REPORTS OF THE FINNISH ENVIRONMENT INSTITUTE
16 | 2015

Urban Form in the Helsinki and Stockholm City Regions

Development of Pedestrian, Public Transport and Car Zones

Panu Söderström, Harry Schulman and Mika Ristimäki

Finnish Environment Institute

REPORTS OF THE FINNISH ENVIRONMENT INSTITUTE 16 / 2015

Urban Form in the Helsinki and Stockholm City Regions

Development of pedestrian, public transport and car zones

Panu Söderström, Harry Schulman and Mika Ristimäki

REPORTS OF THE FINNISH ENVIRONMENT INSTITUTE 16 | 2015
Finnish Environment Institute
Sustainability of land use and the built environment / Environmental Policy Centre

Translation: Multiprint Oy / Multidoc
Layout: Panu Söderström
Cover photo: Panu Söderström

The publication is also available in the Internet:
www.syke.fi/publications | helda.helsinki.fi/syke

ISBN 978-952-11-4494-3 (PDF)
ISSN 1796-1726 (online)

PREFACE

In recent decades, the Helsinki and Stockholm city regions have been among the most rapidly growing areas in Europe. In addition to the peri-urban area surrounding a dense core area, the areas of impact of both cities include several smaller towns, various development corridors and extensive rural areas. How has the urban form of metropolitan areas been structured from the core to the fringes? How should their development be guided? Answering these questions requires international reference data so that solutions that have been successful elsewhere can be utilised in planning and decision-making, and detrimental effects can be prevented.

In order to succeed, the comparison of city regions requires comparable data, applicable methods and identifying the similarities and differences of the administrative and planning systems of the studied regions. In many ways, the Stockholm metropolitan area is an important point of comparison for Helsinki. In terms of its many dimensions, urbanisation in the Stockholm region has been found to be more advanced than in Helsinki, which is why the solutions implemented in Stockholm with regard to urban form should be evaluated in relation to the development of the Helsinki region.

A comparative study of the urban form in Helsinki and Stockholm was originally published in the form of a collection of articles in Finnish (ed. Söderström, Schulman & Ristimäki 2014). The publication explored the development of the city regions through GIS and statistical analyses, literature reviews and expert interviews conducted in the regions. This summarised report made available in English focuses particularly on the GIS-based comparison of the regions from the perspective of three urban fabrics (walking city, transit city and car city) and the urban zones that reflect them. Another key theme in the examination is the increasing polycentric structure of the regions and the related growth of a networked urban structure.

The study was implemented as a cooperative effort between the Department of Geosciences and Geography at the University of Helsinki and the Finnish Environment Institute's built environment and land use research. The project is part of the Helsinki Metropolitan Region Urban Research Programme.

In Helsinki, in April 2015

Harry Schulman
Professor, chief director of the project
University of Helsinki
Dep. of Geosciences and Geography

Mika Ristimäki
Senior Research Scientist
Finnish Environment Institute
Environmental Policy Centre

Panu Söderström
Editor-in-chief of the report
Finnish Environment Institute
Environmental Policy Centre

CONTENTS

1 Introduction

In recent decades, the Helsinki and Stockholm city regions have grown rapidly, and the growth is not expected to slow down in the near future. How and where the new residents and jobs are positioned in the regional structure is crucial in terms of the sustainable development of the urban form.

1.1 Background and goals of the study

This research report delves into the differences and similarities of the Helsinki and Stockholm city regions from the perspective of land use, urban form and the traffic system. Recent developments in the regions were analysed based on GIS data and planning documents. Furthermore, numerous expert interviews were conducted in both city regions. The viewpoint of the study centres on the notion of three urban fabrics - walking city, transit city and car city - which differ in terms of their physical structure and the travel alternatives they offer (Newman & Kenworthy 1996; 1999; Kosonen 2007; 2013; Newman et al. 2015).

The study is structured based on a two-dimensional area division. On a regional level, the city regions being examined have been divided into differing types of urban, peri-urban and rural areas, which corresponds to the commonly used division for city regions (Piorr et al. 2011; Ravetz et al. 2013). On a more specific level, the area examination was structured by utilising the urban zone method to divide the areas into pedestrian, public transport and car zones, which reflect the travel opportunities of the various locations (Schulman & Jaakola 2009; Kanninen et al. 2010; Ristimäki et al. 2011 & 2013).

Finnish city regions have widely been studied from the urban zone perspective within the framework of the Urban Zone project coordinated by the Finnish Environment Institute (Ristimäki et al. 2011; 2013), which analysed the development of 34 Finnish city regions. However, the Helsinki region, which is the only metropolitan area in Finland, does not have a comparative equivalent of the same scale among the Finnish city regions. This study expands the zone-based examination to the Nordic scale, which enables correlating the development of Helsinki with another Nordic capital. The study was conducted between 2012 and 2014.

A cooperative party in the project in Sweden was the Growth and Regional Planning Administration (TRF) of the Stockholm County Council (SCC) (Stockholms läns landsting – Tillväxt- och regionplaneförvaltningen, TRN). This also provided the research project with access to GIS data regarding population and employment developments in the Stockholm region. As regards Helsinki, the project had access to GIS data from the Finnish Monitoring System of Spatial Structure (YKR) with regard to regional development. In addition to this, the project utilised previous area and zone divisions that were prepared for Helsinki during the Urban Zone project.

1.2 From a walking city to a polycentric transit and car city

For almost the entire history of urban construction, walking has been at the core of day-to-day mobility. Due to this, urban structures became dense, with distances from one edge of the city to the other often amounting to no more than a few kilometres. According to many studies, the time people are willing to spend on normal travel for work and errands is roughly constant (Szalai 1972; Marchetti 1994; Newman & Kenworthy 1999, 27; van Wee et al. 2006; Newman et al. 2015). The Marchetti constant refers to a daily time budget of approximately one hour for commutes. Over the course of history, the time budget has remained largely unchanged despite substantial changes in traffic technology and urban form. Thanks to faster and faster modes of transport, the area accessi-

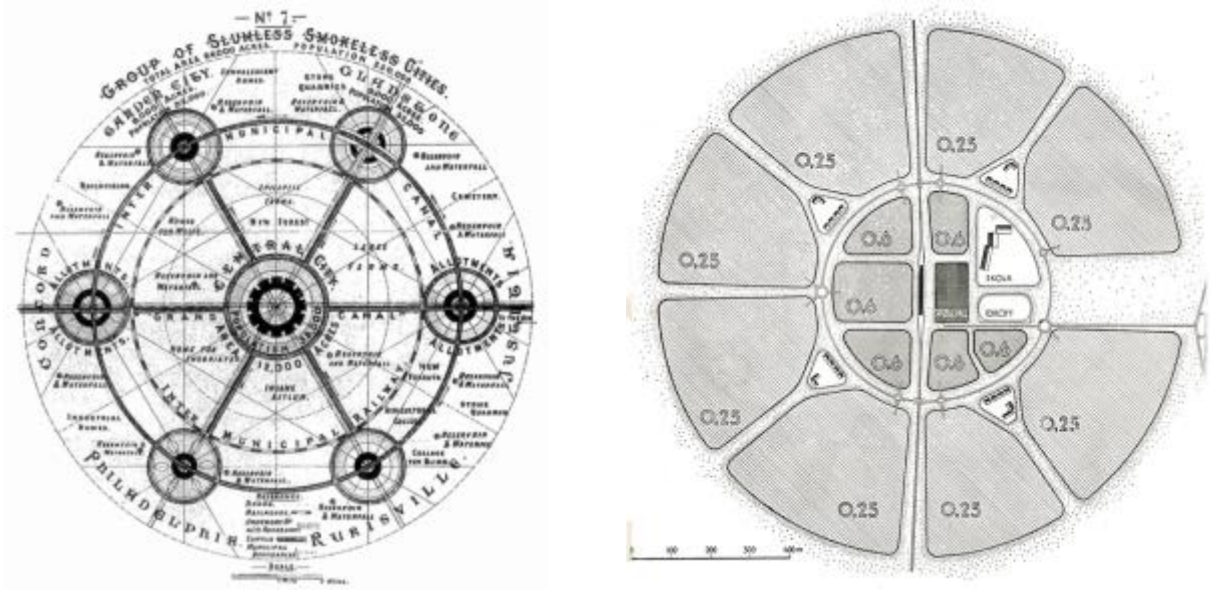


Figure 1: On the left, Ebenezer Howard's idea of garden cities surrounding a central city, and the railway links connecting the units and the city. On the right, a diagram from 1945 depicting a 10,000 resident suburb, which relies on the metro network of Stockholm.

ble by 30 minutes of travel in one direction extended from approximately 2.5 km on foot to 20–30 km through advancements in public transit and car traffic. In addition to the means of travel utilised, the area reachable within the time budget is dependent on the available public transport services and the traffic infrastructure in the area.

With the onset of the Industrial Revolution, a dramatic change occurred in the regional expansion of cities in the 19th century. Tramways and railways enabled extending the urban structure beyond walking distances along track routes and new station areas. New modes of travel enabled cities to become more regionalised and polycentric, based around the station areas (Cervero 1998, 15–33; Newman & Kenworthy 1999, 29).

The idea of garden cities established outside old urban areas, which was put forth by Ebenezer Howard at the turn of the 19th and 20th centuries, spread far and wide and affected the development of numerous city regions (Hall 2002, 88–141). The notion of garden cities was based on decentralisation, dividing the growth of a central city into multiple independent units connected to one another and the city through railway links. This represented the contemporary aims to solve the problems of urbanisation and work towards an ideal city.

The widespread emergence of cars and buses after World War II had an even stronger impact than the development of railway traffic on the change of urban structure. When cars had become commonplace, it was possible to expand residential areas to any direction, irrespective of track routes, and still remain within the one-hour time budget. Extensive, low-efficiency suburban areas based on car traffic became prevalent particularly in North American and Australian cities, which exhibited the strongest growth after World War II (Newman & Kenworthy 1999, 31).

On the other hand, urbanisation has also been strong in the latter half of the 20th century in the Nordic countries, where cities have grown fairly late by European standards. In Finland and Sweden, the decades following World War II were a time dominated by the construction of the welfare state, during which production was primarily focused on public housing and blocks of flats. However, as a result of the simultaneous regionalisation, the core areas of Helsinki and Stockholm experienced a longer phase of negative population development in the 1960s and 1970s.

In addition to the development of traffic technology, the growth of the city region and the orientation of this growth between core and peri-urban areas have been affected by fluctuations in economic trends. For example, Leo H. Klaassen et al. (1981) and Leo van den Berg et al. (1982) emphasised the cyclical development of regions, where an economic downturn is followed by a new period of growth, and the core and peri-urban areas take turns as growth areas. The development model involves four phases: urbanisation, suburbanisation, disurbanisation and reurbanisation.

On the other hand, the ideals of urban planning in various eras have strongly shaped the structure of regions. Both Finland and Sweden strongly adopted the notion of decentralising functions outside the old city centre. Since the beginning of its inception in the 1950s, the template for the Finnish garden city and suburban centre was the Tapiola district in Espoo, which was followed by residential suburbs and related service centres based on more or less standard solutions. Ebenezer Howard's garden city ideology was also a prominent element in the preparation of the 1952 Stockholm master plan (Figure 1; Andersson 2012, 130). The backbone for the new suburban development was a metro network, along which the suburbs were located in a string-like pattern. Some of the centres were designed to serve multiple suburb units, and many of them still function as sub-centres in the city region.

Figure 2: The idea of Copenhagen's 1947 Finger Model was to focus the growth of the region along railway tracks extending radially from the city centre.

Similar phases can be recognised in the development of the structure and traffic system of both Helsinki and Stockholm, although the older and more populated Stockholm has often been one step ahead of Helsinki. The core of both cities is formed by a dense stone-built city proportioned for walking, which began to take form in the Middle Ages in Stockholm and in the early 19th century in Helsinki. Later, growth in both cities has been closely linked with the development of new forms of traffic. This has later supplemented the structure of a traditional walking city with the structures of expanded transit and car cities.

Villa communities situated along tracks and suburbs linked to the city centre by tram routes have been an essential part of the development of the transit city, which began in the latter half of the 19th century. Later, bus traffic and in Stockholm the construction of the metro system, which replaced the suburb tram network in the 1950s and 60s, played a pivotal role in the development of the transit city. In the spirit of Copenhagen's 1947 Finger Plan (Figure 2), construction in Stockholm and Helsinki has been concentrated around radial public transport corridors. Since World War II, however, the increase of car traffic has also created new types of car city structures in the regions. As we get closer to modern times, efforts have concentrated on harmonising the urban form, preventing the harmful effects of traffic and improving the diversity and quality of the urban environment.

The core planning issues in both regions have become more and more regional, extending to encompass the entire metropolitan area. As such, recent years have seen city regions being defined

and outlined through models and theories emphasising multipolar interaction (Kloosterman & Musterd 2001; Davoudi 2003; Sieverts 2003; Meijers & Romein 2003; Dupuy 2008). Furthermore, the essential planning documents of both cities lean more heavily than before on the idea of polycentricity and networked regional structure with nodes formed by various centres in the city regions (e.g. WSP 2008; Promenadstaden 2010; RUFS 2010; KSV 2013).

From the perspective of the development of urban form, regionalisation brings with it both threats and opportunities. In international comparisons, the Helsinki region has sometimes been seen as a cautionary tale of scattered urban form (EEA 2006, 13). At the same time, Stockholm has often been viewed as a prime example of developments regarding urban structure, the public transport system and, in recent years, cycling (Newman & Kenworthy 1999, 208–209; Cervero & Sullivan 2011, 212–214; Vaismaa et al. 2011, 40–41). Substantial differences between areas can also be found within the city regions, with structural concentration and decentralisation occurring simultaneously in different parts of the regions.

1.3 Accessibility and quality of the urban environment

Regional accessibility has emerged as a central factor in selecting the operating locations of companies, with the junction points of ring and exit roads, for example, being often seen as appealing areas for business. The development of the traffic network and relative accessibility of an area significantly impacts the placement of functions in a city region, thereby also affecting the decentralisation of the urban form (Joutsiniemi 2010, 244). In addition to accessibility, various questions regarding the quality and diversity of the urban environment, and the image of the areas, influence where companies decide to settle (Florida 2002; Manninen et al. 2011, 214). For example, advertising agencies and architectural firms often favour areas that offer urban diversity and have a strong identity. On the other hand, it may be difficult to create jobs in areas that are seen as limited and weak in terms of their diversity and image.

Another challenge in a networked city is to arrange public transport links between the centres and areas in the region in a way that provides a competitive alternative for car travel, when a large portion of destinations are not aligned in a radial pattern between the traditional city centre and suburbs. Traditionally, sub-centres have been planned as part of a branching, tree-like public transport system, with the city centre at its core. Later, the needs to join sub-centres by means of orbital public transport links, as well, have increased. In the structure that is taking a more networked shape, sub-centres can become nodes of old radial and new orbital connections, at which point their accessibility is not only dependent on connections to the old city centre. In many cities the potential of a modern light rail system has been identified for managing the new structure, a good example of which is the orbital light rail line Tvärbanan in Stockholm.

Converting the often less or more one-sided and traffic-dominated sub-centres and other suburban concentrations of commercial activity and jobs to diverse places with high-quality pedestrian environments requires a lot of work. Luca Bertolini has examined accessibility from the perspective of station area development, in particular (Bertolini 1996; 1999; 2008; Bertolini & Spit 1998; Bertolini & le Clercq 2003; Bertolini & Dijst 2003). In his node-place model (Figure 3) he presents the two dimensions of accessibility: the relative traffic accessibility (*node*) and the quantity and quality of land use (*place*). In a balanced situation, neither dimension is excessively emphasised in proportion to the other. If a location is a significant node for various forms of traffic, it should also be utilised as an area of diverse land use. Correspondingly, intensive land use should not occur in areas with poor accessibility.

