



**The influence of demographic decline
on the ‘Daily Urban System’:**

A case study into shrinking areas in a
growing city region.

Colofon

Title: The influence of demographic decline on the 'Daily Urban System':
A case study into shrinking areas in a growing city region.

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Preface

The research that is in front of you is conducted by Mike van der Linden as being my master thesis for the master study Urban- and Cultural Geography at the Radboud University located in Nijmegen. This thesis reviews the processes of demographic growth and decline on a regional level. A research field which, in my opinion, could receive more attention.

Acknowledgements

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Mike van der Linden

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Dutch summary

De samenleving is de afgelopen decennia ingrijpend veranderd en zal ook in de toekomst voortdurend veranderen. Onder de oppervlakte is er in de wijze waarop wij leven een grote dynamiek zichtbaar. De activiteiten van mensen zorgen ervoor dat er in een bepaald gebied meer of minder mensen aanwezig zijn op een bepaald moment in tijd. De verschillende activiteiten van mensen hebben in zekere zin invloed op demografische ontwikkelingen en krimp. Van de demografische ontwikkelingen wordt verondersteld dat zij een uitwerking hebben op de samenstelling van een regio. Er ontstaan regio's waar zowel groei als krimp plaatsvindt. In deze regio's leven mensen en wanneer er verschillen ontstaan tussen groeiende- en krimpende gemeenten of gebieden levert dat misschien problemen op. In dit onderzoek wordt gekeken naar verschillende stromen van mensen; zoals werkgelegenheid, voorzieningen en wonen, omdat het gebieden zijn waar je verschillen kunt zien op het gebied van krimpende- en groeiende gebieden in een regio. Dit onderzoek probeert hiermee meer inzicht te krijgen in processen van groei en krimp op een regionaal niveau.

Aan de basis van dit onderzoek ligt de doelstelling meer te weten te komen over hoe groei- en krimp processen in een regio verlopen, om zo een bijdrage te leveren aan het wetenschappelijke debat over krimp en Daily Urban Systems (DUS)'. De centrale vraag die daarbij leidinggevend is: "Wat zeggen de verschillende flows van het 'DUS' over groei/ krimp processen en hebben veranderingen in het 'DUS' invloed op krimp?" Ter beantwoording van deze vraag is het 'DUS' concept aangepast en uitgebreid om als bril te gebruiken om naar krimp in een regio te kijken. Als case is gekozen voor de Regio Eindhoven. De regio Eindhoven is een exceptionele case, het is een dynamische regio op het snijvlak van groei en krimp. Deze dynamiek maakt het een interessante regio om het extended DUS framework te testen.

Met het 'extended DUS framework' is naar krimp gekeken in de regio Eindhoven. De onderzoeksresultaten suggereren dat in het huidige 'DUS' het traditionele hiërarchische monocentrische model overeind blijft. De gemeenten om de stad in de stedelijke concentratie zijn voor werkgelegenheid en voorzieningen gericht op de stad. De gemeenten buiten de stedelijke concentratie, laten meer een gedecentraliseerd patroon zien. Deze gemeenten lijken meer een netwerk te vormen en zijn meer zelfvoorzienend. Er zitten duidelijke verschillen tussen de stedelijke concentratie en het landelijk gebied in de regio en de verschillen worden door de verwachte demografische ontwikkelingen groter. De krimpende delen in de regio krijgen naar verwachting steeds meer te maken met decentralisatie, afstanden tussen voorzieningen en naar voorzieningen worden groter. Decentralisatie van werkgelegenheid en voorzieningen veranderen misschien ook de onderlinge verhoudingen tussen verschillende gemeenten en de stad.

Het dagelijks leefpatroon is groter dan de bestuurlijke gemeentegrenzen suggereren. Het bestaat uit plekken die mensen gebruiken in het dagelijks leven, buiten de eigen gemeente, plekken om te werken, winkelen, wonen, etc. Er vinden hierdoor continue veranderingen plaats in het 'DUS' en deze veranderingen tekenen zich af op verschillende schaalniveaus. Veranderingen in het 'DUS' hebben een uitwerking op de samenstelling van de regio. Er ontstaat door veranderingen in het 'DUS' misschien een andere ruimtelijke structuur, met een nieuwe samenhang. Waardoor de regio mogelijk anders functioneert. Veranderingen in het DUS hebben een andere concentratie en spreiding van mensen tot gevolg. Er ontstaan gebieden waar tegelijkertijd zowel groei als krimp plaatsvindt. Dit heeft tot gevolg een relatieve verandering van de omvang van verschillende kernen in de regio en de functies van de verschillende gemeenten en de stad. Deze veranderingen in het 'DUS' gaan naar verwachting heel geleidelijk, net als het het krimpproces zelf.

Het 'extended DUS framework' zoals gebruikt in deze thesis, lijkt bruikbaar om meer inzicht te krijgen in de relatieve positie en het netwerk waarin gemeenten zich bevinden, de oriëntatie van burgers op hun directe leefomgeving, dagelijks leefpatroon en het vergelijken van groei en krimp. De commuting- en sale flows zijn bruikbaar voor de dagelijkse veranderingen binnen het 'DUS' en om inzicht te krijgen in veranderingen in het 'DUS' op langere termijn zijn migration flows bruikbaar. De migrationflows laten zien waar in het 'DUS' groei en krimp plaatsvindt en hebben een diepere verankering in de regio dan commuting- en sale flows. De flows gecombineerd geven inzicht in het 'DUS', veranderingen in de combinatie van flows kunnen zorgen voor groei en krimp in de regio.

De meerwaarde van het 'extended DUS framework' voor de analyse van groei- en krimp processen zit hem in de combinatie van het dagelijkse leefpatroon in combinatie met migratie. Hierdoor krijgt men inzicht in dagelijkse veranderingen en veranderingen op langere termijn. Met het 'extended DUS framework' is het mogelijk krimp en groei te vergelijken op het gebied van wonen, werkgelegenheid en voorzieningen, binnen een regio. Om zo meer inzicht te krijgen in veranderingen en verschillen tussen groeiende en krimpende gebieden, en krimp te doorgronden. Het 'extended DUS framework' kijkt naar functionele regio's, hoe dingen werken, en niet naar grenzen.

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1 Introduction

This general introduction discusses the project framework, the objective of this project, the type of research that is used, the research model and the research questions. This chapter ends with a thesis outline for the rest of this thesis.

1.1 Project framework

The society has changed dramatically in the past decennia and will also have to deal with changes in the near future. The countries and regions of Western Europe are changing at different scales (Zakirova, 2010). There is a dynamic underneath the surface, which is difficult to detect because it is not visible at first glance. Cities and city regions change all the time and experience the outcomes of developments in the economic structures, the political system and the culture for the part of the world with which they maintain relations with (Lambooy, 1988). They themselves also contribute to the abovementioned processes, through their spatial organisation, spatial behaviour and their way of consumption (Cortie, 1991). The economic changes are closely linked to demographic, political and cultural developments (Van der Laan, 1987). The activities of people also result in a different distribution and concentration of people, in a particular area, at a specific moment in time. The different activities of people have, in a certain manner, influence on demographic developments and shrink.

The debate about demographic developments has received a lot of attention in a relative short period of time. This debate was triggered by demographic developments, projections and the publications of Derks et al. (2006). Demographic developments revolve around 3 variables: birth, death and migration (Poston & Bouvier, 2010). By demographic decline a distinction is made between 'quantitative-' and 'qualitative decline' (Hospers, 2010). 'Hard decline' or 'quantitative decline' is the decrease of absolute numbers of inhabitants and households. 'Soft decline' or 'qualitative decline' is a change of the composition of the population and households. Through the combination of demographic ageing and a stagnating birth rate, regions shall in the future experience (natural) decline of the population. Through this and selective migration, regions will also have to deal with a changed population and household composition. Other than demographic ageing – the precursor of shrink – is shrinkage for the Netherlands as a whole not yet an urgent issue (Rabobank, 2010). This means that there has been done relatively little research about shrinkage. Therefore different issues are left unanswered, which offers space for this study.

The development of an area is embedded in the context of the society of which that region forms part. This study focuses on the development of areas within a metropolitan area. Taking the demographic developments into account it is expected that they have an effect on the composition of a region. Regions arise were growth as well as shrinkage takes place. In these regions people are living and when differences appear between growing- and

shrinking municipalities or areas, than this might cause problems. In this study there will be looked at different flows of people, like employment, facilities and living, because these are areas in which you can see differences in the field of growing- and shrinking surroundings in a region. This study tries to gain more insight in processes of growth- and shrinkage on a regional level.

1.2 Objective

The purpose of this study is to deliver knowledge to those interested and stakeholders. Furthermore, this study tries to clarify demographic shrink through the means of the concept 'Daily Urban System'. The objective is formulated as follows:

"The objective of this study is to gain better insight in how growth- and shrinking processes in a region elapse and to deliver a contribution to the scientific debate about demographic decline and 'Daily Urban Systems'."

In the objective the notion 'Daily Urban Systems' is mentioned as a central concept. The 'Daily Urban System' (DUS) is a designation from human geography for the functional relation between the central city and the closely linked suburbs (Coombes, 1978). The concept 'DUS' is made appropriate to look at shrink in regions. For a set out and explanation of used methods and the underlying conceptual model, reference is made to the chapters 2 and 3. The 'extended DUS framework' contains the following flows: commuting flows, sale flows and migration flows. Through the spectacles of the 'extended DUS framework' there will be looked at growth and shrink in the region to figure out the processes of growth- and shrink.

This study tries to gain insight in how shrink and growth exist next to each other and the reason that one area grows, whilst the other is shrinking. With the 'extended DUS framework' there will be sought for explanations of shrinkage. There will be made a comparison between shrinking- and growing municipalities in a region. Gaining insight in how it is possible that growing- and shrinking areas exist in a region could help to explain why shrinking areas shrink.

1.2.1 Relevance

In this paragraph the relevance of this thesis will be covered. There will be made a distinction between the 'societal-' and 'scientific relevance'.

Societal relevance

The decline of the population became in a short period of time a subject of public debate in the discussion on the demographic developments in the Netherlands, besides demographic

ageing and immigration (Verwest, 2011). Changes in size, growth and composition of the population are for policymakers on virtually every social area of interest. What's concerning is that the Dutch population undergoes major population changes in the upcoming decades (Rabobank, 2010), this also applies to the province of Noord Brabant (Provincie Noord-Brabant, 2012). In many policy areas, the effects of these changes will be noticeable, e.g. education, health, economy and labor market (decrease in the potential labor force), but also to housing and public housing. Furthermore, it is argued that these effects of demographic change will be noticed earlier in the rural areas.

The value of this study lies in the fact that it provides an overview of different shrink related flows. Offering insight in the data of different processes in shrinking areas, can help the making of spatial plans. Information could be derived from this study for different government levels. This project could be relevant for local stakeholders and regions where growth as well as shrinkage is present, or expected. It is crucial to understand the new demographic situation when making new plans and policies, especially when investing in public funding.

Scientific relevance of the project

The public debate about demographic decline in the Netherlands started less than ten years ago. This debate was triggered by demographic developments projections and the publication of Derks et al. (2006), and focussed primarily on demographic developments and possible spatial consequences. Whereas the academic debate on spatial planning, as well as the planning practice, focused mainly on demographic growth. The academic debate started much earlier and was triggered by the suburbanisation of (post) industrial cities (Reckien & Martinez, 2010). The existing literature on demographic decline rarely takes shrinking regions into consideration (Jon & Duin, 2011). A real theory about demographic decline does not exist, according to Hospers (2012). However, there are several assumptions why we shrink. In recent years much research is done into the consequences of demographic aging – a precursor of shrink – the increasing demand for healthcare, the declining demand for (primary) education and the vacancy of existing homes (Verwest, 2011). To a lesser extent, research is undertaken into the absolute decline in population through suburbanisation – a form of selective migration. Research into shrinking areas in a growing region is not done before.

This study may contribute to the academic debate. It aims to deepen the debate on demographic decline and Daily Urban Systems. This research investigates demographic developments in a region and analyses the flows between municipalities and the city. The 'DUS concept' is used for this, which has not before been used to look at demographic shrinkage. Instead, the 'Daily Urban System' is often used to gain insight in growth, in particular for cities or economical agglomerations (Coombes, 1978). Of scientific relevance is that the 'DUS concept' will be extended to research shrink, and this contributes to the

further development of the 'DUS concept'. The extended Daily Urban System model is employed to test the influence of demographic developments in a city region. Demographic developments are phenomena that takes place in a region, the extended model is employed as a lens for looking at these phenomena.

Such work could give new insights into the use of the 'DUS concept'. And so, when extending the 'DUS concept' has added value, it is perhaps possible to use it in other spatial contexts. That is, for looking at growth and decline in a region or urban system. Finally, gaining more insight in growing- and shrinking processes in a region is next to societal relevant, also scientifically relevant. The outcomes of this research could provide material for improved policymaking, but more important, though, is that the processes of growth and decline will be researched on a regional level. It is argued that over recent decades only little research is done on growing and shrinking regions, while in the foreseeable future different regions will emerge with both growing and shrinking areas. The obtained insights could provide new input for the scientific debate about demographic decline and 'Daily Urban Systems'.

1.2.2 Research model

The objective is elaborated in a research model. The research model (fig. 1) serves as a structural base to set up and carry out this project.

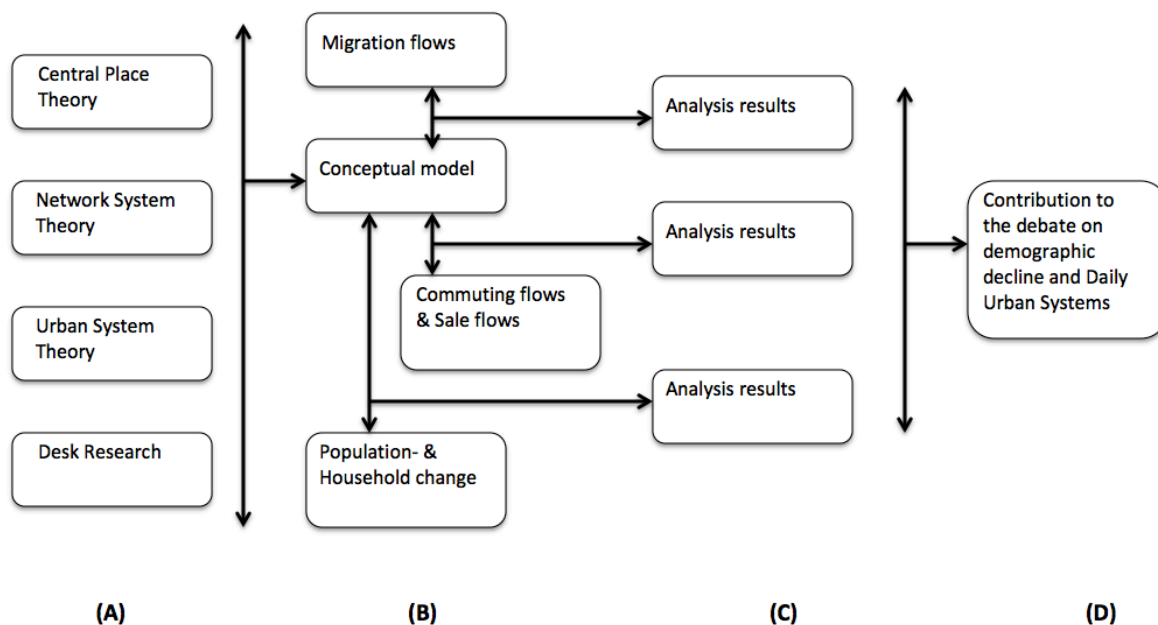


Fig. 1: Research model (author).

Explanation: (A) A study of the problems related to demographic developments in general and changes in urban systems in particular, based on general literature (deskresearch) and on the basis of relevant literature (Central Place Theory, Network System Theory, Urban System Theory), provides the conceptual model. (B) On the basis of which different flows and changes in the Daily Urban System in a region can be explored. (C) A comparison and analysis of the results delivers (D) insight in the processes of changes in the Daily Urban System and the concentration and distribution of people in a region. Through which it contributes to the debate on demographic decline and Daily Urban Systems.

1.3 Research questions

To concretize the objective of this research, a central question with a number of associated sub-questions are formulated. The task is now, after the determination of the objective, to come to a central question that shall lead to an answer and touches the core of it. The main research question of this thesis follows from the objective and is formulated as such:

“What do the different flows of ‘DUS’ say about growing-/shrinking processes and have changes in the ‘DUS’ influence on shrinkage?”

In the central research question the notion of DUS (Daily Urban System) is mentioned as a central concept. The DUS concept will be extended and employed as a lens in this thesis. The extended DUS framework exists out of migration flows, commuting flows and sale flows, and will be used to gain insight in processes of demographic growth and decline. The assumption is that changes in the DUS affect demographic decline, in such a way that there will be differences between growing and shrinking areas on the terrain of migration, employment en retail.

In order to answer the main research question, the following sub questions are formulated:

1) *“How do the migration flows look in the region and how does the ‘DUS’ changes through this?”*

Demographic developments revolve around 3 variables: birth, death and migration (Poston & Bouvier, 2010), migration and migration flows could be an important indicator of how the ‘DUS’ changes: migration results in growth or decline in an area. By examining the migration flows and its orientation, could help to gain insight in how the DUS changes and which differences there are between growing and shrinking areas.

2) *“How do the commuting flows look between the shrinking- and growing municipalities in the region and which differences are in it?”*

Commuting flows are used in the conventional DUS concept for the delineation of DUS. In this thesis the commuting flows and its orientation will be used for investigating the

development of urban networks, as commuting flows constitute the majority of all daily trips. Commuting data is a way to investigate the structure of urban systems (Glanzemann et al., 2004). Comparing the commuting flows between shrinking and growing municipalities can help to gain insight in the differences in the relative position of shrinking- and growing municipalities.

3) "How do the sale flows look between the shrinking- and growing municipalities in the region and which differences are in it?"

Sale flows are an indicator of economic interactions and give insight in shopping behaviour of municipalities and in what way these municipalities are dependent on the surrounding municipalities and the city, for daily- and non-daily groceries. Sale flows and its orientation are thus helpful to gain insight in the functional relation areas/ municipalities have. Comparing the sale flows of growing- and shrinking municipalities could help to gain insight in the differences between sale flows, its orientation and functional relation.

4) "How does the household- and population change in the region, and which influence has this possibly on the different flows and thus on the 'DUS'?"

The population and household development plays for various reasons an important role for changes in the different flows (see also § 2.4). In which way the number of single households, households with (and without) children and single parent households change, and which changes take place in the share of people from 0-14 years, the potential labour force and through demographic ageing, all could influence the different flows. By answering this question, more insight will be gained in this expected influence. The answers to this question could give more insight in the future flows and changes in the DUS of the region.

5) "What added value has the 'extended DUS framework' for the analysis of processes of growth and shrink within the region?"

The extended DUS model is employed to test the influence of demographic developments in a city region. This question aims to answer if the extended DUS framework is useful for this new purpose and if its extension helps with the development of the concept. Evaluating the extended DUS framework, could give new insights into the use of the 'DUS concept', for example to use it in other spatial contexts.

1.4 Method

The study is build up out of a number of components and (partially overlapping) phases.

The first phase is theoretical and consists mainly of desk research in the form of literature study. There is examined what explanations can be found for changes in Daily Urban Systems and the concentration and distribution of people within a region, and how this can be practically investigated.

After the literature study follows the more practical part of this research. By using different flow data and prognoses is investigated which changes in the Daily Urban System occur and what influence demographic developments have.

Additionally there is spoken with councilors of shrinking municipalities and experts, about the demographic developments in the region. These conversations were only used to check the data sources and get a more general picture of the region and demographic developments.

There is chosen for the Region Eindhoven, most important criteria for this was the presence of both growth and deline, as well as economic perspective and more than sufficient employment (the choice for the Eindhoven region will be further elaborated in the methodology chapter).

After the data collection the data is analysed by using EXCEL and ArcGIS (maps). Finally, all the gathered information is processed into this thesis.

1.5 Thesis outline

In this introducing chapter, the motive, objective, research questions and relevance are set out, there will be followed with the theoretical framework in chapter 2. In chapter 2 the used theoretical insights wille be discussed, whereby the central concept 'Daily Urban System' will be extensively elaborated. Chapter 3 will then go into the used methods in this research, the way the research is designed and carried out.

In chapter 4 an introduction is given of the region Eindhoven, the case of this study. In the following chapters 5 till 7 the different flows of the 'Daily Urban System' – the migration flows, commuting flows and sale flows – will be extensively discussed. Chapters 8 and 9 will go into detail about the changing population and households in the region, and try to gain insight in which influence these demographic changes could have on the different flows and thus on the 'Daily Urban System'.

Finally, chapter 10 forms the conclusion. This concluding chapter discusses the implications and limitation of this research and will end with recommendations.

2 Theoretical framework

This chapter discusses the main theoretical approaches and existing studies. The theories that will be worked out in this chapter serve as starting point for this research.

This chapter starts with the 'Central Place Theory' and is followed by the opposed 'Network System Theory'. Then, the 'Urban System Theory' – which is positioned between the 'Central Place Theory' and the 'Network System Theory' – will be extensively elaborated. Thereafter, the 'Daily Urban System' framework will be extended so it can be used to look at shrink in regions. This chapter ends with the presentation of the conceptual model and a conclusion.

2.1 Central Place Theory

The 'Central Place Theory' of Christaller (1966) is a theory that tries to explain the spatial organisation of settlements. When the population is spread evenly over an area, than the settlements should also be spread evenly. But when the concentration and spreading of the population is more random, central places will be concentrated in the best reachable places.

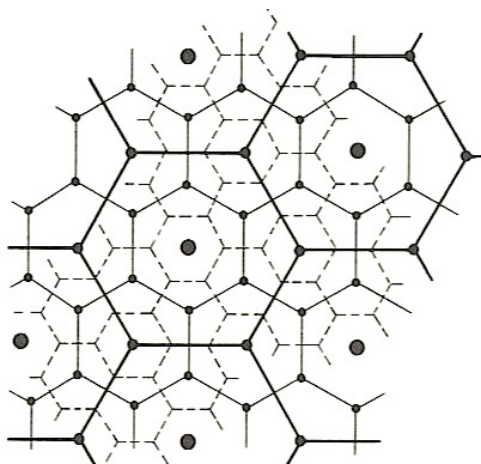


Fig. 2: Model 'Central Place Hierarchy' (Christaller, 1966).

Christaller (1966) has further developed his ideas and elaborated into a theory. The most important element of his theory is that the functions and with that the hierarchical position of settlements, are an outcome of their place in a region. The fundamental characteristic of Christallers model is the rise of a hierarchy of central places, that is to say that a systematic consistency between the size of places and their functional structure is assumed.

In the work of Christaller (1966) is reflected that not only the agriculture or industry determines the spatial pattern, but also the location of the service sector and the residence of the consumer. Because of this consumer-centric relationship, the spatial structure of villages and towns (where the facilities are located) come to the foreground. Christaller saw the economic processes as the engine of demographic and cultural developments.

The 'Central Place Theory' is very economical and most of the theoretical foundations for the 'Central Place Model' are based on flows linked to the physical movements of goods, people and services (Hall, 2001; Limtanakool et al., 2007). The 'Central Place Theory' sets out to predict how through competition for space, an optimal pattern of settlement will emerge (Pacione, 2009). Settlements exist because activities can be more efficiently executed when they are concentrated instead of spread out. It is because of this reason that cities and cores have a certain service area. All regions have some centres which are closer, yet their centres of a higher order (those places which have central functions that extend over a larger region) are found in larger towns which satisfy those demands of the country and of the smaller towns, which the little towns are not able to satisfy (Christaller, 1966). Settlements that interact with and provide goods and services to an adjacent hinterland (as well as to their resident population) have been termed 'central places'. In this respect should be notified that 'central place' is not an equivalent for 'city', because 'central place' refers to the central function of a settlement. In contrast with the 'central places' there are also so called 'dispersed places'. Christaller (1966) describes these 'dispersed places' as all those places which are not centres. They include: (1) areally-bound-ones – those settlements of which the inhabitants live on their agricultural activities, which are conditioned by the land area surrounding them; and (2) point-bound-ones – those settlements of which the inhabitants make their living from resources found at specific locations.

Christaller (1966) talks mainly about goods and services. Seen from the perspective of offer and demand; through an increasing central placement the threshold value of more goods and services is reached, through an increasing central placement more buyers are reached. 'Centrality' is the state in which a location provides its service area. Important in this respect is that 'centrality' refers less to the merely spatial central location than to the central function in a more abstract sense. Within a region, it is possible for the geometric centre to be a very simple dispersed place (Christaller, 1966). The 'centrality' of settlements dictates the quantity of a certain good or service that a settlement can deliver as well as the amount, sorts, and the assortment of mainly the more specialised goods and services. Functions of a higher value appear, when a settlement comes to lie more centralised.

An important consequence of all this is that a settlement has all the functions that a settlement of 'lower centrality' possesses, plus the specialisations that come with 'higher centrality'. These last functions are of a higher level, so more education is required, better payment follows from that, argued is that these cities with a higher centrality on average have a higher level of employment. In the period of suburbanisation this meant that the inhabitants of central cities were also higher educated and more prosperous than those in the region (Cortie, 1991). Because 'central cities' fulfil more functions, they have more

inhabitants than surrounding settlements. To be short, on each criterion the 'central cities' form the top of the hierarchy.

