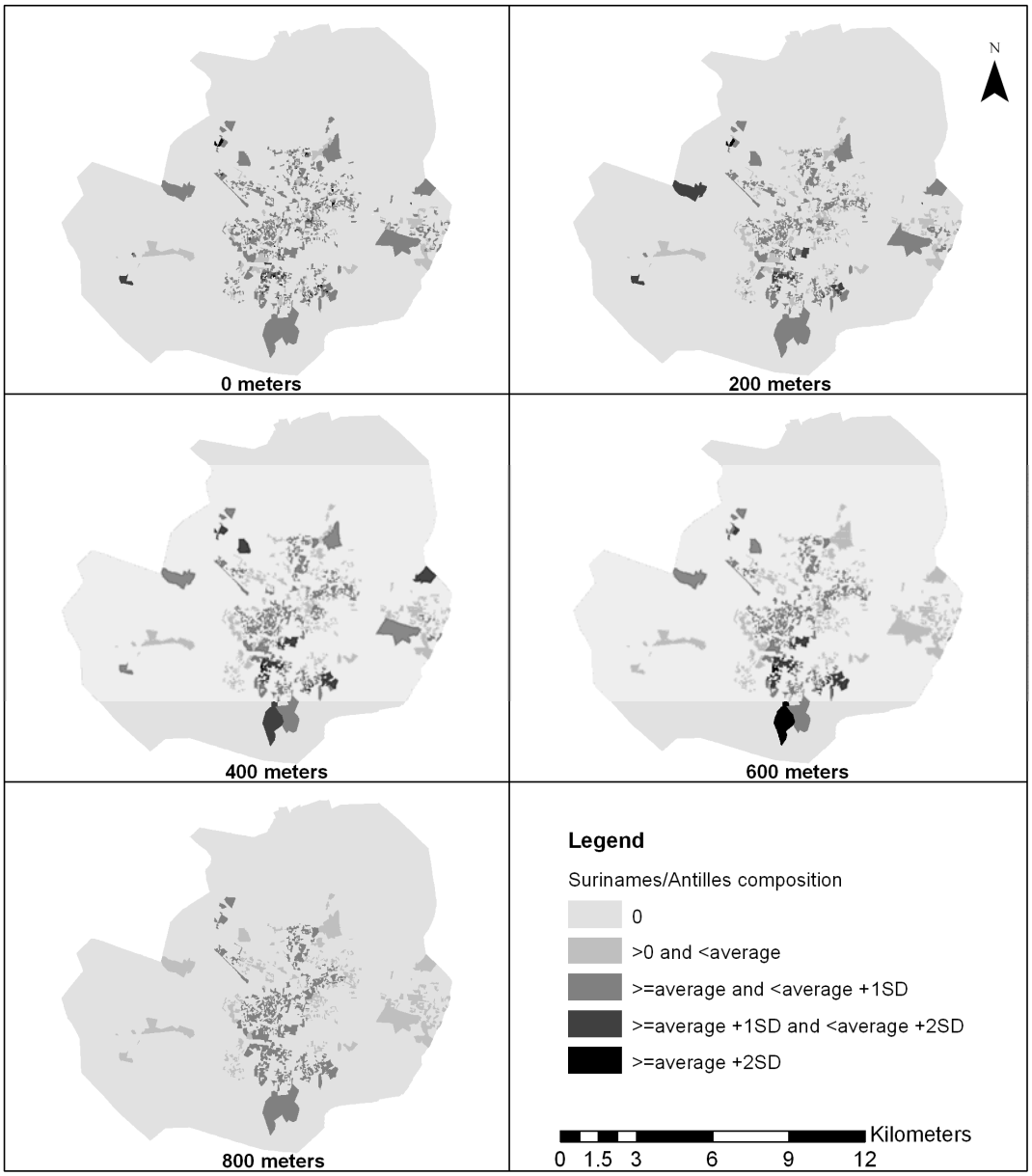


Figure 4-12: Surinamese/Antilles Composition at Different Scale of Neighbourhood

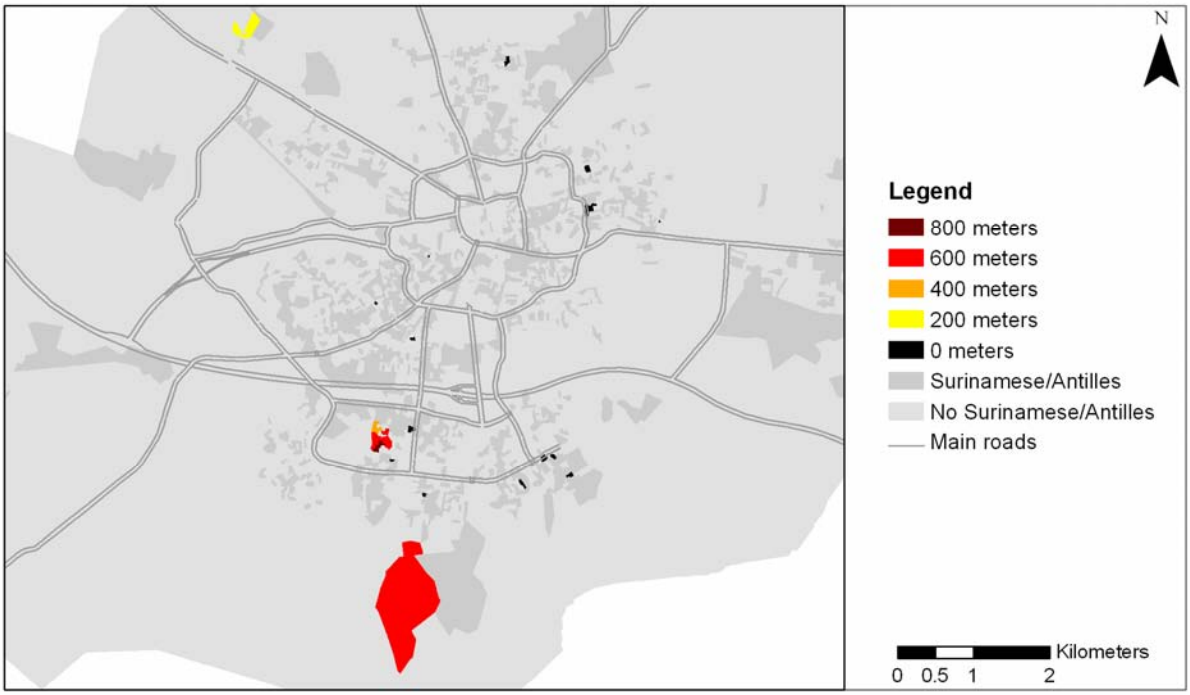


Figure 4-13: Maximum Scale of Surinamese/Antilles Overrepresented Areas

4.2.2.5. Overrepresentation of Indonesian

Figure 4-15 shows Indonesian composition at different scale of neighbourhood. The city average of Indonesian group is 3.17%. Therefore, overrepresented area for Indonesian is a postcode with Indonesian composition over or equal 3.17% plus two standard deviations. Each scale has different standard deviation according to distribution of Indonesian composite population (see Annex 12). At 200 meters scale of neighbourhood, Indonesian composition for overrepresented area is 20.50% (6.5 times from city average). Indonesian compositions at different scale change in urban areas while in rural areas composition slightly changed. In urban areas, many postcodes have underrepresentation of Indonesian at larger scale. This is because the larger the neighbourhood the less number of Indonesian members. However, in rural areas, the overrepresented areas still appeared up to 800 meters scale of neighbourhood. But those areas suffer from insensitivity of large postcode areas (see section 4.2.2.1).

Figure 4-15 shows location of overrepresented areas which reached its maximum scale of neighbourhood for Indonesian group. There are only 10 postcode areas which are concentrated and isolated from many Indonesian members. Most of overrepresented areas reach its maximum scale of neighbourhood at 400 meters. It means that most of Indonesian overrepresented areas are part of concentration within 400 meters scale of neighbourhood. Nevertheless, there is only 0.58% of Indonesian living in those areas. It is because of those overrepresented areas located at rural areas where the density is very low (81 to 2 persons per square km).

4.3. Difference between Residential Characteristic at Overrepresented Area and at City Area

In this section, residential characteristics of overrepresented areas are compared to residential characteristics of entire city according to the level of differentiation. The purpose is to identify residential characteristics which have most characterized postcode areas that have overrepresentation of certain ethnic group. However, those residential characteristics did not reflect residential characteristics of certain ethnic group. Because Surinamese/Antilles and Indonesian have very few overrepresented areas and number of its member living in overrepresented areas, therefore identification of residential characteristics is only applied at Turkish and Moroccan overrepresented areas.