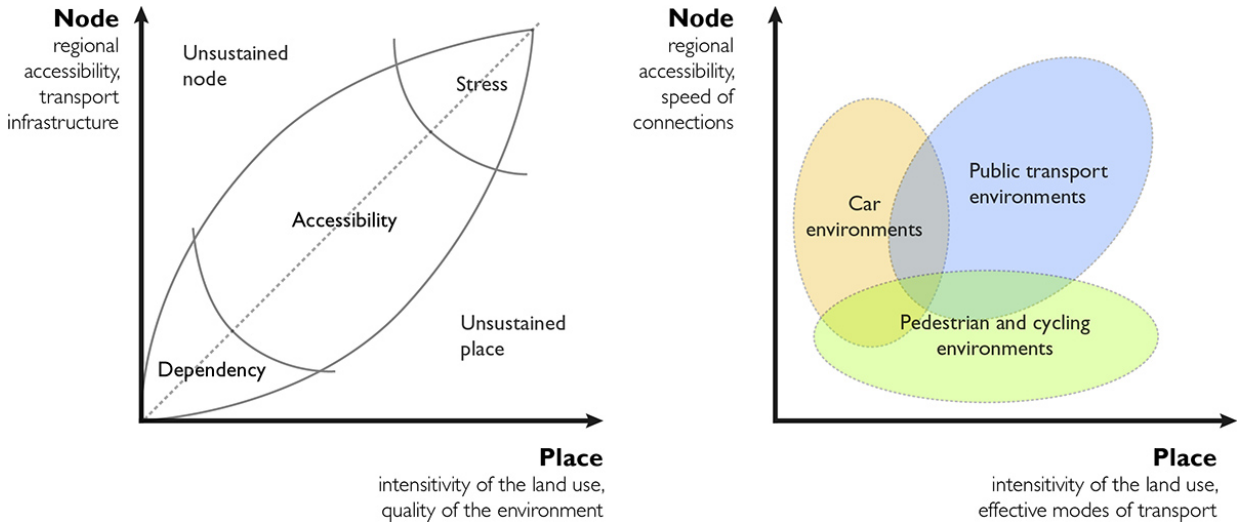


Figure 3: A representation of Bertolini's node-place model. The model divides accessibility into two dimensions, which should be balanced. The diagram on the right depicts the positioning of the various types of travel environments in the model framework.

Bertolini's model also provides a rough indication of the suitability of an environment for various modes of transport (Bertolini & le Clercq 2003, 578). Centres with a strong node dimension but weak place dimension are usually service centres that are part of the car city fabric and include warehouse outlets and large parking areas. On the other hand areas with a strong place dimension but weak node dimension offer good opportunities for walking and cycling, but they are ill suited to serve as important centres due to their poor regional accessibility. As a result, these areas are often primarily residential. In many urban centres with strong node and place dimensions regional accessibility is mainly based on an advanced public transport system, and the possibilities for utilising various modes of travel are diverse.

The logic of where commercial activity is located has strongly adhered to the changes in accessibility, and it has significantly affected the development of urban form (Alppi 2008; Ylä-Anttila 2010, 172). With the increasing frequency of larger commercial units positioning themselves in the proximity of motorway junctions or other accessibility nodes, the local service networks of many residential areas have deteriorated.

The sub-centres offer a form of compromise for the increasing unit sizes and changing location requirements in the field of commerce. The sub-centres hold housing, services and jobs, and the environment supports pedestrian traffic in the public outdoor areas, at least in the target state (Ristimäki et al. 2011, 20; Söderström 2012). The sub-centres are often positioned in traffic network nodes, locations that are accessible by both public transport and car. They also play an essential role in constructing a networked transit city that centres on fluent rail and bus connections between the various hubs in the city region.

A planning trend known as *transit-oriented development (TOD)* in the United States emphasises the significance of modern rail traffic and the mixed and dense urban structure to be created in the station areas of suburbs in the efforts to achieve sustainable urban development (Calthorpe & Fulton 2001, 68; Cervero & Sullivan 2011). In practice, the idea is to build diverse and mixed pedestrian and transit cities around station areas. The station and concentration of commercial activity form the core of the pedestrian zone around which the employment and residential areas are located. The TOD structure is often the goal in systematic development of sub-centres or regional centres. However, a corresponding structure supporting public transport and local pedestrian traffic

has not formed in many newer office park locations and retail areas that have been allowed to develop freely at road traffic nodes.

1.4 The administration and planning of a metropolitan area as a challenge

The administration and planning of a metropolitan area requires a body that takes charge of the overall policy – identifies the regional problems and development needs, sets goals and organises and monitors implementation. Stockholm and particularly Helsinki are small compared to international metropolises, but their significance is great from the perspective of national economy (OECD 2005; 2010). Therefore, metropolitan policy is thought to promote the well-being and competitiveness of the entire country. In both Finland and Sweden, the administrative system of the metropolis areas is multi-tiered, extending to the national, regional and municipal levels. On the national level, the core issues for metropolitan areas are the legal foundation determined by the state, the national goals of area use and urban policy. For example, the state investment policy is based on these, and state subsidies often bear a decisive significance in the development of many arrangements, such as traffic systems.

In Sweden, metropolitan policy has been exercised since the late 1990s, but, instead of physical land use, it has been largely focused on the social problems of the three largest cities and matters of economic growth. However, the Swedish county councils form a strong regional administration for the city regions. As regards Stockholm, the basic regional unit for this study is the county which, in terms of area, corresponds to the Stockholm County Council (Stockholms läns landsting). The county area has an elected council and the right to levy taxes. Together with the provincial administration, which is part of the state administration, it coordinates regional development, social and traffic planning, and is responsible for publically funded health care.

In Finland, metropolitan policy was not incorporated into the national government programme until 2007. In terms of content, the focuses of the Finnish metropolitan policy are administrative development, land use, housing, traffic, international competitiveness, immigration and social integrity. The implementation of the policy is based on municipal cooperation and letters of intent between the state and municipalities. It was agreed in the letter of intent between the state and the municipalities of the Helsinki region on land use, housing and traffic for 2012–2015 that a joint land use plan would be prepared for the Helsinki region, in order to consolidate the development principles and solutions for the regional structure, urban form and traffic system (MAL 2012).

In the Helsinki region, the metropolitan administration has been divided into joint authorities of multiple municipalities that have been activated by the state metropolitan policy. The following lists the most essential administrative bodies: The Helsinki Metropolitan Area Advisory Board and the wider 14-municipality Helsinki Region Cooperation Assembly are pivotal for the strategic cooperation regarding land use, housing and traffic in the region. Helsinki Region Transport (HSL), a joint municipal authority of seven municipalities, and the Helsinki Region Environmental Services Authority (HSY) are responsible for the planning and organisation of public transport as well as water and waste management in the area. HSY is also responsible for producing regional and environmental information. As regards health care, the 24-municipality Hospital District of Helsinki and Uusimaa (HUS) serves as the joint municipal authority for special health care. The Helsinki-Uusimaa Regional Council (26 member municipalities) has an important role in terms of strategic planning, regional planning and cooperation between parties.

Efforts have been made to consolidate the fragmented administration in the Finnish metropolitan area – with slim results so far. The latest attempt was made by the Ministry of Finance, which set up two working groups in 2013 to prepare new legislation and municipal division arrangements for the Helsinki metropolitan area. The metropolitan administration, which was planned to

be instituted in 2017, would have been tasked with making decisions on land use, housing and traffic in the region. However, the government bills and suggested municipal partnerships were poorly received, and the implementation of the new administrative model seems unlikely.

Both in Finland and Sweden, municipalities carry the main responsibility for land use planning. They also have a planning monopoly, i.e. the exclusive right to issue legally binding land use guidelines. However, in some cases, the state can get involved in the planning and decision-making processes of the municipalities (COMMIN 2007; VAT 2008). For example, housing production, traffic and land use in the Helsinki region are included in the national goals for area use that were reviewed in 2008. In the same year, the Land Use and Building Act was amended with an obligation regarding the preparation of a joint master plan for the cities of Helsinki, Espoo, Vantaa and Kauniainen.

In both of the regions examined, strong population growth is expected to continue in the future, which makes the favourable placement of new residents, jobs and services pivotal for the development of their development.

1.5 The Helsinki and Stockholm metropolitan areas as research areas

The delineations of the Helsinki and Stockholm metropolitan areas have varied substantially depending on the interpretation and the issues being at hand. In the Helsinki region, the significant areas in terms of inter-municipal cooperation are the metropolitan area, which encompasses Helsinki, Espoo, Vantaa and Kauniainen, and the wider 14-municipality region, which also includes the peri-urban municipalities in the metropolitan area. At its most expansive, the Helsinki metropolitan area has been interpreted to include the regions of Uusimaa, Häme and Päijät-Häme (OECD 2003, 43).

The Finnish Environment Institute has developed a nationwide functional area division, which enables the examination of city regions as areas irrespective of municipal boundaries. The area delineation is based on commuting, use of services and accessibility (Rehunen & Ristimäki 2012, 58). In 2010, the Helsinki functional area had over 1.5 million residents and slightly over 700,000 jobs (YKR). This area is also used as the research area in the comparison of the urban forms in Helsinki and Stockholm.

Figure 4 presents the delineation of the Helsinki functional area and some of the essential municipalities in the areas surrounding the city region. The cities of Tallinn, Lahti and Hämeenlinna are within 100 km of the Helsinki city centre. On the other hand, the Helsinki–Hämeenlinna–Tampere zone extending north along the main railway route is one of the most established development corridors in the country. Furthermore, the corridor between Helsinki and Lahti has opened up in a new way in the 2000s, with the completion of motorway and railway links.

The Stockholm metropolitan area can also be defined in at least three ways. According to the definitions of Statistics Sweden, the Stockholm metropolitan area is delineated by the borders of Stockholm County (SCB 2005). This delineation is also used in many comparisons of city regions (e.g. OECD 2006b, 26-28). In 2010, the Stockholm County area had slightly over two million residents and over a million jobs. Functionally speaking, however, the Stockholm city region extends beyond the county borders (Figure 4).

The fourth largest city in the country, Uppsala, is situated only 70 kilometres from Stockholm but is part of a different county. The Stockholm functional city region (2,435,000 residents), whose delineation is based on commuting, encompasses almost the entire Uppsala County (Tillväxtanalys 2011, 14). The Stockholm functional area also includes parts of the Västmanland and Södermanland counties.

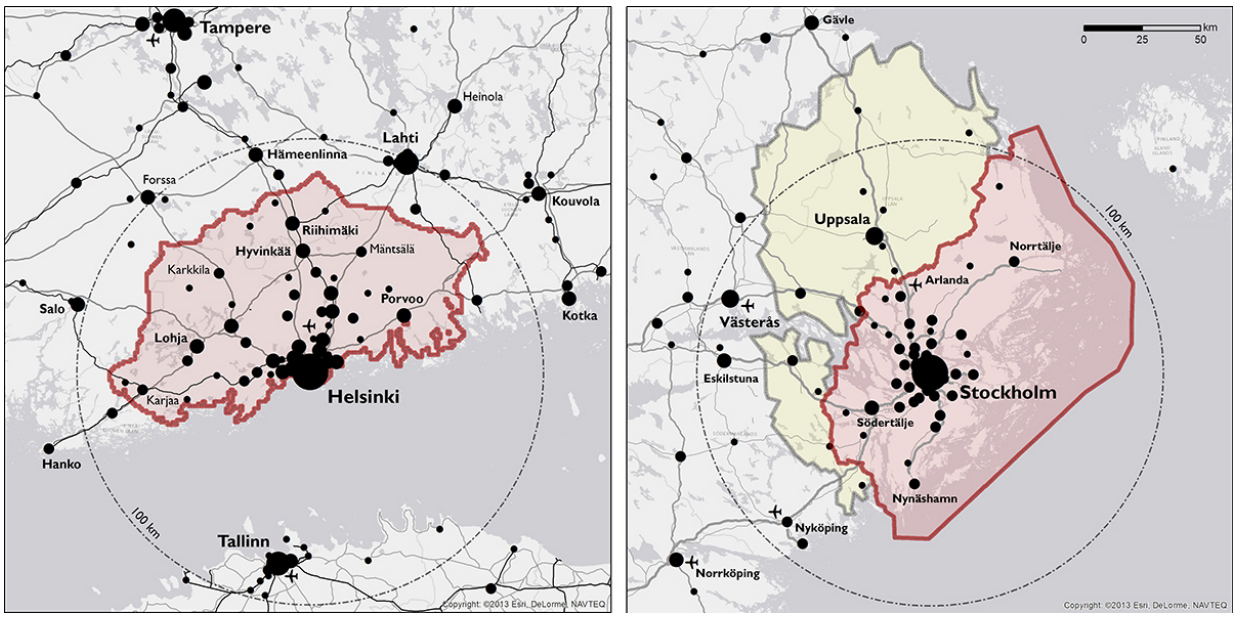


Figure 4: Research areas in the Helsinki and Stockholm regions (red highlight). In Stockholm the functional city region extends beyond the county area examined here (yellow highlight).

At its most extensive, the Stockholm region can be considered to include the entire Stockholm-Mälardalen cooperation area, which consists of four counties and 53 municipalities. In 2010, this area housed 2,630,000 residents. However, according to the OECD regional report (2006b, 28) an area as wide as this cannot be regarded as a contiguous metropolitan area.

The research area used in Stockholm's statistical and GIS analyses is outlined (primarily based on the availability of data) in the borders of Stockholm County. Stockholm County holds 84% of the population of the Stockholm functional area. The connections of the region's functional structure that extend outside the county borders are also taken into account in the interpretation of the results.

Info box 1

Land use, housing and traffic cooperation in the Helsinki region

Municipal consolidations play an important role in the cooperation between the municipalities of the Helsinki region. In the core areas of the metropolitan area (7 municipalities) Helsinki Regional Transport Authority (HSL) is responsible for the planning and organisation of public transport as a joint municipal authority. On the other hand, the *Kuuma* joint municipal authority is a pivotal cooperation body for municipalities in the Central Uusimaa area. Coordination at the level of the wider city region has, for quite some time, been centred on the cooperation of 14 municipalities.

The majority of the municipalities in the Helsinki region are located in the Uusimaa region, within which the general development of urban form and traffic is guided by the regional plan completed in 2007 (UL 2007). The plan was later supplemented with stage plans, of which the second phase regional plan focuses on issues regarding urban form and its unification (UL 2013).

The development of the city region is also significantly affected by letters of intent between the municipalities in the region and the state with regard to land use, housing and traffic. The MAL (land use, housing and traffic) agreement made for the period between 2012 and 2015 (MAL 2012) agreed upon municipal housing production goals, production of state subsidised ARA housing and the basic principles of the development of urban form.

Another goal accordant with the letter of intent is to prepare a joint land use plan for the region, including development principles and solutions for urban form and the traffic system. The land use plan has been prepared by a group consisting of the local planners of the municipalities, and a draft of the plan was published at the end of 2014 (Figure 5; MAL 2014a). Efforts have been made to concentrate construction along public transport routes, favouring complementary construction in built areas. Some of the areas are connected to future traffic investments, such as expansions of commuter train and metro networks.