Christaller underlines the importance of the economic processes as the engine of demographic and cultural developments. First, we should point out that the assumptions of these authors were based on the generally accepted theories of their time. The location of raw materials and limited opportunities for transport – of great importance in Christaller's theory – have become much less important. Examples from later studies e.g. by Cortie (1991) showed that through technology and the availability of modern means of communication, led to a much greater spread of market areas. Technological advances have not only increased the communication of people, goods and information, but also led to spatial specialisation of economic functions within urban areas (Van der Laan, 1987). The Central Place Theory, with a strong hierarchy may be too static to look at current regions.

2.2 Network System Theory

In the previous paragraph was the importance of centrality underlined by the Central Place Theory. An alternative is the Network System Theory, this theory may explain spatial organisation of regions without a strong hierarchy.

Changes in social, economic and technological conditions over time can have a radical effect on the efficient functioning of a settlement pattern. It is for that reason that criticism arose on the 'Central Place Theory'. An alternative is the 'Network System Theory' (Hohenberg & Lees, 1985), based on the concept of the 'dispersed city'. But the 'Network System Theory' is not a replacement for the 'Central Place Theory', Pacione (2009, p. 130) says the following about this: "Whereas the 'central place model' seems most suited to patterns of urban development in industrial economies, the 'network model' appears to be more applicable to economies that have become more service-sector dominated."

According to Van der Laan (1998) the developments in the urban system show a shift towards a network. The differences between the centre and the district are fading and a polycentric urban area arises in which each part has its own function: the urban area gets a multi-centred appearance and suburbs are no longer 'sub' (see Erickson, 1983; Van der Laan, 1987; Law, 1988; Ladd and Wheaton, 1991; Berry and Kim, 1993; Boarnet, 1994; Palen, 1995). This shift has as a result that the hierarchy changes: a shift from a 'vertical hierarchy' to a more 'horizontal hierarchy'. The role that an area plays and 'centrality' is according to Batten (1995) changed. The central position from a centre is no longer dictated by its location, but by the function that the centre has in a larger network.

In 'Network System Theory' a settlement owes her existence to an inter-regional or international intertwined economic, political and cultural system, in which locations are

functional complementary. In 'Network System Theory' a city can become part of the system and can specialise itself without a central location. Within this system a much stronger spatial differentiation takes place than within the 'Central Place Theory'. Unlike 'Central Place Theory' – with a vertical hierarchy and a monocentric city – the 'Network System Theory' has more or less no hierarchy and a polycentric city. The general idea of the monocentric city is that most economic activities are based in the urban core, whereas suburbs only fulfil a residential function. Hence, the relationship between the urban core and its suburbs in the monocentric model is hierarchical – nodal or centralized in the sense that most commuting flows are directed from the suburbs areas towards the central cities (Van der Laan, 1998). In the polycentric or 'network city' complementarity (based on two-way flows between places) replaces hierarchical relationships (characterized by vertical flows between places). By polycentric cities one sees for example that cities specialize themselves. That one city focuses on service A and the other on B. Because of this there is no longer one (mono) centre for everything, but different (poly) centres for different services.

The Central Place Theory which has been discussed in the previous section, is as argued before, one end of the spectrum. The most important difference between the 'Central Place Theory' and the 'Network System Theory' is the spatial organisation of functions and from the population. By the 'Central Place Theory' all functions of the region are in the central city in its most specialized form present; whilst in 'Network System Theory', functions and inhabitants are spread over a large number of cities that (can) lie far apart. Through this there is less of a clear hierarchy. In Central Place Theory, the number of functions that they perform in the region ranks the settlements. The model assumes that the more specialized and less common functions are only present in cities that are the most centrally located in the region. This creates a hierarchy, where the top is formed by the city. This view does not fit in a network system. In a network system are high and low-value functions divided on interregional scale (Cortie, 1991) i.e. that through specialisation can one city have a very different set of functions than the other. The largest city does not form the top of a hierarchy and does not have all the functions, as in Central Place Theory. In addition, the existence of multiple centers in close proximity to each other does not necessarily mean that there are strong functional linkages between these centers (Albrechts, 2001).

In this paragraph the Network System Theory is discussed and the main differences with the Central Place Theory. Both theories complement each other, because one theory looks at the hierarchy of places and the other to the nodality of places.

The next paragraph will discuss the 'Urban System Theory', which is positioned more in the middle of 'Central Place Theory' and 'Network System Theory'.

2.3 Urban Systems Theory

In this chapter the Urban System Theory will be discussed. In the beginning of 'Urban Systems Theory', introduced by Berry (1964) and Pred (1997), 'urban systems' were generally referred to as functionally interdependent sets of cities. Later, Pacione (2009, p. 121) refers to: "a set of towns and cities that are linked together in such a way that any major change in the population, economic vitality, employment or service provision of one will have repercussions for other places". Just as every other system an 'urban system' has an appropriate coherent pattern. It is a system existing of different parts and when changes take place in it, it has outcomes for other areas in the system. That is, when changes take place within the urban system, brings changes in parts of the region and the activities of people. Urban Systems are in constant flux (De Goei et al., 2010).

The structure of urban systems can differ from completely monocentric to completely polycentric. Also, the dominant structure can differ at various spatial scales (Batten, 1995). These different scales will be discussed in the next paragraph.

2.3.1 Different scales

Since the industrialisation city structures have strongly changed. The industrialisation leads to the reinforcement of the central cities, whereby specialisation arose. But cities, according to Pacione (2009), became functionally integrated into regional- and national urban systems, while larger cities expanded and developed their economic and social systems. Pacione (2009) distinguishes different scales of urban systems on intra-national scale. Urban systems that take place within the spatial framework of western industrial countries:

- A 'national system' dominated by metropolitan centres and characterized by a step-like population-size hierarchy, with the number of places at each level increasing in a regular manner with decreasing size of place;
- Nested within the 'national system' are 'regional sub-systems' of cities, displaying a similar but less clearly differentiated arrangement, usually organised about a single metropolitan area;
- Contained within 'regional sub-systems' are 'local sub-systems' or 'Daily Urban Systems (DUSs)' representing the life space of urban residents.

Pacione distinguishes national-, regional- and local systems. When Pacione talks about regions, than he is talking about very large areas, much larger areas than a city region, for example: Vlaanderen, the Randstad or South-Netherland. The local sub-system from Pacione is at the level of a city region. A local sub-system is thus not a district and one core or village. Local must not be interpreted as village. Next to different scales, there is also

made a distinction between different types of urban systems. The next paragraph will go into that.

2.3.2 Different types of urban systems

Van der Laan (1998, p.224) distinguishes three types of urban systems (fig. 3):

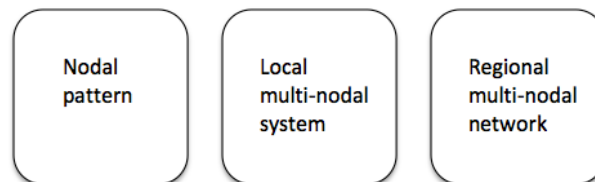


Fig. 3: Different types of urban systems (adapted from Van der Laan, 1998).

- The 'first type' is the traditional hierarchical model where towns are focused at centre towns and cities;
- The 'second type' shows a dehierarchisation at the tower level. Although the hierarchical pattern is still dominant, there is, particularly at the local level, an increase in horizontal, non-nodal towns. The towns become more symmetrical;
- The 'third type' shows, besides multimodality of the local level, an integration of the daily urban system (local sub-system) at the regional level also. Not only do symmetrical towns at the local level exist, increasingly also symmetrical interaction between 'DUSs' emerges.

The different types can be seen, according to Van der Laan (1998), as stages in a development that depends particularly on changes in the economic structure. Thus when the economic structure of a region changes, than the urban system also changes.

Van der Laan's (1998) different types could be linked to 'Central Place Theory' and 'Network System Theory'. The 'first type' urban system, the one with the nodal pattern, has strong similarities with the 'central place cities'. The 'second-' and 'third type' urban systems; the local-multinodal and regional multi-nodal system, could be seen as different 'network cities'. In summary: the urban spatial structure can be characterised either as centralised, exchange, or decentralised. Depending on the existence or non-existence of a regional hierarchy of the different metropolitan relations (Pacione, 2009).

2.3.3 Daily Urban System (DUS)

Contained within 'regional sub-systems' are 'local sub-systems' or Daily Urban Systems (DUSs) representing the life space of urban residents. The metropolitan area is characterized by one or more related concentrations of employment in which a dispersed

population is focused. By using the concept of Daily Urban System can a region be delineated (Dijst, 1995; Hägerstrand, 1970; Ostendorf, 1988). The delineation of urban areas is usually made on the basis of (potential) living and working relationships (Buursink, 1980).

In the debate about DUSs are different views on the DUS and the theory has been applied in various fields. According to Berry (Berry, 1967; Berry et al, 1969; Office of Business Economics, US Department of Commerce, quoted in Berry, 1973) the concept of 'Daily Urban System' describes the pattern of activity around urban areas on a typical working day. Berry (1967) used the 'DUS concept' to state the areal zone in which most of the nation's population carries out the vast majority of their daily activities: employment, retail, and social. He based the 'DUS' on commuting flows, or so called journey-to-work flows.

Also, other researchers have taken advantage of the DUS concept. Coombes et al (1978) presented the 'DUS' as a theoretical argument in favour of urban functional regions as opposed to the traditional areal reporting units of administrative areas. This idea transcends the municipality administrative boundaries. The defining of a 'DUS' consists, according to Coombes (1979, p. 565) of two steps: "firstly urban employment centres (frequently called 'cores') are identified, and secondly commuter hinterlands (or 'rings') are allocated to each core. The first stage involves classifying the base units (local authorities) by size and some measure of metropolitan character (such as employment density). The second stage uses interaction data (journey-to-work flows) to link non-cores to cores." Just as Berry, Coombes uses mainly the commuting flows for the analysis of 'DUSs'.

According to Doxiadis (1968) the 'Daily Urban System' is conceived as the ambit in which each city dweller should carry out – according to acceptable conditions and standards – their activities from a day-to-day basis. Doxiadis (1968) assumes that the activities of people have transformed through time. This happened in different stages, from movement in space only on physical power to the use of cars. Doxiadis (1968) used the 'DUS concept' to set up the boundaries for the major transportation systems. Doxiadis transcended the distinction between the urban- and rural areas.

Finally, Van der Laan (1998), sees the 'DUS' as the traditional view on the local network of a city. The 'DUS' is according to Van der Laan (1998) also called 'Function Urban Regions (FURs)' or 'Standard Metropolitan Statistical Areas (SMSAs)'. The 'DUS' originated as result of an increasing (auto) mobilisation of labour-supply that chose to live outside the city, while labour demand stayed in the urban core. Through this process, the 'DUS' became a synonym for the local urban labour market (Van der Laan, 1998).

2.3.4 Changing DUSs

Next to the different ways in which the DUS concept can be used, are the ways in which DUSs change relevant. The spatial structure of urban systems has changed strongly in the second half of the last century as result of technological innovations, rising levels of affluence and changing lifestyles and household structures (Zandvliet & Dijst, 2005). Public transport and the private car made that people and economic activities disappeared from the centre of the city, whilst at the same time huge suburbs and out-of-town locations for all kinds of business activity arose (Kloosterman & Musterd, 2001). Later, the rise of the information- and communication technology and the rise of prosperity gave people the opportunity to live outside the city. The spatial mobility (on a daily basis) grew through this for almost all households (Musterd & Zelm, 2001). The changes in the 'Daily Urban System' can according to De Goei et al. (2010) be separated in three groups:

- The increased flexibility and mobility of businesses. Central for this are the changes in the spatial distribution of employment opportunities (Renkow & Hoover, 2000);
- The increased flexibility and mobility of households. The effect of increasing flexibility and mobility of people on the urban system is also known as the deconcentration hypothesis. The deconcentration hypothesis holds that urban system dynamics are the result of widespread changes in residential preferences (Renkow and Hoover, 2000). Where the increasing flexibility of firms has changed the nature of the demand for labour, the same advances in transport and communication technologies changed the nature of the supply of labour (Clark & Kuijpers-Linde, 1994; Van der Laan, 1998). The changes in residential preferences are partly caused by demographic developments (Champion, 2002). According to Hall & White (1995) include these the locational preferences of two-earner households, the increasing number of women working, a higher life expectancy, a markedly lower fertility, and an increasing number of single-person households. The common factor in these demographic developments is that they have changed the residential preferences of large groups of people, changing residential patterns, and causing dislocation to the traditional monocentric urban system (Van Ham, 2002);
- Local and regional policies. Local and regional policies can have the explicit intention of economic de-concentration and urban network formation (De Goei et al., 2010). According to Van der Laan (1987), the government in the Netherlands has clearly contributed to the urban deconcentration e.g. through policies in the field of public housing. These policies had strong spatial effects (Van Weesep, 1982) and led to (selective) migration of urban residents to areas outside the city.

From the previous section follows that there are three main reasons for changes in the DUS, which all affect the deconcentration and decentralisation of the population, jobs and facilities.

The emergence of suburban areas near large cities has led to a close relationship between the residential areas in a region and the economic heart of these regions. A polycentric development at this level means that the interdependence between the different cores further increases and that the dominance of the city center decreases. This can be described as a development from monocentric to polycentric. This means that it is possible that within a DUS a shift from a more hierarchical structure such as the Central Place Theory, to a more decentralized structure as in the Network System Theory, can take place. These processes take place on the long term.

The major feature of population trends in recent years has been urban decentralisation (Van Oort et al., 2010). For growth and shrinkage of the population within the DUS must be kept in mind that it is a combination of different developments. Firstly, activities with a specific spatial pattern. Secondly, certain factors act in one area as a factor of attraction (pull), while in another area these factors repel them (push). Thirdly, the specific developments in areas due to population growth i.e. the internal births and deaths in the area, and the external in- and out migration.

2.3.5 Overview DUSs

The 'DUS approach' in practice produces urban systems centred on a single city or compact group of urban areas. A 'DUS' consists of different parts (shopping centres, employment zones and different types of residential areas) which make up a functioning whole. The 'DUS' constitutes a framework for linking the daily activities of the individual with gross trends occurring within a region.

According to Zandvliet & Dijst (2005) a 'DUS' can exist of five types of municipalities. They developed a typology of urban, suburban and rural municipalities in monocentric and polycentric urban systems on the base of dimensions of diurnal weekday variations in visitor populations. A two-step cluster analysis resulted in five types of municipalities: 'Central place', 'Contemporary node', 'Self-contained', 'Mobile children', and 'Local children'.

Below the five types of municipalities within a DUS will be discussed:

1. The 'Central place' type. This type of municipality fulfils a central place within the urban network and is mainly occupied by visitors originating from municipalities on lower spatial scales, carrying out work activities. This type of municipality is at the top of the vertical hierarchy. This is a result from the large diversity of jobs and

services. The 'Central place type' municipality gets during the day mainly job related visits from people of the surrounding municipalities and in the evening visits from people in their spare time. This type of municipality has similarities with what Christaller describes in his Central Place Theory as a 'central place'.

2. The 'Contemporary node'. As a result of functional de-concentration processes, the 'Contemporary node' type of municipality captures the nodes or centres of (working) activity. In comparison with the 'Central place' type, these municipalities do not have a great diversity of jobs and services, but a good accessibility by car. This type attracts visitors with a place of residence on higher spatial scales, undermining the traditional hierarchical system of central places, and claiming a position in the emerging network society (Zandvliet & Dijst, 2005). The 'Contemporary node' type municipality has similarities with municipalities from 'Network System Theory'. The 'Contemporary node' type of municipality forms a nodal point in a network instead of a central function at the top of the hierarchy.
3. The 'Self-contained' type. The 'Self-contained' type is as the name says, self-containing. It provides the own inhabitants of work and services. This type of municipality tends to be small, either by number of residents or surface area. Possibly smaller municipalities offer better (socio-spatial) conditions for establishing self-containment (Zandvliet & Dijst, 2005). This type of municipality is thus not depending on another (central) place and the geographical location of this type within the urban network, is less relevant.
4. The fourth type of municipality is the first of two children-led types: it is labelled the 'Mobile children' type, indicating that the diurnal rhythm within this type is mainly determined by the supply and timing of primary and secondary schools that attract children from other municipalities (Zandvliet & Dijst, 2005). In this type of municipality children are relatively mobile, partly through the spreading of the schools. A big part of the day the children of this type of municipality are present in a surrounding municipality (school time). This type of municipality lies often in the rural area or near to a central place.
5. The 'Local children' type is the fifth type and is unlike the 'Mobile children' type, as the name says, less mobile and more locally focused. This type of municipality is relatively bad accessible and has fewer services and jobs. Residents of this type are dependent on other municipalities. Furthermore, this type of municipality is hardly visited by residents of other municipalities, from a higher or lower hierarchy of within the network.

The five different types of municipalities can appear in a 'Daily Urban System', but not every 'DUS' has each five types. Figure 4 shows an overview from the 'DUS' concept on base of what previously has been discussed.

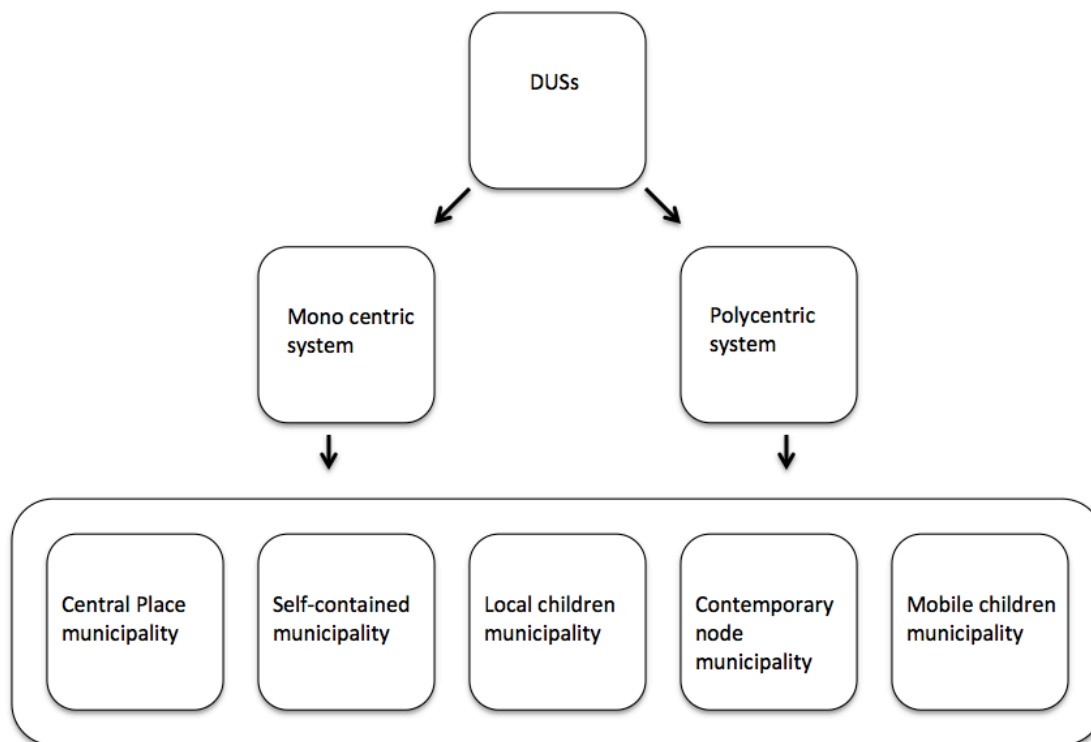


Fig. 4: Overview DUSs (author).

DUSs can be divided in a monocentric system, with a strongly dominating centre and a sharp divide between city and suburban hinterland. Or in a polycentric system, lacking a clear leading city, with a stronger emphasis on the complementarity instead of the hierarchy of places. The relationship between the urban core and its suburbs in the monocentric model is hierarchical – nodal or centralized in the sense that most commuting flows are directed from the suburban areas towards the central cities. (De Goei et al., 2010; Alonso, 1964; Burgess, 1925). However, with a polycentric system, there is not a hierarchy but a decentralized structure. So if the region is polycentric, we expect that residents in their daily activity patterns use different cores and cross commute to a diverse range of places.

A DUS is thus either a 'monocentric DUS' or a 'polycentric DUS'. But, it is possible for a 'DUS' to grow from a 'monocentric DUS' to a 'polycentric DUS'. The 'monocentric DUS' has more similarities with what is described by the 'Central Place Theory' (2.1) and the 'polycentric DUS' has more similarities of what is described by the 'Network System Theory' (2.2).

Both systems exist of different types of municipalities, varying from 'Self-contained' to 'Central place', but not every type is present in each 'Daily Urban System'. A 'DUS' can contain multiple types, but has not per se all five. A 'monocentric DUS' has more often a

'Central place' municipality and for example the 'Local children' type. The opposed 'polycentric DUS' for example, does not have a 'Central place' municipality.

2.3.6 Conclusion Urban System Theory

Christaller (1966) connected the existence of settlements to the regional structure and the limited possibilities to transport goods, people and information. According to Christaller were the functions, and with that the hierarchical position of settlements, a result from their location in a region. The city with the most central location had the most functions, the best functions, and due to the limited daily mobility of people, also the most highly educated and richest inhabitants of the region. Christaller saw the economic processes as the engine of demographic and cultural developments. The distribution of functions completely determined the distribution of people within a region.

However, later research shows that the classic monocentric model (with the assumption that most of the employment and functions are concentrated in the city) loses significance when through technological developments, industry and services becomes more important. Goods, people and information are easier to move and specialisation between regions arises. As a result, cities and regions become part of a network from a different scale: local-regional-national. The position of a city is at that moment determined by the functions that it fulfils within such a network. The vertical hierarchy makes place for a more horizontal hierarchy – with a decentralised structure.

Both theories complement each other, because one theory looks at the hierarchy of places and the other to the nodality of places. The 'Daily Urban System concept' is positioned more or less in the middle of the 'Central Place Theory' and 'Network System Theory'. The 'Central Place Theory' is one end of the spectrum, the other is the 'Network System Theory'. Fig. 5 below shows the position of 'DUS'.



Fig. 5: The position of 'DUS' (author).

A 'DUS' can be monocentric (hierarchal) or polycentric (nodal) and the 'DUS framework' transcends administrative borders of municipalities. The sub-regional scale of the DUS concept seems suitable to gain insight in processes of growth and decline in a city region. Demographic developments transcend administrative borders and should be investigated at the regional level (Hospers, 2012). In addition, the DUS concept with the properties of both

the Central Place Theory and Network System Theory, seems suitable to gain insight in the functional relations between the municipalities and the city.

However, the above studies seem to confirm that the DUS concept in its present form is mainly used to gain insight in sub-regions from an economic context. Generally the 'DUS concept' is primarily used in earlier research to investigate economic movements and economic links between people. Which are measured in commuting flows, goods, services and such. These flows of people, goods, information, and money are produced by the functions present within cities (Hohenberg & Lees, 1995). This research tries to use the 'DUS concept' in a broader context: not only economical but also on different areas. This in order to gain insight in the processes of demographic growth and decline in a city region. I argue that a 'DUS' is more than an economic system and there are also non-economic reasons for changes in a DUS as we saw earlier. The 'DUS concept' is in its current form not applicable for the investigation of demographic developments. Another point of critique is that the 'DUS concept' puts emphasis on daily, hence 'daily'. In this thesis it is about shrink processes and such processes go over a longer period. Van der Laan (1998) already suggested that, the emphasis on the employment structure implies that social and demographic reasons are important too. To be able to study these demographic developments the 'DUS framework' needs to be extended. The DUS framework will be extended in the next paragraph.

2.4 Extending the 'DUS framework'

Central in this study is the extent to which demographic developments affect the Daily Urban System and how changes within the Daily Urban System affect processes of growth and decline in an area. The DUS framework is in its current form, as argued before, is not suitable to investigate shrinkage. But by adapting it, we can make it appropriate to investigate shrink with it.

There is chosen for the 'DUS concept', first of all because this concept is at its basis a regional oriented concept that transcends administrative boundaries. What we observe is always dependent of the geographic scale we look at. Currently in the Dutch context, life is increasingly organized on a regional scale (Ellegard & De Pater, 1999; Nio, 2007). The regionality of activities can therefore only be comprehended from the social- and spatial system of which it is part (Cortie, 1991). The regional level is thus very suitable to investigate processes of growth and decline in the region.

Moreover, the theory is more or less positioned between the 'Central Place Theory' and 'Network Theory'. It has the attributes of 'centrality' and 'networks' and this makes it a suitable concept to gain insight in the dynamic processes (flows, activities, movements) in a city region. However, it is argued that the 'DUS concept' is economically oriented – when using the 'DUS concept' one usually only makes use of commuting data – which is not

enough to gain insight in processes of demographic growth and decline. Christaller underlines the importance of economic processes as the engine of demographic and cultural trends, but later research (Van der Laan, 1987; Van Oort et al., 2010) also shows that the increasing flexibility and mobility of people, the changes in residential preferences and local and regional policies which lead to (selective) migration, also affect changes in the DUS and processes of growth and shrinkage within a region. This could suggest that economy becomes less of a 'driving force', than in the days of Christaller. So, in order to use the 'DUS framework' on a shrinking urban system, it needs to be extended.

The 'DUS framework' will be extended in this thesis with migration flows to be able to apply the framework on a shrinking urban system. Migration is one of the three variables of demographic growth and decline besides births and deaths, and so, an important indicator of how a 'DUS' changes as a result of demographic developments. Commuting flows can change on a daily basis, which does not count for migration flows. Choices regarding the daily mobility can be considered relatively casual and changeable, the choice for the place to live has a much longer time perspective and has consequences for activities that one undertakes. The place to live is a typical choice that has a great impact on the organization of daily life (Van Diepen & Musterd, 2009).