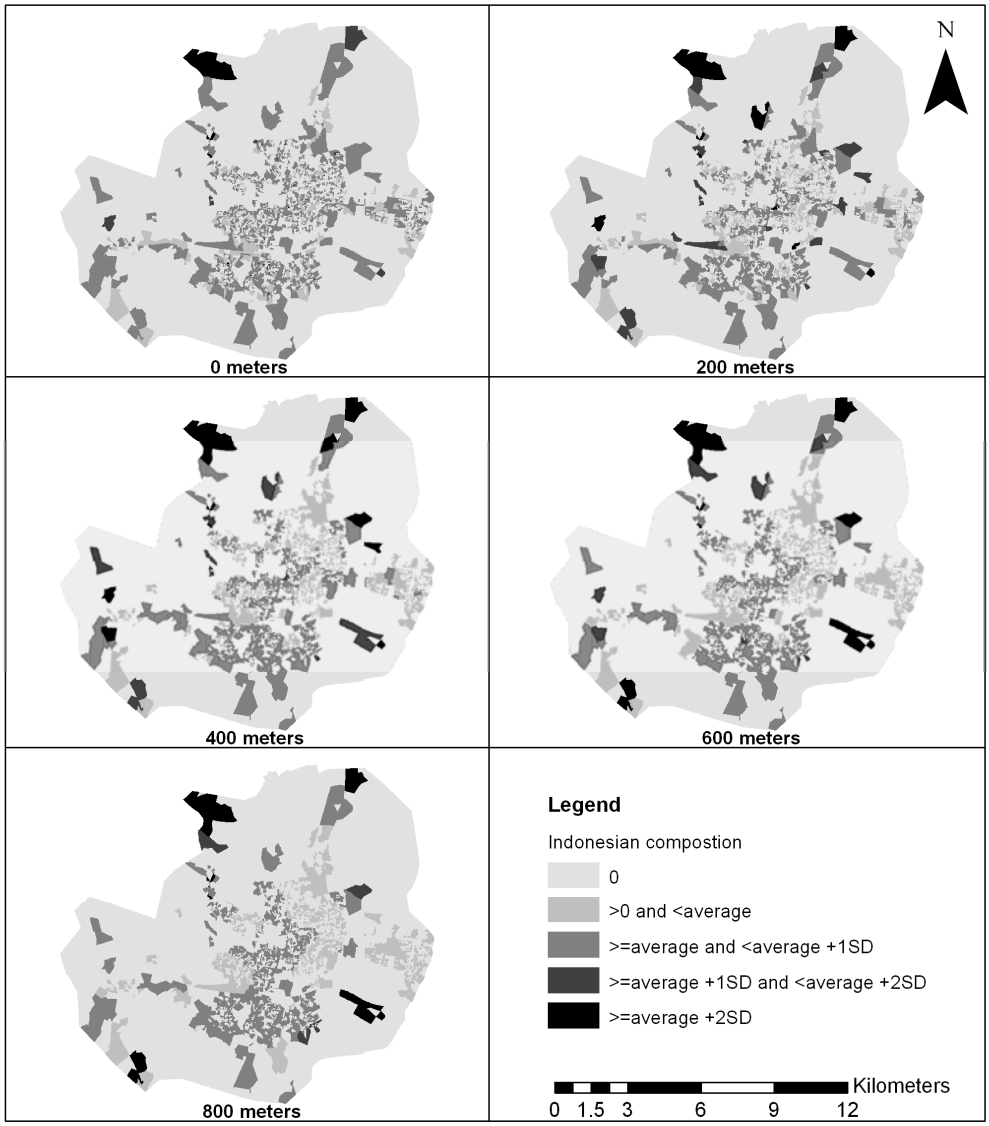


Figure 4-14: Indonesian Composition at Different Scale of Neighbourhood

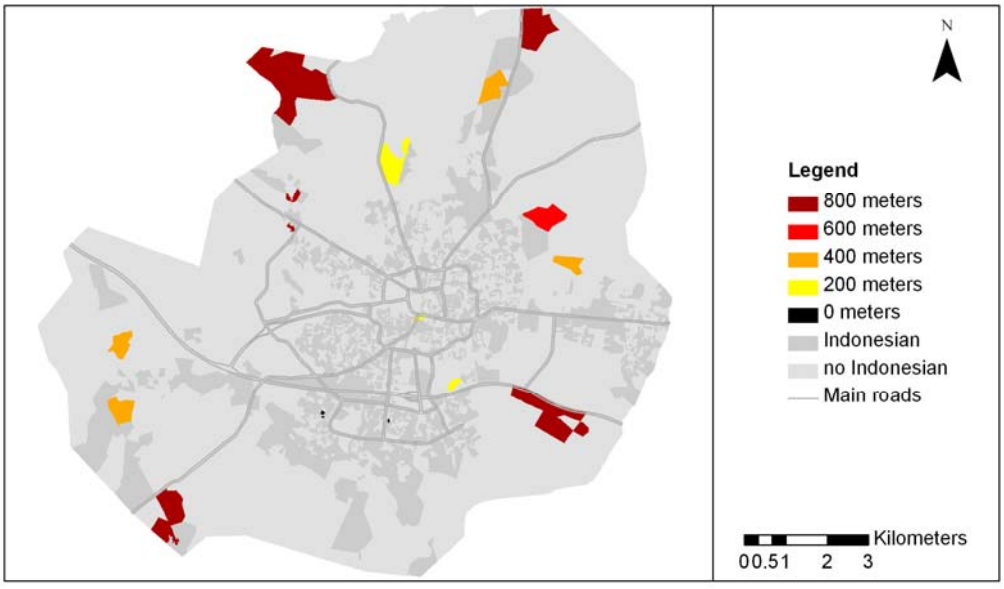


Figure 4-15: Maximum Scale of Indonesian Overrepresented Areas

4.3.1. Housing characteristic of Overrepresented Areas

The housing characteristics of areas which have overrepresentation of Turkish and Moroccan are shown in Table 4-3. It shows Moroccan overrepresented areas have certain housing characteristics (highlighted by grey colour) while Turkish overrepresented areas resemble that of entire city characteristics. For housing tenure, at Turkish and Moroccan overrepresented areas, a relatively large share of public rented house were found compared to entire city. Even though row houses dominate the housing type in Enschede, the percentage is much lower than percentage of row houses at Moroccan overrepresented areas. It means that concentration of Moroccan is characterized by row houses. Another housing characteristic at Moroccan overrepresented areas is less homogeneous in tenure type than entire city.

Table 4-3: Housing Characteristic at Overrepresented Areas

Characteristics	At Turkish overrepresented areas	At Moroccan overrepresented areas	Enschede
Percentage of Housing Tenure			
Owner-occupied	30.3	42.3	47.8
Privately rented	3.3	3.3	13.2
Public rented	66.4	54.5	39.0
Percentage of Housing Type			
Row houses	56.7	100.0	35.5
Semi-detached	2.3	0.0	15.9
Detached houses	0.2	0.0	7.1
Flat	38.7	0.0	26.3
Rooms	0.4	0.0	1.5
Others type	1.7	0.0	8.9
Collective houses	0.0	0.0	4.8
Housing Tenure Mix			
Absolutely homogeneous	43.0	0.0	44.3
Homogeneous	5.0	0.0	10.4
Average homogeneous	15.3	57.1	20.2
Average heterogeneous	33.0	28.6	21.4
Heterogeneous	3.7	14.3	3.7

4.3.2. Socioeconomic characteristic of Overrepresented Areas

Table 4-4 shows that Moroccan overrepresented areas have certain socioeconomic characteristics (highlighted by grey colour) while Turkish overrepresented areas still resemble the characteristic of entire city. Unemployment is characterized Moroccan overrepresented areas where percentage of unemployment in Moroccan overrepresented areas is much higher than entire city. Another socioeconomic characteristic for Moroccan overrepresented areas is most of residents at Moroccan overrepresented areas mostly (90.48%) have lived in those areas less than 10 years. The last socioeconomic characteristic for Moroccan overrepresented areas is the diversity of ethnic non Western living in those areas. It means that areas with an overrepresentation of Moroccans tend to be more heterogeneous according to ethnic non Western mix.

Table 4-4: Socioeconomic Characteristics at Overrepresented Areas

Socioeconomic Characteristics	At Turkish overrepresented area	At Moroccan overrepresented area	Enschede
Average >6 family member per postcode	0.36	0.86	0.14
Average Social Problem per postcode	2.68	2.57	2.20
Percentage of Unemployment	8.69	11.49	4.85
Percentage of Average Length of Resident per postcode			
<10 years	65.1	90.48	50.66
>=10 years and <20 years	34.3	9.52	44.02
>= 20 years	0.6	0.00	5.32
Ethnic Non Western Mix			
Absolutely homogeneous	2.80	0.00	35.93
Homogeneous	3.12	0.00	2.16
Average homogeneous	30.84	0.00	26.84
Average heterogeneous	42.99	71.43	27.61
Heterogeneous	20.25	28.57	7.46

4.4. Comparison on Residential Segregation between Years

In this section, ethnic distributions are compared between 1997 and 2009 for Turkish and Moroccan. The changes are measured at city and postcode level.

4.4.1. Changes on Turkish Distribution

At city level, degree of Turkish residential segregation was reduced from 0.72 to 0.66. It means that Turkish members become more distributed across the city even though city average increased from 6.17% in 1997 to 7.51% in 2009. To support that, Figure 4-16 shows distribution of Turkish which had spread to western and southern part of Enschede. But if we look at the concentration of Turkish, there was an increase in number of areas which have concentration of Turkish. Both explanations imply that the increasing of Turkish population in Enschede was distributed to other part of the city while some of them were concentrated in certain neighbourhoods. It was reflected on the increasing of ethnic members who lived in overrepresented areas. In 1997 there were only 1930 Turkish (26.3%) who lived in overrepresented areas. It increased in 2009 where there was 3330 Turkish (36.9%) who lived in overrepresented areas.

Changes at different scale of neighbourhood show that number of overrepresented areas increased (Figure 4-17). However most of overrepresented areas are still part of Turkish concentration within 600 meters scale of neighbourhood. There were only 468 postcodes areas which were overrepresented in 1997 while in 2009 there were 595 postcode areas. Figure 4-18 displays evidence of increased concentration of Turkish in Enschede at all scales. But we have to be aware that this increasing is not really that high. If we compare number of overrepresented areas to all postcodes in Enschede, there was only 12% in 1997 and 15% in 2009 for 600 meters scale. Another change between 1997 and 2009 is that there were areas which were only overrepresented in 1997 and changed to be non overrepresented areas in 2009. They are scatter within District Boswinkel-Stadsveld. Areas which remain overrepresented in 1997 to 2009 mostly are located at Deppenbroek and Wesselerbrink Noord-West. New overrepresented areas occur in 2009 mostly were located at Stroinkslanden-Zuid and Mekkelholt.

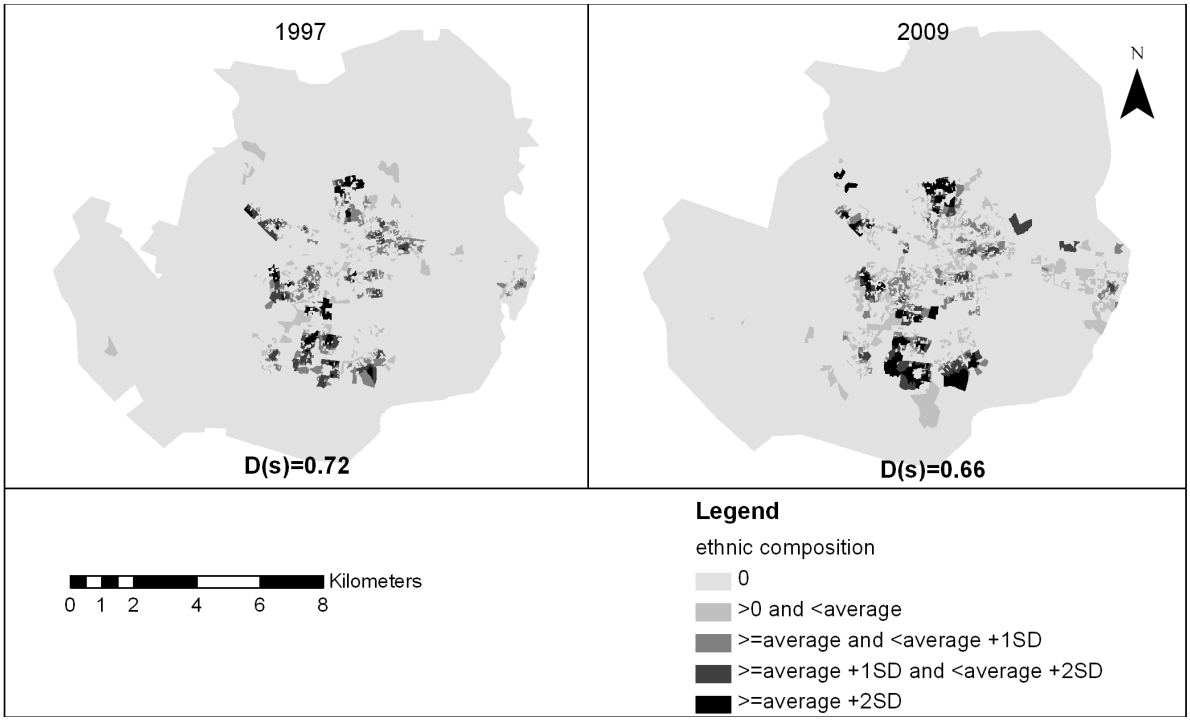


Figure 4-16: Changes on Turkish Distribution 1997 and 2009

There are several areas which had been renovated such as Pathmos and 't Zwering. It might cause changes on ethnic and Dutch population per postcode. According to a key informant[1] , there was a renovation at Pathmos from 2001 to 2007. She added that mostly the new housing tenure changed from public rented to owner occupied houses. Total new housing unit from 1997 at Pathmos is 259 units (I & O Research). Second location, another key informant[2] recognized a renovated area located at 't Zwering. Total new housing unit from 1997 at the area is 191 units (I & O Research). The effect of those new renovated on Turkish residential segregation can be recognized at 600 meters scale of neighbourhood in Figure 4-18. It showed that renovated areas at Pathmos did not affect existing concentration areas nor created new concentration area. Renovation at 't Zwering did not create new concentration area but might have affected ethnic composition at Stadsveld-Zuid where the area become non overrepresented in 2009.