In addition to this, the housing strategy of the region is closely linked to the land use plan (MAL 2014b). Its starting point is a population forecast according to which the area will house two million residents by 2050. The population growth specified in the forecast would correspond to an annual population growth of 1%, which is approximately the current rate. The housing strategy creates a basis for the housing production goals of the municipalities for the duration of the next two MAL agreement periods (2016–2019 and 2020–2023), and it also serves as a shorter-term implementation plan for the land use plan.

At the same time as the land use plan and housing strategy, a new traffic system plan (HSL 2014) has been prepared for the region, which partially serves as a starting point in the negotiations for the next MAL agreement between municipalities and the state. As regards the traffic system plan, the aim has been to present the common mindset for the region in terms of the development of traffic policy and the traffic system. The central purpose of the traffic system plan is to steer people from using cars towards other means of travel such as public transport, cycling and walking.

One element of the traffic system plan is the implementation of vehicle traffic pricing in the metropolitan area. The intention is to use congestion charges to distribute the means of travel more evenly in the region, reduce congestion and emissions, and finance the region's traffic investments. In Stockholm, congestion charges were already implemented in 2006. As of yet, there are no decisions on the method in which the possible congestion charges will be instituted in the Helsinki region.

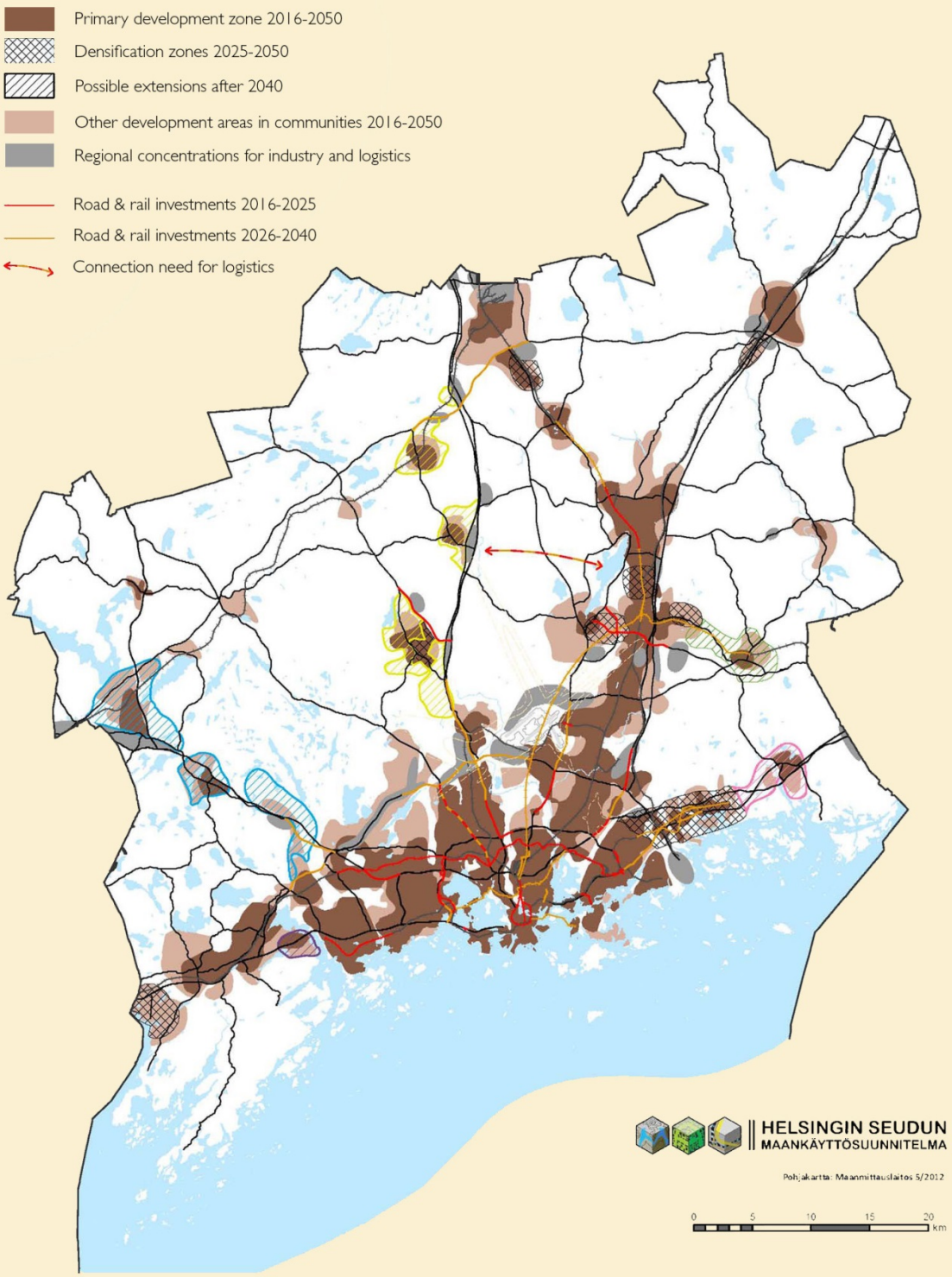


Figure 5: Draft of the Helsinki region land use plan 2050 (MAL 2014a). The plan is closely linked to the traffic system plan, which is being prepared at the same time.

Info box 2

Guidelines of land use, housing and traffic in the Stockholm region

The majority of decisions concerning the traffic infrastructure in the Stockholm region have been created based on the efforts of analysts assigned by the state. The projects to be implemented and their funding have been agreed upon in negotiations between the state, county and municipalities. One of the most significant development packages in recent decades was the Dennis package of 1992, in which agreements were made on the implementation of the inner and outer ring roads of the city and the light rail line Tvärbanan, for example (Claesson 1998, 222–223).

In more recent negotiations held in 2013, an agreement was reached between the state, the Stockholm County Council and the municipalities on the development of the traffic system and housing production in the coming years (Stockholmsöverenskommelsen 2013). The metro expansions encompassed by the agreement were the most significant since the 1970s. By virtue of the expansions, a new metro corridor from the city centre to the Nacka centre will take shape in the region. The same development package involved agreeing upon an implementation plan for 78,000 housing units along the metro lines by 2030, and the expansion of the congestion charge system.

Storstockholms lokaltrafik (SL), which operates under the County Council, is responsible for planning and organising local traffic in the Stockholm region. A joint ticket system is in place within the county, and the area is divided into three payment zones. Some of the commuter lines also extend beyond the county borders. A significant expansion took place at the end of 2012, at which point railway commuter traffic was extended through Stockholm Arlanda Airport to Uppsala, the capital of the neighbouring county.

The Growth and Regional Planning Administration (*Tillväxt- och regeionplaneförvaltningen*) of the Stockholm County Council plays an important role in terms of defining the overarching guidelines of the development of the Stockholm region. After the regional plan of 1991, the central tool for regional development has been the regional development plan, RUFS (*Regional utvecklingsplan för Stockholmsregionen*). The first RUFS was completed in 2001, while the current one was completed in 2010 (Figure 6). The RUFS serves as both a regional plan and development programme. It is not legally binding and instead aims to specify a strong shared mindset.

The development of the region's polycentric structure is a pivotal element in the plan. In addition to the core areas of Stockholm, the plan specifies eight highest level centres – regional urban cores. Not all centres of peri-urban municipalities form an urban core. In contrast to Finland where half of the income from corporation tax is channelled to municipalities, in Sweden all of the tax proceeds go to the state. This means that the municipalities do not have a corresponding need to draw companies within their borders, and a larger number of them can commit to the development of a joint central area.

In addition to condensing and developing the centres, the improvement of accessibility and orbital connections between areas are core goals in the construction of a polycentric region. The plan also proposes increasing the capacity of numerous railway lines and updating obsolete suburban rail routes. With construction initiated in 2009, the fluency of local traffic will be improved by the commuter train line *Citybanan*, which runs under the Stockholm city centre. The line is intended to be activated in 2017, at which point a new railway station will be opened in Odenplan, the hub of the northern part of the city proper.

In the future, tram traffic will be expanded in the suburban area and the city centre. An additional branch to Kista is planned to be added to the light rail line Tvärbanan. There are also plans to connect the existing Saltsjöbanan suburban railway to the tram network. In addition to this, efforts will be made to connect southern suburban centres with tramways.

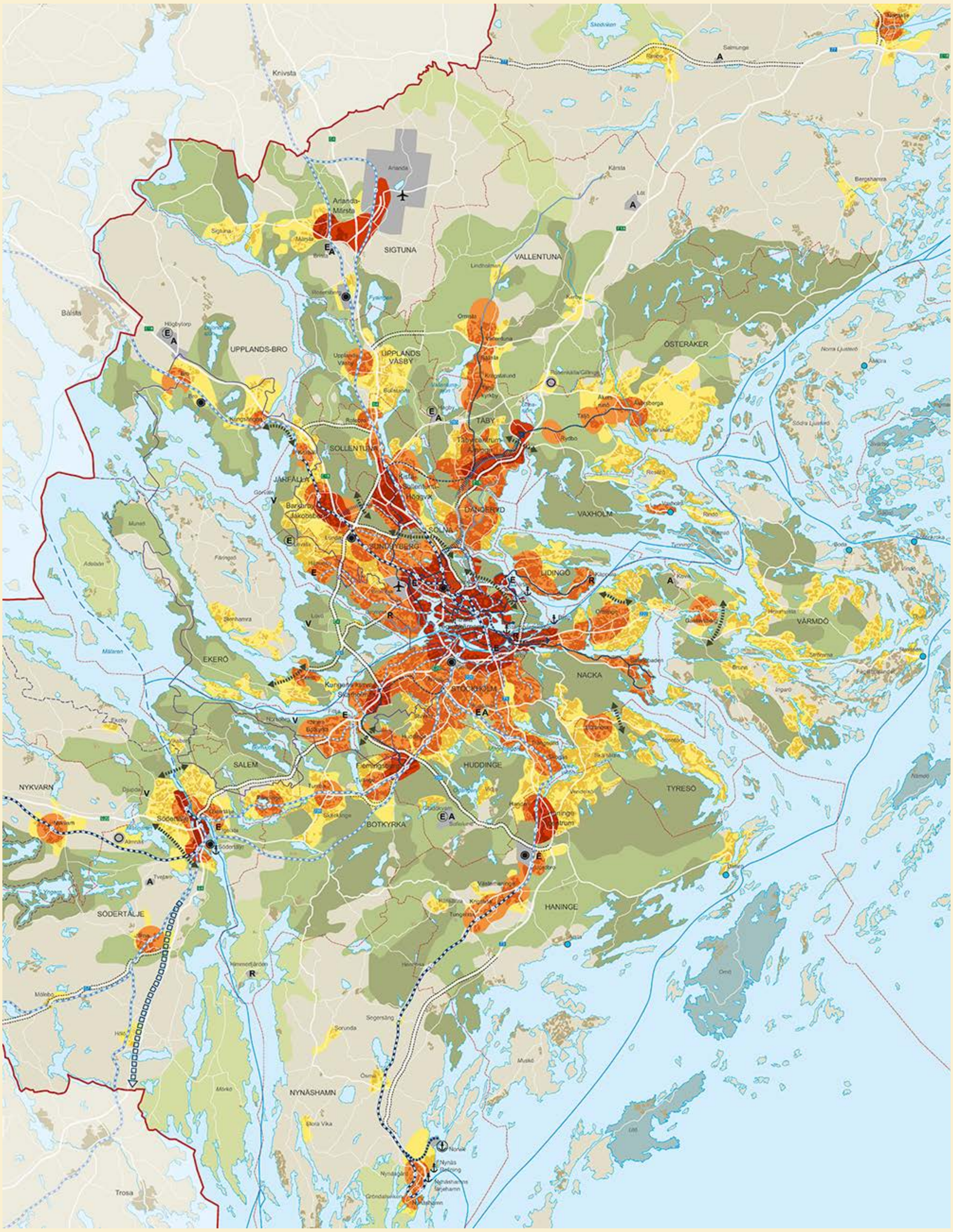


Figure 6: Excerpt from the RUFS 2010 plan map, which depicts the target state of the region in 2030. The map specifies areas and traffic links that require development. The stronger the red highlight, the more crucial the area has been found in terms of regional development.

2 Zone perspective and area divisions of urban form

This chapter describes the background of the Urban Zone approach and the essential characteristics of the various zones. The chapter also specifies the research areas within the city regions and presents the area divisions and criteria used in the comparison.

The uniformity and consistency of the urban form affects day-to-day mobility needs and the opportunities to use various modes of transport for daily travel. Many studies have analysed the urban form using zones that divide the city region into functionally diverse pedestrian zones, public transport zones that are easily accessible by public transport and car zones that lie outside these areas. This study approaches urban form and its changes through a two-tier division based on areas specified on the basis of their distance from the centre as well as the traffic-related zone division.

2.1 Urban Zone approach

This zone-based study is closely linked to the *Model of Three Urban Fabrics* (Kosonen 2007; 2013; Newman et al. 2015). The idea of three urban fabrics is based on the concepts used by Peter Newman and Jeffrey Kenworthy (1996; 1999), which divide the urban structure into a walking city, transit city and car city according to structural characteristics and travel opportunities. Also the urban zone division can be simplified to entail three main classes (Figure 7).

The urban zone approach enables the creation of new information for assessing and planning the urban form of city regions. Zones were separately defined for the densely populated areas of the 34 largest city regions in Finland according to the urban structure in 1990 and 2010 and the available public transport. In addition to which, a zone division describing the situation in 2015 will be completed by the end of the year. The Monitoring System of Spatial Structure (YKR) main-

Figure 7: Division of the urban form into pedestrian, public transport and car zones.

tained by the Finnish Environment Institute was utilised in the analysis of the zones. The data available through the system on the regional positioning of residents, jobs, floor area and other variables can be linked to zone delineations in GIS software. By including time series data, the development of the pedestrian, public transport and car zones of cities can be analysed over a span of up to 30 years.

Pedestrian zones

In pedestrian zones the opportunities for daily mobility are diverse. The majority of travel is conducted on foot since all services are nearby. It is common for most households in a pedestrian zone to not own a car.

The central pedestrian zone is a densely built-up area extending one or two kilometres from the commercial centre, which contains a wealth of jobs and services. In many cities, the core of the central pedestrian zone is formed by pedestrian streets. Especially in large cities, the availability of public transport in the central pedestrian zone is excellent. Central pedestrian zones are limited to the main centres of the city regions and the smaller centres of areas.

The central pedestrian zone is surrounded by a 1–3 kilometre wide **fringe of the pedestrian zone**. The scope of the zone varies according to city size. Particularly in the central cities of regions, the urban structure is mixed and the availability of public transport is diverse. In the Helsinki city centre, the fringe zone is served by a dense tram network, and in Stockholm, the light rail line *Tvärbanan* runs along the outer edge of the zone. The zone is also located at cycling distance from the centre.

In large city regions, the suburban areas surrounding the main centre include sub-centres which are significant in terms of the quantities of services and jobs they offer. **The pedestrian zones of the sub-centres** are areas one kilometre in width, which hold plenty of housing, services and jobs. The core of a sub-centre is often a shopping centre or other commercial hub.

Public transport zones

Based on the level of service, public transport zones are further divided into **intensive public transport zones** and **basic public transport zones.** In intensive public transport zones it is not necessary to plan your travel based on timetables. This zone is distinguished from the basic public transport zone in the core areas of large cities.

Intensive public transport zones often feature dense land use, and the travel distance particularly towards the centre is relatively short on public transport, compared to using a car. Concentrations of housing, employment and services often form along busy tram and metro lines, and the largest and most diverse of these are defined as sub-centres.