Migration flows are more deeply rooted in the region, for a longer term. Hence, by extending the 'DUS framework' with migration, the 'Daily Urban System' becomes a more 'long term urban system'. But extending the 'DUS framework' with migration is essential to gain insight in the processes of growth and shrink.

The model below represents the extended DUS framework.

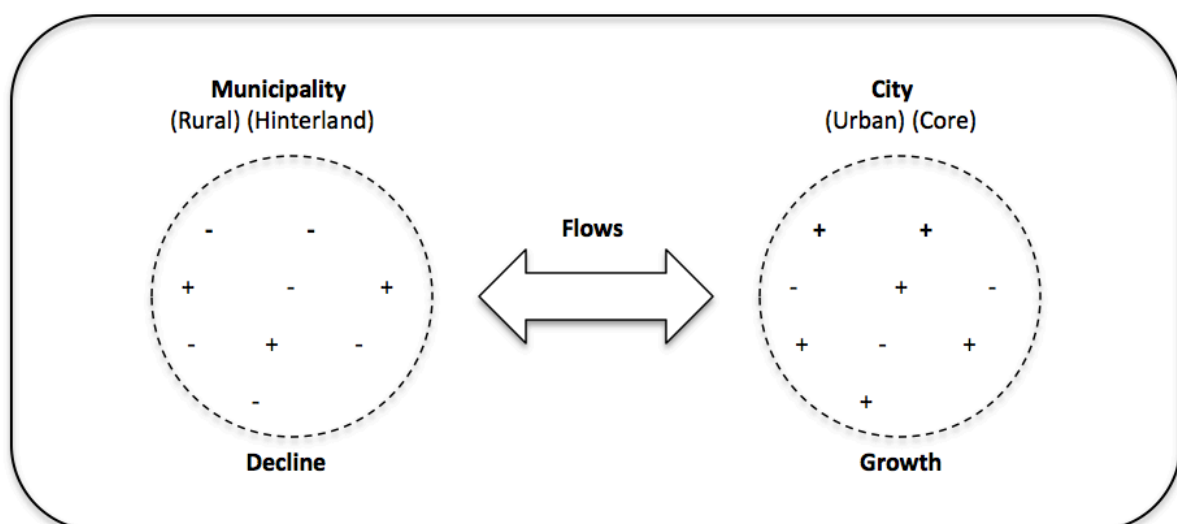


Fig. 6: Extended DUS framework (author).

The container represents the region and the circles represent the space of the different municipalities and the city. The '+' symbol represents a pull factor while the '-' represents a push factor. Within a region different flows between municipalities and the city, and the rural area and the urban concentration areas exist. These flows of activities and movements can help to gain insight in the relative position and the structure (hierarchical or decentralised) in which municipalities are located, the orientation of flows, the daily lifestyle and the contact between city and hinterland.

The model above has attractive aspects for us. With the extended DUS framework different flows between municipalities, between municipalities and the city, and between the rural area and the urban concentration areas can be compared in order to gain insight in differences between growth and shrink within a city region. Below the different flows of the 'extended DUS framework' will be further elaborated:

2.4.1 The different flows of the extended DUS framework

The extended DUS framework exists out of three different flows, whereas the conventional DUS framework only makes use of one set of flows i.e. commuting flows (Hincks & Wong, 2010; Van der Laan, 1998; Coombes et al., 1978). The extended DUS framework uses the three different flows, for three different time periods, which allows us to gain insight in changes in the DUS for the short-, mid- and long term. The sale flows will be used for the short term, and are more local. Commuting flows – from the conventional DUS concept – will be used for the mid to long term and are presumably less local. Furthermore, because one does not change their job on a daily basis, but can decide to do their groceries elsewhere on a daily basis, the commuting flows are considered mid to long term. Third, the migration flows, these are used for the long term. Because one does not frequently moves and moreover, people more often change from jobs than they relocate. There are then 3 intervals: (1) the sale flows with an interval of days or weeks, (2) the commuting flows with an interval of months or years and (3) migration flows with an interval of years.

Sale flows	Commuting flows	Migration flows
Short term	Mid-long term	Long term
Economical	Economical	Non-economical

Fig. 7: The different flows of the extended DUS framework (author).

The different flows of the extended DUS framework are summarized in the overview above (fig. 7). It is argued that the original DUS framework is economically oriented (Hincks & Wong, 2010; Van der Laan, 1998). However, by extending the DUS framework with migration flows, this changes. Migration flows are besides being of great influence on direct changes in the daily urban system for a longer period of time, also especially non-economical. People migrate more often for personal reasons, like the living environment and social (Haas, 2009). With this addition the framework is thus useful to gain insight in non-economical changes in the DUS as well. Which makes it the most important extension to the original DUS framework i.e. it can be used to gain insight in the long-term changes plus non-economical changes.

Migration flows

The DUS concept is used and adaptations have been made. The addition of migration flows is very important for gaining insight in the demographic developments in a city region. Demographic developments revolve around 3 variables: birth, death and migration (Poston & Bouvier, 2010). Migration and migration flows are thus an important indicator of how the 'DUS' changes: migration results in growth or decline in an area.

Migration is defined broadly as: 'a permanent or semi permanent change of residence (CBS, 2010)'. Lee (1966) goes one step further and suggests that every act of migration involves an origin, a destination, and an intervening set of obstacles. In every area there are countless factors that act to hold people within the area or attract people to it, and there are others that tend to repel them. Furthermore, he states that the push- and pull factors at both origin and destination are differently defined for every migrant, or households. Lee (1966) implies thus that there are differences in migration flows between different types of households and age.

Migration is selective, the reason why migration is selective is that persons respond differently to the push- and pull factors at origin and destination (Haas, 2009). Migration flows and relocation movements lead to growth or decline of a particular area. In addition, migration also affects the structure of DUSs. People leave their village and relocate in a village nearby or perhaps outside the region, people move to the city (urbanisation) or out of the city. All these kinds of movements affect 'quantitative-' and 'qualitative' demographic decline. Motifs for outward migration often are the (living) environment, economic perspective or social (Haas, 2009). But also the attractiveness from the city plays a significant role (Hospers, 2010). In order to gain more insight in this attractiveness of the city, the migration to the city is relevant.

Changes in the distribution and composition of the population are not only a matter of birth and death but also of migration. The changes in age and households do affect migration. People who enter the labor force or get married tend to migrate from their parental home,

while persons who are divorced or widowed also tend to move away. These events are important in establishing other types of households (Lee, 1966). In addition, age plays an important role in migration. Starters and young adults – age 25-34 years – are the most mobile group in the housing market, while older people (65 +) the least mobile group (Rabobank, 2010). This means that if in the upcoming decades the number of young adults in the population will continue to decline and the number of the elderly will rise, that as a result the number of movements will decline. It's not just about how many people leave the city, but also which age groups do or do not do this! Another point that Vewest (2010) makes is that planning decisions affect migration and relocation, at least at the local level. Policy and in particular spatial planning decisions can affect the areas of housing, employment, amenities and the attractiveness of the public space. All forms of push and pull factors that influence the migration flows.

Migration is an indicator for how a DUS changes for a longer period of time. With migration the location choice is a choice that has a lot of impact on the organization of the daily life (Van diepen & Musterd, 2009). The house is as starting point an important source of possibilities for (daily) activities. The local housing market thus influences the possibilities for daily activities and migration flows. The housing market is a market where the quantities slowly adjust, houses are built for a longer period of time and the quantities can only be brought back by demolition. Through this, the price (WOZ-value) is very important for the attractiveness. For starters and singles the percentage of rental houses is especially relevant; is it possible to rent a place in their own municipality or are they more or less forced to move, for example to the urban concentration? This also means that since the house as a starting point is an important source of opportunities and constraints for the daily life, and these possibilities and limitations vary per place, than it is likely that households settle in different places in the region, depending on age or life phase (Musterd & Ostendorf, 1994). As a result, the migration flows could change, resulting in a different concentration and distribution of people within the DUS.

Commuting flows

Besides migration flows – which are more deeply rooted within a region – are commuting flows relevant. Commuting is a demand and supply relationship expressed over geographical space (Hincks & Wong, 2010). The commuting flows can be divided into two types of flows. The internal flows, which consist out of people who work and live within the same municipality. And further, the external flows, which consist out of outgoing commuting flows, i.e. flows of people who work in another municipality than where they live. Initially commuting flows were used for the delineation of 'DUS' (Van der Laan, 1998). Commuting flows are useful data when investigating the development of urban networks, as journey-to-work travelling constitutes the majority of all daily trips, both at the inter- and intra-urban scales (White, 1988; Clark and Kuijpers-Linde, 1994). According to Hincks &

Wong (2010) more than other trips, home to work trips tend to cross municipal borders. The choice of studying commuting trips allows a focus on the 'daily urban space' of people. Commuting flows fulfill a significant role in the spending of time and movements of the inhabitants of the municipalities.

Through increased mobility people can live further from their work. The commuting distances today are mainly influenced by social demographic and social-economic factors (Schwanen, 2003). The labour migration, which most of the time has a selective character (Rabobank, 2010), influences the commuting flows and local labour force. Especially the more skilled, young, equipped with more skills, part of the population is drawn from the surrounding area. In the latter area, the composition of the labour force thus increasingly changes in a negative direction i.e. a smaller aging labour force.

Commuting data is a way to investigate the structure of urban systems (Glanzemann et al., 2004). Commuting flows are an indicator for a greater part of the daily activities and describe the pattern of activity around urban areas on a typical working day. This is useful data to see if there are signs of a decentralized pattern. Traditional commuting patterns travel from suburban residential locations to work in urban centres (Hincks & Wong, 2010). Regions and municipalities fulfill different functions for its own population, but also for the people of the surrounding area. In general, the more urban municipalities have an important employment and shop function and more rural municipalities primarily have a more residential function.

Commuting flows are relevant to gain insight in the availability of work and which share of the working population works within the own municipality. Also the orientation of flows is relevant, commuting has a two-fold character: outgoing- and incoming commuting (Van der Laan, 1998). To gain insight in this, there will be looked at the share that works in the own municipality, the city and outside the region. Moreover, Van der Laan (1998) even argues that if the economic structure of a region changes, so will the urban systems.

Sale flows

Sale flows are an indicator of economic interactions (Glanzemann et al., 2004). The sale flows can be divided into two types of flows. The internal flows which consist out of sales made in the own municipality, in which they live. And second, the external sale flows, which consist out of sales made in other municipalities and the city.

Sale flows give insight in shopping behaviour of municipalities and in what way these municipalities are dependent on the surrounding municipalities and the city for daily- and non-daily groceries. 'Daily groceries' refer to the purchase of commodities such as food, cosmetics, and such. 'Non-daily groceries' refer to shopping for clothes, hobby and such. The sale flows give insight in the functional relation between municipalities, and between municipalities and the city, within a 'DUS'. People often come in different municipalities and

the city; some villages are maybe a satellite of a bigger municipality or city. Sale flows are therefore also an indicator for the areal zone in which most of the population carries out the vast majority of their daily activities besides employment and social in the 'DUS'. By collecting and comparing the sale flows from growing- and shrinking municipalities, it is possible to gain insight in which share of the 'daily-' and 'non-daily groceries' take place in the own municipality and outside.

The population development plays for various reasons an important role for changes in sale flows. In the first place, the population in an area forms the market for regional and local businesses. A growth or decline of the population or a changing population, asks for an adaptation of firms in the products and services they offer. Demographic change and the increased diversity in household types have also provided a further sorting of facilities. Moreover, the Province of Noord-Brabant (2012) suggests that support for facilities is based on the (expected) population development in a region.

Which places people use, depends on the accessibility and the activity. The smaller the distances, the more activities one can unfold. The high density in cities comes with a great offer of facilities and a greater variation in functions on a small area, through which the accessibility is good (Burton, 2000). But since the majority of people started using cars, the daily action-radius (and thus the mobility) of people has increased greatly. This gives people the possibility to travel greater distances on a daily basis than before (Doxiadis, 1968). Moreover, in the 30s of the last century more than 90% of the activities took place within a radius of five kilometers around the own home. In 1990 there was a 30 km radius around the house needed to include the same 90% of the daily activities (Van Wee, 1994).

The increased mobility has changed the urban structure (Lambooy, 1988), with as result a decreased importance of centrality (Giddens, 1990). People can buy everything through the Internet and because almost everyone has a car; the geographic proximity of employment, services and shops plays a smaller role. Average distances to facilities still play an important role. Zelm (2001) argues that people have not become footloose and for most of the activities will most people remain in the own urban region.

2.5 Conceptual model

The conceptual framework illustrates the content and argument of this chapter.

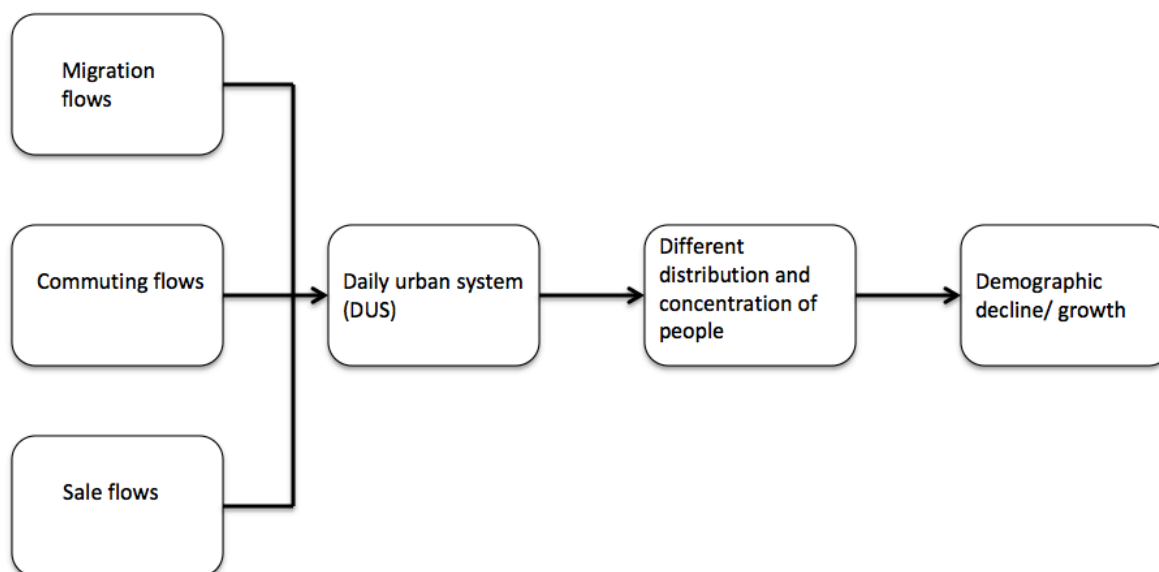


Fig. 8: Conceptual model (author).

The 'extended DUS framework' is employed to view different flows and demographic developments in a city region. By comparing different flows between municipalities and between municipalities and the city more insight can be gained in processes of growth and decline. Following on the theories that give direction to this research, the conceptual model below can be presented. This model states the assumptions that lay at the basis of this research.

The explanation of the conceptual model is as follows. The assumption is that the different flows influence the 'DUS'. Changes in the 'DUS' leads to a different distribution and concentration of people. As a result, demographic decline or growth occurs in a certain area i.e. what people do and where they go, thus determines the distribution and concentration of people. This is consistent with what Horton & Reynolds (1971) stated, namely that the spatial structure adapts to the spatial behavior of its users. The 'DUS' describes how people behave and changes in the 'DUS' might have as a result a certain distribution and concentration of people, in certain places at certain times. Certain places to live, to work, to shop, etc. and at the moment that there are changes in the 'DUS', growth or decline can occur.

2.6 Conclusion theoretical framework

The theories that have been introduced in this chapter serve as starting point for this research. There are common characteristics within the different theories. What most of these approaches have in common is that they mainly concentrate on economic relations.

That is, linkages between and within firms located in different urban nodes (Taylor, 2004). Moreover, in contemporary literature on changing urban systems, it is often argued that the traditional central place conceptualisation is outdated and should be replaced by a network view. At the local or metropolitan intra-urban scale, cities are developing from a monocentric urban city towards a more polycentric urban configuration (Van der Laan, 1987), resulting in a different distribution and concentration of people and activities.

According to Pumain (2003) research on urban systems has shifted from considering the physical appearance of a city region to analyzing the functional flow characteristics between nodes in an urban system. Van der Laan (1998), Hall & Green (2005) and Van Oort et al., (2010) already executed their studies by making use of flow characteristics. This research will make use of flow characteristics, migration data and demographic information. By adding this non-economic information a more complete and better view is obtained, and this makes it possible to gain more insight in processes of growth and shrink in a city region. Shrink is an example of how a 'DUS' works, changes, and influences practice.

A 'DUS' is a concept that is invented to explain certain relations and phenomena, 'shrink' is the actual phenomenon that takes place in practice. In this way, the phenomenon 'shrink' is used to test the 'extended DUS framework'. The 'DUS' concept is extended to gain more insight in the distribution and concentration of people and activities, which cause growth and shrink in areas.

Shrink is not only about economics, also not only about the economics of today, shrink is about a lot more than that and is a process over a longer period of time. Shrink influences areas such as the liveability, housing market and social. Furthermore, shrink changes the population and households, and so, the distances between people. Migration is besides birth and death one of the three variables of demographic developments. Adding migration to the 'DUS framework' is necessary because commuting flows can change, in principle, tomorrow. Migration flows are deeper rooted in the region and are more useful to gain insight in the longer term, in comparison with the use of only economic flows.

In his chapter different theoretical insights have been discussed and the 'DUS concept' is extended to be applicable to view processes of growth and shrink in a city region. To use the 'extended DUS framework' empirical information is necessary of commuting-, migration- and sale flows. The different flows give information about the current 'DUS', but by complementing these flows with the expected demographic developments (prognosis), it is possible to gain insight about changes in the 'DUS' for the future. The next chapter will make clear how the research will be conducted, that is, in what way the central- and sub questions will be answered (the empirical framework).

3 Methodology

The objective of this research is to gain better insight in how processes of demographic growth and decline take place in a region and to deliver a contribution to the scientific debate about demographic decline and DUSs. Therefore different flows and demographic prognoses will be researched. In this chapter the chosen research strategy and the choice of the research material will be addressed. First the research strategy will be addressed, how the research object is approached and with what research strategy. Thereafter will we discuss the choices made on the research material.

3.1 Research strategy

Before selecting a research strategy, we have to make some considerations: width or depth, qualitative or quantitative research, and the choice for field work or desk work. This process entails preliminary considerations, steps in the process, and overall considerations used throughout the process (Creswell, 2012). We will now elaborate the considerations that are being the most appropriate for answering the research questions as presented in paragraph 1.3.

The first consideration that has been made is the choice for width or depth. Here is chosen for in-depth rather than wide. Getting an in-depth and detailed insight in the processes of growth and decline in a region is our goal. The second consideration concerns the choice for qualitative or quantitative research. There is chosen for quantitative research, the Systematic empirical investigation of quantitative properties and phenomena and their relationships (Creswell, 2012). This research consists of quantitative research: analysis of different flows and demographic projections of a city region. The final consideration concerns the choice for field or desk research. Because demographic decline and the different flows in this thesis are mainly quantitative (numbers), there is chosen for desk research.

3.1.1 Types of research strategies

Verschuren and Doorewaard (2007) make a distinction between five types of research strategies, the whole of interrelated decisions on the way a research is going to be conducted. The research strategy is the nuts and bolts of the research, describing the rationale for the research and the steps taken for finding information and documenting results. The five types of research strategies are: the survey, the experiment, the grounded theory, the case study, and desk research (Verschuren & Doorewaard, 2007).

The survey is the most used variant of quantitative research. A survey is a systematic questioning of a large number of persons by a number of predetermined points. It is a type of research that allows the researcher to gain a broad image of an in time and space

extended phenomenon (Verschuren & Doorewaard, 2007; Swanborn, 1987). Moreover, a survey focuses on the practices of the group, the population. The survey could be a suitable method to research different flows in a region. However, when looking at the research questions for this study, questioning enough respondents to deliver representative results, would take extensive time. Downside of the survey research strategy is that it gives a sort of draft about the research phenomenon (Verschuren & Doorewaard, 2007), while this study tries to go in depth. Another downside is that a survey requires a lot of knowledge prior to the start of the survey.

The next type of research strategy is the experiment. An experiment is an orderly procedure carried out with the goal of verifying, refuting, or establishing the validity of a hypothesis (Verschuren & Doorewaard, 2007). Experiments provide insight into cause and effect by demonstrating what outcome occurs when a particular factor is manipulated. Experiments vary greatly in their goal and scale, but always rely on repeatable procedure and logical analysis of the results. The experiment research strategy is not suited for this study because of the fact that the researched phenomena (or its variables) in this research cannot be controlled or manipulated by the author.

Being in-depth rather than wide, this research dismisses the strategies of survey and experiment. A third option is the grounded theory strategy, it is a systematic methodology involving the discovery of theory through the analysis of data (Martin & Turner, 1986). This strategy involves the founding of a theory. The founded theory research strategy is a method that a researcher can use to get an overall view of a complex situation on a limited scale (Verschuren & Doorewaard, 2007). This limited scale could be the region Eindhoven. For the grounded theory approach only a minimum knowledge of the phenomenon is necessary prior to the research. The grounded theory approach is not entirely suitable for this study. Theory plays a role in this research, as the concept of Daily Urban System is the focus of this thesis. Yet, the aim of this thesis is not purely theoretical. This study is characterised by a rather explorative nature and the founded theory strategy is not fully applied here.

The fourth strategy is the case study. The case study strategy aims at getting an in-depth and detailed insight into one or a few specific processes or objects, which are (artificially) delimited in time and space. A case study is defined as a strategy for empirical research that uses different sorts of data (Robson, 2002). Other characteristics are e.g. that the number of research objects is limited, the data collection is labourintensive, the strategy is more about depth than width, the strategy makes use of a selective (strategic) sample and the use of quantitative data and methods (Verschuren & Doorewaard, 2007; Swanborn, 1987). These are all properties of the strategy that can very clearly be related to my research questions (paragraph 1.3).

The last type of research strategy is desk research. The empirical part of this thesis makes the strategy of desk research a sufficient method. The desk research strategy is based on using materials that have been produced by others, and the researcher reflects on this already existing material to come to new insights (Verschuren & Doorewaard, 2007). This existing material contains documents, which are standardized artefacts, in so far as they typically occur in particular formats: as notes, case reports, statistics, annual reports, etc. (Wolff, 2004). Other characteristics of this research method are that the researcher has no direct contact with the research object (this means, for instance, no interviews or observations), and the material is reflected upon from a different perspective than the one used to produce the data. Verschuren & Doorewaard (2007) make a distinction between three categories of data that can be used for conducting desk research: literature (books, articles, papers), secondary data (empirical data brought together by researchers through other inquiries, such as transcripts of interviews) and official statistical data (collected periodically for a wider audience).

After presenting the five types of research strategies, the experiment strategy seems the least suitable for this study. Being rather in-depth than wide, and because of the limited time for this study, this research dismisses the survey strategy. The grounded theory is not chosen because the aim of this thesis is not purely theoretical. Rather, a case study research that provides a detailed description/analysis of one or few parts of a phenomenon is appropriate. Out of the different types of research strategies I have chosen the case study and desk research as being the most appropriate for answering the research questions as presented in paragraph 1.3. When looking at my research objective and questions, and the alternative strategies, I think the combination of these two strategies can be considered to form an appropriate approach for my thesis.

3.1.2 The case study: The Eindhoven region

Case studies are extremely usable for the answering of 'how-' and 'why-questions' (Verschuren and Doorewaard, 2007). In a case study, research is done to one or some limited objects. In this thesis the 21 municipalities of the Eindhoven region form the 'case'. The choice for the regional scale follows from the theory that lies at the basis of this study. It is argued that the population composition and change of neighborhoods should be studied from a regional perspective. The local scale, at municipality level, is too small for interpreting the dynamics of demographic developments. Furthermore, different studies suggested that the majority of the daily activities of people take place on this regional scale. There is chosen for only one (1) region as case: a single case study. A single case study can be sufficient to do statements in a broader context, when it's an exceptional case. An exceptional case is defined as having strategic importance in relation to the general problem. An exceptional case allows the following type of generalization: 'If it is valid for

this case, it is valid for all (or many) cases.’ In its negative form, the generalization would be, ‘If it is not valid for this case, then it is not valid for any (or only few) cases’ (Yin, 1994). It should be noted that a particular difficulty in each geographical study is the definition of the area covered by the study (Lambooy, 1988). In other words, the statements on the regional developments may not be valid for all objects, in this case the areas included in the analysis. Furthermore, an exceptional case is a particular case, and this means that we need to be careful with drawing general conclusions.

It is argued that an average, or typical, case is often not the richest in information. Therefore, it is more useful to select subjects that offer an interesting, unusual or particularly revealing set of circumstances (Yin, 1994). The Eindhoven region is such an exceptional case. The Eindhoven region is selected on the basis of a number of criteria. The region as a whole needs to grow demographically but should nevertheless have shrinking municipalities, this is necessary for the comparison of shrinking and growing municipalities. In addition, the region has to have economic perspective, i.e. sufficient employment and has to be attractive for businesses. This is because population decline often occurs in regions with few economic prospects and we are mostly curious about the non-economic reasons for differences between growth and decline in a region. The Eindhoven region meets these criteria: the region grows, but within the region there are shrinking areas. It is a dynamic region on the cutting edge of demographic growth and shrink. This dynamic makes it an interesting region for testing the ‘extended DUS framework’. Moreover, for an average region you can always come up with a concept that is applicable. But the Eindhoven region is a complicated region, with growth and shrink and economical perspective – for example, the Eindhoven region forms one of the three pillars of the Dutch economy (Brainport development, 2012) and has 15% more jobs than there are people who belong to the labor force.