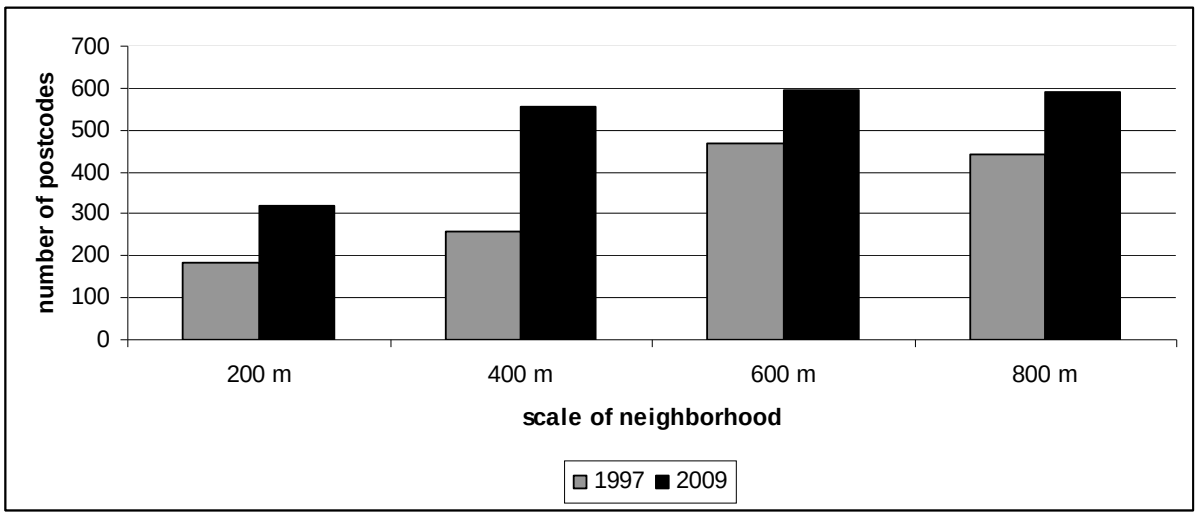


Figure 4-17: Changes on Number of Overrepresented Areas

[1] Feedback discussion with Key Informant from De Woonplaats Housing Corporation, February 2011
[2] Feedback discussion with Key Informant from I & O Research, February 2011

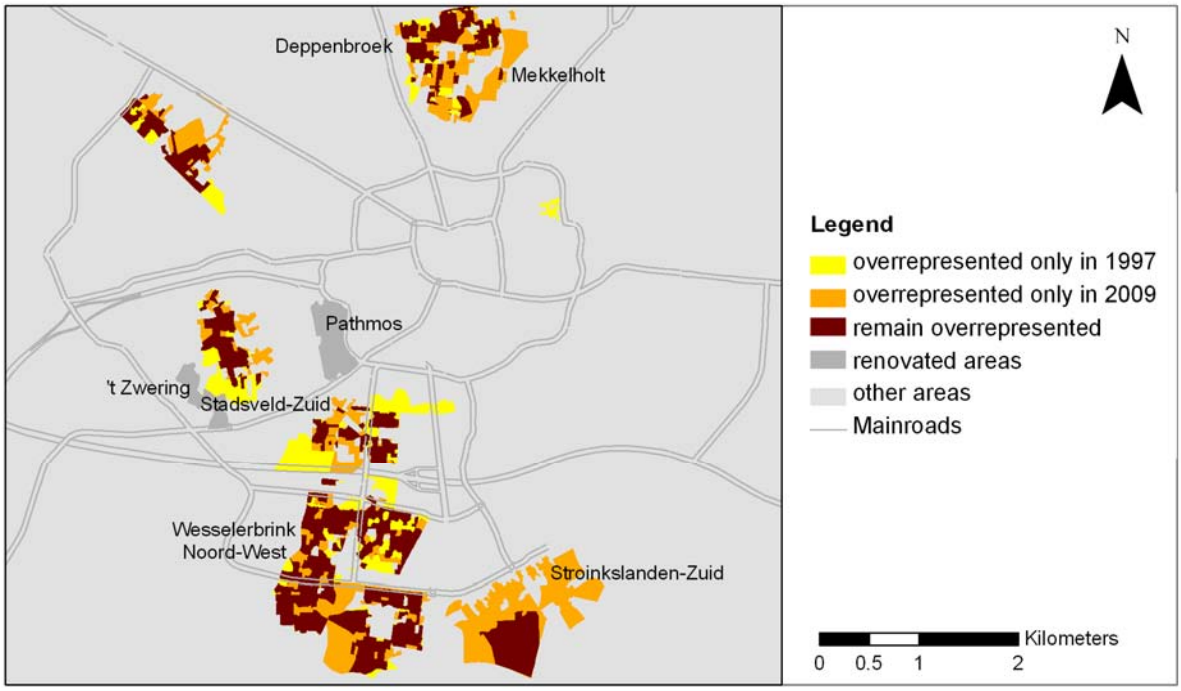


Figure 4-18: Changes on Turkish Concentration Areas between 1997 and 2009 at 600 meters scale

4.4.2. Changes on Moroccan Distribution

Degree of Moroccan residential segregation was decreased slightly from 0.87 to 0.84. It means that differential distribution and clustering between Moroccan and Dutch group in Enschede did not change significantly. In 1997 to 2009, percentage of Moroccan group slightly increased from 1.57% to 1.91%. They become distributed to southern and eastern part of Enschede where in 1997 those areas had no Moroccans (Figure 4-19). However, measuring Moroccan concentration at 200 to 800 scales of neighbourhood shows that there was no overrepresented area (Moroccan composition equal or more than 1.57% plus two standard deviations) in 1997. It means that in 1997 even though Moroccans live at few areas within the city but they were not concentrated in larger neighbourhood. The maximum scale of neighbourhood in 1997 is at 0 meters which means Moroccan overrepresented areas only occurred within their postcode areas (zero scale) in 1997 (see Annex 12).

Therefore, even though Moroccans are still not distributed across the city but they become more concentrated. At zero meter scale, in 1997 there were only 6.88% Moroccan lived in 12 overrepresented areas and in 2009 there were 10.63% Moroccans lived 24 overrepresented areas. The concentration became larger because overrepresented areas only appeared at larger scale in 2009 while in 2009 there is no overrepresented area (Figure 4-20). Those larger concentrations of Moroccans are located in Wesselerbrink Noord-Oost.

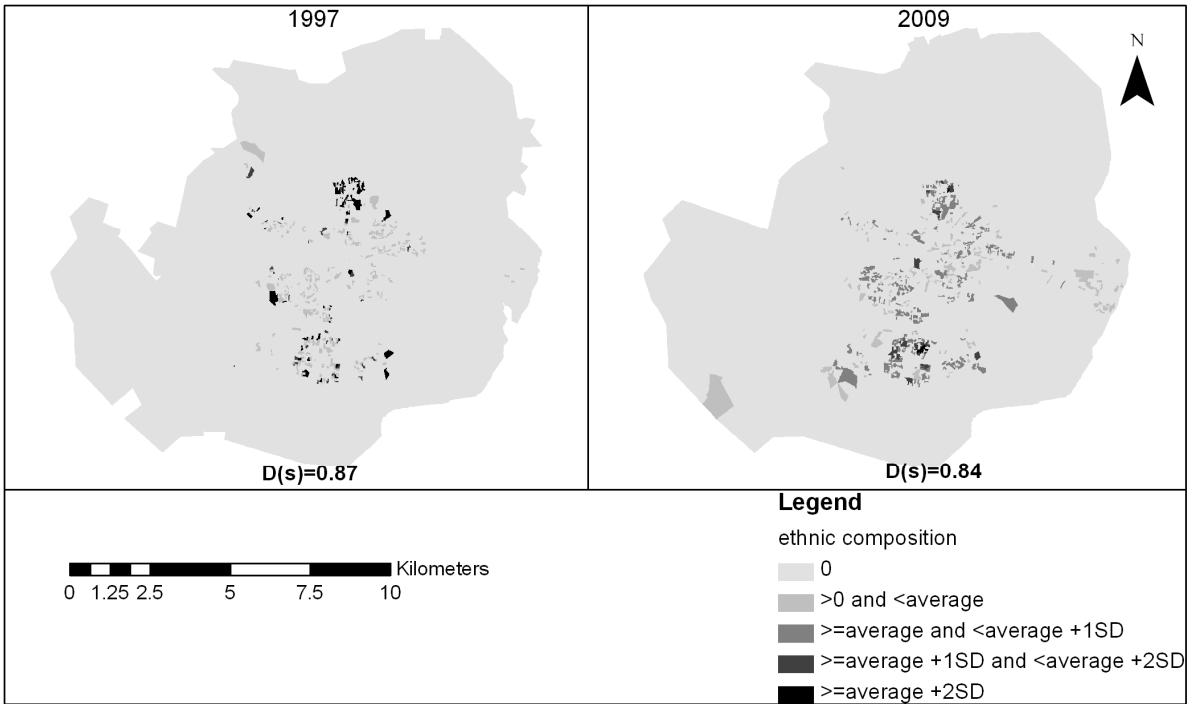


Figure 4-19: Changes on Moroccan Distribution 1997 and 2009

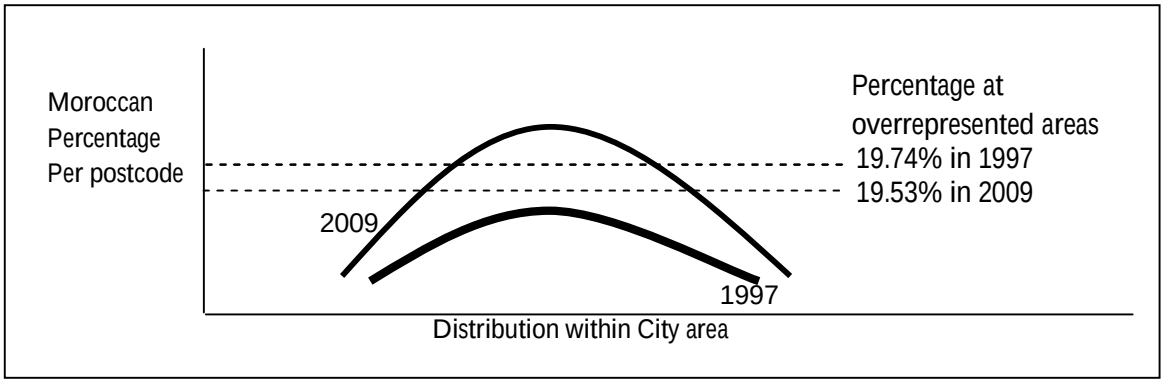


Figure 4-20: Illustration of Moroccan Concentration in 1997 and 2009 at 200 meters scale

5. THE RESIDENTIAL SEGREGATION PROFILE IN ENSCHEDE

This chapter presents the analytical discussion of the results to shows three main outputs of the residential segregation profile in Enschede. In the first section, residential segregation patterns for all ethnic groups are discussed. Second section discusses residential characteristics in segregated areas. Last section contains changes on residential segregation between 1997 and 2009.

5.1. Residential Segregation Pattern

5.1.1. Residential Segregation in City and Postcode Level

Each ethnic group has different degree of residential segregation and spatial concentration. Table 5-1 shows that there is variability of residential segregation among ethnic groups in Enschede.

From "Municipality Atlas 2006" (Marlet & Woerkens, 2006), non spatial Dissimilarity index used for measuring segregation for all ethnic group in Enschede is low (D=0.3). In this study, it showed that using spatial Dissimilarity Index for each ethnic group, ethnic groups are experiencing different degree of segregation. According to Wong (1993), spatial Dissimilarity index can was also be used, other than measuring evenness, because it measured the opportunity of intra-zonal interaction between ethnic groups. He added that distance between areal units, as spatial measurement, is affecting interaction among ethnic groups. The difference of residential segregation is very distinguished between Turkish and Indonesian. From four ethnic groups in Enschede, Moroccans are experiencing the highest degree of segregation (Figure 4-4). Referring to hypothetical configuration of two ethnic groups (Figure 2-5), degree of Moroccan residential segregation is same as configuration (b), not distributed with relatively large ethnic cluster. Meanwhile degree of Indonesian residential segregation is close to configuration (a) which uniform pattern of ethnic enclaves. This might have correlation with the background of migration. Moroccan & Turkish came as worker immigrant. Their family reunification caused new immigrants settle in the same area as former immigrants. But Surinamese/Antilles and Indonesian came because they were given the choice of citizenship since they came from former colonies. They both are more integrated into Dutch society because most of them could speak Dutch and at least marginally familiar with Dutch culture ("Multicultural Netherlands," 2010). It is supported by Bangley (1971) where he concluded that Indonesians are integrated in the Netherlands where they are tolerated and accepted by the Dutch society.