In a basic public transport zone, the maximum frequency of a line is 15 or 30 minutes, depending on the location of the area. The population density of the public transport zone must be sufficient for the public transport lines to be feasible.

Car zones

Car zones are often located at the fringes of city regions. In car zones, the use of public transport is rare and a high percentage of the population owns a car, since in a sparsely populated area the service level of public transport is low and distances are long. The zone is problematic in terms of the environment, as long commutes and travel for service access cause carbon dioxide emissions and other environmental detriments (e.g. Ristimäki et al. 2011, 69–70). The extensive land use required by the traffic infrastructure and parking also frequently deteriorates the quality of the urban environment (e.g. Söderström 2012).

A large part of the car zone consists of detached housing that forms sparsely populated localities. People primarily use cars to commute and access services and hobby activities. Similarly to car zones within the localities, day-to-day travel outside densely populated areas is almost fully reliant on cars.

2.2 Areal divisions in the Helsinki city region

GIS materials used

The core of the materials used for examining the Helsinki region is formed by the statistical data on population, jobs and building stock in the Monitoring System of Spatial Structure (YKR), which has been saved at an accuracy of 250 metre grid cells. The YKR system delineations for densely populated areas, which are based on building density, floor area and area populations in 2010, were used as the basis for the zone division.

As regards the Helsinki region, the study utilised area and zone divisions created earlier for the Urban Zone project (Ristimäki et al. 2011; 2013), which describe the state of the urban form and public transport system in the benchmark year 2010. For this project, a corresponding area division for the Stockholm city region was created. This enabled the comparison of the development and current state of the urban form of the two metropolitan areas.

Forming the distance-based area division

The purpose of the area division which is primarily based on distance from the city centre was to distinguish varying parts in the urban form, which can then be compared between the city regions. Questions and issues related to planning also differ significantly at varying distances from the city centre.

In research of the urban form, areas situated at varying distances from the city centre have often been divided into three categories: urban, peri-urban and rural areas. The research area in the Helsinki region was divided into eight area classes that differ in terms of their location within the urban form, distance from the city centre or connection to the public transport networks. The area classes and the urban zones located in them serve as a basis for the comparison of the Helsinki and Stockholm city regions.

A summary of the criteria of the area delineations is presented in Table 1. The map in Figure 8, on the other hand, describes the division of the Helsinki region into various area classes.

Forming the zone division of the urban form

Within each area class, the distribution of the population and jobs in the various travel-related zones of the urban form were examined, and the density figures of the zones were compared. Table 2 presents the zone division criteria used in the Helsinki metropolitan area. For some zones, the criteria differ in densely built-up core areas and sparser peri-urban and rural areas.

Figure 9 presents the zone division in the central areas of the Helsinki region. The map also specifies the core areas of the city region (urban core and urban area combined), which correspond to the urban built-up areas of the Helsinki metropolitan area. The zone division was applied to the densely populated areas throughout the entire functional area of Helsinki, and the full version can be found in Appendix 1.

Table 1: Distance-based area criteria in the Helsinki metropolitan area.

	Criterion
Urban core	Area at 0–10 km of ground distance from the centre of Helsinki.
Outer urban area	Area at 10–15 km of ground distance from the centre of Helsinki. In the area of impact of the main railway line and the coastal railway line, the distance extends to 20–25 km from the city centre.
Rail oriented peri-urban area	Area at 0–3 km of ground distance from railway stations that meet the 30-min service frequency criterion during peak hours.
Inner peri-urban area	Area at 15–30 km of ground distance from the centre of Helsinki. In the area of impact of the main railway line and the coastal railway line, the area begins at a distance of 20–25 km from the city centre.
Outer peri-urban area	Area at 30–50 km of ground distance from the centre of Helsinki.
Mid-sized towns (core and fringe areas separately)	Smaller city region located within Helsinki's area of impact (over 15,000 residents). The urban core and the outer urban area, at respective distances of 0–5 km and 5–10 km from the centre, are separated.
Small towns	Area at 0–5 km of ground distance from centre of a densely populated area that meets particular criteria regarding population, population density, employment and area density.
Rural area	The areas that does not meet the criteria of the other area classes. Delineated by the outer boundary of the research area.

Table 2: Travel-related urban zone criteria on the Helsinki metropolitan area.

	Core area	Other area classes
Central pedestrian zone	Cells no more than 2 km from the Helsinki city centre.	Cells no more than 1 km from a town centre.
Fringe of pedestrian zone	Cells 2–5 km from the Helsinki city centre that feature a diverse urban form or that are encompassed by the tram network.	Cells 1–2.5 km from a town centre.
Sub-centre pedestrian zone	GIS analysis based on public transport, commercial service level, population and job numbers highlights functional concentrations. Zone radius approx. 1 km.	
Intensive public transport zone	Cells where the public transport frequency is no more than 5 min for buses or 10 min for trains or trams; walking distance max. 250 m (bus) or 400 m (rail).	
Public transport zone	Cells where the public transport frequency is no more than 15 min; walking distance max. 250 m (bus) or 400 m (rail).	Cells where the public transport frequency is no more than 30 min; walking distance max. 250 m (bus) or 400 m (rail).
Car zone	Densely populated areas that do not meet the criteria of the other zones.	
Areas outside localities	Cells outside YKR densely populated area.	

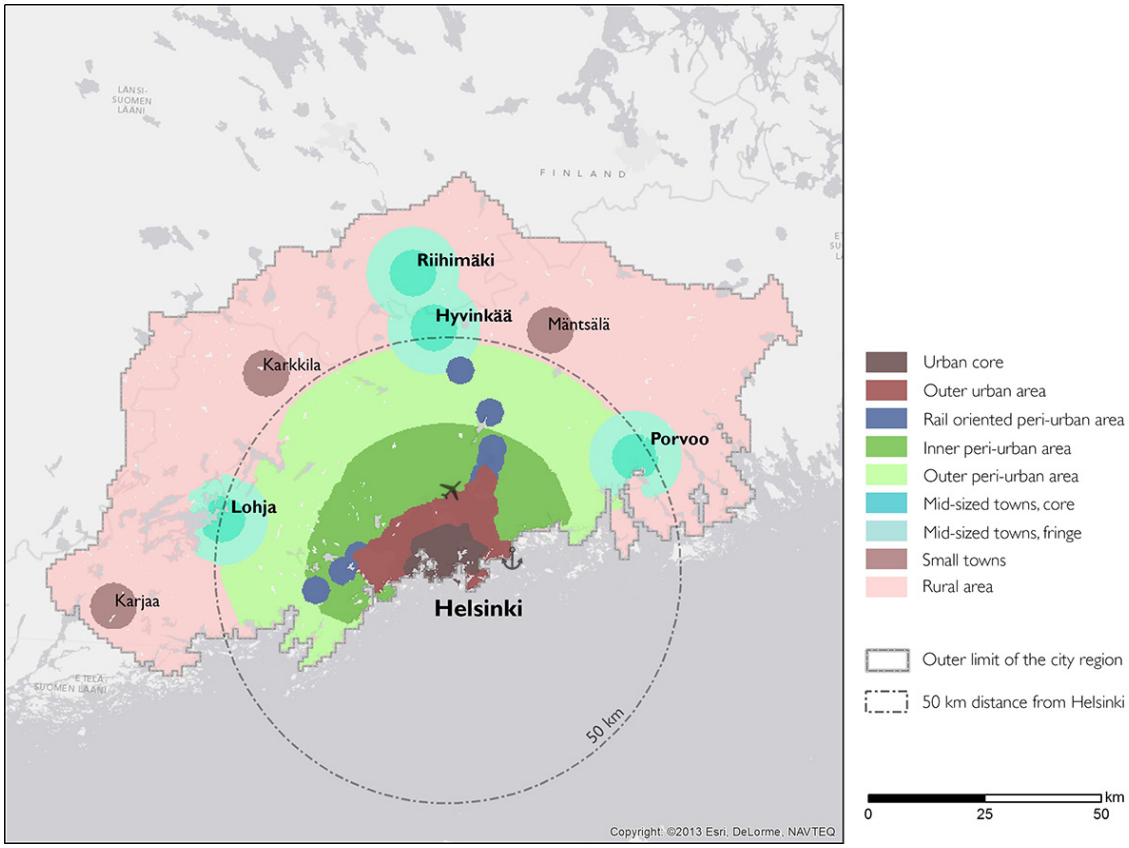


Figure 8: Distance-based division of the Helsinki region.

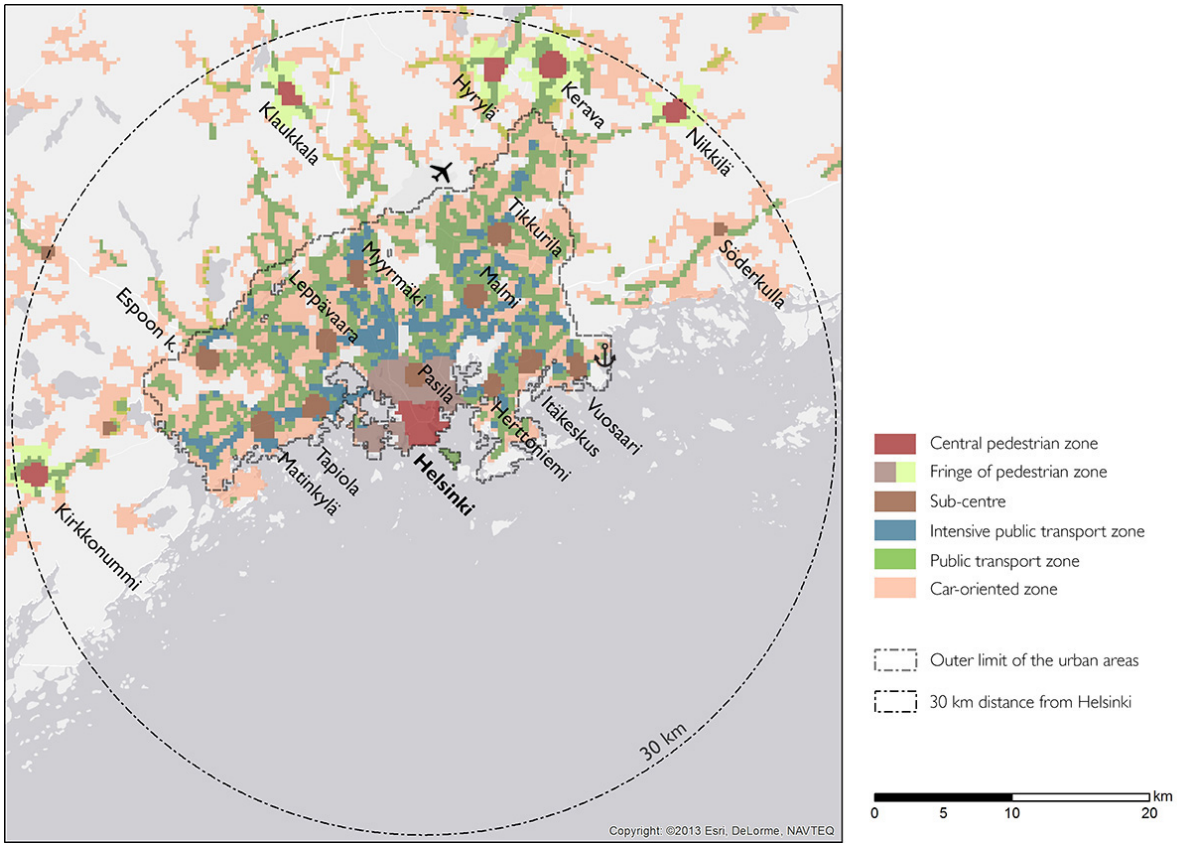


Figure 9: Zone division of the urban form in the central parts of Helsinki region.

Forming a network of centres

In many metropolitan areas, numerous concentrations of jobs, services and housing have formed alongside the old city centre. The examination of polycentric and network structures have also been a prominent part of the study of the urban form in recent decades (e.g. Bertolini 1996; Calthorpe & Fulton 2001; Sieverts 2003; Alppi & Ylä-Anttila 2007; Joutsiniemi 2010).

In the Helsinki metropolitan area, the role of the Helsinki city centre compared to other hubs in the region remains dominant, but a stronger polycentric structure is in the process of taking shape in the region. Figure 10 presents the results of centre analyses in the core areas of the city region. The network of centres in the area is presented in its entirety in Table 3.

The core variables in identifying city centres were population, number of jobs, number of jobs in retail and service level of public transport (Ristimäki et al. 2011, 20–23). This approach aimed to locate diverse centres and sub-centres where a mix of services and functions is situated in the same area and everything is also accessible on foot. The network of functionally diverse centres in the Helsinki region is included in the zone division of the urban form.

Table 4 presents in italics all those centres that GIS data analyses indicated were at a lower level than other centres in the same area class – a separate fringe zone has not been delineated for these centres. In earlier zone surveys conducted in the Urban Zone project, these centres formed a separate sub-centre class. However, for the sake of simplicity, the regional comparison of this study combines the data regarding the centres with the data on the central pedestrian zones in the same area class.

Table 3: Centres and sub-centres in the Helsinki region.

Urban core	Helsinki city centre and sub-centres Pasila, Tapiola, Leppävaara, Malmi, Itäkeskus and Herttoniemi
Outer urban area	Sub-centres Matinkylä, Espoo Centre, Myyrmäki, Tikkurila and Vuosaari
Rail oriented peri-urban area	Kerava, Järvenpää, Kirkkonummi, *Jokela, Masala*
Inner peri-urban area	Klaukkala, Hyrylä, Nikkilä, *Veikkola*, *Söderkulla*
Outer peri-urban area	Nummela, Nurmijärvi, *Siuntio, Vihti, Rajamäki, Kellokoski, Pornainen,*
Mid-sized towns, core area	Porvoo, Lohja, Hyvinkää, Riihimäki
Mid-sized towns, fringe area	*Virkkala*
Small towns	Karjaa, Karkkila, Mäntsälä
Rural area	*Pohja, Inkoo, Pusula, Loppi, Tervakoski, Oitti, Monninkylä*

Lower class centres for which no separate fringe zone is delineated are shown in italics.