The chosen case study strategy will provide in-depth insight in the way processes of growth and decline take place in the region. The chosen method is suited to research the changes in DUS for the short, mid-long and long term. The next paragraph will elaborate on the data that will be used to do this.

3.2 Research material

The next issue to be tackled has to do with the selection of the data, the raw material to be analysed to answer the research questions. The bulk of the data I will be using for achieving this goal has been produced and published by primarily CBS, SRE, PRIMOS and the province of Noord-Brabant. This paragraph will further elaborate on the research material.

3.2.1 Literature

Scientific research frequently uses existing documents, like scientific literature (Swanborn, 1987). Scientific literature in this thesis is used to formulate the theoretical framework (chapter 2) and to structure and organize this study. As described in the research model (fig. 1) the literature in this research is used for a study of the problems related to demographic developments in general and changes in urban systems in particular. Based on general literature (deskresearch) and on the basis of relevant literature (Central Place Theory, Network System Theory, Urban System Theory), the conceptual model (fig. 8) was formulated. Which will be used in chapters 5-9 to explore the different flows and changes in the DUS in the region Eindhoven.

3.2.2 Data for the different flows

In the theoretical framework (chapter 2) was investigated which factors result in changes in the DUS. An exponent of that is the extended DUS framework, which exist out of three different flows, for three different time periods, which allows us to gain insight in changes in the DUS for the short-, mid- and long term. Growth and decline will be compared on the terrain of migration, commuting and sales, for the purpose of answering the research questions as formulated in paragraph 1.3. The three different flows of the extended DUS framework are covered in chapter 5-7 and answer subquestion 1-3. Below each of the flows of the extended DUS framework will be discussed and which data¹ will be used in order to answer the related research question.

Migration flows

Central in this research are the flows and the changes in the DUS, so we need data about these flows. For the analysis of the migration flows there is made use of statistical data from CBS. This CBS data exists out of absolute numbers of movements to other municipalities. This are actual migration flows from- , between- and to other municipalities. This statistical data from CBS is worked out in EXCEL and is added as appendix 1. The 21 municipalities are placed in rows and columns, and the number of movements per municipality is worked out in such a way that if one reads from left to right, one can see where everyone migrated to, per municipality. This spreadsheet shows the different absolute migration flows in the region. To gain insight in the criss cross migration flows in the region, the absolute migration flows are accumulated for each municipality and worked out in EXCEL.

The above-mentioned EXCEL sheets are not suitable to compare differences between growth and decline. The spreadsheet does not give a clear overview to easily see these

¹ For the flows of the 'DUS' actual data from the past years is used because there are no prognoses for future flows available.

differences. Furthermore, the differences in the absolute number of migrations are often minimal, which makes it impossible to make founded statements about the findings. The differences should be viewed on the regional scale, this is also the logical scale to investigate demographic developments (Ellegard & De Pater, 1999; Nio, 2007; Cortie, 1991). Moreover, the differences on local level are often dependent on where new houses are being built (Van der Laan (1987); Van Weesep, 1982; Oort et al., 2010). This is why we used the numbers from the EXCEL sheets to make balances. The migration flows are processed in balances. The balances are compared in such a way that growing and shrinking municipalities can be compared, the urban concentration and rural area can be compared, and the balances give insight in the orientation to the city.

Commuting flows

For the analysis of the commuting flows there is also made use of statistical data from CBS and is worked out in 2 EXCEL spreadsheets (appendix 2), (1) absolute commuting flows and (2) accumulated commuting flows. However, the spreadsheets have another orientation, one should read them per column. When reading per column we can see the internal and external commuting flows per municipality in the region Eindhoven. The spreadsheet with the accumulated commuting flows gives an overview of the total commuting flows and gives us insight in the relative position of the municipalities and the orientation of the flows.

However, the commuting flows presented in a EXCEL spreadsheet are not easy to compare. In order to compare shrinking and growing municipalities and differences between the commuting flows, the data from the EXCEL sheets is worked out in balances. Which makes it possible to compare the commuting flows between shrinking and growing municipalities, the rural area and the urban concentration, and the orientation towards the city.

Sale flows

For the analysis of the sale flows is made use of statistical data from SRE. The sale flows are worked out in a similar fashion as the commuting flows in EXCEL (appendix 3). However, the difference is that the data is in percentages. Each percentage represents a share of the sale flows of the respondents combined. There is made a distinction between daily and non-daily sales. This makes it possible for us to gain insight in the daily sales and the non-daily sales – which take place once per week or month. The EXCEL sheet also gives insight in the internal and external sale flows and to which municipality.

In order to compare the sale flows of shrinking and growing municipalities, the percentages have been worked out in balances. The balances show the differences between growing and shrinking municipalities, the urban concentration and the rural area, and the orientation to

the city. This makes it possible to gain insight in the differences and the share of internal and external flows.

3.2.3 Data for the demographic developments

It is possible that within a DUS a shift from a more hierarchical structure such as the Central Place Theory, to a more decentralized structure as in the Network System Theory, can take place. These processes take place on the long term. For this reason (and to answer the fourth research question), chapter 8-9 will elaborate extensively on the demographic developments in the region on the long term, with the help of different prognoses.

For the analysis of the demographic developments we make use of the most recent prognoses from PRIMOS and the Provincie Noord Brabant. There is chosen for the prognoses of PRIMOS and the Provincie Noord Brabant, because these prognoses take the housing program into account. As argued before, the planning of houses has influence on the local differences between municipalities (Van der Laan (1987); Van Weesep, 1982; Oort et al., 2010).

Because of practical reasons, there is made use of data per municipality, despite the focus on growing- and shrinking areas. For the demographic developments actual data is used (2005-2011) and prognosis (2010-2040); actual data about demographic developments between 2005-2011, and for expected developments the prognosis till 2040. This data is necessary to gain insight in the demographic developments of various municipalities and how the demographic developments spread through the region. In order to be able to compare the differences between the urban concentration and the rural area, and between growing and shrinking municipalities, the absolute quantitative data is summarised in pie charts.

3.2.4 Maps

For the geographer the map is the most famous form of generalization (Cortie, 1991). For this research different maps are made with ArcGIS, because the quantitative data is too static. The maps are built up out of data from the different flows and the demographic developments. The different maps made for this study exist of the 21 municipalities of the Eindhoven region and each map has different flows and variables in them.

To be able to compare growth and decline on a regional level, all the 21 municipalities of the region (the limited objects that form the case) are included in the map. In this way, each map gives an overview of the complete region and the geographical locations of all the municipalities, and the urban concentration and rural area. The maps make it easy to compare growth and decline on the regional level, between the rural area and the urban concentration, and on the local level. This is only possible by calculating the absolute

numbers to relative numbers (percentages). Comparing the absolute numbers of municipalities that differ in size etc. is not sufficient or correct. The relative numbers are translated to balances and these balances are used in the maps. The absolute numbers are thus at the basis of each map, but translated to balances for comparison.

3.3 Conclusion

The collected data from flows and prognosis are taken as input to do a comparison analysis for all researched municipalities, with the objective to find explanations for the similarities and difference between the various growing and shrinking municipalities in the region Eindhoven. A comparison and analysis of these results delivers insight in the processes of changes in the Daily Urban System and the concentration and distribution of people in the region. Through which it contributes to the debate on demographic decline and Daily Urban Systems.

Multiple sources are used to execute this research, as a result this research contains different elements that can lead to different sorts of knowledge, as described in Verschuuren and Doorewaard (2007). The focus of this research lies at 'descriptive-' and 'explanatory knowledge'. The knowledge that through this research is generated is 'descriptive knowledge': about the different flows of the 'extended DUS framework' and about the changing population- and households in the region. And simultaneously, 'explanatory knowledge': about the differences between shrinking- and growing areas.

Before the actual analysis is presented, however, it is important to provide the necessary background information on the Eindhoven Region. This will be the focus of the next chapter.

4 The Eindhoven region

In this chapter the Eindhoven region (= the case) will be further introduced. The Eindhoven region forms one of the three pillars of the Dutch economy and is in 2011 declared to be the 'Smartest region of the world' (Brainport development, 2012). The region Eindhoven lies in the south of the Netherland, in the province of Noord-Brabant. The region has 21 municipalities (fig. 9) and is separated in a rural area (LG) and an urban concentration area (SCG). The Dutch applied spatial research about regions and policies makes use of this dichotomy rural area and urban concentration area.

The map below illustrates this separation of the municipalities in the region.

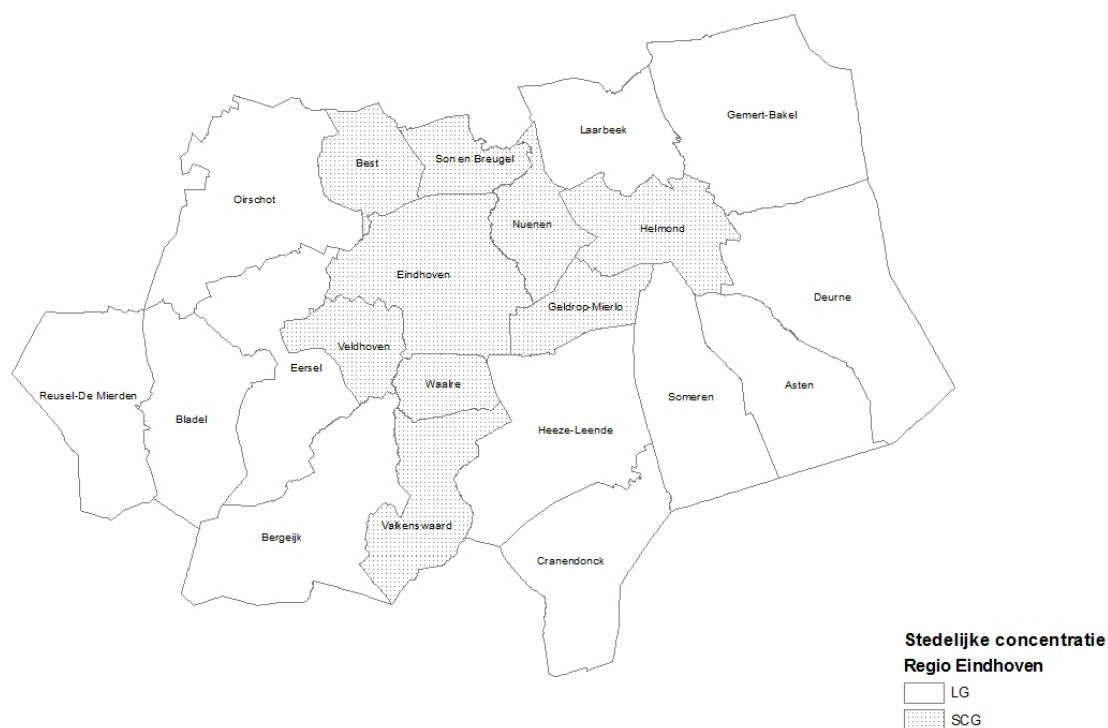


Fig. 9: Map region Eindhoven with separation 'Urban concentration (SCG)' and 'Rural area (LG)' (own map).

Current demographic situation

The absolute (quantitative) population between 2005-2011 is used to gain insight in the current growth and decline in the region. Later, in chapter 8, the expected population change for the region will be addressed. The overview below shows the actual changes between 2005 and 2011 for the region. In the overview a distinction is made between the urban concentration and rural area, and the total of the region. The green colour means growth compared to the previous term, the colour red means a decline.

Population	2005 (feitelijk)	2011 (feitelijk)
Urban concentration	489700	500400
Rural area	236800	238500
Total	726500	738900

Fig. 10: Overview absolute population (author, adapted from Provincie Noord-Brabant, 2012).

The region has grown over the past years, as well as a whole as the urban concentration and the rural area individually. Next to the regional growth, it is relevant to focus at the local quantitative growth. The figure below (fig. 11) shows the actual changes between 2005 and 2011 per municipality.

Actual population	2005	2011
Asten	16260	16295
Bergeijk	28925	28810
Best	19135	19385
Bladel	18100	18075
Cranendonck	20040	20370
Deurne	32005	31675
Eersel	18295	18165
Eindhoven	208455	216035
Geldro-Mierlo	37845	38390
Gemert-Bakel	27880	28905
Heeze-Leende	15205	15295
Helmond	85830	88560
Laarbeek	21640	21530
Nuenen c.a.	23180	22240
Oirschot	17905	17845
Reusel-de Mierden	12300	12605
Someren	18115	18315
Son en Breugel	15135	15655
Valkenswaard	31055	30620
Veldhoven	42765	43590
Waalre	16475	16480

Fig. 11: Overview absolute population per municipality in the region Eindhoven (author, adapted from Provincie Noord-Brabant, 2012).

Between 2005 and 2011 there have been 8 municipalities that had to deal with shrink: a population decline in comparison with 2005. The red colour in figure 8 shows this. Thus despite the fact that the region was growing, there were 8 of the 21 municipalities that had to deal with shrink.

The Eindhoven region is a region with economic perspective and demographic growth. However, there are parts of the region that shrink, while other parts grow. This dynamic makes it an interesting case to test the 'extended DUS framework'. In the following chapter the first set of flows from the 'extended DUS framework' will be analysed.

5 Migration flows in the Eindhoven region

After describing the methodology and having outlined some theoretical positions and insights as found in literature, the following chapters (5-9) will look into the empirical findings of this research. These findings will be related to general ideas and characteristics of the theories as described in chapter 2.

This chapter addresses the first sub question: *“How do the migration flows look in the region and how does the ‘DUS’ changes through this?”* This is done on the basis of quantitative data about movements and the local housing market. This chapter focuses on migration to the rural area and the urban concentration, migration to the city, and the local housing market, in order to see how the migration flows look in the region and how the ‘DUS’ changes through this.

The theory that lies at the basis of this study implies that migration changes the concentration and distribution of people within the ‘Daily Urban System’. Migration is next to birth and death, one of the three causes for demographic shrink. Migration is an indicator for how the ‘DUS’ changes and gives insight in growth and shrinkage. Functions such as employment and shopping have a monthly, weekly or even daily user frequency. For migration this frequency is much lower. It is therefore argued that migration is an indicator for how a DUS changes for a longer period of time.

The region as a whole grew between 2005 and 2011, but already there were municipalities that were dealing with demographic shrink. This shrink seems to be the result of selective migration. This selective migration is caused by push- and pull factors of the surrounding: the housing market, employment, facilities, but also the attractiveness of the city plays a role. Migration has a big influence on quantitative- as well as qualitative shrink, not only directly through e.g. the movement of younger people, but also because more people move away, than that return to an area.

5.1 Migration flows in the Eindhoven region

In appendix 1 are the absolute and accumulated migration flows presented in an EXCEL overview. The flows between Reusel de Mierden and Bladel, and the flows from Valkenswaard to Bergeijk, show big differences. When analysing the accumulated migration flows, it becomes clear that there are a lot of changes in flows between municipalities. Remarkable is that Eindhoven (the central city) loses more than a hundred inhabitants to Veldhoven. This could be the result of the newly build residential area ‘Meerhoven’. Furthermore, the shrinking municipalities of Laarbeek and Valkenswaard lose a lot of residents to resp. Gemert-Bakel and Bergeijk (also a municipality with demographic decline).

It is hard to compare the municipalities in the region and see differences between them, with only the EXCEL sheet (appendix 1). In the following paragraphs the numbers from the EXCEL sheets are used to create maps. For the geographer the map is the most famous form of generalization (Cortie, 1991), and the maps make it easier for us to compare growth and shrink between areas, municipalities or on the regional level.

5.2 Migration to the rural area and the urban concentration

In order to gain insight in the differences between the urban concentration and the rural area in the region, the migration flows between them are mapped. The in- and outgoing migration flows are relevant to gain insight in the development of the DUS of the city region Eindhoven: develops the 'DUS' more centrally towards the urban concentration, or more spread out over the rural area? When the urban concentration grows compared to the rural area, than this can result in a bigger duality between city and hinterland.

The map below (fig. 12) shows the percentage of movements from the urban concentration to the rural area in the region. The green colour is the rural area and all municipalities have the same colour, because the map wants to make clear the movements from the urban concentration to the rural area. The percentage represents the share of the movements that have moved from the urban concentration area to the rural area. For example: 10-19 means that from al movements 10 till 19% moved to the rural area. The other share of the movements took place within the own municipality, the urban concentration or outside the region.

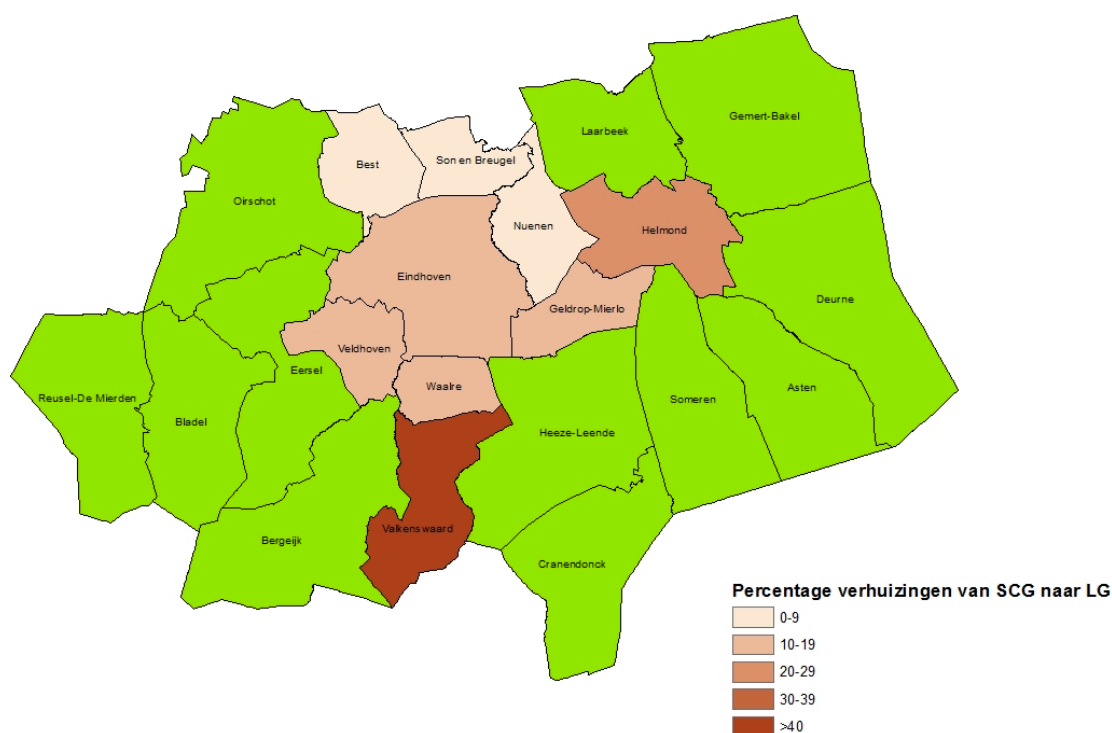


Fig. 12: Map 'movements to the rural area' (own map, adapted from CBS, 2009).

Striking is that 20 till 29% of the movements from Helmond, and more than 40% of the movements of Valkenswaard, went to the rural area. This could possibly be caused by the fact that a lot of the neighbouring municipalities, of both municipalities, are rural municipalities.

The map below (fig. 13) shows the percentage share of the movements to the urban concentration area, from the rural area. The darker the colour, the higher the (percentage) of total movements. The share of movements to the urban concentration is especially high with the neighbouring municipalities of the urban concentration. There, almost 40% of the movements take place to the urban concentration. By comparison of map 9 and 10 it becomes clear that the rural area has more movements to the urban concentration area, than the other way around – from the urban concentration to the rural area.

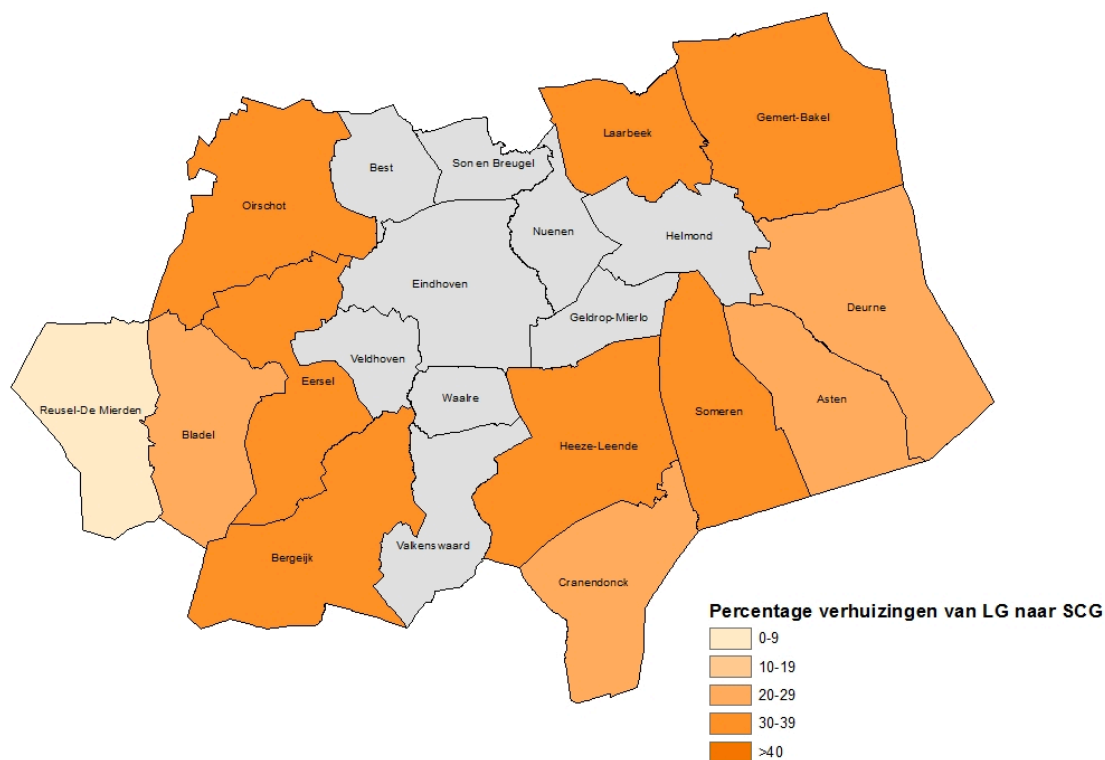


Fig. 13: Map 'movements to the urban concentration' (own map, adapted from CBS, 2009).

From the 8 municipalities that between 2005-2011 had to deal with shrink, 6 lie in the rural area. The urban concentration area only counts 2 shrinking municipalities. Whereby, one for less than 10 per cent moves to the rural area and the other for more than 40 per cent. This doesn't say much, it is only two municipalities and the difference between them is 30 per cent. It is more relevant to look at the 6 shrinking municipalities in the rural area. From the 6 shrinking municipalities of the rural area, moves on average, more than 30 per cent to the urban concentration. Thus, from all movements that take place per rural municipality, moves at least 30 percent to a municipality in the urban concentration.

If the urban concentration grows relative to the rural area, contributes to the emergence of a more monocentric urban area. Although the map is a snapshot, it shows that more relocation take place from rural areas to the urban concentration, than vice versa.

5.3 Migration to the city

Besides migration to the rural area and the urban concentration, is migration to the city relevant. To gain insight in the city as pull factor. The attractiveness of the city is a worldwide trend, which is apparent on all spatial scales. If there are a lot of movements to the city, then that can be an indication that the city is a more central place within the ‘DUS’ of the region. When the share of movements to the city is relatively low, than it could be an indication for a more polycentric system – lacking a clear central city.

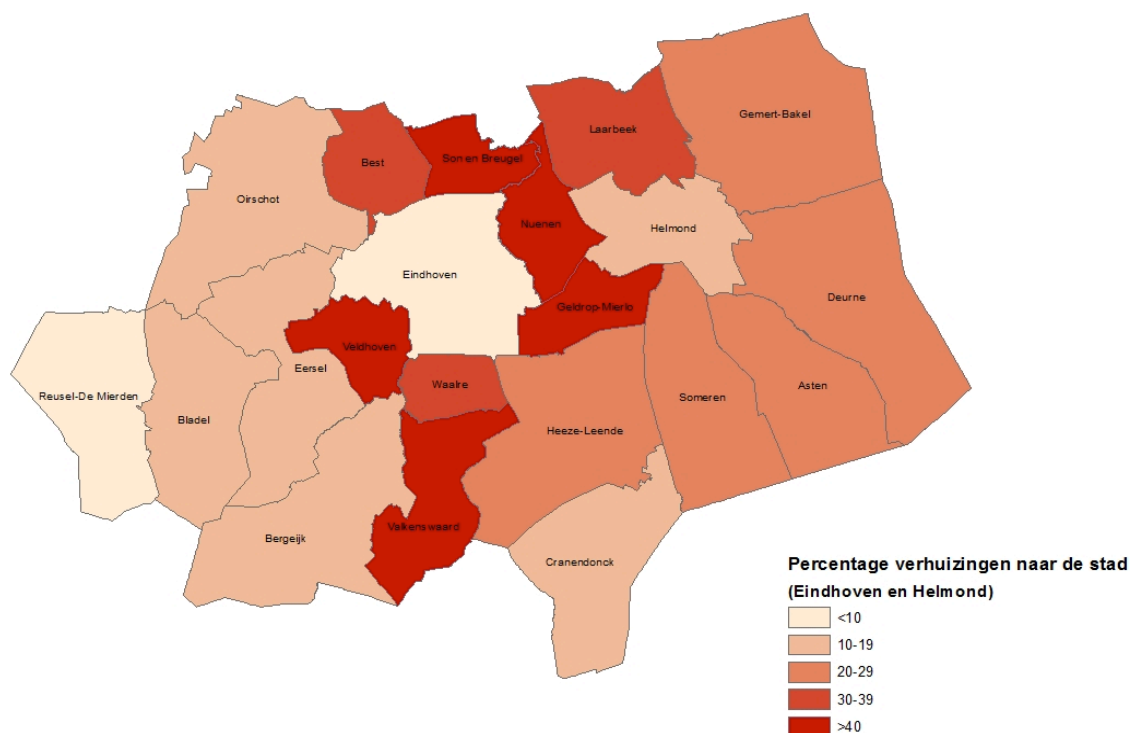


Fig. 14: Map ‘movements to the city’ (own map, adapted from CBS, 2009).