Table 5-1: Residential Segregation in Enschede

Ethnic Groups	Degree of segregation	Concentration
Turkish	Least distributed (0.66)	Many large concentration areas
Moroccan	Not distributed (0.84)	Few concentration area
Surinamese/Antilles	Least distributed (0.70)	Few large concentration areas
Indonesian	Distributed (0.49)	Few large concentration areas

To see the spatial concentration of each ethnic group, overrepresented areas were measured and visualized (Figure 4-8 to Figure 4-14). This spatial concentration is very helpful to identify residential segregation pattern which Wong (2002) argued that segregation is not uniform within the city and therefore each areal

unit within must be measured. Concentration of four ethnic groups mostly located at southern part of Enschede. This coincides with the area where the urban growth of Enschede occurred after 1970 (see section 3.5.3). However, there are low percentages of postcode areas which have overrepresentation of ethnic groups. Areas which part of large concentration of Surinamese/Antilles or Indonesian appear only in few areas (Table 5-1). The Turkish group has the highest percentage of overrepresented areas. There are 15% of the postcode areas in Enschede have Turkish overrepresentation. Those areas are part of large concentration of Turkish. Other locations of Turkish overrepresented areas are dispersed at Northern and Western part of Enschede.

Spatial concentration areas of Turkish group might be due to the differences in religion within their group. According to a key informant[3], there are two Turkish groups in Enschede which are Turkish Islam and Turkish Christian (Suryoye). Turkish Islam came as labour immigrants in late 1960 while Suryoye group came as refugees during the period 1975 – 1980. This time of arrival had made location of both groups different. Turkish Islam concentrations might be found in Deppenbroek and Twekkelerveld. Those areas were built in 1950 (see section 3.5.3). It was strengthened by Turkish participants whom lived in those areas for more than 25 years. As Kempen (1998) argued that in medium cities (e.g. Enschede), concentration of labour immigrants are found in the early post-1945 areas. They are predominance of publicly rented houses in apartment blocks. But the time of arrival is not only the reason of location difference between Turkish Islam and Suryoye. He added that Suryoye group is reluctant to live in the same neighbourhood with Turkish Islam. Suryoye group, who came after Turkish Islam, occupied southern part of Enschede.

5.1.2. Residential Segregation at Different Scale of Neighbourhood

Using different scales of neighbourhood, it was revealed that the pattern of each ethnic group varied in number and location of overrepresented areas. As explained by Feitosa (2007), measuring residential segregation at different scales of neighbourhood showed the pattern of residential segregation. It was done by comparing population of one ethnic group and total population of ethnic group and Dutch. It determined if individual postcode has more or less proportion than city average. Thus ethnic proportion was calculated within certain scale of neighbourhood (Wong, 2008). Scale of neighbourhood was defined as distance to neighbouring postcodes from each individual postcode. The larger the scale, the more neighbouring postcodes will be counted into ethnic proportion.

At zero meters scale, the ethnic proportion at each postcode is calculated without considering neighbouring postcode. This is defined as non spatial measurement (Reardon & O'Sullivan, 2004; Wong, 1993). The results, showed in all maps of maximum overrepresented areas, indicated that at zero meters scale, many overrepresented areas revealed as single area. Spatial concentration dramatically changed when proximity to neighbouring postcodes are considered. There are many postcode areas that become overrepresented areas and others become non overrepresented areas. This is because population within postcode area is influenced by population in neighbouring postcode. Wong (2002) explained that neighbouring areas should be counted as if they are in the same unit because administrative boundaries (i.e. postcode) hinders population interaction. Therefore, measuring concentration within neighbourhood area is better than measuring only within its postcode because neighbourhood area reflects social environment without bounded by administrative unit (i.e. postcode).

To see whether each postcode is part of the larger conglomerate of postcodes which have high proportion of ethnic group, proportion of ethnic group was calculated at 200, 400, 600 and 800 meters scale of neighbourhood. The results showed that many ethnic members are part of large concentration. Turkish,

[3] Feedback discussions with an key informants from Enschede Municipality, February 2011

Surinamese/Antilles, and Indonesian are still experiencing overrepresented areas at higher scale. For example, only 38% of Turkish in Enschede lived in concentration areas (200 meters scale) but isolated from other Turkish members. At larger concentration areas (800 meters scale) the percentage increased to become 53% of Turkish. In addition measuring at different scale could recognize how large the area with overrepresentation of certain ethnic group is. For example, there is no overrepresentation of Moroccan at 800 meters scale of neighbourhood. It means that Moroccan only concentrated at small neighbourhood (below 800 meters scale). While other ethnic groups still concentrated at a larger scale of neighbourhood (up to 800 meters scale). Therefore, it implies that the probability to find Moroccan concentration areas is rather small than Turkish, Surinamese/Antilles and Indonesian concentration areas.

Nevertheless, not all postcode areas are sensitive to the change of neighbourhood scale up to 800 meters. Rural areas in Enschede have averagely large postcode areas with low density. Those large postcodes are not sensitive to the changes at small scale. For example areas with overrepresentation of Surinamese/Antilles or Indonesian may still remain overrepresented compared to city average up to 800 meters scale but the absolute number of ethnic members is very low. In this case, concentration at those areas becomes unrealistic. This happens when the range of postcode areas and the range of density in city are too large. It caused some postcodes are not sensitive to the change of scale. Reardon et al. (2009) and Feitosa et al. (2007) used larger scale up to 4400 meters scale (they called macro scale). Using macro scale, overrepresentation at those large postcode areas might change because it will considered more neighbouring areas.

Due to the nature of spatial measurement, ethnic concentrations are sensitive to the population composition of nearby areal unit (Wong, 2008). Measurement at different scale showed ethnic proportion on some areas became lower or higher than at city. Ethnic proportion is vulnerable to neighbouring areas which are more intense with the increasing of scale (Feitosa, et al., 2007). When the ethnic population increases in neighbouring postcodes, the ethnic proportion will be higher. But when the Dutch population increases then the ethnic proportion will be lower. In addition, the higher the scale the average ethnic members per postcode become higher since ethnic population at neighbouring postcodes is counted. It affected standard deviation for each scale. Because the city averages for all ethnic groups are low than the maximum percentage for overrepresented areas is only 20.5% at 200 meters scale for Turkish (see Annex 12).

5.2. Residential Characteristic in Segregated Area

Residential characteristics related to residential segregation has been important concerns in many literatures. Studies from Kempen & Weesep (1998), Deurloo & Musterd (2001), and Musterd & Andersson (2005) recognized factors related to residential segregation. Several residential characteristics at postcode level were used to describe the residential condition where there were overrepresentations of Turkish or Moroccan. Residential characteristics were compared to characteristics at city level to see the difference. However, only several factors characterized the overrepresented areas in Enschede. It is need to point out that those relations do not represent or bear causal relation. They are simply unbiased characteristics of conditional in overrepresented areas.

Only at Moroccan overrepresented areas there are certain residential characteristics differ from the overall city. Housing type at Moroccan overrepresented areas is 100% row houses (Table 4-3). However the tenure type is rather heterogeneous. This supports the study in Amsterdam showing that at Moroccan overrepresented areas housing tenure is rather heterogeneous (Deurloo & Musterd, 2001). However this implies that there is no correlation of housing tenure and residential segregation (Kempen & Weesep, 1998). This study showed that even in housing tenure mix, Moroccan segregation still occurs. For socioeconomic characteristic, Moroccan overrepresented areas, there is more unemployment compared to

overall city. Ode & Veenman (2003) argued that unemployment risk for Turkish, Moroccan, and Surinamese/Antilles in the Netherlands has significant factor from language problem. As at Moroccan overrepresented areas are mixed with other ethnic non Western, it might be that high number of unemployment in Moroccan overrepresented areas is not caused by unemployment from Moroccan its self but by unemployment from other ethnic non Western. Meanwhile, a key informant[4] remarked from the fact that there are many different ethnic groups live in the same areas where Moroccan is overrepresentation; that the existence of ethnic non western might be attracting Moroccan to concentrate. Iceland (2004) found that change in ethnic composition was associated with the change of residential segregation in overall region. He indicated that in American metropolitans the increasing diversity of Asian and Hispanic was actually associated increases in segregation. This study gives argument to the relation between Moroccan and ethnic non Western which might cause concentration in 2009.

5.3. Changes on Residential Segregation Pattern

From the results obtained in section 4.4, some changes on residential segregation occurred between 1997 and 2009. Degrees of residential segregation for Turkish and Moroccan are getting decreased. It means that Turkish and Moroccan is more distributed across the region. New areas such as Glanerburg at eastern part of Enschede might attract Turkish and Moroccan. Those areas are predominantly by row houses and public rented houses. Rural areas in Enschede are still not the place where Turkish and Moroccan live. It might be because rural areas are predominantly detached houses and owner occupied houses. It might imply that the housing price was too high that many Turkish and Moroccan could not afford.

Nevertheless, residential segregation is slightly worse in term of concentration. Many ethnic members increased in certain places causing the higher proportion. To see the changes on concentration, overrepresentation of Turkish and Moroccan in 1997 was calculated at different scale. It was revealed that in 1997 there was no concentration of Moroccan but in 2009 there are few overrepresented areas with the maximum radius 600 meters. For Turkish, number of overrepresented areas increased at each scale. But the highest number of overrepresented areas is still at 600 meters scale. The changes of number overrepresented areas were due to the cross shift of ethnic and Dutch among postcodes or the growth of ethnic and Dutch population.

Housing mobility within Enschede might change ethnic composition at a postcode. Housing mobility within Enschede happened when ethnic members moved closer to areas which had larger numbers of their ethnic while Dutch moved out from ethnic overrepresented areas[5]. From the interview, Turkish and Moroccan participants did not choose their housing location because of ethnic similarity. But I must underline that there are only few participants to represent it. With the assumption that most of Turkish members do not consider ethnic similarity as preferences on location and have low housing mobility, changes on composition from housing mobility within city becomes dependent on the mobility of the Dutch. According to Zorlu & Latten (2009), Dutch tend to choose neighbourhoods with a higher share of native Dutch. Using that as an assumption, then the changes on composition is due to the movement of Dutch to other area with a higher share of native Dutch. Housing mobility can be generated by the renovation of residential areas. As the descriptions of Figure 4-18, there are renovated areas affected and not affected on residential segregation over time. It was done by comparing overrepresented areas between 1997 and 2009 using certain radius.

[4] Feedback discussions with an key informants from KISS, February 2011

[5] A key informant called it as water bed effect which might be caused by urban renewal

Other factor affecting changes of number of overrepresented areas is ethnic and Dutch population growth in city level, consisting of new born and immigrants. A key informant[6] argued that when ethnic population increases in a certain location, it might be due to high fertility. In section 3.5.1, I described that the Moroccan & Turkish growth between 1997 and 2009 due to migration, since the birth growth was much lower than ethnic growth. Moreover, as explained in section **Error! Reference source not found.**, Moroccan participants settled at areas where their ethnic community already existed or wherever housing unit was available. Therefore the concentration that appeared in 2009, might be because there are new Moroccan immigrants who came between 1997 and 2009 and settled near former immigrants.

[6] Feedback discussions with an key informants from I & O Research, February 2011

6. CONCLUSIONS & RECOMMENDATIONS

The objective of this last chapter is to summarize the study. It is composed in two three main sections. First section presents the conclusive remarks from the aim of this study. Second section shows the limitation of methodological operation in achieving answer to all research questions. Third section proposes recommendations for further research following this study.

6.1. Conclusion

In drawing conclusion of this study, the research aim, which is to assess residential segregation profile for ethnic group in Enschede, is evaluated against the findings and the observation.