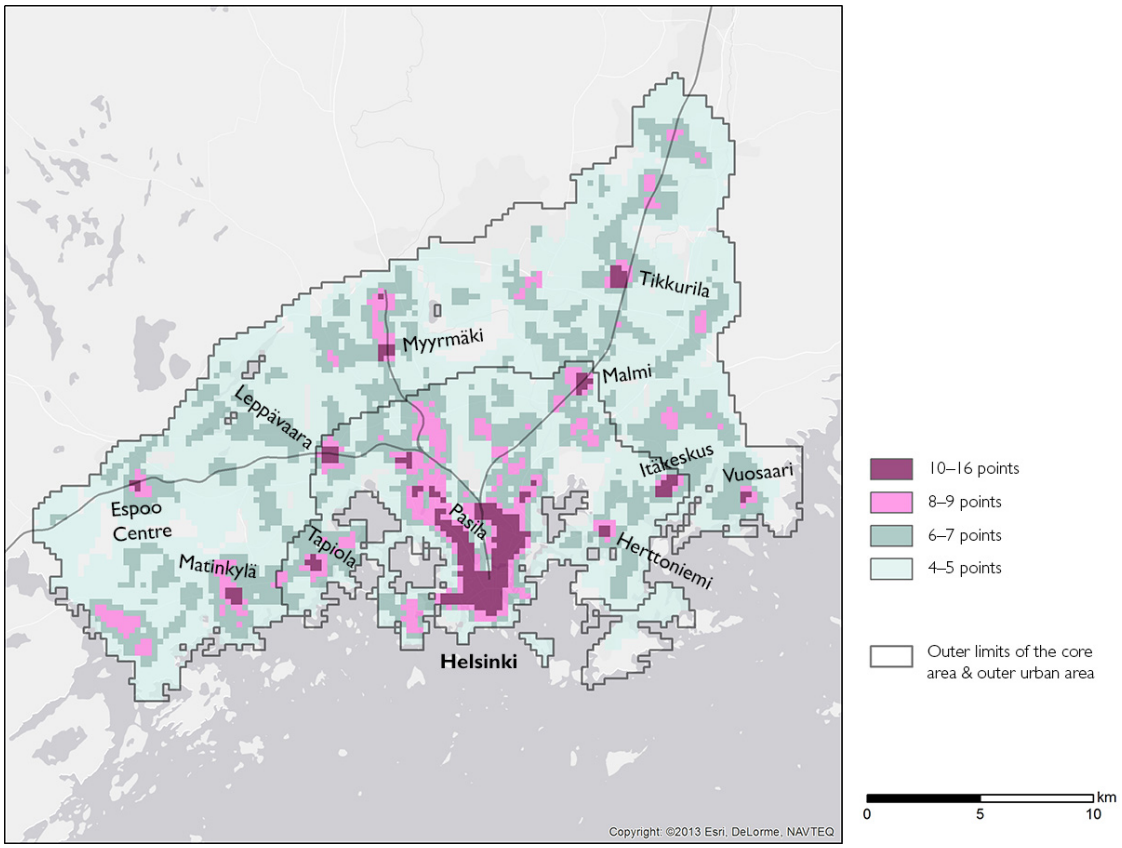


Figure 10: Combination map of the centre analyses in the core areas of the Helsinki region.

2.3 Areal divisions in the Stockholm city region

GIS materials used

The research project had access to coordinate-based real estate register materials including a wealth of data on properties, buildings and the population (Fastpak 2010). As regards population data, reference material from the year 2000 was also available for comparison (SLL 2000). In addition to this, we utilised a register of company domiciles, which includes information on the locations of offices and facilities as well as the classified job count (Företagsregistret 2011). For purpose of analyses, the employee numbers of the locations have been converted to median-based approximate numbers, which can be added together for each respective area.

The zone method divides the densely populated areas of metropolitan areas into pedestrian, public transport and car zones based on a particular set of criteria. In Finland, the basis for the zone divisions is formed by the densely populated area delineation of the Monitoring System of Spatial Structure (YKR). It describes the situation in 2010 and is based on building density, floor area and the population numbers of the areas. In order to ensure a valid comparison, a densely populated area delineation corresponding to the Finnish YKR specification was prepared for the Stockholm city region, utilising the population and real estate register data from 2010. The same procedure was also used to create a densely populated area delineation depicting the reference year 2000, based on a combination of statistical data from 2000 and 2004.

Table 4: Distance-based area criteria in the Stockholm metropolitan area.

	Criterion
Urban core	Area at 0–8 km of ground distance from the centre of Stockholm.
Outer urban area	Area at 8–15...20 km of ground distance from the centre of Stockholm. The distance of the outer edge of the area varies. Fringe areas that are sparsely populated or separated by water bodies were excluded from the area.
Rail oriented peri-urban area	Area at 0–3 km of distance from railway stations that meet the 20-min service frequency criterion during peak hours.
Inner peri-urban area	Area at 15–30 km of distance from the centre of Stockholm. In the area of impact of busy railway stations, the area extends to a maximum of 35 km from the city centre.
Outer peri-urban area	Area at 30–50 km of distance from the centre of Stockholm.
Mid-sized towns (core and fringe areas separately)	City region within Stockholm's area of impact that is self-reliant in terms of jobs (over 20,000 residents) and reliant on railway traffic. Urban core 0–5 km and urban area 5–10 km from the main centre of the city.
Small towns	Separate town within Stockholm's area of impact (10,000–20,000 residents). Area delineation 0–5 km from the city centre.
Archipelago	Archipelago areas with no fixed land link to the mainland.
Rural area	The areas that does not meet the criteria of the other area classes. Delineated by the outer boundary of the research area.

Forming the distance-based area division

Stockholm was examined utilising a similar area division that was used in prior studies of the Helsinki region. However, the area delineation criteria were adapted to suit a larger and denser city region and the available GIS data. A summary of the areas and their delineation criteria is provided in Table 4. The areas are shown on a map in Figure 11.

Forming the zone division of the urban form

In addition to the area divisions spanning the entire research area, the densely populated areas were divided into various pedestrian, public transport and car zones based on the criteria presented in Table 5.

In the area classes of the urban core and outer urban area, some of the zone criteria deviate from the criteria of the other area classes. Stockholm's urban core and outer urban area form a point of comparison for the equivalent areas of the Helsinki region, which correspond to the urban parts of the metropolitan area. For this area the criteria are stricter than those applied to the rest of the region, particularly with regard to the service frequency of public transport lines.

Figure 12 presents the zone division in the central parts of the Stockholm city region. Also the outer boundary of the region's core urban areas is overlaid on the map. The densely built-up urban area is lined by peri-urban municipalities of varying sizes. The zone division of the entire county is presented in Appendix 2 of the report.

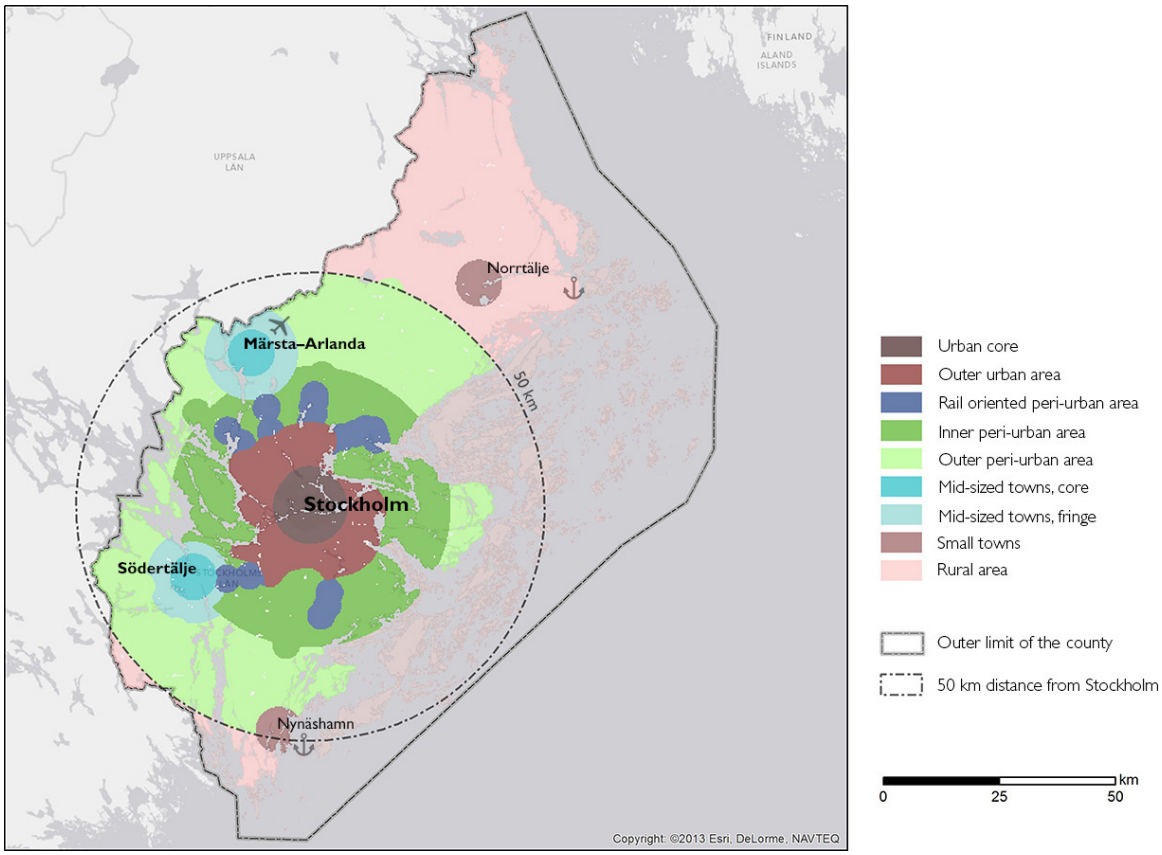


Figure 11: Distance-based area division of Stockholm County.

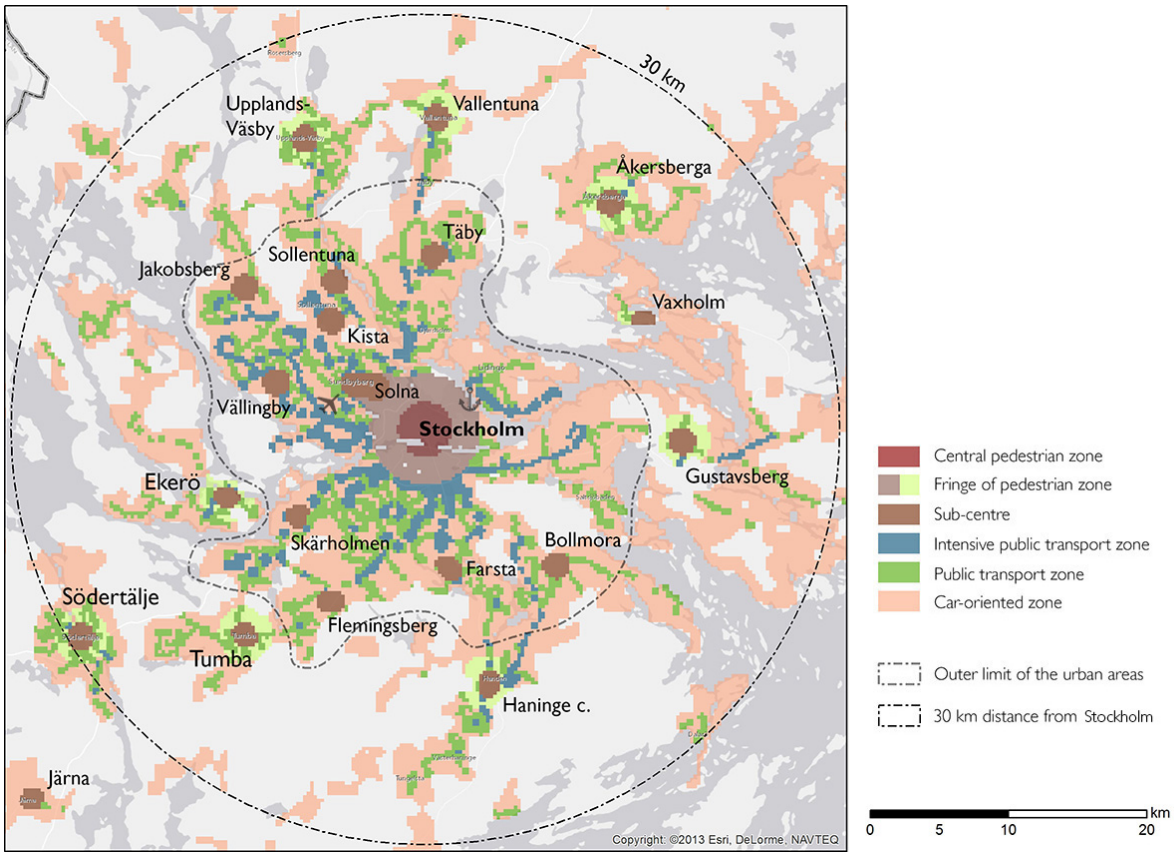


Figure 12: Zone division of the urban form in the central parts of Stockholm region.

Table 5: Criteria for travel-related urban zones in the Stockholm metropolitan area.

	Core area	Other area classes
City centre pedestrian zone	Cells no more than 2 km from the Stockholm city centre.	Cells no more than 1 km from a town centre.
City centre fringe zone	Cells 2–4 km from the Stockholm city centre.	Cells 1–2 km from a centre with over 1,000 jobs.
Sub-centre pedestrian zone	GIS analysis based on commercial service level and population and job numbers highlights functional concentrations. Pedestrian zone radius approx. 1 km.	
Intensive public transport zone	Cells where the public transport frequency is no more than 5 min for buses or 10 min for trains or trams; walking distance max. 250 m (bus) or 400 m (rail).	
Public transport zone	Cells where the public transport frequency is no more than 15 min; walking distance max. 250 m (bus) or 400 m (rail).	Cells where the public transport frequency is no more than 30 min; walking distance max. 250 m (bus) or 400 m (rail).
Car zone	Densely populated areas that do not meet the criteria of the other zones.	
Areas outside localities	Cells outside densely populated areas.	

Forming a network of centres

The network of centres in the Stockholm region (central pedestrian zone, sub-centre pedestrian zone) was defined based on the GIS data method developed within the framework of the Urban Zone project, which is described in detail in the project's first phase report (Ristimäki et al. 2011, 20–23). The core variables in identifying city centres were population, number of jobs and number of jobs in retail. This approach aimed to locate diverse centres and sub-centres where a mix of services and functions is situated in the same area and everything is also accessible on foot.

The centre network analysis was conducted on each part of the region separately, and within each area the pedestrian zone was restricted to the centres in the highest class of the four-tier scale. The limit values for population, jobs and job numbers in retail that affected the centre classification increased in proportion to how central the area in question was. In addition to the main centre, the method also identified 10 sub-centres in core areas of the region (Figure 13). Furthermore, based on the analysis, 19 other centres and their fringe zones were included in other parts of the region (Table 6).

Table 6 Centres and sub-centres in the Stockholm region.

Urban core	Stockholm centre, Sundbyberg–Solna sub-centre
Urban area (sub-centres)	Kista, Flemingsberg, Täby, Jakobsberg, Sollentuna, Skärholmen, Farsta, Vällingby, Bollmora
Rail oriented peri-urban area	Haninge centrum, Upplands Väsby, Vallentuna, Åkersberga, Tumba
Inner peri-urban area	Gustavsberg, Ekerö, Vaxholm
Outer peri-urban area	Järna, Rimbo, *Nykvarn, Ösmo*
Mid-sized towns, core area	Södertälje, Märsta
Mid-sized towns, fringe area	Sigtuna
Semi-rural area	Hallstavik, *Älmsta*
Small towns	Norrtälje, Nynäshamn
Archipelago	*Sandhamn, Ljusterö*

Centres with less than 1,000 jobs are shown in italics; no separate fringe zone is delineated for them.