The map (fig. 14) shows the percentage share of the total of all movements per municipality that has moved to the city. The ‘city’ is in this context the municipalities Eindhoven and Helmond. The darker the colour, the higher the percentage that moves to the city is. The map illustrates that a large share of the suburbs of Eindhoven moves to the city, by the suburbs of Helmond this is lower. Furthermore, the map shows that more people move from Helmond to Eindhoven than the other way around. The map also shows that more people in the east of the region move to the city than the people in the west. This could be the result of the big number of residential areas that Helmond has developed, which cause an in-flow of people from the surrounding municipalities – and thus an out-flow in the surrounding municipalities.

When comparing the differences between the share of movements to the city of households from growing- and shrinking municipalities, it appears that shrinking municipalities move relatively more often to the city compared to growing municipalities. However, this difference is only 1 per cent, resp. 26,4 % compared to 25,4 %.

5.4 Local housing market

As we saw in Chapter 2, the mobility of people has increased dramatically in recent decades. The daily activity pattern changed through this, but also under the influence of numerous social trends such as increased prosperity, individualization and emancipation processes.

It is argued that the Daily Urban System of people has increased in recent decades because people are able to overcome greater distances in their daily lives. The residential area is therefore still important when it comes to the location of the house. The house as starting point is an important source for possibilities of (daily) activities. Furthermore, the most important reason to move is often the quality of the house and the (living) environment. This makes the local housing market an important push- or pull factor for migration. The housing stock increasingly determines the population size, it is also assumed that the municipal (local) population change is strongly correlated with the local housing market. As a result, the local housing market has influence on migration flows and thus on changes in the DUS.

On 1 January 2011 there were almost 315,000 homes in the region Eindhoven. According to CBS, 40% of these homes were rental. To gain insight in the differences in the local housing market, the house price and the percentage of rental houses is relevant. First the house price, the price of a house is very important for its attractiveness (Rabobank, 2010). The attractiveness of houses is like location, depending on the price. High house prices can possible be a motive for different households to move to a different municipality.

The map below (fig. 15) shows the average house value per municipality (WOZ-value); the darker the colour, the higher the average house value. The average house value in the rural municipalities is a little bit higher than in the urban concentration. When comparing the average WOZ value between growing and shrinking municipalities, it appears that the WOZ value in Euro's in shrinking municipalities is considerably higher compared to growing municipalities. A difference of more than 30.000 Euro's i.e. more than 10 per cent.

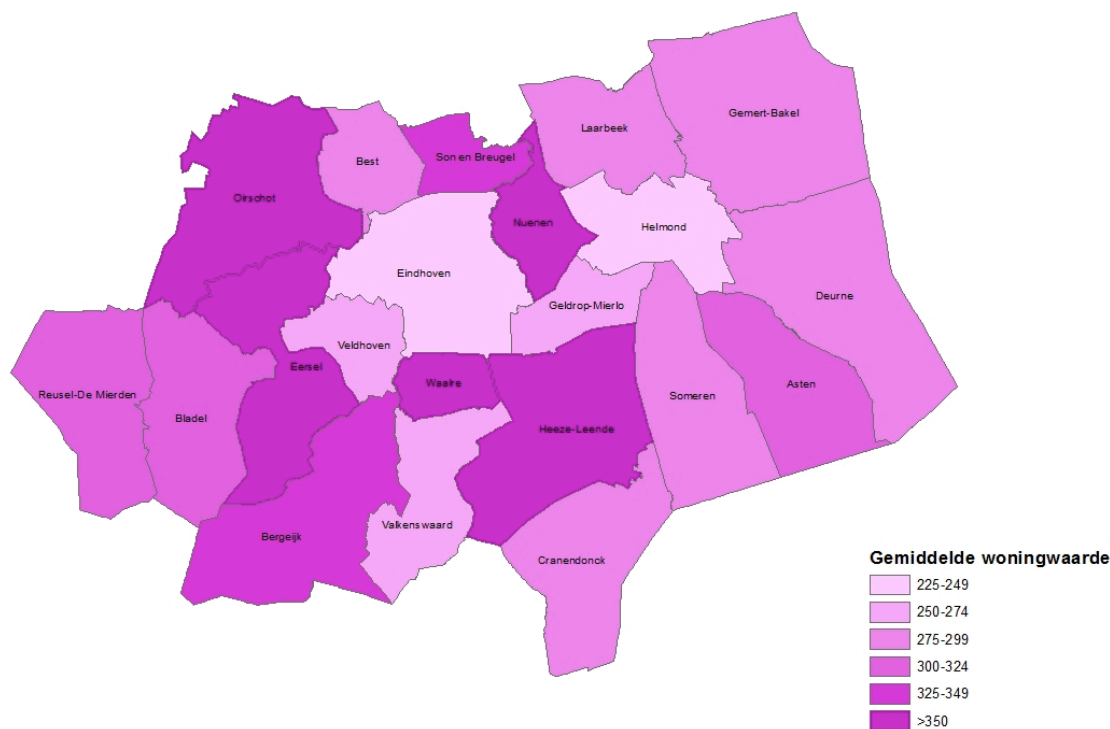


Fig. 15: Map 'average house value (WOZ)' (own map, adapted from CBS, 2008²).

This difference suggests that the high WOZ value could lead to more outward migration to cheaper houses from people in municipalities with a high WOZ value. This might also mean that municipalities with a higher average WOZ value have to deal relatively more with shrink.

Next to the average house value, are the percentages of rental houses in the region relevant: not everybody can (or wants) to buy a house. These households are designated to the (social) rental houses that a municipality has. Especially one- and two-person households and broken families live often (temporarily) in a rental house. But also a lot of rental houses are inhabited by elderly, who often lived there for decennia (SRE, 2011). Some municipalities have only a little percentage of rental houses. As a result, some households are more or less forced to move outside their own municipality.

The map below (fig. 16) gives an overview of the percentage rental houses per municipality in the region. For example: >20 means that less than 20% of the housing stock of the specific municipality exists of rental houses. The map shows that Eindhoven has the highest percentage of rental houses. Furthermore, Helmond has also a relatively large percentage of rental houses, which makes both cities attractive for renters. The map also shows that the urban concentration has a larger percentage of rental houses compared to the rural area. Striking is that the rural municipalities in the east of the region (the neighbouring municipalities of Helmond) have a relatively higher percentage of rental houses than in the

² Chosen is for the WOZ value of 2008 because this gives insight in the house prices before the economic crisis.

west (the neighbouring municipalities of Eindhoven). Maybe this can be explained because Eindhoven has a higher percentage rental houses than Helmond.

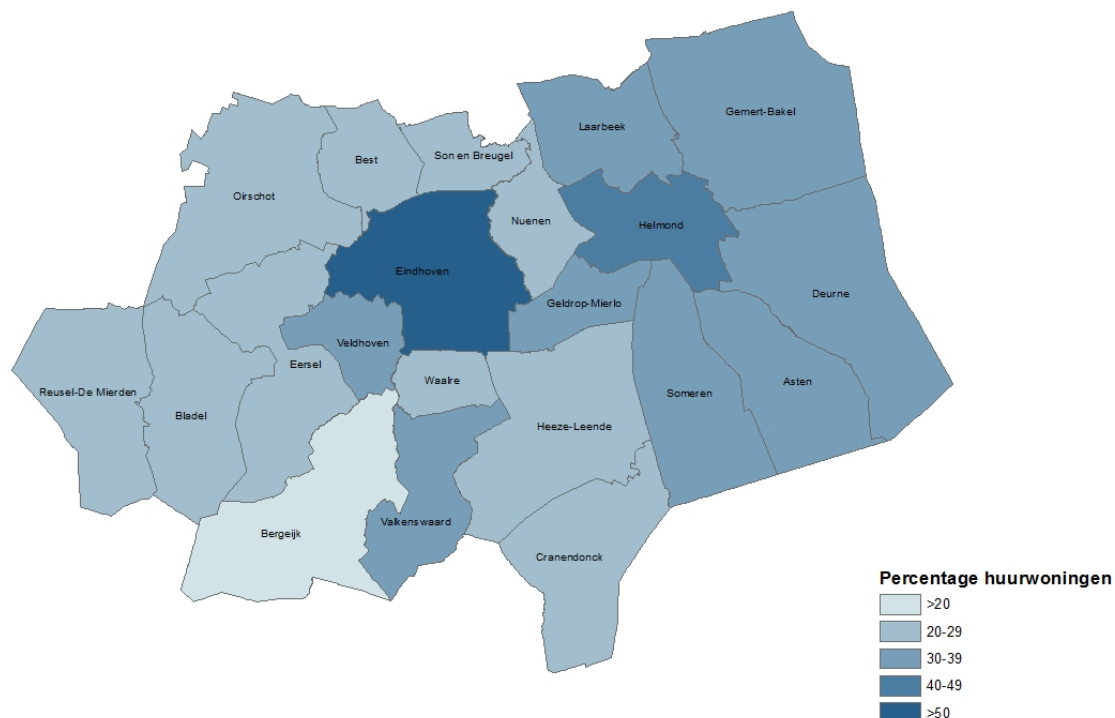


Fig. 16: Map 'percentage rental houses' (own map, adapted from CBS, 2008).

When comparing the percentages of rental houses between shrinking- and growing municipalities, it shows that growing municipalities have a higher percentage of rental houses compared to shrinking municipalities. The difference is more than 5 per cent, resp. 32,3% compared to 27%. Notable is that the municipalities that shrink, have a lower percentage of rental houses, whilst the surrounding municipalities have a higher percentage. This could be the result of outward migration of people that where not able to relocate in a rental house in their own municipality.

5.5 Conclusion

In this chapter, the migration flows and the local housing market in the Eindhoven region were analysed.

After examining the data on migration to the rural area and the urban concentration, migration to the city, and the local housing market, can be concluded that growth and shrinkage lie literally next to eachother. The migration in the Eindhoven region mostly takes place over a short distance to neighbouring municipalities and the city. More people move to the urban concentration and the city, from the rural area, than the other way around.

The migration flows take place in a Christallerian fashion, the flows are orientated at the centre of the region i.e. the urban concentration and the city.

Growth in the region as a result of migration does not just takes place, instead, it often takes place at the expense of the development of the surrounding areas, e.g. the urban concentration grows at the expense of the rural area. This can possibly be explained because rural municipalities in the region have relatively less rental houses and the houses are more expensive – higher WOZ value. Moreover, also the attractiveness of the city plays a role. The difference between migration flows to the city of growing- and shrinking municipalities, is relatively small. This suggests that both growing- and shrinking municipalities are attracted to the city.

The overview below displays the differences between growing- and shrinking municipalities.

	Migration flows Migration to city	WOZ (euro)	% Rental
Growing	25.4	292000	32.3
Shrinking	26.4	323000	27
Difference	1	31000	5.3

Figure 17: Overview: 'differences growing- and declining municipalities in the Region' (author).

The analysis of the differences between growing and shrinking municipalities on the basis of WOZ value and the percentage of rental houses, show minor differences.

The results suggest that when there are changes in the housing market, for example through newly built houses, then migration flows from surrounding municipalities can be attracted, e.g. resulting in outward migration of neighbouring municipalities. Furthermore, it has been assumed that the municipal (local) population change is strongly correlated with the local housing market (Van der Laan (1987); Van Weesep, 1982; Oort et al., 2010), this seems to be the case. The housing stock increasingly defines the population size and migration flows. As a result, municipalities can demographically decline through a lack of construction sites or opportunities to build houses. Despite that these municipalities can be very attractive.

Migration flows and the housing market also indirectly influence the activities that people undertake. The house as starting point has great influence on which activities one undertakes in (daily) life, and therewith on the 'Daily Urban System'. The assumption that migration flows change the DUS for a longer time seems correct. The migration flows in the Eindhoven region result in a different distribution and concentration of people in the region: some areas grow, while the other shrinks. Like Christallers theory, as discussed in chapter 2, the migration flows are all aimed at the centre of the region. The relatively big share of

movements to the city and the urban concentration from the rural area, make that the urban concentration and the city grow at the expenses of the rural area in the region. As a result, the duality between urban and rural becomes bigger in the Eindhoven region. The relative high share of movements to the city, the relative low average WOZ value and the relative high percentage of rental houses, result in a more central position in the 'DUS' for the city. Especially for rental houses is one designated on the city.

Due to the migration flows in the Eindhoven region, the nodes and linkages between them change in the DUS. This also affects the hierarchy within the DUS. The central oriented migration flows result in a more central place hierarchy. The different migration flows in the region result in bigger distances between people. These distances become larger over time and especially in shrinking towns and the rural area. The figure below illustrates this.

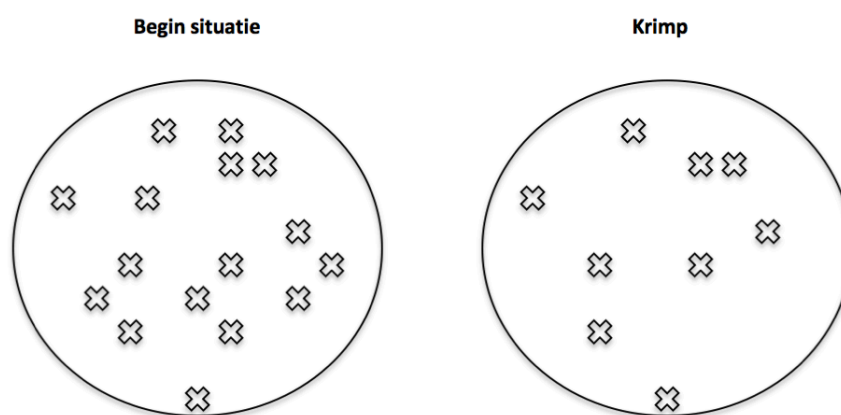


Fig. 18: Shrink and people (author)

The circles represent a random municipal border, the crosses are inhabitants or households. The left circle represents the neutral situation while the right circle represents the neutral situation with demographic decline. When the crosses disappear (right circle), while the municipal border stays the same, result in more space for less people in the right circle. However, as a consequence, the distances between these people become bigger. Finally, the decline of the number of crosses i.e. inhabitants or households, also result in a different distribution and concentration.

6 Commuting flows in the Eindhoven region

This chapter addresses the second sub question: *“How do the commuting flows look between the shrinking- and growing municipalities in the region and which differences are in it?”* For this question quantitative data about commuting is used. In this chapter we focus at the different percentages of outgoing commuting flows: which share of the labor force works outside the own municipality, outside the region, and in the city. These percentages are relevant in order to gain insight in differences in commuting flows between shrinking- and growing municipalities in the region.

Besides migration flows – which are deeper rooted in the region – are commuting flows relevant. The choice of studying commuting trips allows a focus on the ‘daily urban space’ of people. Commuting flows are an indicator for a great part of the daily activities and give insight in employment. Moreover, commuting flows give more insight in the relative position and the network in which municipalities are located: is there a strong hierarchy or more of a de-centralized pattern within the ‘DUS’. The theory that lies at the basis of this study implies that regions and municipalities fulfill different functions for its own population, but also for the people of the surrounding area. In general, the more urban municipalities have an important work and shop function, and the more rural municipalities have more a residential function.

6.1 Commuting flows in the Eindhoven region

Appendix 2 shows the absolute and accumulated commuting flows in the Eindhoven region. The internal commuting flows are the highest for the central city Eindhoven, followed by Helmond. The smallest internal commuting flows can be found in Nuenen and Waalre, both municipalities out of the urban concentration, neighboring Eindhoven. These municipalities strongly depend on other municipalities for employment.

The accumulated commuting flows show that a lot of commutation takes place within the region. They show, despite accumulated, big commuting flows from the urban concentration to the city. From Best, Geldrop-Mierlo, Helmond, Son en Breugel, Valkenswaard and Veldhoven, to the core city Eindhoven. This clearly shows the centralized structure of the region.

In the following paragraphs the numbers from appendix 2 are worked out in different maps per theme, in order for a further comparison of growth and decline in the region.

6.2 Commuting outside the own municipality

In the region live according to CBS on 1 January 2011 488,000 people between 15 and 65 years. 346,000 of them belong to the labor force. In total there are 398,000 jobs in the

region. That means there are 15% more jobs than there are people who belong to the labor force.

In order to see to what extent the municipalities in the region have an employment function, and to gain insight in the differences between the commuting flows, we will start by looking into which share of the working labour force works outside the own municipality. This particular share gives insight in the availability of work and employment within the own municipality. The map below (fig. 19) displays the percentage of the working labour force that works outside its own municipality.

The map demonstrates that for all municipalities, with the exception of Eindhoven, more than 40% works outside its own municipality. In Eindhoven works more than 60 percent of the workforce in their own municipality. The percentage that works outside Eindhoven is very low, probably as a result of the wide range of jobs there.

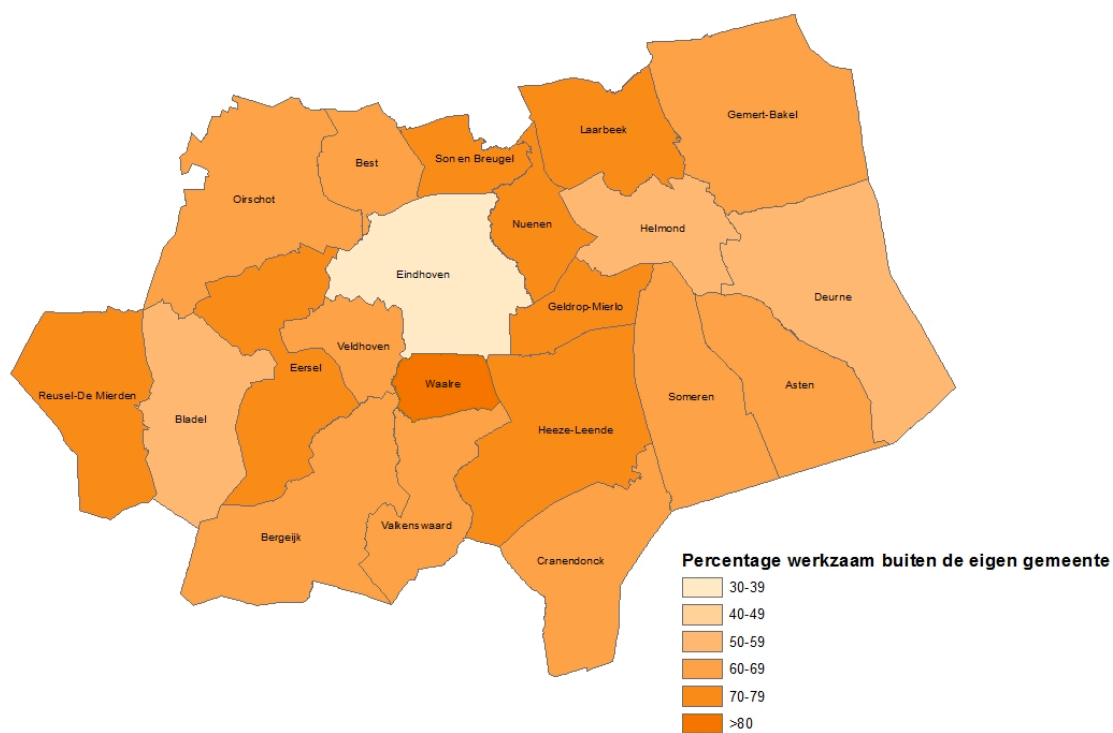


Fig. 19: Map 'percentage working outside the own municipality' (own map, adapted from CBS, 2009).

The map also demonstrates that more than 60% of the inhabitants of the urban concentration works outside its own municipality. For the municipalities in the urban concentration applies that only a minority is working in the own municipality. This means that they are depending on other municipalities and the city for employment. Probably most of the working labour force of the urban concentration in the region works in the city.

From the working labour force of the rural area works more than half outside its own municipality. Furthermore, they also live further from their work in comparison with the working labour force from the urban concentration. Furthermore, it was assumed that the work place forms an important motive to relocate over greater distances, this makes insight in availability of work for shrinking municipalities probably extra interesting.

After comparing the percentages of ‘working outside the own municipalities’, between shrinking- and growing municipalities, it appears that the differences are very small (< 0.5 %). An explanation for this could be that residents of shrinking as well as growing municipalities mainly work in the city. The next paragraph will further address this.

6.3 Commuting to the city

The percentage of the working labour force that works outside the own municipality was useful data to gain insight in the availability of work. Furthermore, it is relevant to know which percentage works in the city. The map below (fig. 20) displays the percentages per municipality that is working in the city (=Helmond or Eindhoven). For example: 20-29 means that of the working labour force of the concerning municipality, 20 till 29% percent is working in the cities Eindhoven or Helmond.

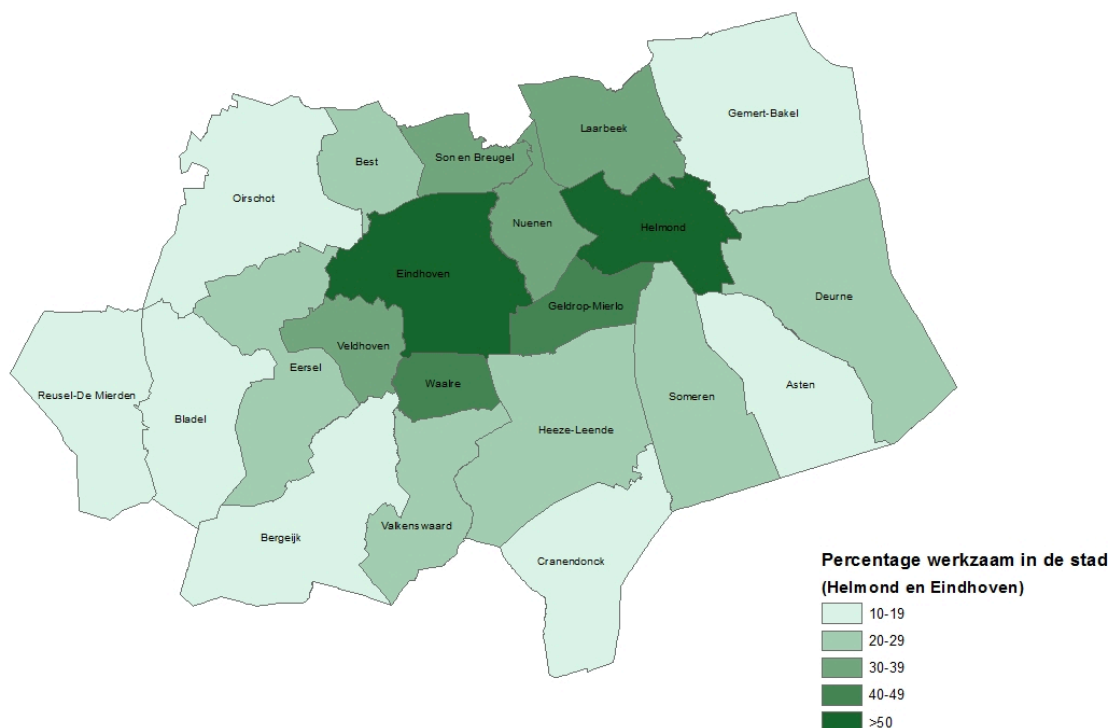


Fig. 20: Map ‘percentage working in the city’ (own map, adapted from CBS, 2009).

The darker the colour on the map, the higher the percentage that works in the city. The percentage for Eindhoven and Helmond itself is of course very high, because the majority of the cities Eindhoven and Helmond work in their own municipality.

From the rural municipalities at the edge of the region, works only a small percentage in the cities Eindhoven or Helmond. Perhaps these municipalities are oriented at a city outside the region. Another explanation could be that the distance to the city is too big. The map clearly demonstrates that how further the municipality lay of the city, the smaller the percentage that works in the city. The commuting patterns suggest that the geographical location of municipalities strongly determines where people go to work in the region. Remarkable is that from the municipalities Oirschot and Bergeijk only a small percentage works in the city, while this percentage for the neighbouring municipalities lies a lot higher, and whilst Oirschot and Bergeijk both work for more than half outside the own municipality. There is no explanation found for this.

When comparing the percentages 'working in the city', between shrinking- and growing municipalities, it appears that inhabitants of growing municipalities work relatively more often in the city compared to shrinking municipalities. The difference is more than 10 per cent. Of the 8 shrinking municipalities lie 6 in the rural area, the distance to the city is for these municipalities bigger compared to the growing municipalities in the urban concentration. Perhaps because the distance to the city is bigger, these municipalities work outside the region (this will be discussed in the next paragraph). However, it could be that these municipalities are more self-sufficient with respect to employment and less dependent of the central city within the 'DUS'.

6.4 Working outside the region

Besides the percentages 'working outside the own municipality' and 'working in the city', it is relevant to know which percentage 'works outside the region' and for which municipalities this percentage is high. This helps to better understand the percentages 'working outside the own municipality' and 'working in the city' which were discussed in the previous paragraphs.