- Assessing residential segregation profile

This study shows that in order to advance the understanding of the geography of ethnic residential, measuring at disaggregated level areas that explicitly reveal spatial pattern of residential segregation need to be given more attention. The study has advanced the hypothesis about residential segregation measurement, that spatial proximity to neighbouring areas has a large impact on variability of residential segregation. Measuring at zero meters scale of neighbourhood treats each postcode area independently, thus indicating single-unit concentration. Meanwhile, measuring at different scales of neighbourhood identify a postcode in terms of the ethnic composition of its neighbours, thus indicating a concentration of areal units. Therefore, a postcode with overrepresentation of certain ethnic group has higher ethnic composition relative to city average. The empirical analysis shows that many areas are part of a larger spatial concentration. Those areas are spatially sensitive to ethnic composition and the size of neighbouring areas. The changes on ethnic composition in neighbouring areas (which might also be attributed to urban renewal, natural growth etc) will affect spatial concentration of certain areas.

- The residential segregation profile in Enschede

Using 1997 and 2009 postcode data of Enschede, the study revealed that four ethnic groups in Enschede have different pattern of residential segregation. Each ethnic group experiences different residential segregation in term of housing distribution and spatial concentration. The highest degree of residential segregation is for Moroccan group which means generally Moroccans are clustered and not distributed evenly across the city. To identify spatially the distribution across the city, overrepresentation of each ethnic group was measured at postcode level. There are only few areas have overrepresentation of certain ethnic group which Turkish group has the highest percentage of overrepresented areas (15% of all postcodes in Enschede). Concentration of Turkish, Moroccan and Surinamese/Antilles are located at southern part of Enschede while Indonesians are concentrated around the urban fringe. Moroccans are concentrated in a neighbourhood scale of up to 600 meters. Turkish, Surinamese/Antilles, and Indonesian are still concentrated at larger scale of neighbourhood. Other result shows that even though ethnic members are concentrated at certain locations, they do not eventually settle at those areas that differ (in term of housing and socioeconomic characteristics) from the rest of city. The residential characteristics of those areas with overrepresentation of Turkish resemble characteristics of the entire city. Meanwhile, areas with overrepresentation of Moroccans have certain residential characteristics that differ from those of the entire city. Compared to 1997, the distribution of Turkish origin population in 2009 is slightly more dispersed but the concentration areas slightly increased. For Moroccan, ethnic members are still not distributed evenly across the city but new concentration areas appeared in 2009. Changes on spatial

concentration of Turkish were identified because there was change on ethnic composition in neighbouring areas due to urban renewal.

6.2. Study Limitation

In the course of this research, some limitations were encountered:

- Limitation on the study approach

Reardon et al. (2009) and Feitosa et al. (2007) used larger scale up to 4400 meters scale to capture whether segregation changes have been driven largely by increases of ethnic composition in larger scale of neighbourhood. However, this study has limited the scale of neighbourhood up to 800 meters scale due to the large processing of data and long processing time. It causes large postcode areas (radius more than 800 meters) to be insensitive to the change of different scales.

- Limitation on the data collection

Due to the unavailability of housing and socioeconomic data at household level for each ethnic group, this study captured residential characteristics of segregated area by using housing and socioeconomic data at postcode level. It represents residential characteristics at areas where there is overrepresentation of certain ethnic group. However, it is better to use housing and socioeconomic data for each ethnic household because can give more detail information about which ethnic characteristics live in the overrepresented areas.

According to Taylor (1986), neighbourhood characteristics consists of four general categories, environmental, socioeconomic, public service, and location characteristics. Since the data available was at postcode level, only socioeconomic data were used to describe characteristics of ethnic overrepresented areas.

Another limitation is that interview was done with only 8 ethnic members from Turkish and Moroccan due to time and difficulties in gathering ethnic members. This number was insufficient to represent ethnic preferences on housing location. They could not represent first, second and third generation of ethnic members.

- Limitation on the method

For this study, proximity to neighbouring areas used airline distance instead of network distance. It was assumed that residents can interact with neighbours with no significant barrier.

The time interval used is too short to reveal good trends of residential segregation. The changes might be more obvious if the peak time of immigrants who came to Enschede when some labour immigrants came back from their home countries in late 1980 were used. This can be able to capture the distribution of first generation, second generation and third generation of ethnic groups.

6.3. Further Research Recommendation

Recommendations for future research are made based on the methods and results of this study.

- Further research from methodology

The research has modified spatial measurement to be able to capture variability in residential segregation. Further study can be done aimed at revealing consequences of mixed neighbourhood at different scales. Further study can focus on specific area where there was a project of mixed neighbourhood. Using the ethnic composition before the project and after the project, ethnic concentration can be measured to which extent mixed neighbourhood affect segregation across the city.

- Further research from results

The output showed that at Moroccan overrepresented areas, there is more diversity of ethnic non Western. This might be used as a background for further research focusing on segregation among ethnic non Western. It might find out whether ethnic non Western members' areas are more integrated within their group or with native Dutch. From the changes of residential segregation, it is necessary to identify the housing mobility of Dutch to see whether the segregation is significantly due to the reluctance of native Dutch to move into ethnic concentrated neighbourhoods.

LIST OF REFERENCES

Andersen, H. S. (2003). *Urban Sores: On the interaction between segregation, urban decay and deprived neighbourhoods*. Cornwall: Ashgate.

Apparicio, P., & Petkevich, V. (2006). Segregation Analyser. Retrieved 7 November, 2010, from http://www.inrs-ucs.uquebec.ca/default.asp?p=grlaser

Bagley, C. (1971). Immigrant Minorities in the Netherlands: Integration and Assimilation. *International Migration Review, 5*(1), 18-35.

Blanc, M. (1991). Urban Housing Segregation of the North African "Immigrants" in France. In E. D. Huttman (Ed.), *Urban housing segregation of minorities in Western Europe and the United States*: Duke University Press.

Blauw, W. (1991). Housing Segregation for Different Population Groups in the Netherland. In E. D. Huttman (Ed.), *Urban housing segregation of minorities in Western Europe and the United States*: Duke University Press.

Bolt, G. (2009). Combating residential segregation of ethnic minorities in European cities. *Journal of Housing and the Built Environment, 24*(4), 397-503.

Bolt, G., Burgers, J., & Kempen, R. v. (1998). On the Social Significance of Spatial Location; Spatial Segregation and Social Inclusion. *Netherland Journal of Housing and the Built Environment, 13*(1).

Bolt, G., & Kempen, R. V. (Eds.). (2000). *Concentratie en segregatie in Nederlandse steden*. Utrecth: Van Gorcum.

Bolt, G., Kempen, R. v., & Ham, M. v. (2008). Minority Ethnic Groups in the Dutch Housing Market: Spatial Segregation, Relocation Dynamics and Housing Policy. *Urban Studies, 45*(7), 1359–1384.

Brown, L. A., & Chung, S.-Y. (2006). Spatial segregation, segregation indices and the geographical perspective. *Population, Space and Place, 12*(2), 125-143.

Carr, J. H., & Kutty, N. K. (Eds.). (2008). *Segregation: The Rising Cost for America*. New York: Routledge.

Clotfelter, C. T. (1999). Public school segregation in metropolitan areas. [Article]. *Land Economics, 75*(4), 487.

Cortese, C. F., Falk, R. F., & Cohen, J. K. (1976). Further Considerations on the Methodological Analysis of Segregation Indices. *American Sociological Review, 41*(4), 630-637.

Deurloo, M. C., & Musterd, S. (1998). Ethnic Clusters in Amsterdam, 1994-96: A Micro-area Analysis. *Urban Studies, 35*(3), 385-396.

Deurloo, M. C., & Musterd, S. (2001). Residential profiles of Surinamese and Moroccans in Amsterdam. *Urban Studies, 38*(3).

Duncan, O. D., & Duncan, B. (1955). A Methodological Analysis of Segregation Indexes. *American Sociological Review, 20*(2), 210-217.

Edgar, B., Doherty, J., & Meert, H. (2004). *Immigration and Homelessness in Europe*. Bristol: The Policy Press University of Bristol.

Fahey, T., & Fanning, B. (2010). Immigration and Socio-spatial Segregation in Dublin, 1996-2006. *Urban Studies, 47*(8), 1625-1642.

Feitosa, F. F., Camara, G., Monteiro, A. M. V., Koschitzki, T., & Silva, M. P. S. (2007). Global and Local Spatial Indices of Urban Segregation. *International Journal of Geographical Information Science, 21*(3).

Fellmann, J. D., Getis, A., & Getis, J. (1997). *Human geography: landscapes of human activities*: Brown & Benchmark.

Friedrichs, J., & Alpheis, H. (1991). Housing segregation of Immigrants in West Germany. In E. D. Huttman (Ed.), *Urban housing segregation of minorities in Western Europe and the United States*: Duke University Press.

Galster, G. (1987). *Homeowners and Neighborhood Reinvestment*. Durham: Duke University Press.

Galster, G. (2007). Neighbourhood Social Mix as a Goal of Housing Policy: A Theoretical Analysis. *International Journal of Housing Policy, 7*(1), 19-43.

Grady, S. C. (2006). Racial disparities in low birthweight and the contribution of residential segregation: A multilevel analysis. *Social Science & Medicine, 63*(12), 3013-3029.

Grbic, D., Ishizawa, H., & Crothers, C. (2010). Ethnic residential segregation in New Zealand, 1991-2006. *Social Science Research, 39*(1), 25-38.

Harsman, B. (2006). Ethnic diversity and spatial segregation in the Stockholm region. *Urban Studies, 43*(8), 1341-1364.

Hårsman, B., & Quigley, J. M. (1995). The Spatial Segregation of Ethnic and Demographic Groups: Comparative Evidence from Stockholm and San Francisco. *Journal of Urban Economics, 37*(1), 1-16.