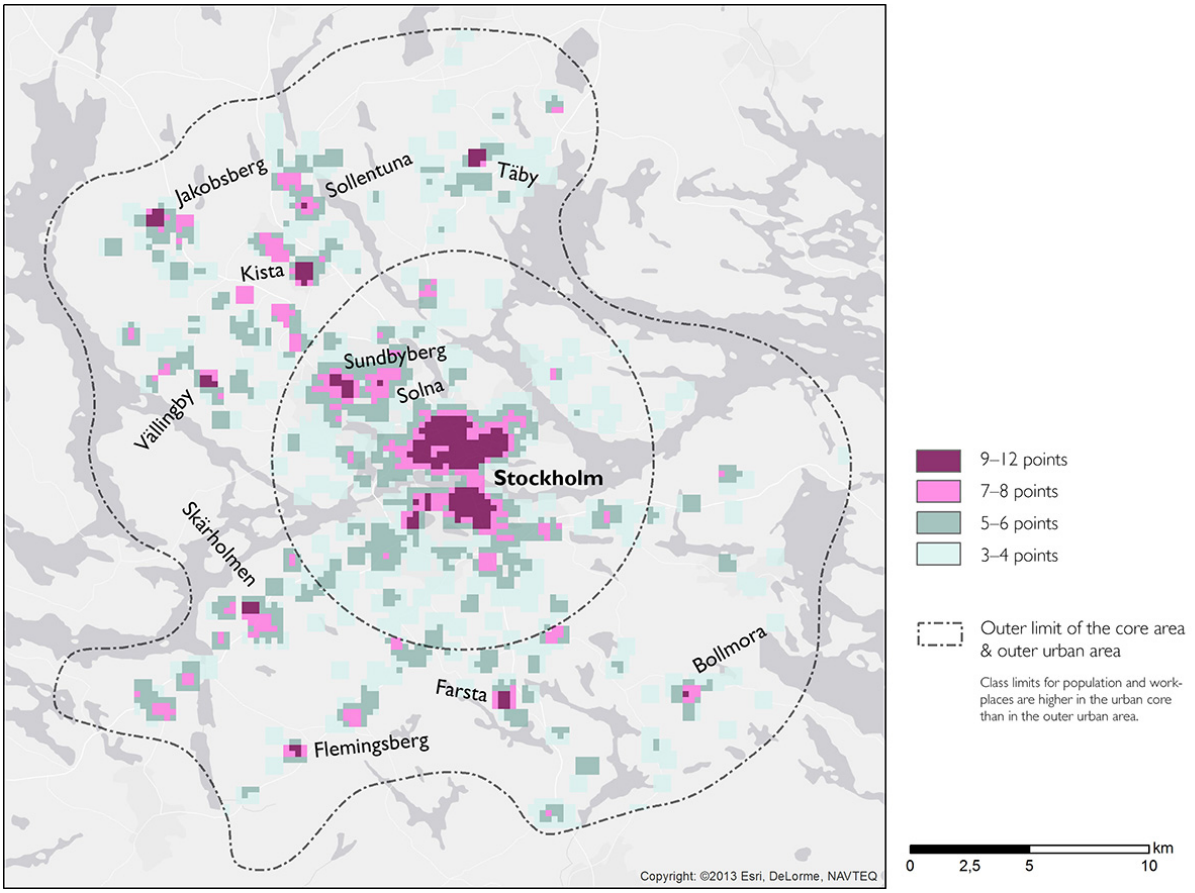


Figure 13: Combination map of the centre analyses in Stockholm's urban core and urban area.

3 Positioning of population and jobs in the urban zones

This chapter covers the positioning of the population and jobs in the various parts of the urban regions. The figures regarding the Stockholm and Helsinki regions are examined in parallel, which enables the comparison of the city regions in the benchmark year 2010. The chapter also addresses changes that occurred in the period from 2000 to 2010.

3.1 Area classes compared

The comparison of the Stockholm and Helsinki city regions is structured according to the area divisions prepared for the research areas. Figure 14 presents the research areas and area classes of the Stockholm and Helsinki regions, using a matching scale. As regards the Stockholm region, the delineation of the research area corresponds to the boundaries of Stockholm County, while in the Helsinki region the area was delineated according to the functional area of Helsinki.

In the Stockholm city region, the core and peri-urban areas surrounding the area in a ring-like pattern are significantly larger in area than their counterparts in the Helsinki region. This is due to the disparate positioning of the cities in relation to the sea: Approximately only 50% of the area surrounding Helsinki is land, whereas 70% of the area within a 50 km radius of Stockholm is land, despite the city's coastal location. The situation is brought to an even starker relief if we only view the 8 km wide core urban area surrounding the very centre of the city. In Helsinki, this area is only 44% land, whereas in Stockholm the proportion of land area is 83%. Therefore, in the Stockholm region, there is nearly twice the amount of potential land for construction when compared to Helsinki.

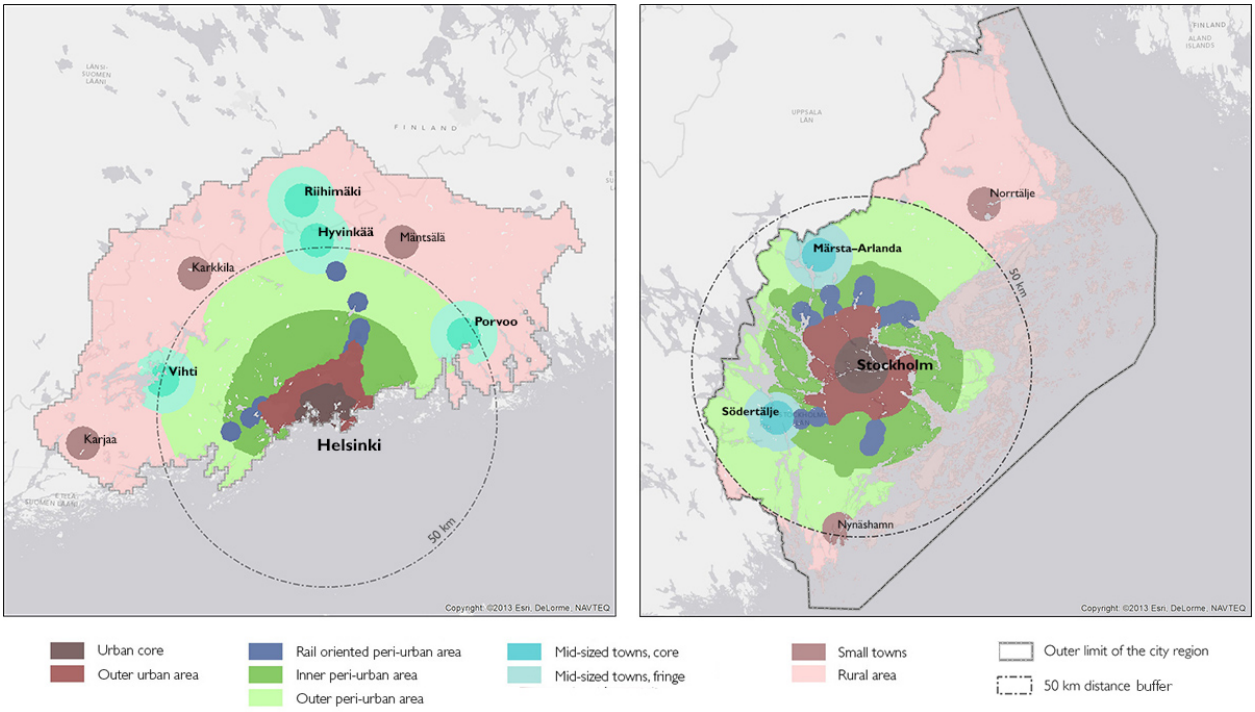


Figure 14: The research areas and area classes compared in the Helsinki and Stockholm city regions.

3.2 Population and jobs in various parts of the region

In both city regions, the majority of the population (Helsinki 65%, Stockholm 71%) resides in the urban core or outer urban area (Table 7). In Stockholm, the percentage of residents in the urban core was slightly higher than in Helsinki, and the population near the city centre was an absolute 300,000 higher than in Helsinki. In both city regions, the core areas accumulated the majority of the population growth in the 2000s. With regard to Stockholm, it should be noted that the population of the urban core closest to the city centre increased by over 80,000 residents in a decade. In Helsinki the growth was concentrated outside the central area of the city, in the outer urban area.

In addition to the core areas, the proportion of the population living in the rail-oriented peri-urban area was larger in Stockholm than in Helsinki. In the Helsinki region, the outer urban area and the mid-sized towns (Porvoo, Lohja and the Hyvinkää–Riihimäki region) emerged as areas with more residents than corresponding locations in Stockholm. On the other hand, Uppsala (140,000 residents), which is located in the Stockholm region outside the county boundaries, operates practically as an independent town belonging to the Stockholm region, although its figures are not included in the county statistics.

Table 7: Population and population changes in the areas within the city regions, 2000–2010.

Helsinki	Population 2010	Population (%)	Pop. /ha	Change 2000–2010	Change (%)	Relative change
Urban core	445,745	29.3%	36.8	+20,861	+4.9%	↘
Outer urban area	543,728	35.8%	17.5	+57,856	+11.9%	↗
Rail-oriented peri-urban area	99,728	6.6%	6.2	+11,318	+12.8%	↗
Inner peri-urban area	91,344	6.0%	1.0	+16,561	+22.1%	↗
Outer peri-urban area	88,878	5.9%	0.5	+15,312	+20.8%	↗
Mid-sized towns, core area	129,834	8.5%	4.6	+9,219	+7.6%	↘
Mid-sized towns, fringe area	27,033	1.8%	0.4	+2,846	+11.8%	↗
Small towns	28,927	1.9%	1.3	+2,669	+10.2%	→
Semi-rural area	63,835	4.2%	0.1	+4,278	+7.2%	↘
Total/average	**1,519,052**	**100.0%**	**1.7**	**+140,920**	**+10.2%**	**→**
Stockholm						
Urban core	726,989	36.1%	42.8	+81,035	+12.5%	↗
Outer urban area	719,820	35.8%	14.4	+60,165	+9.1%	↘
Rail-oriented peri-urban area	213,890	10.6%	7.3	+18,291	+9.4%	↘
Inner peri-urban area	118,654	5.9%	1.0	+17,395	+17.2%	↗
Outer peri-urban area	62,412	3.1%	0.4	+7,240	+13.1%	↗
Mid-sized towns, core area	91,652	4.6%	6.3	+6,912	+8.2%	↘
Mid-sized towns, fringe area	15,429	0.8%	0.5	+2,245	+17.0%	↗
Small towns	32,078	1.6%	3.0	+1,597	+5.2%	↘
Semi-rural area	25,984	1.3%	0.2	+1,396	+5.7%	↘
Archipelago	4,810	0.2%	0.1	+79	+1.7%	↘
Total/average	**2,011,718**	**100.0%**	**3.1**	**+196,355**	**+10.8%**	**→**

Table 8: The positioning of jobs and related changes in areas of the city region, 2000–2010.

Helsinki	Jobs 2010	Jobs (%)	Jobs /ha	Change 2000–2010	Change (%)	Relative change
Urban core	365,065	51.2%	30.1	+5,557	+1.5%	↘
Outer urban area	185,572	26.0%	6.0	+13,398	+7.8%	↗
Rail-oriented peri-urban area	27,784	3.9%	1.7	+4,261	+18.1%	↗
Inner peri-urban area	27,575	3.9%	0.3	+5,266	+23.6%	↗
Outer peri-urban area	26,885	3.8%	0.2	+4,160	+18.3%	↗
Mid-sized towns, core area	49,354	6.9%	1.8	+2,716	+5.8%	↗
Mid-sized towns, fringe area	6,240	0.9%	0.1	+1,115	+21.8%	↗
Small towns	9,461	1.3%	0.4	+1,526	+19.2%	↗
Rural area	14,458	2.0%	0.0	+471	+3.4%	↘
Total/average	**712,394**	**100.0%**	**0.8**	**+38,470**	**+5.7%**	→
Stockholm						
Urban core	622,629	60.7%	36.6	+65,359	+12.3%	↘
Outer urban area	226,295	22.1%	4.5	+33,124	+16.2%	↗
Rail-oriented peri-urban area	61,293	6.0%	2.1	+6,484	+11.3%	↘
Inner peri-urban area	24,363	2.4%	0.2	+7,581	+33.0%	↗
Outer peri-urban area	10,704	1.0%	0.1	+1,087	+8.0%	↘
Mid-sized towns, core area	45,455	4.4%	3.1	+6,330	+16.1%	↗
Mid-sized towns, fringe area	17,464	1.7%	0.6	-2,798	-14.8%	↘
Small towns	13,598	1.3%	1.3	+1,912	+15.5%	↗
Rural area	3,042	0.3%	0.0	-1,654	-25.1%	↘
Archipelago	634	0.1%	0.0	-247	-17.0%	↘
Total/average	**1,025,477**	**100.0%**	**1.6**	**+117,178**	**+12.9%**	→

Jobs in the Helsinki and Stockholm regions are far more concentrated than the population (Table 8). In the Stockholm region, as much as 83% of jobs are located in the core areas, with Helsinki close behind at 78%. The urban core areas that are closest to the city centres hold over 50% of jobs in both city regions, which makes their job density many times higher than in the other areas.

The combined job numbers of mid-sized and small towns are under 10% of the total number of jobs in both city regions. This indicates that, quantitatively speaking, significant polycentricity does not seem to occur at the city region level, as both regions appear strongly dominated by the main centres and their immediate surroundings.

Population and job development in the 2000s

During the study period, the relative population growth in both areas was clearly strongest in the peri-urban areas of the regions. Particularly rapid growth was seen in the inner and outer peri-urban area of Helsinki, where the growth percentages over the ten-year study period were 22% and 21.5%. Compared to the average growth in the Helsinki region (10.2%), the peri-urban areas grew at over twice the speed. In the Stockholm region, too, growth in the peri-urban areas was clearly above the regional average, but the absolute population of the areas still increased less than in the clearly smaller Helsinki region. The distribution of population growth between the areas of the city regions is presented in the diagram shown in Figure 15.

Over the course of the 2000s, the number of jobs in the Stockholm region has increased significantly more than in the Helsinki region. Approximately 117,000 new jobs have been created in the Stockholm region, while in the Helsinki region only 38,000 new jobs have emerged. Percentage-wise, Stockholm gained over twice as many jobs than the Helsinki region. The diagram in Figure 16 depicts the distribution of the new jobs in the various parts of the regions in more detail.

Substantial differences can be observed in the positioning of new jobs in the different parts of the city regions. In the Helsinki region, only about 50% of the increase in jobs has occurred in the urban areas, whereas in Stockholm, 85% of the new jobs have been created in the urban core or outer urban area. In the Stockholm region, the majority of the new jobs have formed to the urban core. Conversely, in the Helsinki region growth in the urban core has been minor and focused mostly in the outer urban area and other parts of the region.

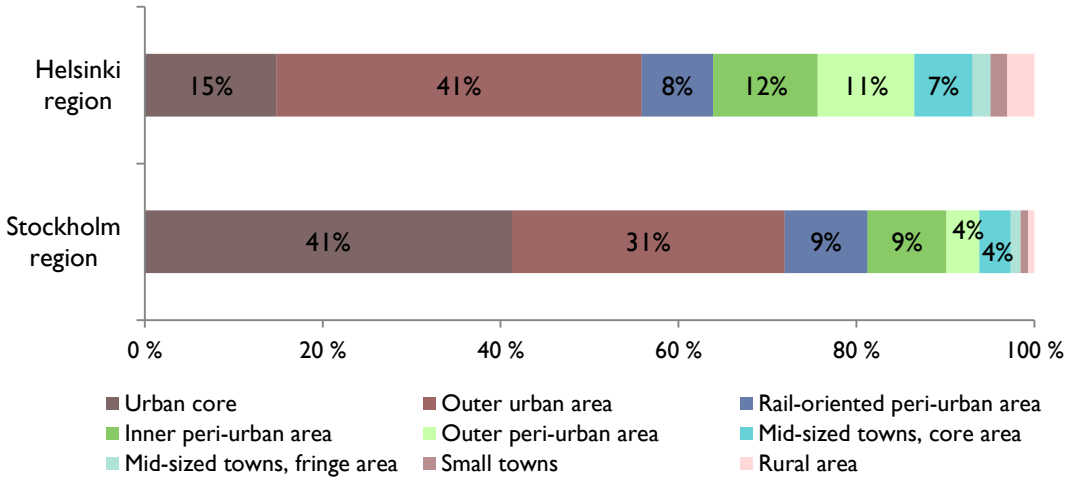


Figure 15: Population distribution in the Helsinki and Stockholm regions between 2000–2010.