Figure 21 displays the percentages of the working labour force per municipality that works outside the region Eindhoven. The darker the colour, the higher the percentage that works outside the region Eindhoven.

The map shows that especially the northern municipalities in the region work outside the region (20 till 29%), with the exception of Oirschot (30 till 39%). For the southern municipalities it is more unlikely that they work outside the region, because they live at the border with the country Belgium. Regarding the northern municipalities, it is possible that these municipalities are more oriented at a city in another region, e.g. Tilburg or Den Bosch. The comparison of fig. 20 and 21 shows clearly that this is the case for Oirschot – the percentage 'working in the city' was the lowest whilst the percentage 'working outside the region' was the highest.

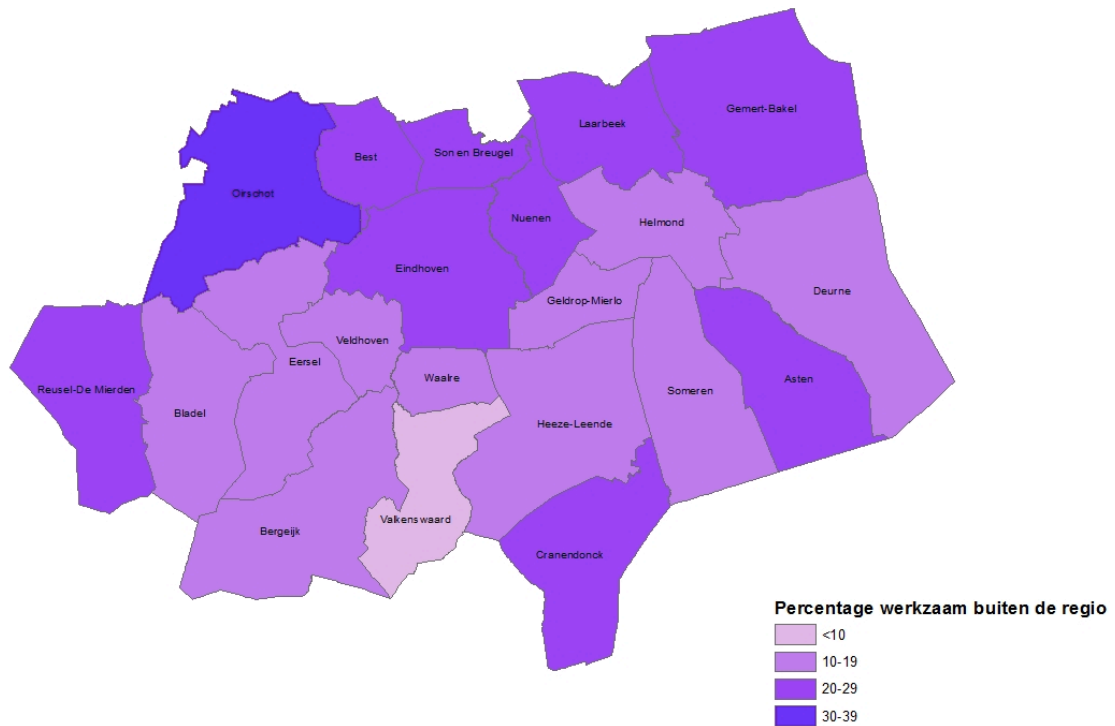


Fig. 21: Map 'percentage working outside the region' (own map, adapted from CBS, 2009).

Furthermore, the map demonstrates that the municipalities south of Eindhoven have relatively few people that work outside the region. Striking is the municipality Valkenswaard, perhaps as a result of its location – central in the south of the region – the percentage 'working outside the region' is the lowest. Furthermore, by comparison of the percentage 'working outside the region' between shrinking- and growing municipalities, it appears that the differences are little: only a half a per cent. Inhabitants of growing- as well as shrinking municipalities work, almost as often, outside the region.

6.5 Conclusion

In this chapter the commuting flows in the Eindhoven region were analysed.

After examining the data about which share of the labor force works outside the own municipality, outside the region and in the city, can be concluded that the majority from the region works in the own region. This shows the strong commitment of the labour force to the businesses in the own region. For the majority of the municipalities in the region applies, however, that only a minority of the labour force works in the own municipality. For the rural area counts that more than half works outside the own municipality and the inhabitants live relatively further away from their work. The further a municipality lays from the city, the smaller the percentage that works in the city.

The accumulated commuting flows in appendix 2 showed that again most of the flows where oriented at the cities Eindhoven and Helmond, with one exception. From the analysis of the percentages 'working in the city', it appears that municipalities from the urban

concentration area work mainly in the city. This shows the resemblance with the theory of Christaller, where the traditional commuting patterns travel from suburban residential locations to work in urban centres. The core city Eindhoven attracts workers that have their residence in Eindhoven and the neighbouring municipalities directly surrounding Eindhoven.

Furthermore comes from the analysis of commuting flows, that outside the urban concentration, in the rural area, the commuting flows rarely focus on the city. The commuting flows in the rural area show more cross commuting between municipalities. This suggests that the rural area has a more decentralized pattern.

	Commuting flows outside municipality	To the city	Outside region
Growing	64.1	33.3	19
Shrinking	64.5	23.1	18.5
Difference	0.4	10.2	0.5

Figure 22: Overview: 'differences growing- and declining municipalities in the Region' (author).

The overview above (fig. 22) displays the differences between commuting flows from growing- and shrinking municipalities. The differences between shrinking- and growing municipalities are very small, only a few per cent. Except for commuting to the city, inhabitants of growing municipalities commute more often to the city.

7 Sale flows in the Eindhoven region

In this chapter the third sub question will be addressed: *“How do the sale flows look between the shrinking- and growing municipalities in the region and which differences are in it?”* For the analysis of the sale flows is made use of quantitative data. This is done on the basis of different percentages of in- and outgoing sale flows – which share of the daily groceries takes place in another municipality and which share of the non-daily groceries takes place in the own municipality – and the average distances to facilities.

These sale flows are relevant to gain insight in how the sale flows look between the shrinking- and growing municipalities in the region and which differences there are in it. Furthermore, comparing sale flows between shrinking- and growing municipalities could help to gain insight in differences between growth and shrinkage in the region. Furthermore, it was assumed that municipalities perform different functions for its own population, but also for the people of the surrounding area. It is argued that urban municipalities fulfill a more important function compared to rural municipalities. To gain more insight in this relative position or the network in which municipalities in the region Eindhoven are located, and the orientation of inhabitants in their daily activities, the sale flows will be analysed.

7.1 Sale flows in the Eindhoven region

Appendix 3 shows the sale flows in the Eindhoven region. The daily sale flows are clearly oriented on the own municipalities, >70% of the daily sale flows expenditures take place there. The ‘daily groceries’ refer to the purchase of basic products like food, cosmetics and such. However, the non-daily sale flows show another orientation, a lot of the municipalities are oriented on the city of Eindhoven en Helmond. The non- daily sales refer to clothes, hobby, and such. The region is characterized by one or more related concentrations of shops/ facilities on which a dispersed population is focused. Remarkable are the non-daily sale flows to the rural municipality Asten, it appears that Asten fullfils some kind of central place function in the rural area in the east of the region.

In the next paragraphs the sale flows will be further elaborated with the help of maps. These maps are built up out of the numbers from appendix 3 and make it easier to compare.

7.2 Daily groceries

With the sale flows it is possible to see if there are differences between growing- and shrinking municipalities, e.g. if shrinking municipalities have to do their daily groceries more often outside the own municipalities. Figure 23 below shows the percentages of the daily groceries (food and beverages, drugstore) that are done outside the own municipality.

Relevant for this research is which share of the groceries is done outside the own municipality.

In the region, the large majority of the population does the daily shopping in their own municipality. The municipalities in the urban concentration do relatively more daily groceries (food and beverages, drugstore) in their own municipality, compared to the rural municipalities. For a couple of the rural municipalities 20% or more of the daily groceries is done outside the own municipality. This means that 1 in 5 people who live in the rural area do their daily groceries in another municipality. In Eersel this is even higher; more than a quarter of the daily groceries are done there in another municipality.

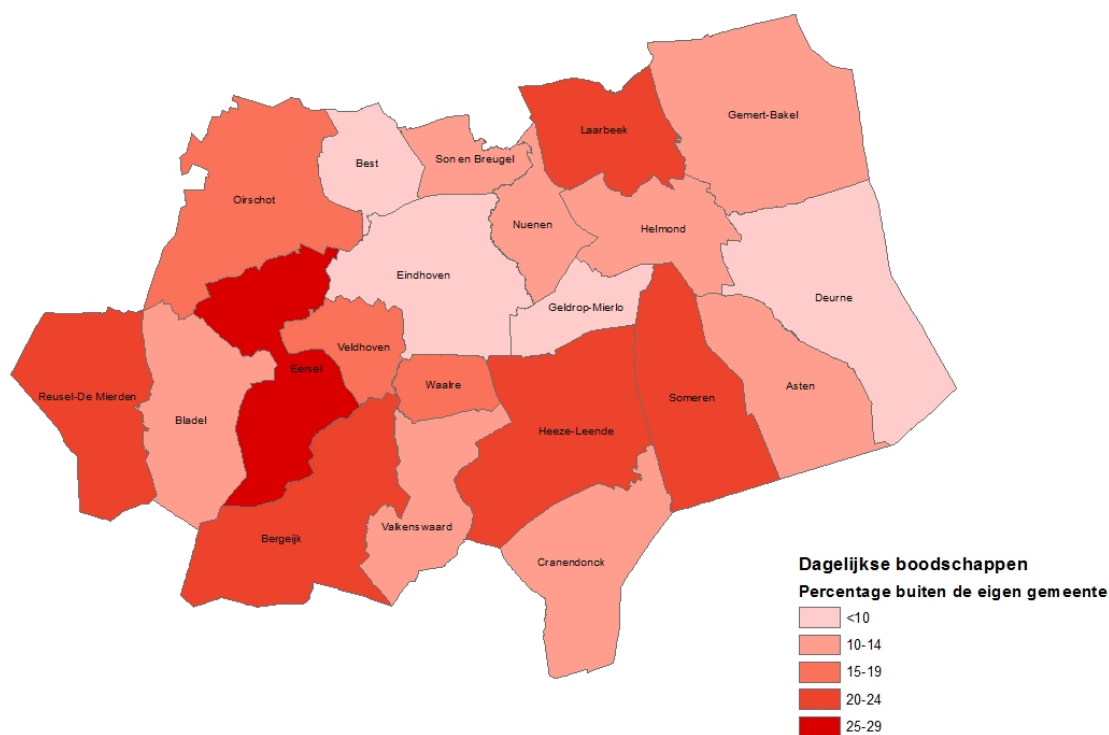


Fig. 23: Map 'daily groceries' (own map, adapted from SRE, 2009).

The percentages for daily groceries within the own municipality are compared between growing- and shrinking municipalities. The comparison shows that growing municipalities do relatively more often groceries within the own municipality compared to shrinking municipalities. The difference is more than 3 per cent. Besides daily groceries are the non-daily groceries important. The next paragraph addresses the non-daily groceries.

7.3 Non-daily groceries

Non-daily groceries take place on a non-daily basis. The 'non-daily groceries' refer to shopping for clothes, hobby and such, which take place on a weekly or monthly basis. Non-

daily take up relatively more time compared to daily groceries. The map (fig. 24) below shows the percentages of the non-daily groceries (clothes, hobby, etc.) that take place within the own municipality. It is relevant to know for which share people can turn to their own municipality. The darker the colour in the map, the bigger the percentage of non-daily groceries that are bought within the own municipality.

In Eindhoven and Helmond does the majority of the population the non-daily shopping in their own municipality. This is due to the fact that Eindhoven and Helmond, as cities, have a lot of facilities and shops for non-daily groceries. For the rest of the municipalities applies, that the majority of the population does the non-daily shopping outside the own municipality. The sale flows are mainly focused on the city. A lot of the municipalities in the urban concentration, but also outside, belong to the catchment area of the city. A large part of the users of the city do not live in the city. However, remarkable is that Asten (municipality from the rural area) has the same percentage as Helmond (a city in the urban concentration). This suggests that Asten is more self-contained.

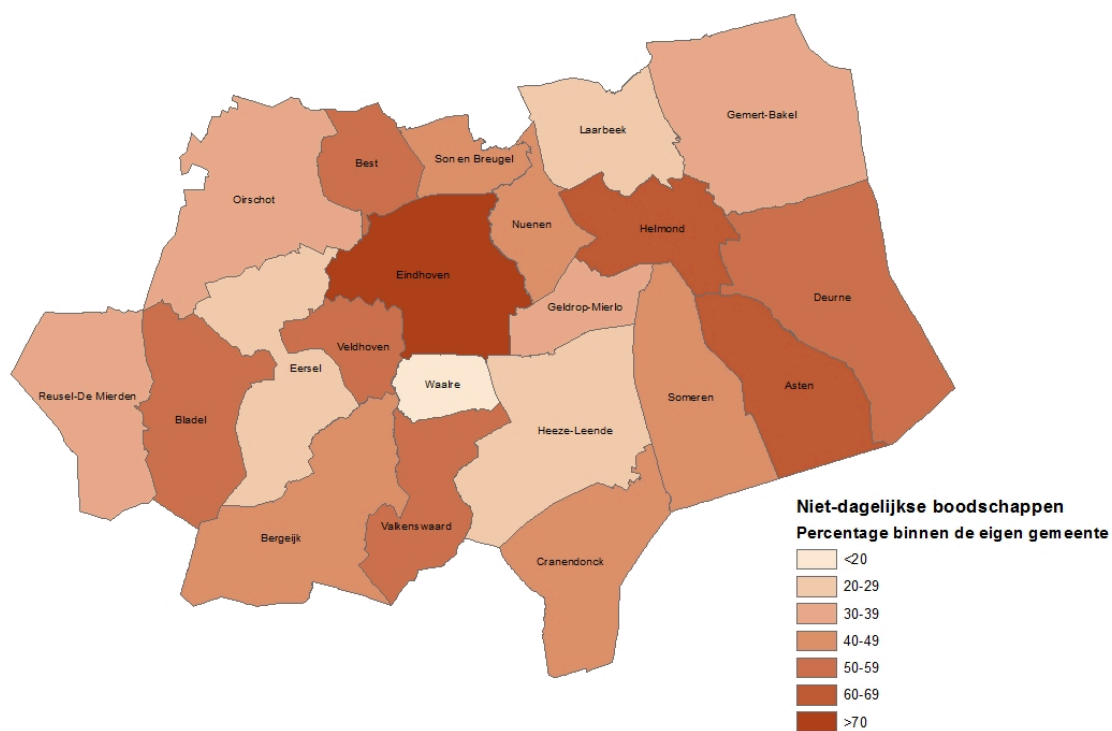


Fig. 24: Map 'non-daily groceries' (own map, adapted from SRE, 2009).

From the analysis of the map can be stated that the rural area, compared to the municipalities from the urban concentration, do relatively less non-daily groceries in the own municipality. This suggests that the municipalities in the rural area are more dependent on other municipalities and the city, for non-daily groceries.

From a comparison of percentages for non-daily groceries, between shrinking- and growing municipalities, reveal that there are no big differences. The difference between growing- and shrinking municipalities is less than 2 per cent. The growing municipalities do their non-daily groceries relatively more often within the own municipality compared to the shrinking municipalities. As a consequence, it could be that the shrinking municipalities have to travel further for non-daily groceries. The next paragraph will address the distances to facilities.

7.4 Distances to facilities

It is argued that through increased mobility people are less dependent of the shop at the corner e.g. it is even possible to do your daily groceries online and let them be delivered at your home. People need less and less facilities in the neighbourhood because of the physical things that we need. However, less use of a certain facility asks for a greater market and as a result facilities move further away from people.

Furthermore, it is assumed that distances to facilities become bigger when there are less people that make use of the particular facility. This would mean that the distances to facilities in shrinking municipalities and the rural area are larger compared to growing municipalities and the urban concentration. After the analysis of the average distances to facilities in the region Eindhoven per municipality (CBS, 2008), blijkt inderdaad dat in the rural municipalities in the region the average distance to the nearest elementary school is higher compared to the municipalities in the urban concentration. This also counts for the average distance to the secondary school, the library and the shop for daily groceries.

7.5 Conclusion

In this chapter the sale flows in the Eindhoven region were analysed.

After examining the data about in- and outgoing sale flows and at average distances to facilities can be concluded that there is many cross-border shopping behavior in the Eindhoven region, especially for non-daily shopping. The vast majority of the population of the region does the daily groceries within the own municipality, however, for non-daily shopping the majority goes to another municipality or the city.

The non-daily sale flows in the urban concentration clearly match the patterns of Christallers theory. Hincks & Wong (2010) already suggested in chapter 2 that regions and municipalities fulfill different functions for its own population, but also for the people of the surrounding area. Where the more urban municipalities have an important employment and shop function and more rural municipalities primarily have a more residential function. This also applies to the Eindhoven region. In the rural area in the east of the region, it appears that Asten fulfills a central function for its surrounding municipalities.

The differences between sale flows of growing- and shrinking municipalities in the region are summarised in fig. 25 (below), based on the daily groceries and the non-daily groceries.

	Sale flows Daily groceries	Non-daily
Growing	85.4	44.3
Shrinking	82.3	42.6
Difference	3.1	1.7

Figure 25: Overview: 'differences growing- and declining municipalities in the Region' (author).

Inhabitants of growing municipalities do their daily- and non-daily groceries more often in the own municipality, compared to inhabitants of shrinking municipalities. However, the differences are small, resp. 3.1 and 1.7 per cent.

The analysis of the distances to facilities suggested that distances to facilities/ shops become bigger when there are less people that make use of the particular facility. It is argued that if through demographic decline there will be less consumers, than perhaps there will be too much facilities/ shops.

8 Population change in the Eindhoven region

This chapter addresses the first part of the fourth sub question: “How does the population- and households change in the region, and which influence has this possibly on the different flows and thus on the ‘DUS’?” This chapter will go into the population change, chapter 9 addresses the household change. The population change in the Eindhoven region will be analysed by using prognoses. This will be done on the basis of the changes in the percentage share of youngsters (0-14), elderly (65+ and 75+) and the potential labor force, in order to see how the population changes in the region and which influence these changes possibly have on the different flows and thus on the ‘DUS’.

In the previous chapters the different flows of the extended DUS framework have been discussed. These different flows gave information about the current ‘DUS’, by complementing these flows with data about the expected demographic developments (prognoses), it is possible to gain more insight in the changes in the ‘DUS’ for the future. The theory that lie at the basis of this research implies that in the context of population change, the relation between the different age groups is important for the range of facilities, demand for houses and supply in the labor market.

8.1 Quantitative population change

Firstly the quantitative population change of the Eindhoven region will be addressed. The quantitative population change, or absolute population change, is displayed below in an overview (fig. 26). There is made a distinction between urban, rural and total. The overview displays the changes for the region until 2040. The green colour represents growth compared to the previous term, the red colour represents a decline.

	2005 (factual)	2011 (factual)	2025 (prognosis)	2040 (prognosis)
Population				
Urban concentration	489700	500400	523900	534000
Rural area	236800	238500	242800	232800
Total	726500	738900	766700	766800

Fig. 26: Overview absolute population (adapted from Provincie Noord Brabant, 2012).

The total region is expected to grow until 2025, according to the prognosis. However, between 2005 and 2011, 8 municipalities already had an absolute population decline. The overview (fig. 26) is not sufficient to see the differences between growth and decline in the region. To see these differences it is necessary to look at a more local level, at the level of individual municipalities. The map below (fig. 27) displays the absolute population change on the local level. This map illustrates the division of the population growth and decline in the region Eindhoven. The colours represent the percentage of absolute population change

in 2025 compared to 2011. There is chosen for the prognosis of the province Noord-Brabant (2012) because this is the most recent prognosis (January 2012). Furthermore, this prognosis also proves to be more positive than previous prognoses (like the one of the CBS 2011) i.e. less quantitative decline is predicted in the prognosis of the province Noord-Brabant (2012) compared to the prognosis of the CBS (2011).

The map shows that until 2025 most municipalities in the Eindhoven region do not decline in absolute number of inhabitants. The prognosis predicts that around the year 2030, more than half of the municipalities will have to deal with quantitative decline. This while the region (total) and urban concentration continue to grow. Result of this could be that the differences in growth between the urban concentration and rural area become bigger in the 'DUS'.

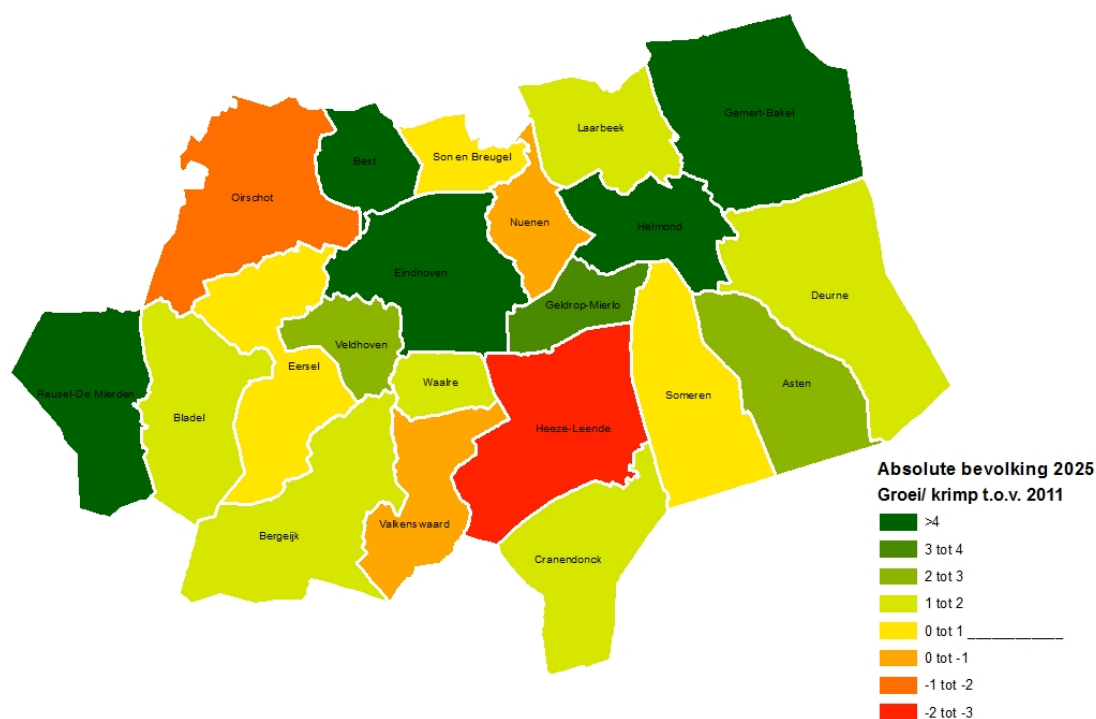


Fig. 27: Map 'absolute population' (own map, adapted from Province Noord Brabant, 2012).

The growth until 2025 is mainly predicted in the urban concentration area, the cities Eindhoven and Helmond are expected to grow with more than 4% until 2025. The rural area is expected to grow less fast until 2025, compared with the urban concentration area. The map shows that a large number of the rural municipalities will have to deal with a declining number of residents, or a minimal growth. More than third of the municipalities in the region had a decline of the absolute population between 2005 and 2011. The prognosis predicts that most of these municipalities continue to shrink.

The absolute population numbers say too little about shrink in the region. The changes in the composition and the balance between youngsters and elderly is much more relevant. The influence of demographic decline on the 'Daily Urban System' | A case study into shrinking areas in a growing city region

This qualitative change, the ‘shrink behind the numbers’, will be addressed in the next paragraphs.

8.2 Growth and decline of percentage youngsters in the region

The prognosis of PRIMOS (2011) is used to gain insight in the predicted qualitative changes of the population in the Eindhoven region. The predicted changes between 2010 and 2040 are used. The number of youngsters is an important indicator for the development of the population, they form the future of municipalities and the region. Especially for the balance in the population composition are youngsters important i.e. the share of youngsters can compensate the share of elderly (65+ and 75+).

The map below shows the percentage youngsters (0-14 year) in 2040 compared to 2010. The greener the colour, the bigger the decline of the number of youngsters.

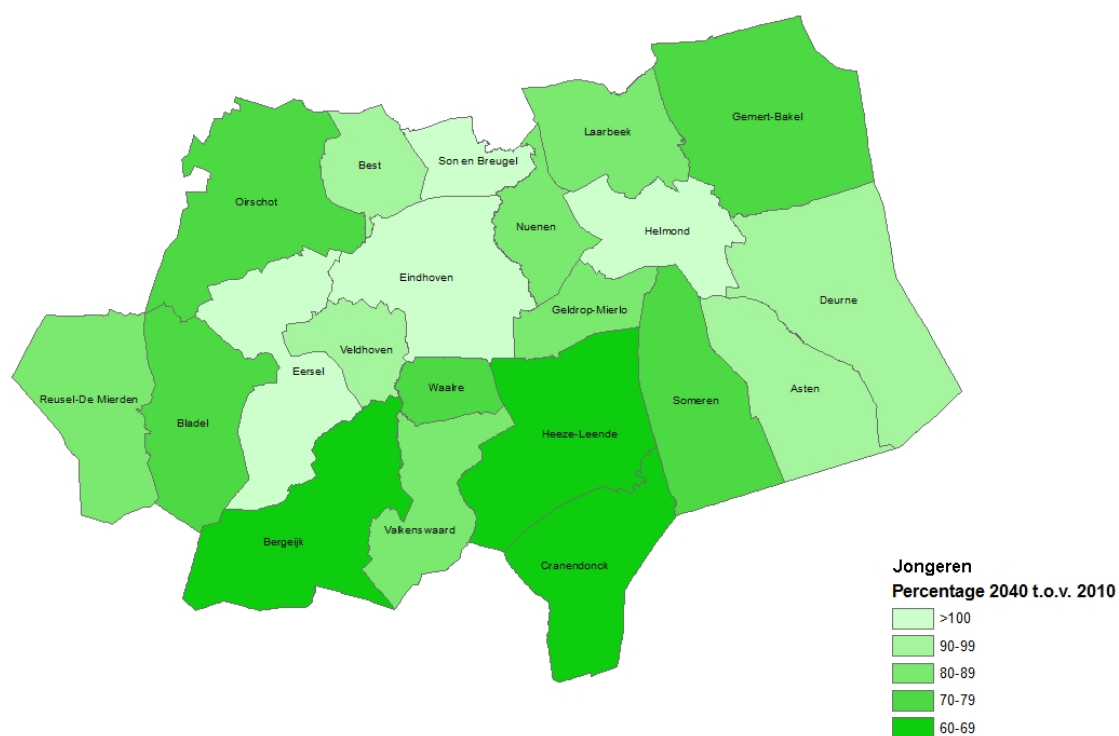


Fig. 28: Map ‘youngsters in the region’ (own map, adapted from PRIMOS, 2011).