Iceland, J. (2004). Beyond Black and White: Metropolitan residential segregation in multi-ethnic America. *Social Science Research, 33*(2), 248-271.
Ireland, P. (2008). Comparing Responses to Ethnic Segregation in Urban Europe. *Urban Studies, 45*(7), 1333-1358.
Jakubs, J. F. (1981). A distance-based segregation index. *Socio-Economic Planning Sciences, 15*(3), 129-136.
Kaufman, J. L. (2000). Chicago: Segregation and the New Urban Poverty. In W. Ostendorf & S. Musterd (Eds.), *Urban segregation and the welfare state inequality and exclusion in western cities*. London: Routledge.
Kempen, R. V., & Özüekren, A. s. (1998a). Ethnic Minority Housing in the European Union: A Case Study of Turks. *Tijdschrift voor economische en sociale geografie, 89*(4).
Kempen, R. v., & Özüekren, A. s. (1998b). Ethnic Segregation in Cities: New Forms and Explanations in a Dynamic World. *Urban Studies, 35*(10), 1631-1656.
Kempen, R. V., & Weesep, J. V. (1997). Segregation, Housing and Ethnicity in Dutch Cities. *Window on the Netherland, 88*(2), 188-195.
Kempen, R. v., & Weesep, J. v. (1998). Ethnic Residential Patterns in Dutch Cities: Backgrounds, Shifts and Consequences. *Urban Studies, 35*(10), 1813 - 1833.
Laan Bouma-Doff, W. v. d. (2007). Confined Contact: Residential Segregation and Ethnic Bridges in the Netherlands. *Urban Studies, 44*(5-6), 997-1017.
Marlet, G., & Woerkens, C. v. (2006). *Atlas 2006 voor Gemeenten*. Utrecth: Stichting Atlas 2006 voor Gemeenten.
Massey, D. S., & Denton, N. A. (1987). Trends in the Residential Segregation of Blacks, Hispanics, and Asians: 1970-1980. *American Sociological Review, 52*(6), 802-825.
Massey, D. S., & Denton, N. A. (1988). The Dimensions of Residential Segregation. *Social Forces, 67*(2), 281-315.
Multicultural Netherlands. (2010). Retrieved 5 February, 2011, from http://dutch.berkeley.edu/mcnl/
Murie, A., & Musterd, S. (1996). Social Segregation, Housing Tenure and Social Change in Dutch Cities in the Late 1980s. *Urban Studies, 33*(3), 495-516.
Musterd, S. (2005). Social and Ethnic Segregation in Europe: Levels, Causes, and Effects. *Journal of Urban Affairs, 27*(3), 331-348.
Musterd, S., & Andersson, R. (2005). Housing Mix, Social Mix, and Social Opportunities. *Urban Affairs Review, 40*.
Musterd, S., & Deurloo, R. (1997). Ethnic Segregation and the Role of Public Housing in Amsterdam. *Tijdschrift voor economische en sociale geografie, 88*(2), 158-168.
Ode, A., & Veenman, J. (2003). The Ethno-Cultural and Socio-Economic Position of Ethnic Minority Groups in the Netherlands. In L. Hagendoorn, J. Veenman & W. Vollebergh (Eds.), *Integrating Immigrants in the Netherlands: Cultural versus Socio-economic Integration*. Aldershot: Ashgate Publishing.
Ostendorf, W., Musterd, S., & Vos, S. D. (2001). Social Mix and the Neighbourhood Effect. Policy Ambitions and Empirical Evidence. *Housing Studies, 16*(3).
Pacione, M. (Ed.). (1987). *Social Geography: Progress and Prospect*. New York: Croom Helm.
PBL. (2010). *Nieuwbouw, verhuizingen en segregatie: Effecten van nieuwbouw op de bevolkings samenstelling van stadswijken*. Den Haag: Planbureau voor de Leefomgeving.
Phillips, D., & Karn, V. (1991). Racial Segregation in Britain: Patterns, Process, and Policy Approaches. In E. D. Huttman (Ed.), *Urban housing segregation of minorities in Western Europe and the United States*: Duke Univeristy Press.
Phillips, D., & Unsworth, R. (2002). Widening Locational Choices for Minority Ethnic Groups in the Social Rented Sector. In P. Somerville & A. Steele (Eds.), *'Race', Housing and Social Exclusion*. London: Jessica Kingsley Publisher Ltd.
Reardon, S. F. (2006). A conceptual framework for measuring segregation and its association with population outcomes. In J. M. Oakes & J. S. Kaufman (Eds.), *Methods in social epidemiology*. San Francisco: Jossey-Bass.
Reardon, S. F., Farrell, C. R., Matthews, S. A., O'Sullivan, D., Bischoff, K., & Firebaugh, G. (2009). Race and space in the 1990s: Changes in the geographic scale of racial residential segregation, 1990-2000. *Social Science Research, 38*, 55-70.
Reardon, S. F., & O'Sullivan, D. (2004). Measuring of Spatial Segregation. *Sociological Methodology, 34*, 121-162.
Saltman, J. (1991). Theoritical Orientation: Residential Segregation. In E. D. Huttman (Ed.), *Urban housing segregation of minorities in Western Europe and the United States*: Duke University Press.
Smets, P., & den Uyl, M. (2008). The Complex Role of Ethnicity in Urban Mixing: A Study of Two Deprived Neighbourhoods in Amsterdam. *Urban Studies, 45*(7), 1439-1460.

South, S. J., & Deane, G. D. (1993). Race and Residential Mobility: Individual Determinants and Structural Constraints. *Social Forces, 72*(1), 147-167.
Subramanian, S. V., Acevedo-Garcia, D., & Osypuk, T. L. (2005). Racial residential segregation and geographic heterogeneity in black/white disparity in poor self-rated health in the US: a multilevel statistical analysis. *Social Science & Medicine, 60*(8), 1667-1679.
Taylor, R. B. (1986). *Urban neighborhoods : research and policy*. New York: Praeger.
Turner, M. A., & Ross, S. L. (1992). How Racial Discrimination Affects the Search for Housing In X. N. D. S. Briggs (Ed.), *The geography of opportunity: race and housing choice in metropolitan America*. Massachusetts: The Brooking Institute.
Van Eijk, G. (2010). *Unequal networks: Spatial segregation, relationships and inequality in the city*: IOS Press.
Vang, Z. M. (2010). Housing Supply and Residential Segregation in Ireland. *Urban Studies, 47*(14), 2983-3012.
Wilkes, R., & Iceland, J. (2004). Hypersegregation in the Twenty-First Century. *Demography, 41*(1).
Williams, D. R., & Collins, C. (2001). Racial Residential Segregation: A Fundamental Cause of Racial Disparities in Health. *Public Health Report, 116*.
Wong, D. W. S. (1993). Spatial Indices of Segregation. *Urban Studies, 30*(3), 559-572.
Wong, D. W. S. (2002). Modeling Local Segregation: a Spatial Interaction Approach. *Geographical and Environmental Modelling, 6*, 81-97.
Wong, D. W. S. (2003). Implementing spatial segregation measures in GIS. *Computers, Environment and Urban Systems, 27*(1), 53-70.
Wong, D. W. S. (2008). A Local Multidimensional Approach to Evaluate Changes in Segregation. *Urban Geography, 29*(5), 455-472.
Yang, P. Q. (2000). *Ethnic Studies: Issues and Approaches* New York: State University of New York Press.
Yücesoy, E. Ü. (2006). *Everyday urban public space: Turkish immigrant women's perspective*. Amsterdam: Het Spinhuis.
Zorlu, A., & Latten, J. (2009). Ethnic Sorting in The Netherlands. *Urban Studies, 46*(9), 1899-1923.

ANNEX 1. STUDIES ON MEASURING SEGREGATION AT DIFFERENT SCALE

Attributes	Wong*	Feitosa**	Reardon***
Areal unit	Census tract	Census tract	Grid Cell
Concept	Composite Population Enumeration unit boundaries, such as census tract boundaries, are not legitimate features prohibiting or hindering population interaction	Local Population Intensity Intensity of exchange experiences with their neighbours	Local Environment People in a grid cell will interact to other cell in their local environment
Neighbourhood boundaries	Adjacent neighbour	Bandwidth Kernel/radius in meters	Bandwidth Kernel/radius in meters
Population in neighbourhood	Sum of its areal unit plus neighbours	Weighted sum using distance decay	Weighted sum using distance decay

*) (Wong, 2002)
**) (Feitosa, et al., 2007)
***) (Reardon, et al., 2009)

ANNEX 2. LIST OF KEY INFORMANTS

No	Name	Position	Institution	Category	Purpose
1	Joke Grooters	Program Coordinator	Research Institute for Urban Society (KISS)	Expert	concept of mix neighbourhood, effectiveness of desegregation policies, and explanatory factors of residential segregation
2	Sawitri Saharso	Professor in Intercultural Governance	University Twente	Expert	
3	Jan Schukkink	Senior Communication Advisor	Enschede Municipality	Practitioner	experience dealing with segregation and mix neighbourhood opinion for effectiveness of segregation policies
4	Josette Minten	Housing Team Leader South West Enschede	De Woonplaats Housing Corporation	Practitioner	
5	Arent de Haan	senior information specialist	I & O Research	Data provider	data and information related to ethnic distribution

ANNEX 3. GROUP INTERVIEW GUIDENCE

(English Version)

Topic: Influencing Factors in Housing Decision among Ethnic Groups

This focus group is one of inputs for master thesis conducted by Rian Wulan Desriani, student from ITC University of Twente. The study itself is intended to assess residential distribution among ethnic groups in Enschede. The importance is how to recognize characteristic of residential among ethnic groups will help policy maker develop equal housing policy for all ethnic groups. Purpose of questionnaire is to gain information about views and experiences of housing decision

1. Age :
2. Gender :
3. Household member :
4. Education :
5. Postcode :
6. Neighbourhood :
7. Year's length stayed in Netherland :
8. Year's length stayed in Enschede :
9. Consideration to choose your current neighbourhood (please add if there are more)

No	Considerations	Answer
1	Close to relatives	**O** Yes **O** No
2	Low social problem	**O** Yes **O** No
3	Prestige of place	**O** Yes **O** No
4	Distance to school	**O** Yes **O** No
5	Distance to Centrum	**O** Yes **O** No
6	Distance to workplace	**O** Yes **O** No
7		
8		
9		

10. Satisfaction of neighbourhood condition

O very high **O** High **O** Moderate **O** Low **O** Very Low

11. Consideration to choose your current house (please add if there are more)

No	Considerations	Answer
1	Type of tenure (rent or private)	**O** Yes **O** No
2	Housing type (row houses, high rise, detached houses)	**O** Yes **O** No
3	Building age	**O** Yes **O** No
4	Room size	**O** Yes **O** No
5	Price	**O** Yes **O** No
6		
7		
8		

12. Satisfaction of housing condition

O very high **O** High **O** Moderate **O** Low **O** Very Low

Sometimes we have to face the fact that what we want is different than what we get. Several limitations might occur to decide the right house. The limitation comes from internal and external situation. Internal situation might be financial, norm or believe, etc. External situation might be limited information, discrimination, number of low rented housing, etc.

13. What kind of problem did you face in deciding house?

Mix neighbourhood means each neighbourhood would have a mixed housing stock or a mixed of ethnic groups with certain proportion. Mix neighbourhood is intended to increase integration in region.

14. Do you think your neighbourhood is a mix ethnic neighbourhood?

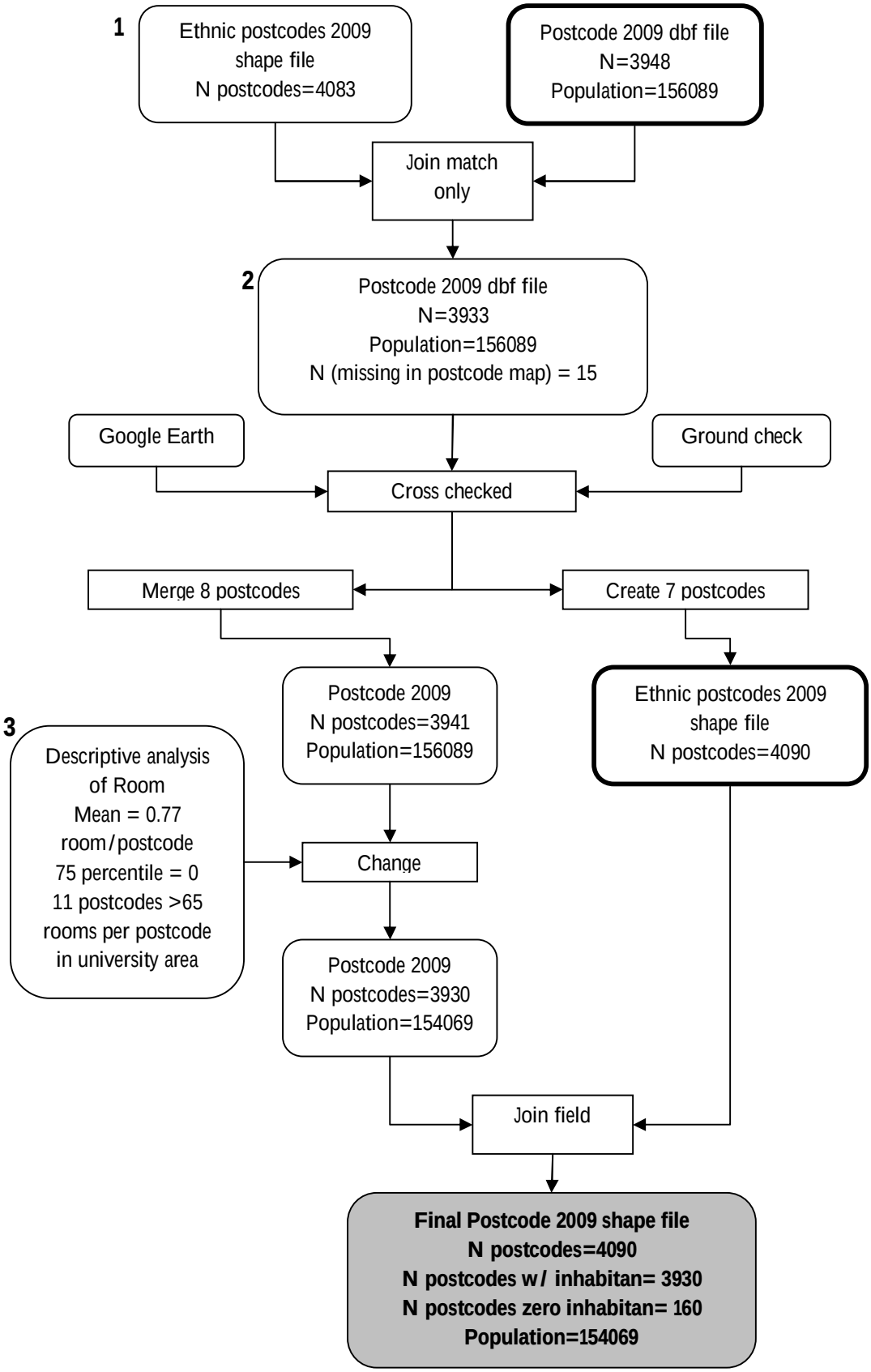
    O Yes **O** No

15. Do you think your neighbourhood is a mix income neighbourhood?

    O Yes **O** No

Thank you for your participation!