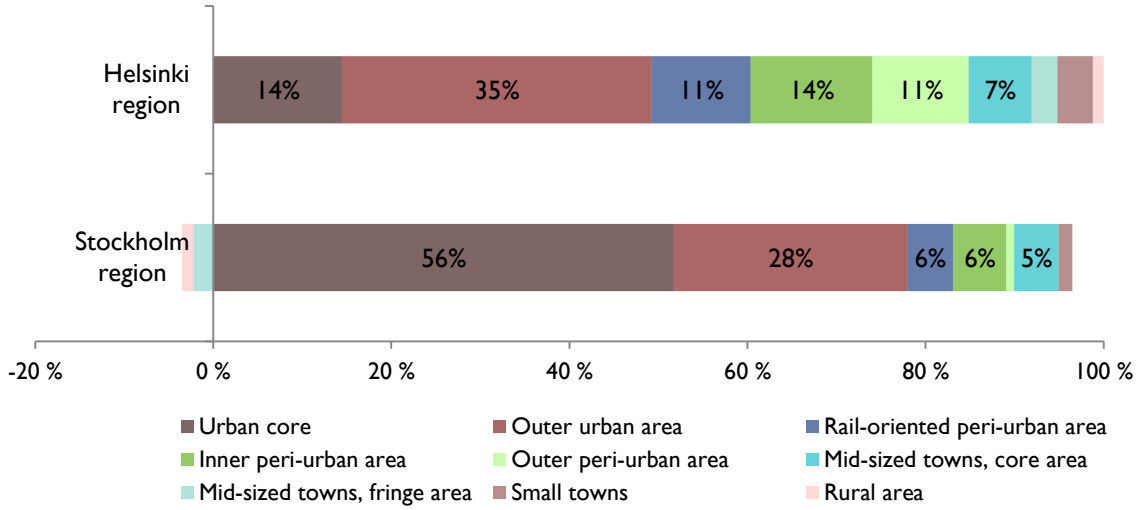


Figure 16: The distribution of job growth in the Helsinki and Stockholm regions between 2000–2010.

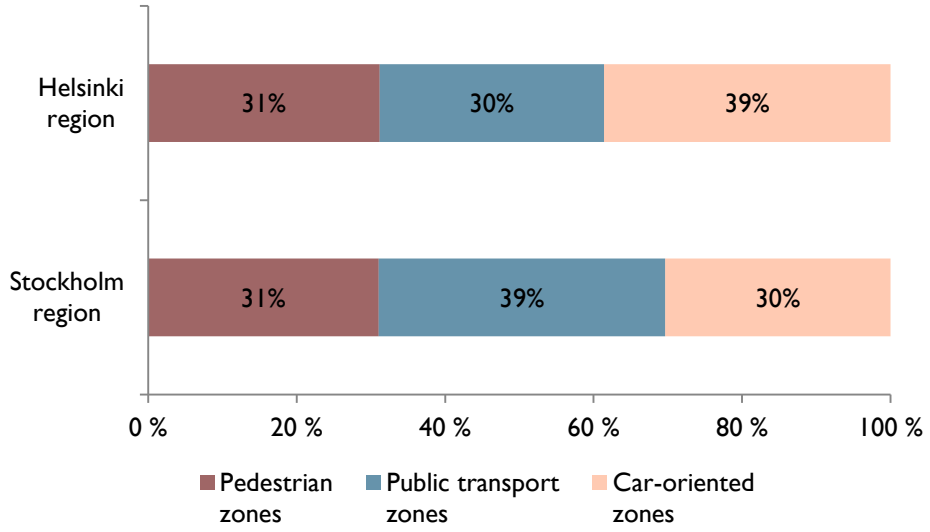


Figure 17: Distribution of population growth 2000–2010.

The diagram in Figure 17 describes the positioning of population growth between 2000 and 2010 at the level of the entire region. Growth in the Helsinki region is much more concentrated in car zones than in the Stockholm region, whereas public transport zones have drawn large numbers of people in Stockholm.

3.3 Population and jobs by area and zone

In the following, we will compare information regarding the urban zones in the Helsinki and Stockholm regions one area at a time. The urban core and outer urban area together form the core of the city region, the figures of which have been consolidated to facilitate examination. We will cover this essential collection of areas slightly more extensively than other areas. After this, we will move on to comparing the various peri-urban areas and examining zoned structure in mid-sized towns, small towns, rural areas and the archipelago. Finally, we will provide a small summary of the zoned structure of densely populated areas.

Urban core and outer urban area

The core areas consist of the urban core and the outer urban area. In this context, the data on these areas is presented jointly. The core areas consist of the urbanised areas of the city regions: the city centre, the inner city area and the densely built-up suburban areas that surround them. Table 9 presents the basic key figures regarding the population and jobs in the various urban zones of the area.

The city centre and its fringe zone emerged as focus areas in terms of job concentration in the core areas. In Stockholm, 50% of all jobs in the core areas were located in the city centre or its fringe zone. In Helsinki, the share of the city centre was slightly lower, approximately 38%. The proportion of public transport zones as job areas was clearly higher in the Helsinki region than in Stockholm. In other words, viewed from the perspective of job positioning, the structure of the core areas in Helsinki were more polycentric than in Stockholm. In Stockholm the focus on the city centre and its fringe zone also extended to the distribution of population, but the differences were smaller than with jobs. In absolute terms, nearly twice as many people live near the city centre in Stockholm than in Helsinki.

Population and job densities are both considerably higher in the pedestrian zone of the Stockholm compared to Helsinki. In the fringe of pedestrian zone the densities are more even, but the 50% larger land area of the Stockholm city centre's fringe zone also provides significantly more land for construction than in Helsinki. On the other hand, the area density of the fringe of pedestrian zone in Stockholm is lowered by the vast recreational areas of Djurgården, Norra Djurgården and Hagaparken, which are located within it. Moreover, the densities of the sub-centres and intensive public transport zone are approximately 10–20% higher in Stockholm than in Helsinki.

Between 2000 and 2010, the centres of both cities – the central pedestrian zones – have exhibited slower population growth than in other zones in both cities (Figure 18). In the pedestrian zone of the Helsinki city centre, the number of jobs has also dropped during the study period (Figure 19). As regards Stockholm, it bears noting the strong growth in the fringe of pedestrian zone, which has gained 30,000 residents and over 30,000 new jobs. Significant efforts have been implemented to develop the area in the 2000s. Several areas expanding the city centre have been completed over the course of the 2000s, with Hammarby Sjöstad and Liljeholmen among the most significant new districts.

Table 9: Zones of the core areas in Helsinki and Stockholm.

Helsinki	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Central pedestrian zone	71,376	99	7.2%	+2,281	+3.3%	↘	103,114	143	18.7%
Fringe of pedestrian zone	109,836	55	11.1%	+7,483	+7.3%	↘	97,663	49	17.7%
Sub-centre	133,860	50	13.5%	+14,721	+12.4%	↗	84,381	32	15.3%
Intensive public transport zone	226,748	35	22.9%	+12,137	+5.7%	↘	125,545	19	22.8%
Public transport zone	292,840	24	29.6%	+23,522	+8.7%	↗	97,906	8	17.8%
Car-oriented zone	154,595	12	15.6%	+18,355	+13.5%	↗	40,169	3	7.3%
Total/average for densely pop. area	**989,473**	**27**	**100.0%**	**+78,717**	**+8.6%**	→	**550,637**	**15**	**99.7%**
Stockholm									
Central pedestrian zone	151,108	150	10.4%	+7,432	+5.2%	↘	235,000	233	27.7%
Fringe of pedestrian zone	184,512	58	12.8%	+29,917	+19.4%	↗	186,325	59	21.9%
Sub-centre	165,807	52	11.5%	+11,890	+7.7%	↘	126,872	40	14.9%
Intensive public transport zone	381,499	47	26.4%	+33,383	+9.6%	↘	155,337	19	18.3%
Public transport zone	303,639	25	21.0%	+29,975	+11.0%	↗	91,616	7	10.8%
Car-oriented zone	259,066	10	17.9%	+28,588	+12.4%	↗	53,138	2	6.3%
Total/average for densely pop. area	**1,445,631**	**27**	**99.9%**	**+140,022**	**+10.8%**	→	**848,923**	**16**	**99.9%**

In Helsinki, population growth in the fringe of pedestrian zone has been more modest than in Stockholm over the study period. However, the number of jobs in the fringe zone has increased significantly. Furthermore, it is likely that the growth will continue to be focused in the fringe of pedestrian zone. The opening of the Vuosaari Harbour in 2008 freed up vast areas from port operations to meet the needs for expanding the inner city. The Jätkäsaari and Kalasatama districts, which are currently under development, will, upon their completion, substantially increase the population and job numbers in the fringe of pedestrian zone.

In both city regions, sub-centres held over 15% of the jobs in the core areas. In the sub-centres, the number of jobs in proportion to the number of local residents was slightly higher in Stockholm (0.8 per resident) than in Helsinki (0.6). The sub-centres of Stockholm have gained 17,000 new jobs between 2000 and 2010. Among the core area zones, the pedestrian zones of the sub-centres have shown the second highest percentage increases in job numbers after the fringe of pedestrian zone. Over the same period, the number of jobs in the Helsinki sub-centres has only increased by slightly over 1,000. Chapter 4 will cover the sub-centres in the core areas and the polycentric structure in more detail.

Significant differences can be seen between the core areas of Helsinki and Stockholm in terms of the positioning of the population in the public transport zones of varying levels. In Stockholm, the intensive public transport zone housed 26% of the core area population, whereas in Helsinki the corresponding percentage was 23. In Helsinki, the basic level public transport zone is a focus area for population (30%), while in Stockholm the share of this zone is almost 10 percentage points smaller. On the other hand, even though Stockholm boasts a more robust public transport offering than Helsinki, a larger part of the population lives in the car zone.

Over the study period, population growth in the car zone was higher than average for the core areas of both Helsinki and Stockholm. In the core areas of the Helsinki region over one-fourth of new residents settle in the car zone, whereas in Stockholm the growth of the car zone corresponds to roughly one-fifth of the area total.

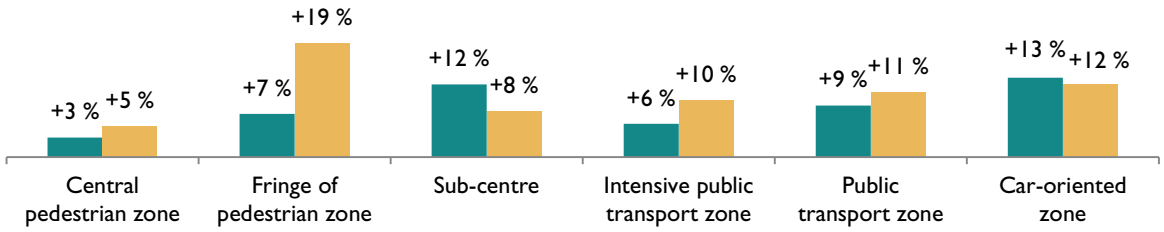


Figure 18: Population development in the core area zones between 2000 and 2010 (%).

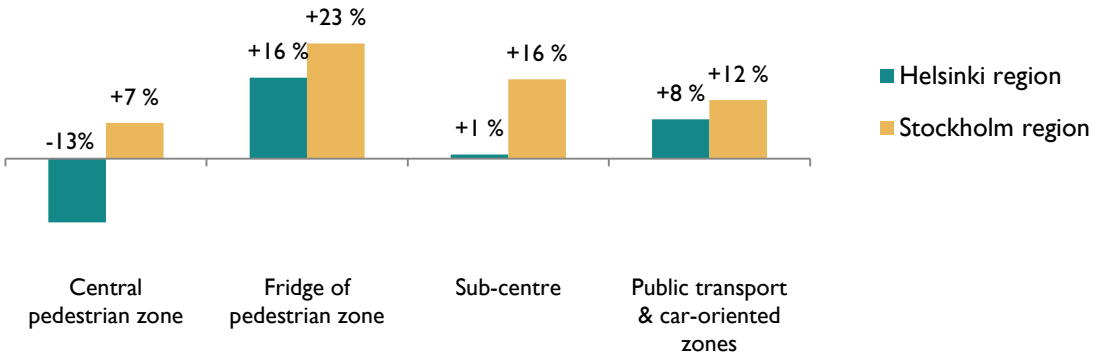


Figure 19: Development of job numbers in the core area zones between 2000 and 2010 (%).

Rail-oriented peri-urban area

The rail-oriented peri-urban areas are corridors that line the main rail traffic routes. In Stockholm, this area class includes six railway corridors in a finger-like pattern, four of which are supported by the region's commuter train system (pendeltåg) and two by the branches of the narrow-tracked Roslagsbanan suburban railway system. In the Stockholm region, this area class encompasses the centres of Upplands Väsby, Vallentuna, Åkersberga, Tumba and Haninge, for which separate pedestrian zones have been delineated. The public transport zone, too, holds numerous densely built-up station areas where services and housing have been concentrated.

In Helsinki, there are only two railway corridors that extend outside the core area – they are located along the main railway line and the coastal line. The centres of the main railway line corridor are Kerava, Järvenpää and Jokela. Along the coastal line Kirkkonummi falls within this category. In the Helsinki region, a similarly contiguous and string-like urban structure as in Stockholm has not taken shape between the centres. Compared to Stockholm, the public transport zone outside the centres holds a relatively small number of residents and jobs.

In both regions, population increase between 2000 and 2010 was strongest in the car zone, where growth has been both absolutely and relatively faster than in any other zone. The car zone in the Helsinki region has exhibited particularly rapid growth. The relative position of public transport zones has also strengthened in Stockholm, whereas growth in the pedestrian zones of both regions has remained below the average growth percentage of the area class. The centres have seen a particularly low amount of growth in the Stockholm region.

Table 10: Zones of the rail-oriented peri-urban area.

Helsinki	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Central pedestrian zone	30,518	27.4	30.6%	+2,315	+8.2%	↘	12,864	11.5	46.3%
Fringe of pedestrian zone	43,092	14.1	43.2%	+3,492	+8.8%	↘	8,160	2.7	29.4%
Public transport zone	6,075	10.7	6.1%	+530	+9.6%	↘	1,559	2.7	5.6%
Car-oriented zone	19,142	4.3	19.2%	+5,188	+37.2%	↗	5,020	1.1	18.1%
Total/average for densely pop. area	**98,827**	**10.8**	**99.1%**	**+11,525**	**+13.2%**	**→**	**27,603**	**3.0**	**99.3%**
Outside the densely pop. area	901	0.1	0.9%	-207	-18.7%		181	0.0	0.7%
Stockholm									
Central pedestrian zone	47,181	32.9	22.1%	2,504	+5.6%	↘	17,916	12.5	29.2%
Fringe of pedestrian zone	50,846	12.3	23.8%	1,472	+3.0 %	↘	14,329	3.5	23.4%
Public transport zone	67,126	18.5	31.4%	6,459	+10.6%	↗	19,031	5.2	31.0%
Car-oriented zone	47,553	5.6	22.2%	7,820	+19.7%	↗	9,700	1.1	15.8%
Total/average for densely pop. area	**212,706**	**12.0**	**99.4%**	**18,255**	**+9.4%**	**→**	**60,976**	**3.4**	**99.5%**
Outside the densely pop. area	1,184	0.10	0.6%	36	+3.1%		317	0.03	0.5%

Inner peri-urban area

The inner peri-urban area is not located along the railway corridors. In both city regions this area class holds approximately 4% of the region's population. In the Helsinki region the area holds a higher number of jobs in proportion to the population than in Stockholm.