The map demonstrates that in particular the number of youngsters in the rural area declines strongly compared to 2010, especially in the south of the region. Furthermore, the map shows that for the urban concentration area a smaller decline of the number of youngsters is predicted, and for the cities Eindhoven and Helmond no decline is predicted.

A decline in the number of youngster’s results in a relative increase of the percentage elderly within a municipality. The number of youngsters is partly a good indicator for the size of the expected demographic ageing. When a declining number of youngsters and a

growing number of 65+ people are present within the same municipality, than this may result in a stronger (absolute) population decline. It is therefore important to gain insight in the increase of elderly (65+ and 75+) within the region, this will be addressed in the next paragraph.

8.3 Growth and decline of percentage elderly in the region

The map below displays the predicted percentage change of elderly (65+) in the region in 2040 compared to 2011. The number of elderly gives an indication of the size of the demographic ageing – a precursor of shrink. The assumption is that municipalities with a lot of people that are over 65 years of age, will shrink faster and earlier.

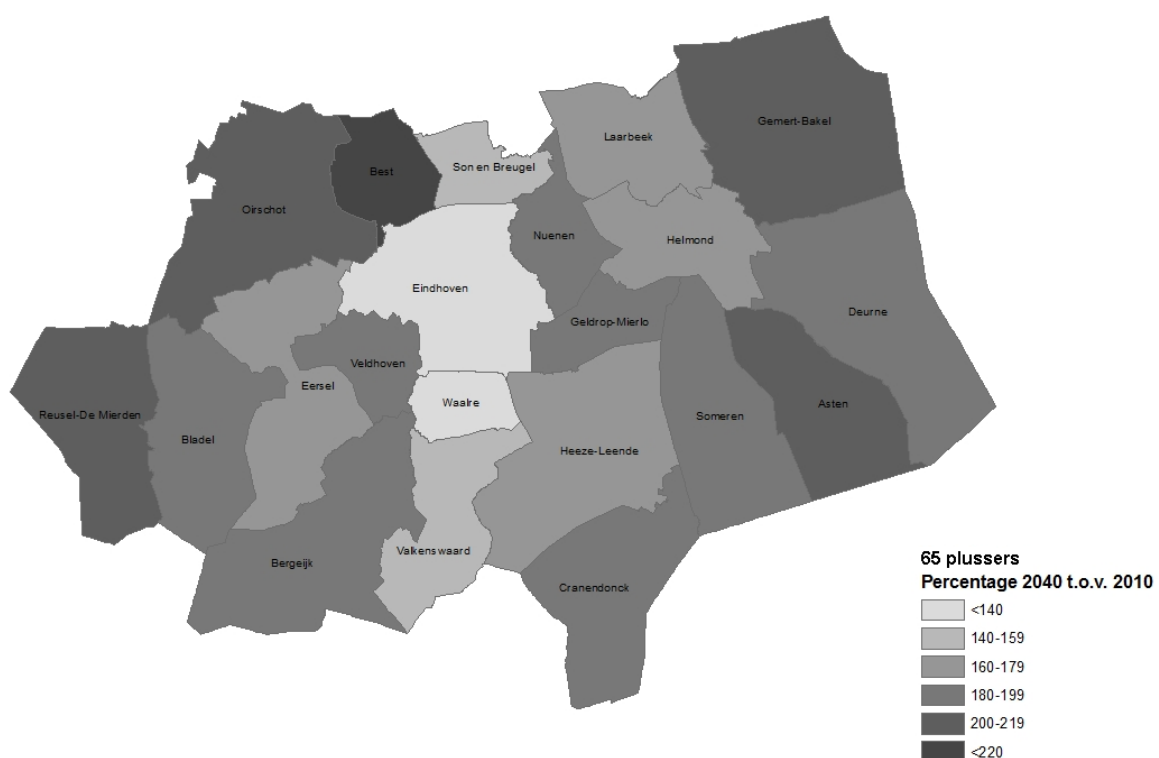


Fig. 29: Map 'percentage elderly 65+ in the region' (own map, adapted from PRIMOS, 2011).

The map shows that for the whole region an increase of people of 65+ years old is predicted in 2040 compared to 2010. A strong increase of 65+ people is predicted for the rural areas. For the urban concentration and the city Eindhoven a smaller increase of the percentage 65+ is expected. It is argued that municipalities with a lot of elderly (65+) are expected to shrink faster compared to municipalities with a smaller share of people that are older than 65. Moreover, municipalities with a lot of elderly over the age of 75, will shrink even quicker.

The map below shows the predicted increase in the number of people that are older than 75 years – differences in percentages between 2010 and 2040. The darker the colour, the

bigger the predicted difference between 2040 and 2010. The map clearly illustrates that for the rural area a stronger increase is expected. From the moment that this expected group of 75+ people will pass away, and the birth rate stays the same, then the particular municipalities will shrink dramatically. Assumed is: the bigger the share of people older than 75, the bigger the group that falls away and thus the higher the population decline.

The percentage of 75+ will also increase for the urban concentration, but this predicted increase is much lower than that of the rural area, thus the population decline will be less there compared to the rural area. As a result, the differences between growth and decline between urban and rural might increase in the 'DUS'.

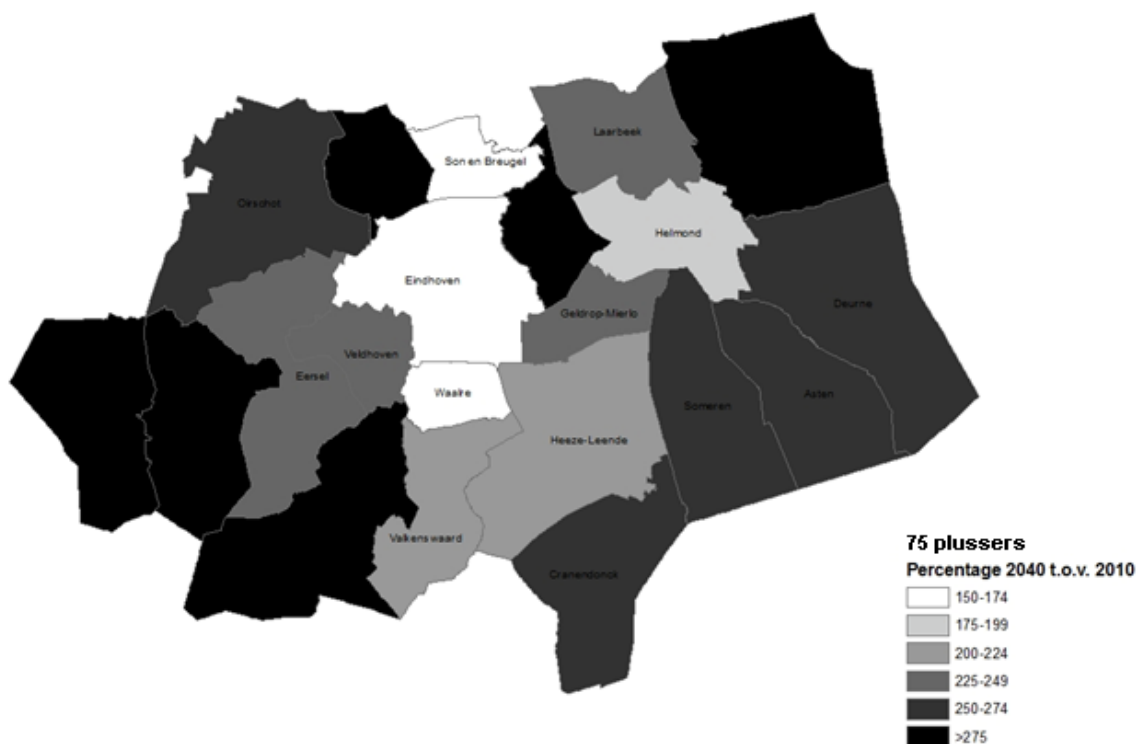


Fig. 30: Map 'percentage elderly 75+ in the region' (own map, adapted from PRIMOS, 2011).

As result from the combination of the decline in the number of youngsters, the increase in the number of elderly, and absolute population decline, can the potential labour force decline. In the region were in 2011 about 398.000 jobs and the labour force of the region existed of about 346.000 people, 50.000 people from outside the region already worked in the region (SRE, 2011). A further decline of the labour force in the region could possible lead to a structural scarcity on the labour market. The next paragraph will address the expected changes in the potential labour force in the Eindhoven region.

8.4 Growth and decline of the potential labour force in the region

The map below illustrates the expected decline of the potential labour force in the region. The darker the colour, the bigger the predicted percentage decline in 2040 compared to 2010.

Again the rural municipalities are predicted to decline more compared to the urban concentration. For the municipalities in the urban concentration is also expected that they will have to deal with a decline of the potential labour force, however, the decline is much lower compared to the rural area. Perhaps because the urban concentration has relatively more youngsters and less elderly compared to the rural municipalities and these differences prevail according to the prognosis.

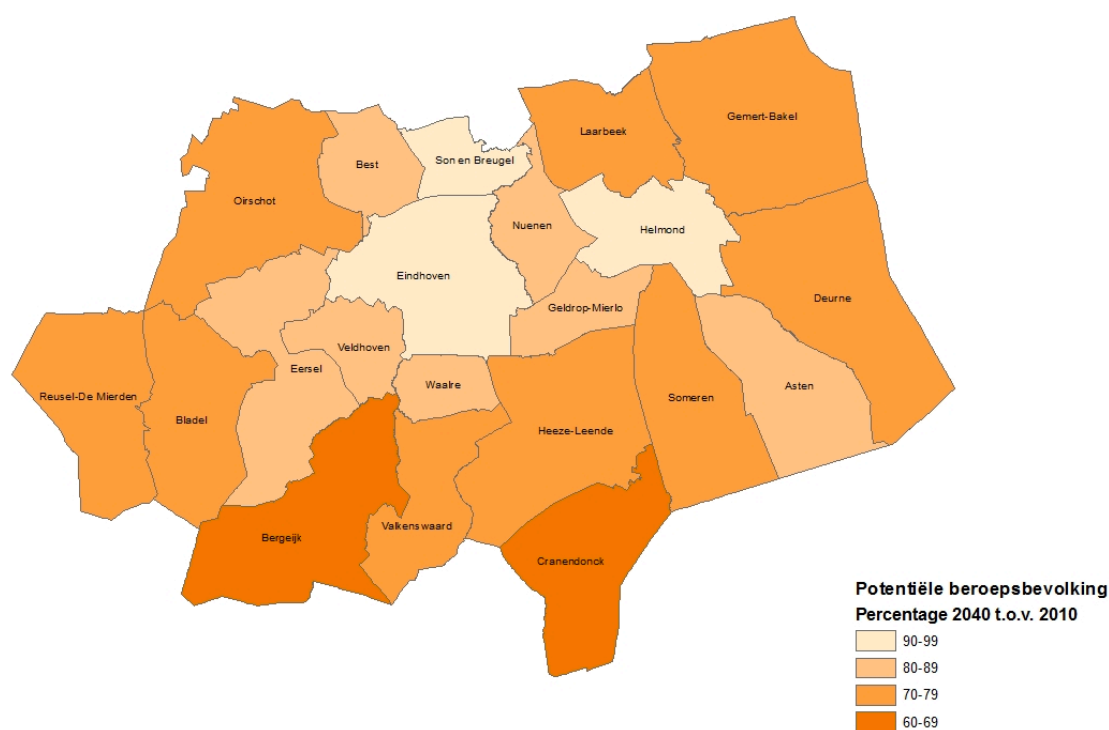


Fig. 31: Map 'potential labour force' (own map, adapted from PRIMOS, 2011).

According to prognosis the potential labour force in the region will strongly decline in size: as a result from the predicted increase of elderly and decrease of youngsters. From the explosive increase of elderly is expected that they retire and as a result a lot less people will be working in the nearby future. This might result in a smaller economy.

8.5 Conclusion changing population of the Eindhoven region

In this chapter the predicted population changes of the Eindhoven region were analysed.

After examining the quantitative data about the changes in the percentage share of youngsters (0-14), elderly (65+ and 75+) and the potential labor force between 2040 and 2010, can be concluded that the composition of the population changes. The predicted differences are for the rural area greater than for the urban concentration. Furthermore is assumed, that these changes will be expected earlier for the rural area.

For the majority of the region Eindhoven is a decrease in the number of youngsters and an increase in the number of elderly people expected. The differences are smallest for the city Eindhoven and greatest for the rural area. It is striking, however, that the aging process in the upcoming decades, especially in the rural areas will be higher than in the urban concentration. As a result of the decrease in the number of youngsters, and the increase in the number of elderly, the potential labour force will be smaller. As a result, the expected demographic decline is probably caused mainly by excess mortality.

The changes in absolute numbers between the different age groups are summarized in pie charts (Fig. 32); SCG is urban concentration, LG is rural area. If we take a look at the pie charts, and compare the urban concentration and the rural area in 2010, we see only little differences in the composition. However, if we make the same comparison for 2040, we see big differences between the urban and rural area. Furthermore, if we compare the pie charts with the total composition, between 2010 and 2040, we see big differences. Noteworthy is that the number of elderly grows at the expense of the potential labour force.

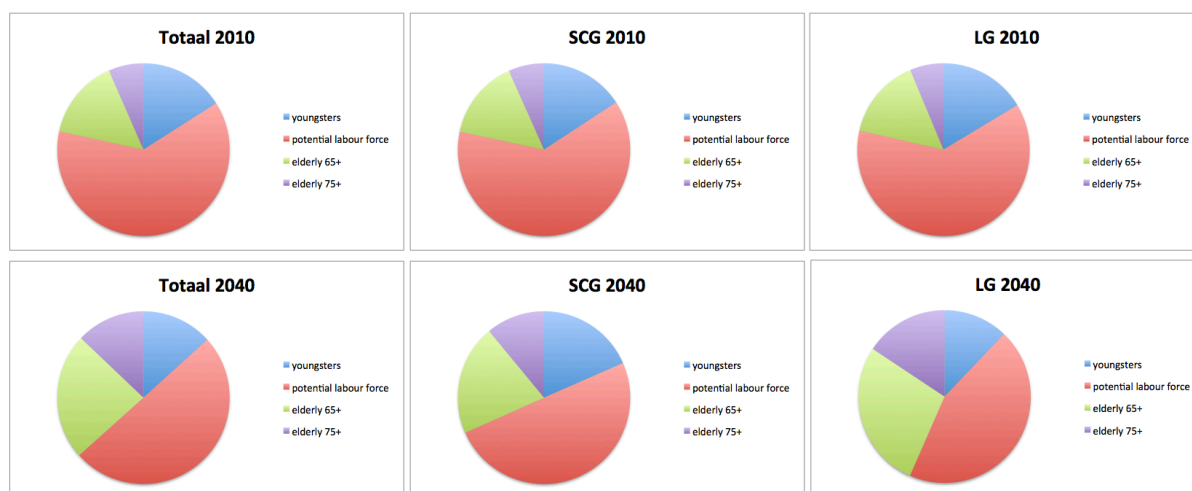


Fig. 32: Pie charts absolute numbers population change (author, adapted from PRIMOS, 2011).

It was assumed that the changes in the relation between the different age groups is important for the range of facilities, the housing market and labour supply.

Furthermore implies the theory that lies at the basis of this study that changes in the population influence the different flows of DUS. Below the possible influence from the population change on the different flows of DUS will be discussed:

First, the migration flows. The changes in the composition of the population in the Eindhoven region are expected to affect migration flows. It is argued that age influences the motives to relocate and relocation tendencies, and that elderly are the least mobile group. As a result of the changes in the region i.e. less youngsters and much more elderly, there will be less migration flows. Furthermore, this implies that the local housing market is demographically ageing. Through this, the migration from young adults from the rural area to the urban concentration, will no longer be compensated by other age groups

Secondly, the commuting flows. It is expected that the changes in the composition of the population in the region affect the commuting flows. Commuting flows form the major part of the movements in the region, however, as a result of demographic ageing and a smaller potential labour force, there will be less commuting flows. Furthermore, the movements of youngsters out of the rural municipalities maybe works as a catalyst on the mutual differences between the municipalities: for the urban concentration the in-flow of youngsters can work as a brake on the shrinking labour force, but for the rural municipalities it can work as an accelerator of shrink.

Finally, the sale flows. It is argued that the changing population in the region influences the sale flows. The declining and changing population in the region result in a changing demand for facilities and shops, e.g. through the declining number of youngsters and increasing number of elderly, we will need less schools and more healthcare facilities. Furthermore, because facilities and shops will move further away from people, suggest that the sale flows outside the own municipality will increase.

9 Household change in the Eindhoven region

This chapter addresses the second part of the fourth sub question: *“How does the population- and households change in the region, and which influence has this possibly on the different flows and thus on the ‘DUS’?”* This chapter will go into the household change in the region. The household change in the Eindhoven region will be analysed by using prognoses. This will be done on the basis of the changes in the percentage share of one-person households, families with children, and one-parent families, in order to see how the households change in the region and which influence this possibly has on the different flows and thus on the ‘DUS’.

Demographic developments result in population change, as well as household change. Household change refers to the increase- or decrease of the absolute number of households. Household change also refers to the change of the composition of the households. About 10 per cent of the region is expected to experience household decline before 2035, around 2040 is predicted that half of the region will experience a decline in the number of households (CBS, 2011). Furthermore, it is assumed that demographic developments can influence the growth- or shrink of households, and changes in households can influence growth- or decline in a certain place.

9.1 Growth and decline of the percentage one-person households in the region

First the one-person households will be discussed. The one-person household exists out of only one (1) person. The map below (fig. 33) illustrates the predicted percentage changes of the one-person households in the region, based on the statistics of PRIMOS (2011). The darker the colour, the bigger the percentage difference between 2040 and 2010.

First of all there needs to be made a side-note, the expected changes in the percentage ‘one-person households’ in the city Eindhoven is limited because there are already a lot of people who live alone in the city: more than 45% (SRE, 2011). A city as Eindhoven has also more apartments, flats, studios etc. in comparison to other municipalities i.e. the housing market for single people is more interesting in the urban concentration and the city e.g. through the lower average WOZ-value and a higher percentage of rental houses. Relevant is how the number of ‘one-person households’ in the rural area increases – the housing market in the rural area is less suitable for this type of household.

The map shows that for the rural municipalities a larger percentage increase is expected for the ‘one-person households’, compared to the urban concentration. This increase might be caused by the deaths of partners in the two-person households; grandpa or grandma passes away and one of them stays behind, this changes the ‘two-person households’ in a ‘one-person household’. This seems plausible, the rural area has a lot of elderly that live together and when one of them dies, the number of one-person households rises. The increase of the

number of ‘one-person households’ as result of the death of the partner, can have an effect on the affordability of houses. Especially in the municipalities where the share of elderly strongly increases and the average WOZ-value is high. Can the two-person households still afford their house when one of them passes away?

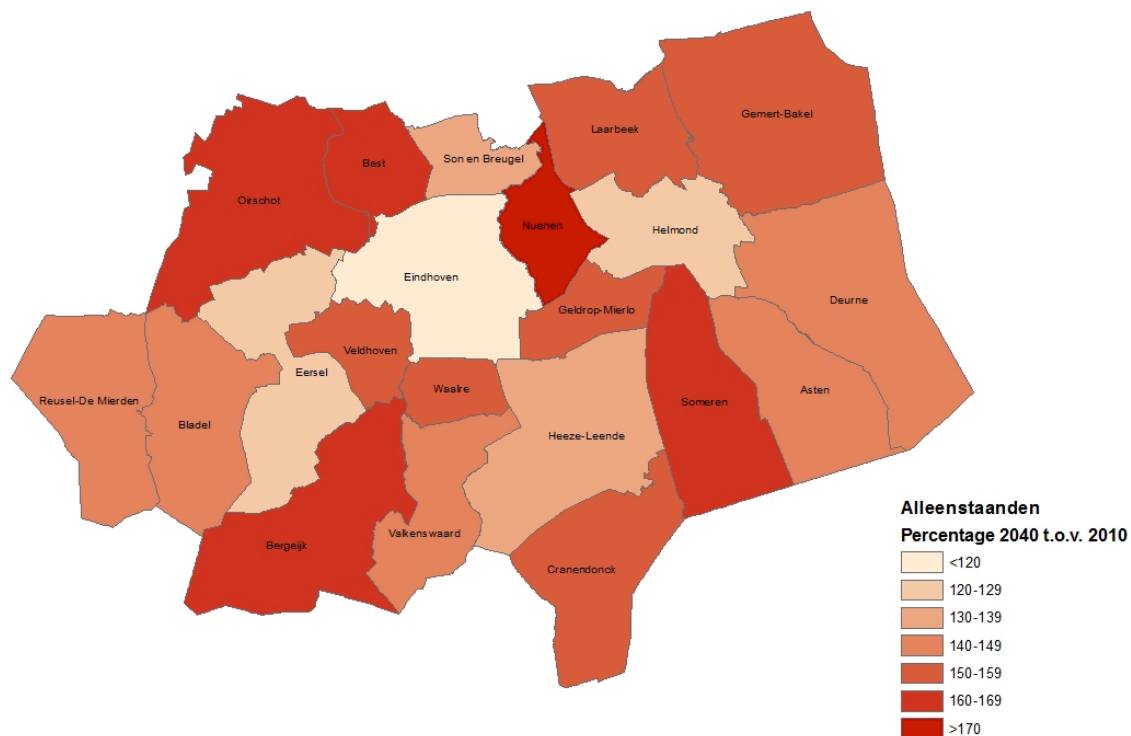


Fig. 33: Map ‘one-person households’ (own map, adapted from PRIMOS, 2011).

9.2 Growth and decline of the percentage families with children in the region

Besides the number of ‘one-person households’, it is relevant to know how the ‘families with children’ are expected to develop. This is especially important for the municipalities that already shrink, or municipalities with a strong predicted increase of elderly. For the balance of the population composition this is rather important.

The map below (fig. 34) displays the predicted percentage changes from the ‘families with children’ in the region. The bigger the percentage decline, the darker the colour in the map. The map shows that for the major part of the urban concentration, a minimal decline of the percentage ‘families with children’ is expected. The differences between 2040 and 2010 are small compared to the rural area. For the rural area, a relatively strong decline is predicted.

As a result of a predicted significant increase of the percentage elderly in the rural area, in combination with an expected percentage decline of the ‘families with children’, the rural area might shrink earlier and faster.

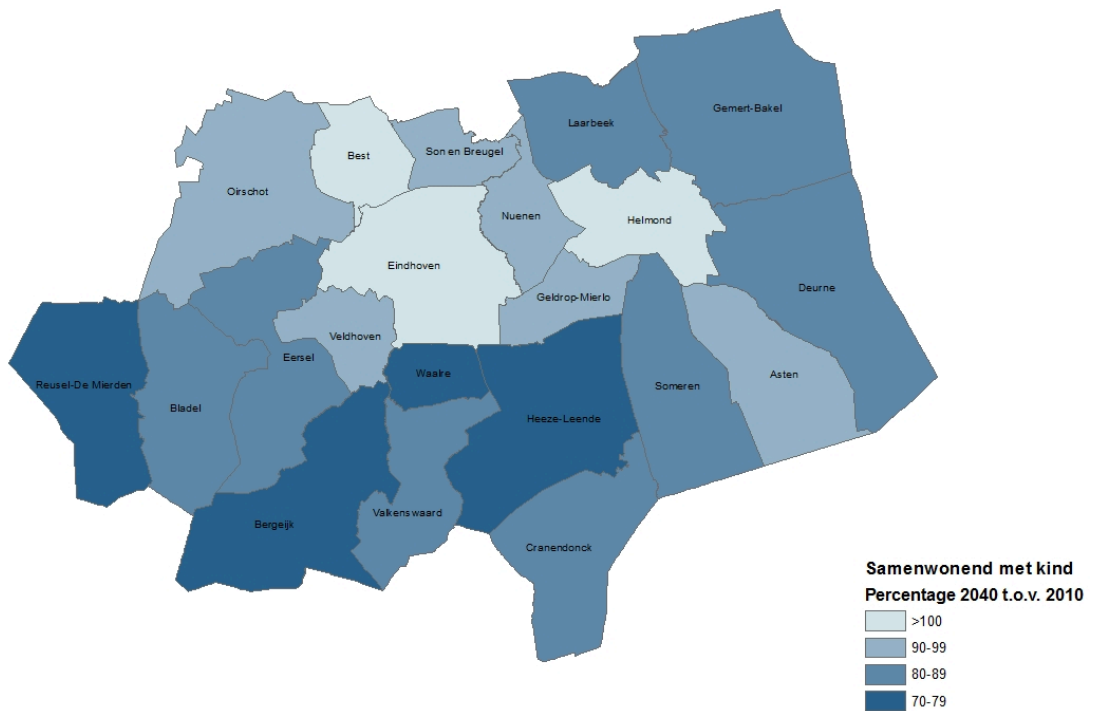


Fig. 34: Map 'families with children' (own map, adapted from PRIMOS, 2011).