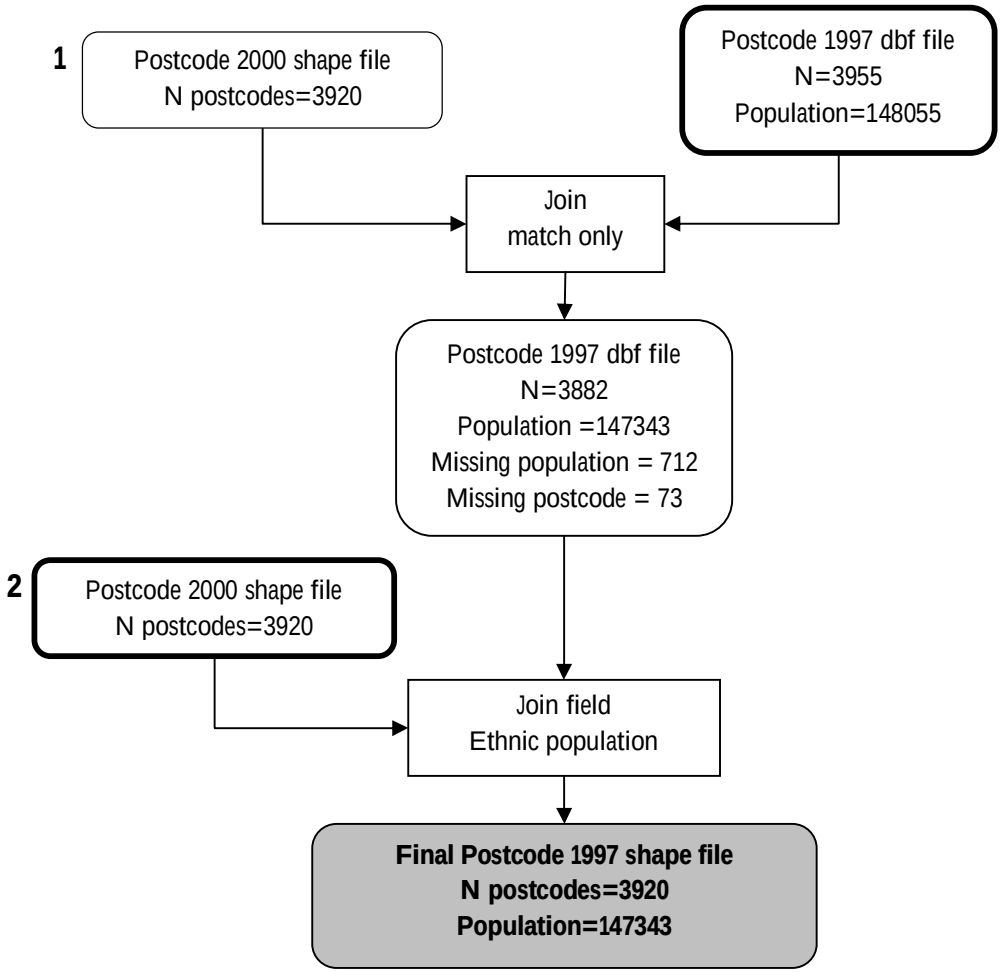
ANNEX 4. VALIDATING POSTCODE DATA 2009



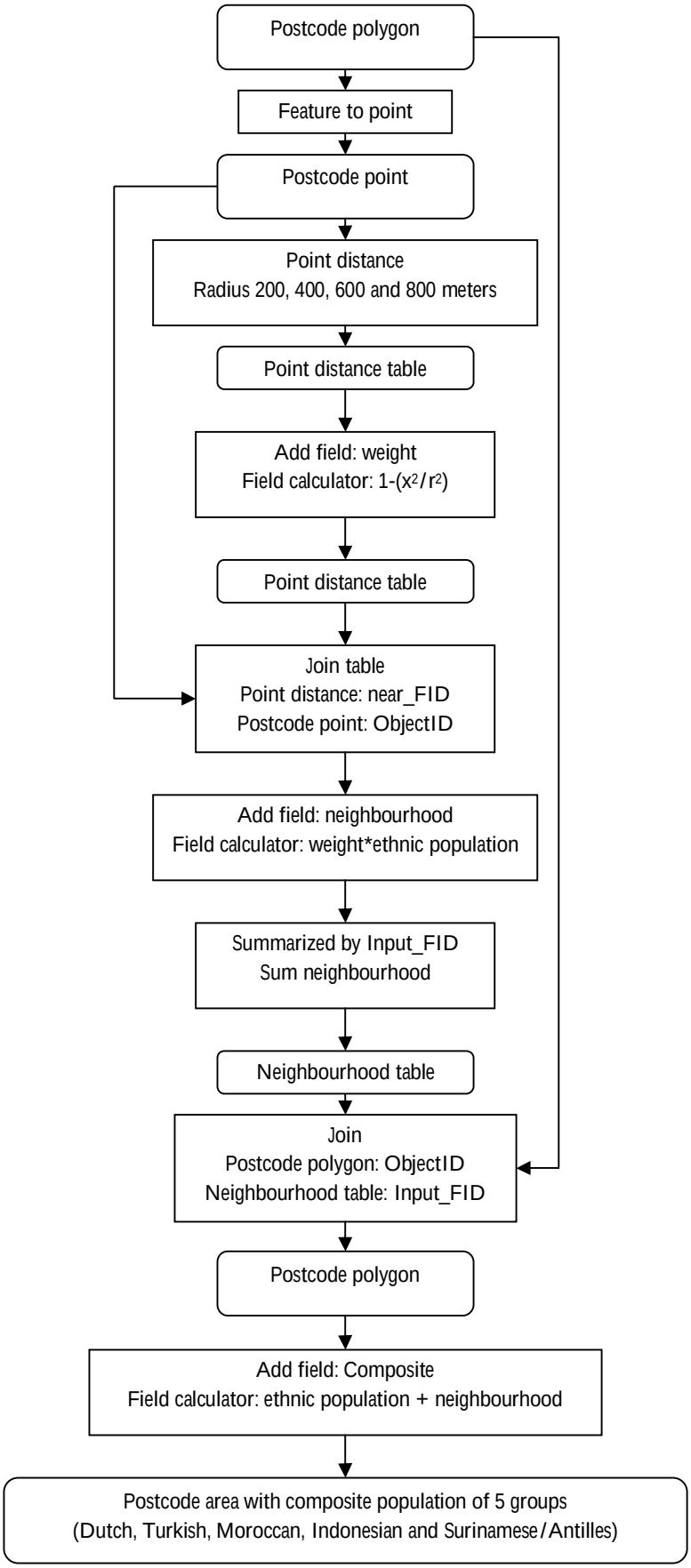
ANNEX 5. NEW AND MERGE POSTCODES

No	New Postcodes	Population	Address	Create or Merged to
1	7548EJ	12	roelof blokzijlstraat	7548AW
2	7548EH	28	boekelose stoomblekerij	7548AW
3	7548EG	24	boekelose stoomblekerij	7548AW
4	7544SH	12	houwbeekhof	7544SG
5	7541PK	3	Walmink Es	7541WG
6	7534PH	1	Huize Holterhoflaan	7536PD
7	7531TV	21	Oosterhof	7531TK
8	7523EZ	1	Korhoenplantsoen	7523ET
9	7532TJ	19	Grasjuffer	7532TJ
10	7532TH	43	Waterjuffer	7532TH
11	7532TG	18	Kanaaljuffer	7532TG
12	7532TE	21	Winterjuffer	7532TE
13	7532TD	14	Grasjuffer	7532TD
14	7532TC	79	Grasjuffer	7532TC
15	7532TA	61	Bosbeekjuffer	7532TA
	Total	357		