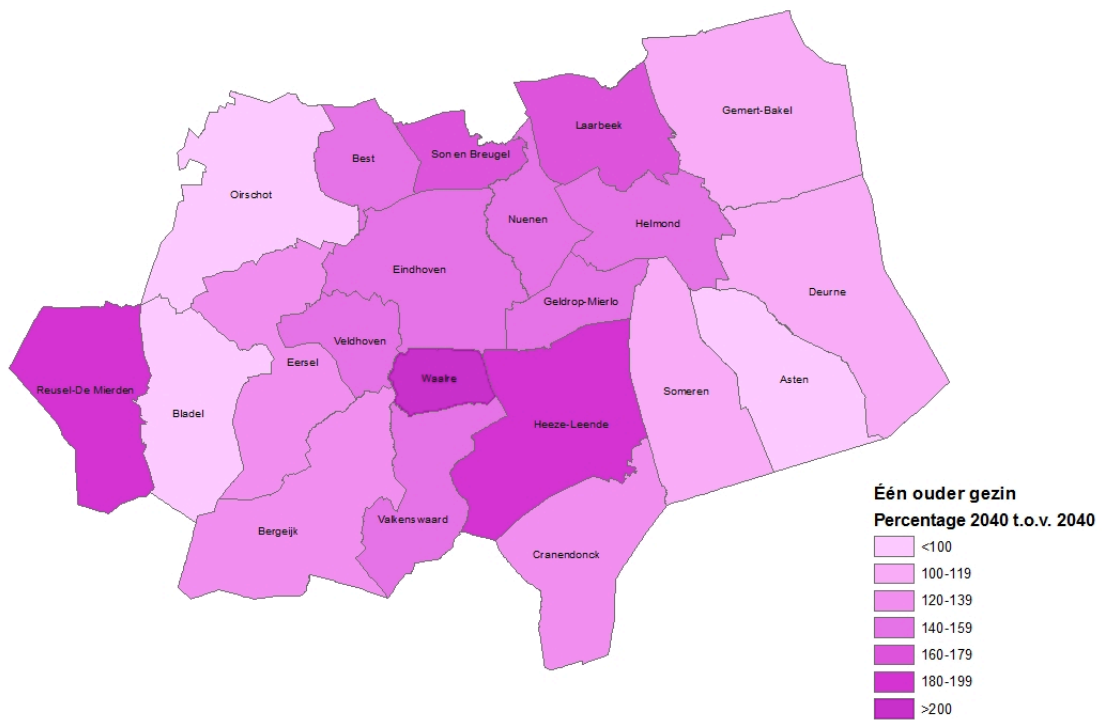


Fig. 35: Map 'one-parent families' (own map, adapted from PRIMOS, 2011).

9.3 Growth and decline of the percentage one-parent families in the region

'One-parent families' refer to families with only one (1) parent, mostly the result of a divorce or through the death of one of the parents. The map (fig. 35) shows the expected percentage increase of the 'one-parent families' in the region. The darker the colour, the stronger the increase in 2040 compared to 2010.

Almost everywhere is an increase of the number of 'one-parent families' predicted. The municipalities in the urban concentration have a relatively stronger increase of the number of 'one-parent families', compared to the rural municipalities. For a couple of the shrinking municipalities a huge increase of the percentage 'one-parent' families is predicted.

9.4 Conclusion household change in the Eindhoven region

In this chapter the predicted household changes in the Eindhoven region were analysed.

After examining the quantitative data about the changes in the percentage share of one-person households, families with children, and one-parent families between 2040 and 2010, can be concluded that the number of households increases and the composition changes. As a consequence of excess mortality and selective migration the households in the region will change. It is expected that there will be more one-person households and one-parent families, and less families with children in the region. This implies that there will be less people living in one (1) house in the foreseeable future.

The number of one-person households is expected to increase in every municipality in the region, but the differences are greatest in the rural area. This is a remarkable, because an increase in the number of one-person households is normally reserved for the urban concentration. The percentage families with children are predicted to decline in all the municipalities, with the exception of the city. This decline is smallest in the urban concentration. Further, the number of one-parent families increases mainly in the urban concentration, remarkable is that the closer to the city, the higher the percentage difference.

The changes in absolute numbers between the different household types are summarized in pie charts (Fig. 36); SCG is urban concentration, LG is rural area. Note: the 2-person households will not be discussed. The comparison of the urban concentration and the rural area in 2010 already show differences. The share of one-person households in the urban concentration is much higher, while the share of families with children is much higher in the rural area.

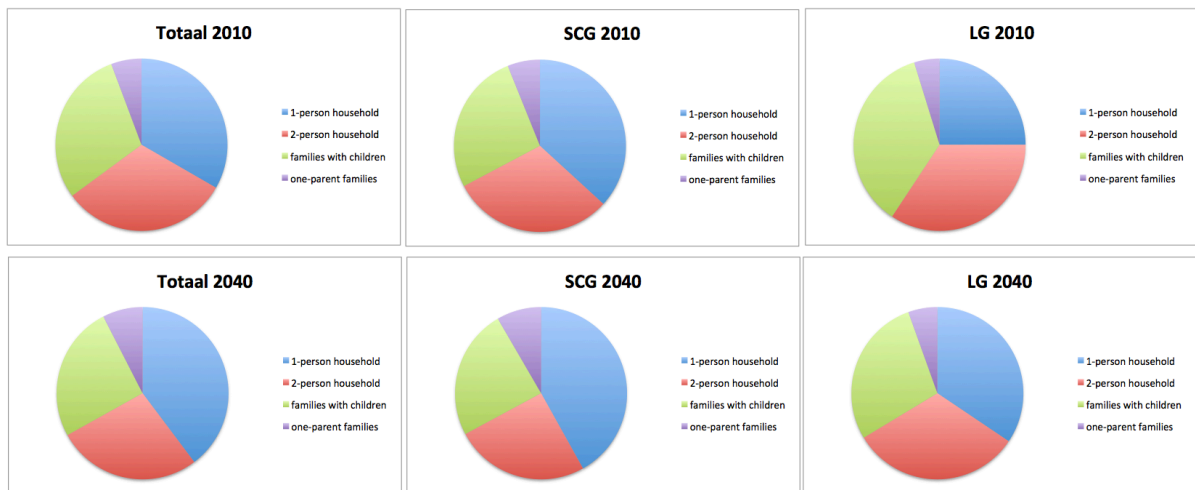


Fig. 36: Pie charts absolute numbers household change (author, adapted from PRIMOS, 2011).

Between 2010 and 2040 has the urban concentration an increase in one-parent families and one-person households, while in the rural area the share of families with children decreases and the share of one-person households increases, according to the prognosis. When comparing the pie charts for 2040, the urban concentration and rural area look more alike. Furthermore, for the region total is expected that the one-person households will increase at the expense of the families with children.

The theory that lies at the basis of this study implied that changes in the households' influences the different flows of DUS. Below the possible influence from the household changes on the different flows of DUS will be discussed:

First the migration flows. The households in the region change, this also changes the migration flows. People who enter the labor force or get married tend to migrate from their parental home, while persons who are divorced or widowed also tend to move away, as a result the types of households change. Furthermore, the predicted increase of the number of households, demands extra houses. Which influences the local housing market, and through that, the migration flows.

Second, the commuting flows. The household change has no significant impact on the commuting flows in the region.

Finally the sale flows. The changes in households could result in a small change in the demand for facilities and shops in the region.

10 Conclusion and discussions

In this chapter conclusions are drawn based on findings as described in the previous chapters. Key findings of the research are presented here. This chapter ends with recommendations for future research and for improved policy making.

At the basis of this study lies the objective to gain more insight in how processes of growth and shrink in a region elapse and thus to deliver a contribution to the scientific debate about demographic decline and 'DUSs'. The central question thereby was: *"What do the different flows of 'DUS' say about growing-/shrinking processes and have changes in the 'DUS' influence on shrinkage?"* In order to address this question, the concept of Daily Urban Systems was extended to use as a lens to look at growth and decline in the region. The case of this study was formed by the Eindhoven region. The Eindhoven region is an exceptional case, it is a dynamic region on the cutting edge of growth and shrink. These dynamics made it an interesting region to test the 'extended DUS framework' on.

10.1 Results

The migration, commuting and sale flows in the Eindhoven region have been analysed. For the Eindhoven region can be concluded that there is a thin line between growth and shrinkage. As argued the migration in the Eindhoven region mostly takes place over a short distance to neighbouring municipalities and the city. More people move to the urban concentration and the city, from the rural area, than the other way around. Growth in the region as a result of migration does not just takes place. Instead, as argued in chapter 2 (Musterd & Ostendorf, 1994; Van Diepen & Musterd, 2009), it often takes place at the expense of the development of the surrounding areas, e.g. the urban concentration grows at the expense of the rural area. From the commuting flows can be concluded that the majority from the region works in the own region. This shows the strong commitment of the labour force to the businesses in the own region. For the majority of the municipalities in the region applies, however, that only a minority of the labour force works in the own municipality. In the rural area in the Eindhoven region works more than half outside the own municipality and the inhabitants live relatively further away from their work. Moreover, from the analysis of the sale flows can be concluded that there is many cross-border shopping behavior in the Eindhoven region, especially for non-daily shopping. The region Eindhoven is characterized by one or more related concentrations of shops/ facilities on which a dispersed population is focused. The vast majority of the population of the region does the daily groceries within the own municipality, however, for non-daily shopping the majority goes to another municipality or the city. The patterns of the different flows of the extended DUS framework all have similarities with Christallers theory of centrality (1966). In line with Hincks & Wong (2010) the region Eindhoven and its municipalities fulfill different functions for its own population, but also for the people of the surrounding area. The cities of Eindhoven and Helmond have an important employment and

shop function and more rural municipalities primarily have a more residential function, with the exception of Asten.

The overview below displays the differences between flows of growing- and shrinking municipalities. The results from the migration flows show that the WOZ-value and the percentage of rental houses may have an effect on migration. The differences between commuting flows are very small. The differences between sale flows of shrinking- and growing municipalities are also small.

	Migration flows Migration to city	WOZ (euro)	% Rental	Commuting flows outside municipality	To the city	Outside region	Sale flows Daily groceries	Non-daily
Growing	25.4	292000	32.3	64.1	33.3	19	85.4	44.3
Shrinking	26.4	323000	27	64.5	23.1	18.5	82.3	42.6
Difference	1	31000	5.3	0.4	10.2	0.5	3.1	1.7

Figure 37: Overview: 'differences growing- and declining municipalities in the Region' (author).

The theory that lies at the basis of this research implied that these changes between growing and shrinking municipalities would be bigger (Musterd & Ostendorf, 1994; Van diepen & Musterd, 2009; White, 1988; Clark and Kuijpers-Linde, 1994; Lambooy, 1988; Glanzemann et al., 2004). This could be the result of the degree of demographic decline in the region, which is only a few per cent for third of the region. It also could be explained through the close proximity to the cities Eindhoven and Helmond that offer jobs and facilities. Furthermore, it was assumed (Renkow & Hoover, 2000; Van Ham, 2002; Van Oort et al., 2010; Musterd & Ostendorf, 1994; Van diepen & Musterd, 2009) that the differences in growth and decline were mostly the result of migration. However, the fact that the housing prices in shrinking municipalities are relatively high, and the commuting and sale flows are relatively stable, suggests that the demographic decline in the Eindhoven region is not driven by migration. Instead, municipalities do not grow as a result of a lack of construction sites or opportunities to build houses, and, shrink as a result of demographic ageing and excess mortality.

Besides the different flows in the region, the prognoses about de population and household change were analysed. From the analysis of the changing population is concluded that for the majority of the region Eindhoven a decline in the number of youngsters and a growth in the number of elderly people is predicted. The differences are smallest for the city Eindhoven and greatest for the rural area. As a result from the decrease in the number of youngsters, and the increase in the number of elderly, the potential labour force will be smaller.

On the basis of the changing households is concluded that the number of one-person households is expected to increase in every municipality in the region, but the differences are greatest in the rural area. This is a remarkable, because an increase in the number of

one-person households is normally reserved for the urban concentration. The percentage families with children are predicted to decline in all the municipalities, with the exception of the city. The one-person households will increase at the expense of the families with children.

It was assumed (Lee, 1966; Haas, 2009; Van diepen & Musterd, 2009) that changes in the population and household would influence the different flows in the region. The outcomes of the analysis suggest that the changes in the composition of the population in the Eindhoven region affect the different flows. As a result of the changes in the region i.e. less youngsters and much more elderly, there will be less migration flows and the local housing market is demographically ageing. Furthermore, the commuting flows in the region will decline. Commuting flows form the major part of the movements in the region, however, as a result of demographic ageing and a smaller potential labour force, there will be less commuting flows. Then, the sale flows. The declining and changing population in the region result in a changing demand for facilities and shops, further, because facilities and shops will move further away from people, it is expected that the sale flows outside the own municipality will increase.

From the results follows that the duality between the urban concentration and the rural area increases in the region. The growth and decline in the region does not develop in some linear fashion e.g. the municipalities do not lose population at the same time, instead, growth and shrink literally lie next to each other. The daily activities and different flows within the 'DUS' transcend the administrative municipality borders. It exists out of places that people use in their daily lives, outside the own municipality. The urban concentration in the region is designated to the city, however, the urban concentration is more designated to the surrounding municipalities. People in the Eindhoven region thus use different places, places to work, shop, live, etc. As a result from this, the changes in the region are in constant flux.

The demographic developments and the predicted changes in the DUS have an effect on the structure of the region. Through changes in the 'DUS' a different spatial structure may arise with a new cohesion. This suggests that the region might function differently in the foreseeable future. These changes result in a different distribution and concentration of people, on a daily basis as well for a longer term. As a result, a relative change in the size of different cores in the region and a relative change in the functions of the municipalities and the city. Expected is that these changes in the 'DUS' go very gradual, just as the shrink process itself.

However, although the Eindhoven region has shrinking areas and is expected to shrink more, there are no big foreseeable problems on the regional scale. On the local scale, that of the shrinking municipalities, there the thinning of the households will perhaps keep the municipalities from further shrinking.

10.2 Implications of this study

The conceptual model showed the assumptions that lied at the basis of this research in chapter 2. Fig. 38 below shows the conceptual model again. Assumed was that the different flows had influence on the 'DUS'. The explanation was: what people do and where they go, determine the distribution and concentration of people. Temporarily and for the longer term. The 'DUS' describes how people behave and changes in the 'DUS' have as a result a certain distribution and concentration of people, on certain places and at certain times. Certain places to live, work, shop etc. and at the moment that there are changes in the 'DUS', growth or shrink can occur.

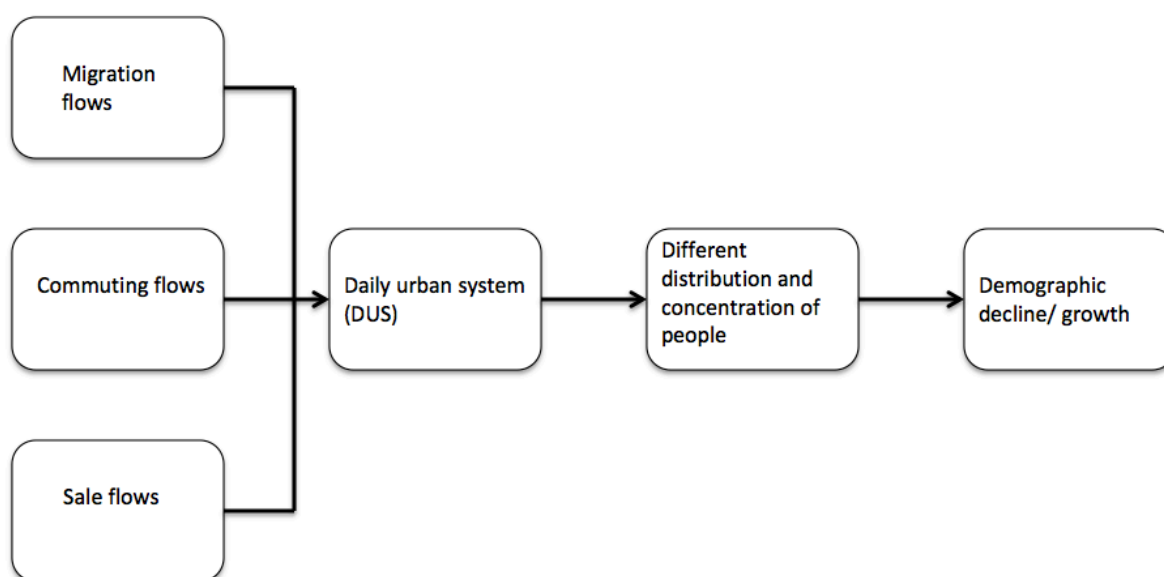


Figure 38: Conceptual model (author).

The findings strongly suggest that in order to gain more insight in the relative position and the network in which municipalities are located, the orientation of the civilians on their direct living surrounding and the daily activities in the region, the commuting- and sale flows proved to be relevant for this. To gain insight in changes in the DUS for a longer term, migration flows proved to be useful. The migration flows show where in the DUS growth or shrink takes place and are deeper rooted in the region than commuting- and sale flows. The combined flows give insight in the DUS and changes in the combination of flows cause growth and shrink in the region.

The conceptual framework developed for this study, which was based on the Daily Urban System, was useful for gaining insight into the differences in growth and decline in the region. The results from this study have shown that the conceptual framework needs to be refined in certain ways. It is hard to say if demographic variables e.g. the differences in the

distribution and concentration of people in the region, are independent or dependent variables. As a result, the last arrow (from 'different distribution and concentration of people' to 'demographic decline/ growth) could either point both ways. Furthermore, an additional textblock with 'demographic developments' could be introduced on the left side of the model.

To address the last sub question: *"What added value has the 'extended DUS framework' for the analysis of processes of growth and shrink within the region?"* The added value lies in the combination of daily flows combined with migration. Through this more insight is gained in daily changes as well as changes on the longer term. With the 'extended DUS framework' it is possible to compare shrink and growth within a region on the basis of living, working and shopping. Furthermore, the 'extended DUS framework' transcends administrative borders and looks at the functional region and how things work.

In order to answer the central question: *"What do the different flows of 'DUS' say about growing-/shrinking processes and have changes in the 'DUS' influence on shrinkage?"* Is made use of the 'extended DUS framework' and is answered via the subquestion 1-4. We can provide our empirical findings only with very preliminary interpretation. As argued, the changes in the region are in constant flux. The current DUS changes continuously as a result of all kinds of flows between nodes, and these changes take place on different scales (local and regional). All these flows influence the concentration and distribution of people, and at a certain level, these changes influence shrink: the migration flows demonstrate how this takes place. The growth is basically based on two sources: (1) internal growth, and (2) external growth. This thesis demonstrated that demographic developments influence the different flows of 'DUS', and that people of different age undertake different activities. In this way, the different flows in the 'DUS' influence and is influenced by shrink.

10.3 Limitations of this study

In this paragraph there will be looked at the limitations of this study. With the 'extended DUS framework' is looked at the Eindhoven region in this thesis, perhaps another framework would give other results. The 'extended DUS framework' exists out of only 3 kinds of flows. One could argue if more flows would give extensive results. If, for example, there will be looked at flows concerning sports and recreation, it could possibly give more insight in the spending of time of people in weekends, furthermore, it could give more insight in the daily activities of elderly that do not work anymore.

A single case study is undertaken to gain insight in processes of growth and decline in the region. If there was more time, though, the method of a survey could provide more extensive results, compared to the single case study. With a survey it would be possible to ask each individual 'how' and 'why' they move across the region. Furthermore, a multiple case study would also give extensive results, however, this assumption may be questioned

because Eindhoven is an exceptional case. Nonetheless, it would be helpful to test the 'extended DUS framework' on more than one (1) region.

Different experts have been interviewed for this thesis, interviewing more than these three experts could give extensive results. For instance interviewing an expert that has published about urban systems.

This research made use of existing data of different flows in the region, this data exists of absolute numbers of inhabitants per municipality. It would be even more useful to have this flow data per type household and/ or age category. This could lead to more specific and concrete results for this research. Next to factual data uses this research different prognosis. A population prognosis does predictions about the most probable developments of the population and uses trend data. Trend data that is available at that moment. The basis exists of hard, empirical data that lead to quantitative statements about the future. It is important to take into account, that the further there will be looked forward, the more important the assumptions become.

Some results of this study illustrate a review of a snapshot of a process. There are well-commented assumptions pulled through in time. But the current trends can also turn around. Think for example about the trend we saw earlier of the increasing number of 'one-person households', perhaps this trend changes soon: how are all those 'one-person households' going to pay their house? Moreover, it is very difficult predict all kinds of developments, while there is still an economic crisis going on.

10.4 Recommendations

In this chapter different recommendations will be made, for future research and improved policy making. Through the course of this research, different possibilities for future study have also emerged. Next to the more quantitative approach of this research, could future research look more qualitative at processes of growth and decline. For example, there could be looked at the social ties with places of inhabitants. Why do people want to stay in shrinking areas? The attractiveness of a neighbourhood, municipality or city is not only determined by the spatial structure. A village or neighbourhood is not only a brick surrounding, but represents also a 'cultivated' surrounding according to Boomkens (2006). Demographic development eventually starts en ends with people, areas themselves don't grow or decline. And so, are there social reasons for changes in the Daily Urban System?

Furthermore, research could be done in order to extend the 'DUS framework' even further. Which flows, besides the 3 used in this thesis, could be useful? Extended research could be conducted in the Eindhoven region with new extensive data, or the 'extended DUS framework' could be tested on another growing city region with shrinking areas.

The empirical results presented in this paper have implications for policy. There are changes in the 'DUS' and these changes influence planning practice. However, planning practice also influences the flows of the 'DUS'. The flows do not emerge spontaneously, but are created by the spatial possibilities. They are born in the policy context. Inhabitants don't think: I am going to relocate, instead, flows are being generated because houses are being built elsewhere. A municipality is an area with administrative borders where decisions are made which generate these kinds of flows. As a result, the growth in the region is partly dependent on what is going to be built. In this way, some municipalities grow, while others grow less or shrink. It has been argued that the municipal (local) population change is strongly correlated with the local housing market, as a result, the housing stock increasingly defines the population size and migration flows. However, through the demographic developments and demographic ageing on the housing market in the Eindhoven Region, there will be less migration. This means that municipalities that shrink, need to be careful when they expand their housing stock. It is easily possible that they built too much houses. It is also possible that building houses in one place, will lead to shrink in neighbouring municipalities. The expanding of the housing stock should therefore be discussed on a regional level in the Eindhoven region.

The results suggested that through the fact that the housing prices in shrinking municipalities are relatively high, and the commuting- and sale flows are relatively stable, that the demographic decline in the Eindhoven region is not driven by migration. It is thus mostly the result of demographic ageing (less births, more deaths). This means that planning practice should presuppose the demographic developments as 'constant' and 'data'. This means that they will not grow anymore in the traditional sense e.g. more people, facilities, houses and such. This is why it is important to reconsider what growth is. Is growth after 4 years 1000 extra inhabitants or households, or is it more important, that there is less unemployment, less congestion and more people have a nice house. The question is in what way planning practice expresses growth? Do they do that in more offices, houses, etc., or in a different way? Growth should perhaps be redefined. Some concrete results could be growth in durability, more energy efficient, etc. This is a shift from quantitative growth to qualitative growth.

The results of this research strongly suggest that the differences between the rural area and the urban concentration will grow. The urban concentration is expected to grow, while parts of the rural area will continue to demographically decline. The shrink in the region asks for a supra-local approach, whereby collaboration and consultations between municipalities is necessary. An approach that transcends administrative boundaries. This in order to prevent those municipalities will only go for their own success and start to compete with each other. If, for example, a shrinking municipality builds extra houses to attract new inhabitants, could result in outward migration of neighbouring municipalities. Resulting in shrink in the surrounding municipalities, and this only moves the problem to another municipality.

Another foreseeable problem of this competition is that there will be a possible surplus created. To prevent this, supra-local consultation needs to take place, the last growth needs to be planned carefully. Villages are after all not autonomous anymore, they are connected with other parts of the region and inhabitants cross their municipality borders every day. This supra-local consultation should not only be about living, but about employment and facilities as well.

As results of the sale flows and changing population showed, shrink also influences the demand for shops and services. The accessibility becomes more important, especially for facilities. This accessibility is currently based on old patterns. However, it is argued that as a result of the increased mobility, the accessibility of facilities became more important than the availability. The mobility structure determines partly also the distribution of facilities, and so, breaking old patterns is suggested. The increasing number of elderly is less mobile and it is important to keep facilities that move further away, still available for this group. Facilities should perhaps be clustered in the best accessible places e.g. between municipalities, or in a Central Place Theory kind of fashion.

Finally, for the region Eindhoven it would be useful when there would come a common ambition or view – a shared vision – that is not only managerial but also spatial, to ensure a shared problem perception and a supra-local approach to demographic decline. The biggest challenge thereby is probably the existence of local managerial- and administrative borders.

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