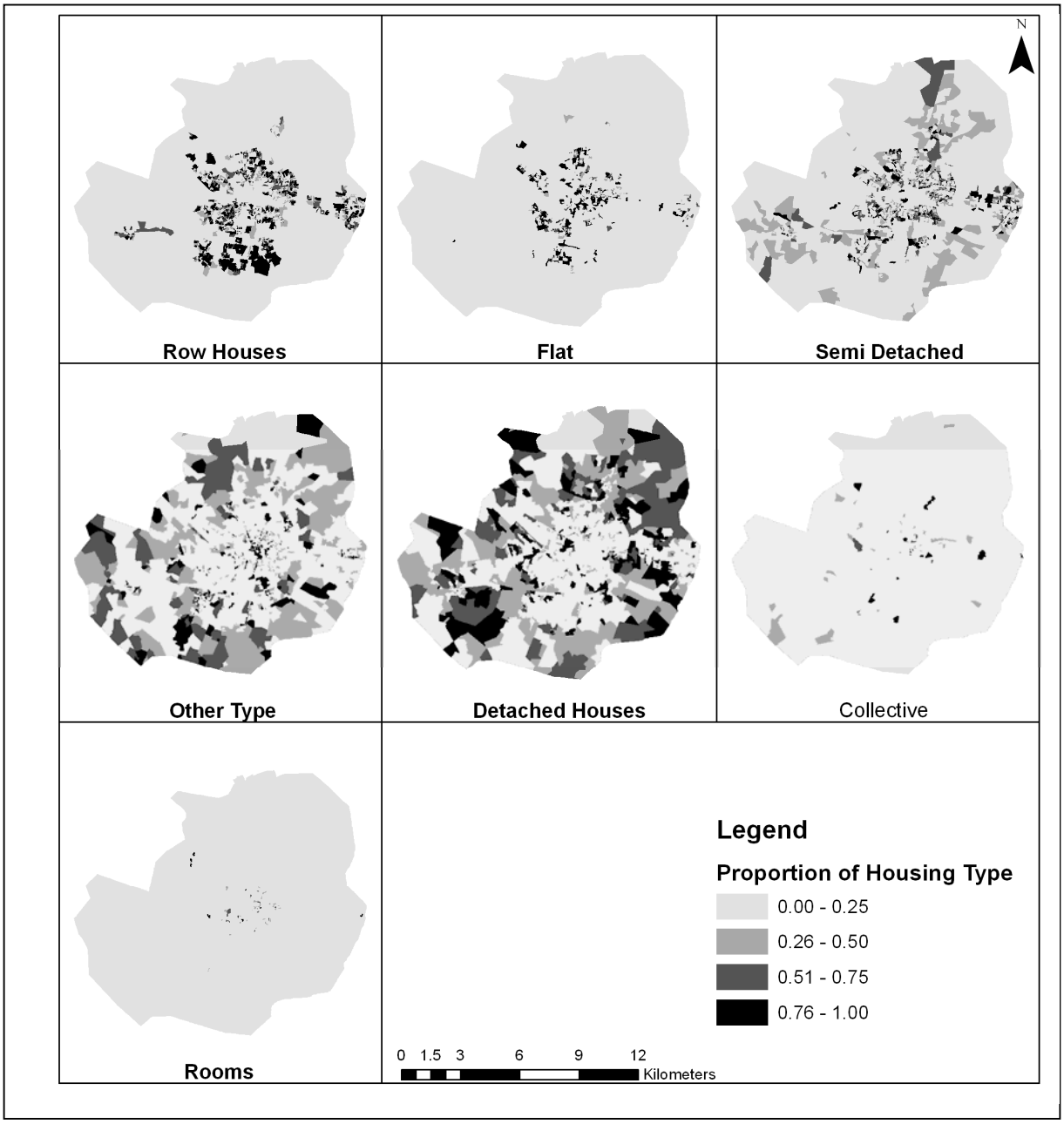
ANNEX 6. JOINING POSTCODE 1997



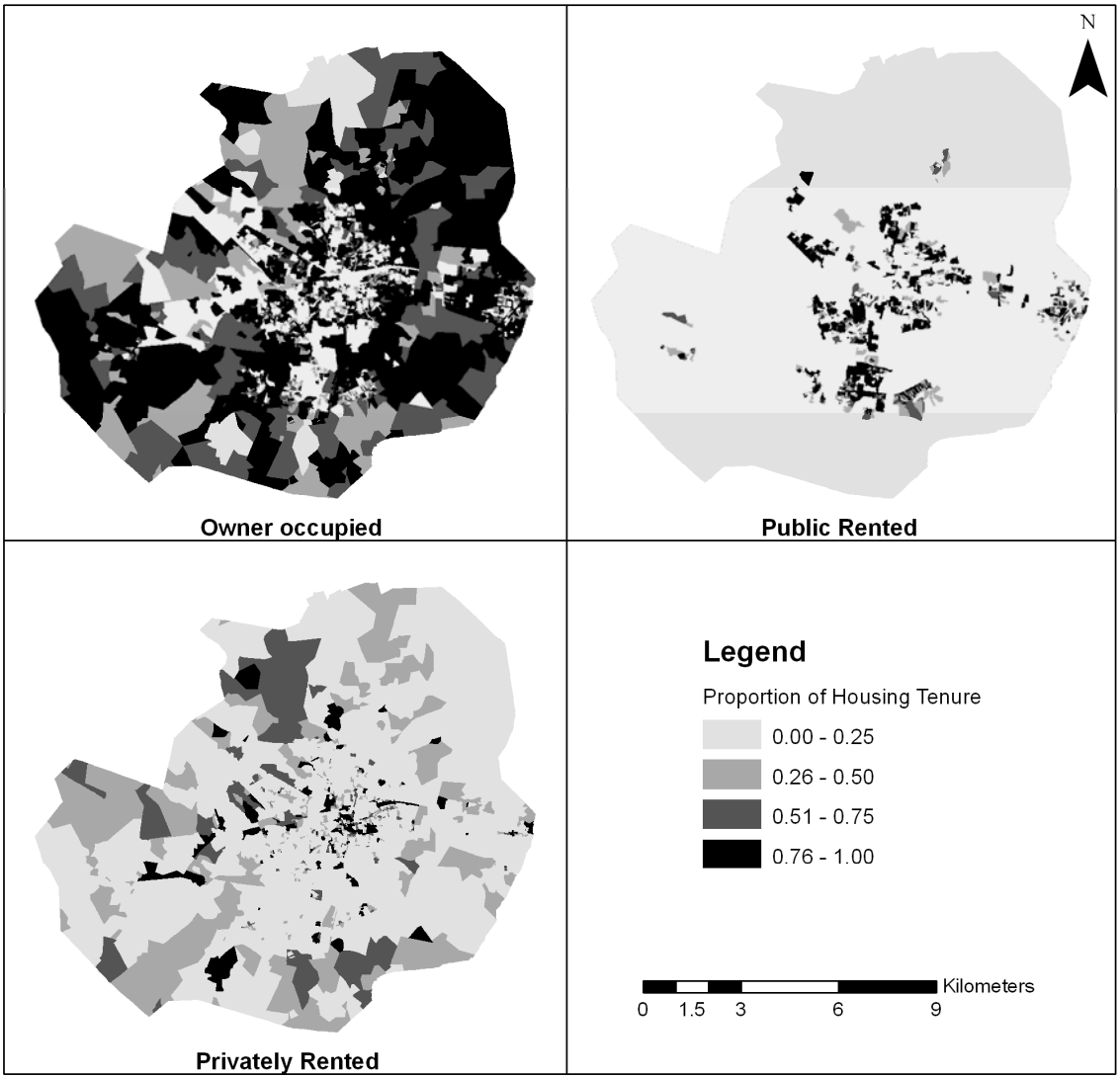
ANNEX 7. CALCULATING COMPOSITE POPULATION



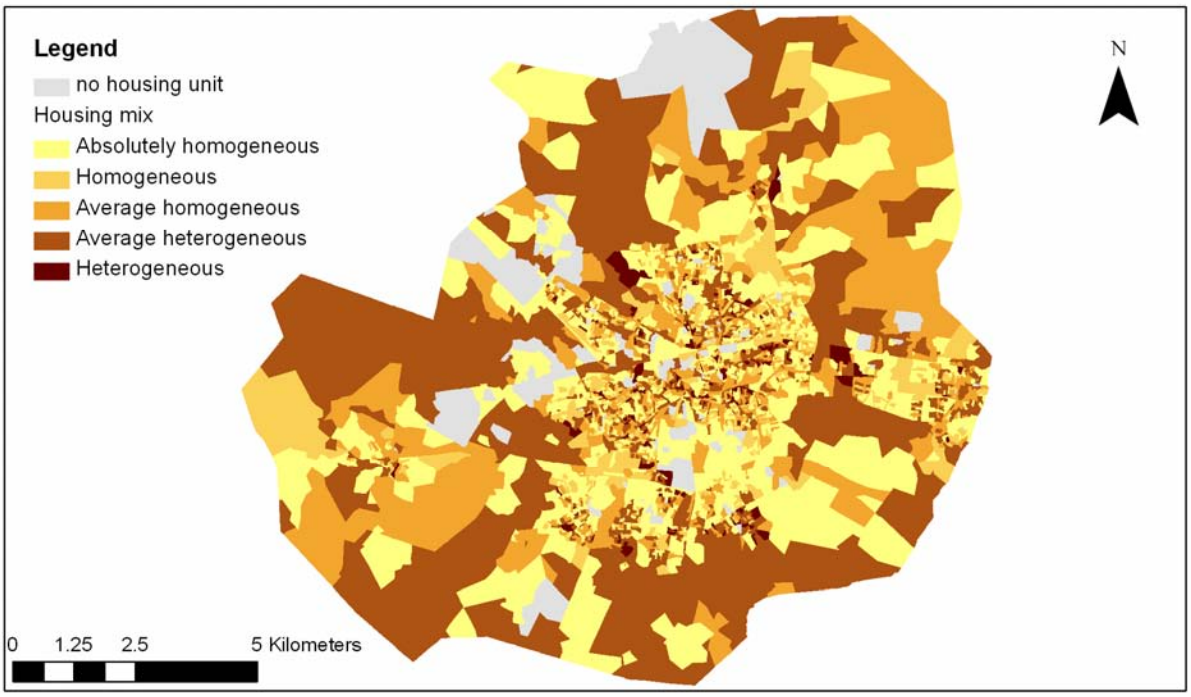
ANNEX 8. DISTRIBUTION MAPS OF HOUSING TYPE



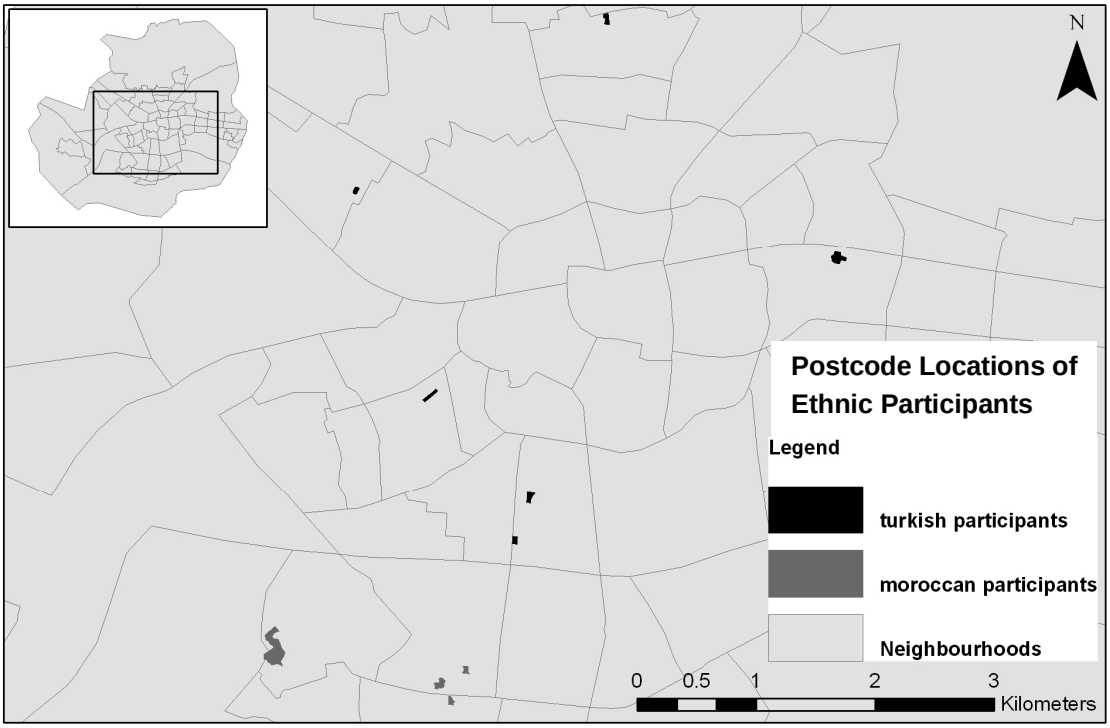
ANNEX 9. DISTRIBUTION MAPS OF HOUSING TENURE



ANNEX 10. DISTRIBUTION MAPS OF HOUSING TENURE MIX



ANNEX 11. POSTCODE LOCATION OF ETHNIC PARTICIPANTS



ANNEX 12. CALCULATING OVERREPRESENTED AREA

Parameters for Surinamese/Antilles and Indonesian in 2009

Scale (m)	Surinamese/Antilles			Indonesian		
	Ethnic percentage in city	Ethnic average per postcode	Percentage at overrepresented areas	Ethnic percentage in city	Ethnic average per postcode	Percentage at overrepresented areas
0 Non spatial	2.47	0.7	39.07	3.17	0.9	39.48
200	2.47	3.4	19.26	3.17	4.9	18.97
400	2.47	10.3	12.16	3.17	15.7	12.01
600	2.47	19.5	9.51	3.17	31.5	9.41
800	2.47	30.8	8.07	3.17	51.5	8.05

Parameters for Turkish & Moroccan in 2009 and 1997

Year	Scale (m)	Turkish			Moroccan		
		Ethnic percentage in city	Ethnic average per postcode	Percentage at overrepresented areas	Ethnic percentage in city	Ethnic average per postcode	Percentage at overrepresented areas
2009	0	7.51	2.3	42.26	1.91	0.5	39.56
	200	7.51	16.5	20.50	1.91	2.4	19.53
	400	7.51	91.0	13.03	1.91	6.4	12.74
	600	7.51	161.0	11.66	1.91	11.4	10.01
	800	7.51	261.8	10.77	1.91	17.4	8.48
1997	0	6.17	1.9	41.37	1.57	0.5	38.42
	200	6.17	13.7	19.19	1.57	1.9	19.74
	400	6.17	38.2	13.96	1.57	4.6	13.13
	600	6.17	145.8	10.16	1.57	7.9	10.42
	800	6.17	235.3	9.31	1.57	11.7	8.85