The pedestrian zones in Stockholm are the Gustavsberg centre of the Värmdö Municipality, Ekerö which is located on an island on Lake Mälaren and Vaxholm which is known as the hub of the inner archipelago. In the Helsinki region the area class includes the Nurmijärvi centre Klaukkala, Tuusula centre Hyrylä and Sipoo centre Nikkilä, along with the smaller centres of Söderkulla and Veikkola. The population and job densities of the centres in the Stockholm region are, on average, slightly higher than those of the centres in the Helsinki region.

The car zone's share of the population in the inner peri-urban area is 38–46% in the city regions, in addition to which a part of the population lives in car-dependent areas outside the densely populated areas. In the Stockholm region, a large number of jobs in the fields of national defence, prison administration and logistics are located outside the densely populated area. Some of the jobs in the Helsinki region are also located in sparsely populated areas.

In both regions, the population growth in this area class is concentrated in the car zones. The proportion of sparse population, particularly in Helsinki, has been decreasing, which may be due to former sparsely populated areas increasing in density to form sparse car zone localities. However, during the study period significant growth also took place in the public transport zone of the Helsinki region. Yet, the zone's population share is still almost 10 percentage points lower than that of the Stockholm region.

Table 11: Zones of the inner peri-urban area.

Helsinki	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Central pedestrian zone	12,837	14.7	14.1%	+1,125	+9.6%	↘	5,506	6.3	20.0%
Fringe of pedestrian zone	16,776	7.5	18.4%	+2,761	+19.7%	↘	4,073	1.8	14.8%
Public transport zone	17,435	5.2	19.1%	+4,234	+32.1%	↗	7,644	2.3	27.7%
Car-oriented zone	35,095	2.1	38.4%	+9,981	+39.7%	↗	7,573	0.5	27.5%
Total/average for densely pop. area	**82,143**	**3.6**	**89.9%**	**+18,101**	**+28.3%**	**→**	**24,796**	**1.1**	**89.9%**
Outside the densely pop. area	9,201	0.1	10.1%	-1,540	-14.3%		2,779	0.0	10.1%
Stockholm									
Central pedestrian zone	11,872	18.8	10.0%	+1,321	+12.5%	↘	5,713	9.1	23.4%
Fringe of pedestrian zone	11,616	9.6	9.8%	+577	+5.2%	↘	1,611	1.3	6.6%
Public transport zone	33,477	8.3	28.2%	+3,454	+11.5%	↘	6,216	1.5	25.5%
Car-oriented zone	54,556	1.9	46.0%	+12,201	+28.8%	↗	7,408	0.3	30.4%
Total/average for densely pop. area	**111,521**	**3.2**	**94.0%**	**+17,553**	**+18.7%**	**→**	**20,948**	**0.6**	**86.0%**
Outside the densely pop. area	7,133	0.09	6.0%	–158	–2.2%		3,415	0.04	14.0%

Outer peri-urban area

The outer peri-urban area is situated within a radius of approximately 30–50 km from the main centres of the city regions. In the Stockholm region, the area held four centres: Järna and Rimbo, and the smaller Nykvarn and Ösmo. In the Helsinki region, the centres of this area class are the Nurmijärvi parish village and Nummela in Vihti, as well as the smaller Vihti parish village, Rajamäki in Nurmijärvi and Pornainen.

In the area, the urban form is relatively scattered. Over 60% of the population lived in the sparse car zone or entirely outside the densely populated area in both city regions. The population growth of the 2000s has also mostly concentrated in the car zone, the area of which has increased in both regions. With the expansion of the densely populated area, the population in the sparsely populated areas has decreased in both areas.

In absolute terms, the population increase of the outer peri-urban area in Helsinki has been over double that of the Stockholm region. Nevertheless, the growth of the outer peri-urban area in the Stockholm region has been faster than the area class average.

The car zone and the areas outside localities also held a considerable number of jobs. In the Helsinki region, almost 60% of jobs were located outside city centres and the public transport zone. The high number is partially explained by the Kilpilahti concentration in Porvoo. The Neste oil refinery and other companies operating in connection to it employ over 2,000 people in total.

Table 12: Zones of the outer peri-urban area.

Helsinki	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Central pedestrian zone	15,257	14.2	17.2%	+1,443	+10.4%	↘	6,496	6.0	24.2%
Fringe of pedestrian zone	7,121	6.4	8.0%	+1,018	+16.7%	↘	2,266	2.0	8.4%
Public transport zone	7,725	4.7	8.7%	+2,109	+37.6%	↗	2,862	1.8	10.6%
Car-oriented zone	34,355	2.3	38.7%	+11,900	+53.0%	↗	6,182	0.4	23.0%
Total/average for densely pop. area	**64,458**	**3.5**	**72.5%**	**+16,470**	**+34.3%**	→	**17,806**	**1.0**	**66.2%**
Outside the densely pop. area	**24,420**	0.2	27.5%	-1,158	-4.5%		**9,079**	0.1	33.8%
Stockholm									
Central pedestrian zone	14,170	17.7	22.7%	+706	+5.2%	↘	3,973	5.0	37.1%
Fringe of pedestrian zone	4,124	2.9	6.6%	+396	+10.6%	↘	986	0.7	9.2%
Public transport zone	5,933	3.5	9.5%	+299	+5.3%	↘	952	0.6	8.9%
Car-oriented zone	23,500	1.0	37.7%	+6,861	+41.2%	↗	2,505	0.1	23.4%
Total/average for densely pop. area	**47,727**	**1.8**	**76.5%**	**+8,262**	**+20.9%**	→	**8,416**	**0.3**	**78.6%**
Outside the densely pop. area	**14,685**	0.10	23.5%	–1,022	–6.5%		**2,288**	0.02	21.4%

Mid-sized towns – core

In the Stockholm region, the mid-sized towns include the towns of Södertälje and Märsta. In the Helsinki region, the towns of Porvoo, Lohja, Hyvinkää and Riihimäki fall within the area class. The figures for the core (radius 5 km) and fringe (5–10 km from the centre) of the mid-sized towns have been covered separately in Tables 13 and 14.

In the Stockholm region, Södertälje is a structurally dense and traditionally urbanised town. Märsta, in turn, did not develop into a centre until late in the 20th century, primarily due to the proximity to Stockholm Arlanda Airport. Both Södertälje and the Märsta-Arlanda area have been designated as regional urban cores in the RUFS 2010 plan. The university town of Uppsala is not located within the county area, which is why it was excluded from this study. Functionally speaking, however, Uppsala can be considered as one of the mid-sized towns in the Stockholm region.

The population and job density in the mid-sized towns of the Stockholm region is clearly higher than in the corresponding areas in the Helsinki region. The differences particularly heightened in the city centre and its fringe zone. On the other hand, the pedestrian zones hold a larger proportion of the residents and jobs in the Helsinki region than in the Stockholm region, where the public transport zone also emerges as a preferred area of residence.

In the 2000s, population growth in the core areas of the mid-sized towns in both city regions has been markedly slower than the regional average rate. The majority of the growth has taken place in the car zones. The pedestrian and fringe zones of the city centres have also grown, but at a significantly slower rate. In the Helsinki region, the public transport zones of the mid-sized towns have weakened and their absolute population numbers have decreased.

Table 13: Mid-sized towns, core area zones.

Helsinki	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Central pedestrian zone	29,910	25.7	23.0%	+1,595	+5.6%	↘	19,313	16.6	39.1%
Fringe of pedestrian zone	58,408	12.9	45.0%	+4,180	+7.7%	↘	15,941	3.5	32.3%
Public transport zone	14,560	14.4	11.2%	–256	–1.7%	↘	5,242	5.2	10.6%
Car-oriented zone	25,098	4.8	19.3%	+4,254	+20.4%	↗	8,115	1.5	16.4%
Total/average for densely pop. area	**127,976**	**10.7**	**98.6%**	**+9,773**	**+8.3%**	**→**	**48,611**	**4.1**	**98.5%**
Outside the densely pop. area	1,858	0.1	1.4%	-554	-23.0%		743	0.0	1.5%
Stockholm									
Central pedestrian zone	16,681	36.4	18.2%	+329	+2.0%	↘	13,405	29.2	29.5%
Fringe of pedestrian zone	33,273	21.3	36.3%	+1,728	+5.5%	↘	16,773	10.8	36.9%
Public transport zone	27,975	24.2	30.5%	+1,763	+6.7%	↘	6,659	5.8	14.6%
Car-oriented zone	12,977	3.1	14.2%	+3,132	+31.8%	↗	8,337	2.0	18.3%
Total/average for densely pop. area	**90,906**	**12.4**	**99.2%**	**+6,952**	**+8.3%**	**→**	**45,175**	**6.2**	**99.4%**
Outside the densely pop. area	746	0.10	0.8%	–40	–5.1%		280	0.04	0.6%

Mid-sized towns – fringe

In the Stockholm region, the most pivotal location in the fringe area of the mid-sized towns is Stockholm Arlanda Airport, which is located in the public transport zone outside Märsta. An exception has been made to classify Arlanda as a densely populated area although it is not populated. The area boasts over 12,000 jobs, and the airport is served by both the high-speed train Arlanda Express and the Stockholm commuter trains. In addition to the airport, the area surrounding Märsta holds the old town of Sigtuna, which is a popular tourist attraction. There are no concentrations in the peri-urban area of Södertälje. The nearest neighbouring centres Järna, Nykvarn and Tumba are located over 10 km away, outside the area.

In the Helsinki region, one small centre falls within this area class, Virkkala in Lohja, which has its own pedestrian zone. The main population centres of Lohja and Porvoo extend far into the fringe area. Conversely, in Hyvinkää and Riihimäki the main population centres are almost entirely within five kilometres of the centre points of the towns. The fringe areas hold other smaller localities, however.

Within the area class, the share of residents and jobs outside the densely populated area was far larger in the Helsinki region than in the Stockholm region. In the Helsinki region, particularly jobs in elderly care, industry and wholesale trade, in addition to primary production, were located outside the densely populated areas.

Population growth in the area has been clearly faster than the area class average in the Helsinki region. New residents have settled in the car zone almost without exception. In the Stockholm region, in turn, the strong growth of the fringe of pedestrian zone in Sigtuna has been a notable development.

Table 14: Mid-sized towns, fringe area zones.

Helsinki	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Central pedestrian zone	1,017	18.1	3.8%	-11	-1.1%	↘	242	4.3	3.9%
Fringe of pedestrian zone	-	-	-	-	-	-	-	-	-
Public transport zone	3,440	6.3	12.7%	+376	+12.3%	↘	926	1.7	14.8%
Car-oriented zone	12,589	2.9	46.6%	+2,556	+25.5%	↗	2,932	0.7	47.0%
Total/average for densely pop. area	**17,046**	**3.4**	**63.1%**	**+2,921**	**+20.7%**	**→**	**4,100**	**0.8**	**65.7%**
Outside the densely pop. area	9,987	0.1	36.9%	-75	-0.7%		2,140	0.0	34.3%
Stockholm									
Central pedestrian zone	3,525	19.6	22.8%	+486	+16.0%	↘	1,152	6.4	6.6%
Fringe of pedestrian zone	3,308	7.4	21.4%	+1,045	+46.2%	↗	389	0.9	2.2%
Public transport zone	2,230	7.6	14.5%	+210	+10.4%	↘	10,285	34.9	58.9%
Car-oriented zone	3,556	1.9	23.0%	+251	+7.6%	↘	4,746	2.5	27.2%
Total/average for densely pop. area	**12,619**	**4.5**	**81.8%**	**+1,992**	**+18.7%**	**→**	**16,572**	**5.9**	**94.9%**
Outside the densely pop. area	2,810	0.1	18.2%	+253	+9.9%		892	0.0	5.1%

Small towns

As regards the area class of small towns, we examined a five-kilometre wide area around the centre points of the towns. In the Stockholm region, the area class includes the Nynäshamn harbour town (14,000 residents) south of Stockholm and the centre of the northern part of the county, Norrtälje (18,000 residents).

In the small towns of the Stockholm region, especially the population and job densities of the centres are notably higher than in their comparative counterparts in the Helsinki region. The central structure of Norrtälje, which was established in the 17th century, is particularly dense and pedestrian-oriented. Nynäshamn is younger as a town. Its history is linked to the outer harbour of Stockholm, which was established in the early 20th century, and the railway link that was opened around the same time.

In the Helsinki region, the small town classification covers the towns of Karkkila and Mäntsälä and the Karjaa centre. Their main population centres are home to approximately 8,000–11,000 people each, which means that the towns are slightly smaller than their points of comparison in the Stockholm region.

Population growth in the small towns of the Helsinki region has matched the average of the area classes. In the Stockholm region, however, the growth of the small towns has been considerably slower than the regional average. The car zones have exhibited the fastest relative growth in both city regions. Particularly in the Helsinki region, the growth percentage of the car zone (+44.2) is notably high.

Table 15: Small town zones.

Helsinki	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Central pedestrian zone	**10,255**	11.7	35.5%	+937	+10.1%	↘	**4,698**	5.3	49.7%
Fringe of pedestrian zone	**12,893**	6.0	44.6%	+678	+5.6%	↘	**2,874**	1.3	30.4%
Public transport zone	**143**	5.7	0.5%	-22	-13.3%	↘	**54**	2.2	0.6%
Car-oriented zone	**3,351**	2.1	11.6%	+1,027	+44.2%	↗	**1,405**	0.9	14.9%
Total/average for densely pop. area	**26,642**	**5.8**	**92.1%**	**+2,620**	**+10.9%**	→	**9,031**	**2.0**	**95.5%**
Outside the densely pop. area	**2,285**	0.1	7.9%	+49	+2.2%		**430**	0.0	4.5%
Stockholm									
Central pedestrian zone	**14,277**	26.6	44.5%	+524	+3.8%	↘	**7,264**	13.6	53.4%
Fringe of pedestrian zone	**14,239**	12.4	44.4%	+692	+5.1%	↘	**3,989**	3.5	29.3%
Public transport zone	**1,063**	4.9	3.3%	+103	+10.7%	↗	**591**	2.7	4.3%
Car-oriented zone	**1,731**	1.3	5.4%	+321	+22.8%	↗	**1,400**	1.1	10.3%
Total/average for densely pop. area	**31,310**	**9.7**	**97.6%**	**+1,640**	**+5.5%**	→	**13,244**	**4.1**	**97.4%**
Outside the densely pop. area	**768**	0.10	2.4%	–43	–5.3%		**354**	0.05	2.6%

Rural area

Growth in rural areas has been slower than the average of the area classes in both regions. The area is located further away than the areas that are most significant for peri-urbanisation. Even so, significant growth has taken place in the car zone of the rural areas, especially in the Helsinki region.

The rural area of the Helsinki region holds many small centres: Inkoo, Pohja, Pusula, Loppi, Tervakoski, Oitti and Monninkylä. The densely populated area outside the centres is denser in the rural areas of Helsinki than in the Stockholm region. It should be noted, however, that a significantly larger portion of the population lives outside the densely populated areas in the Helsinki region than in the rural areas of Stockholm.

The rural area of the northern part of Stockholm County holds the Hallstavik industrial centre, whose pedestrian zones hold the majority of the jobs in the area class in question. The nearby area is also home to the smaller centre Älmsta, which has its own pedestrian zone. The rural areas of Stockholm County are more sparsely populated outside the centres than their counterparts in the Helsinki region. That said, the majority of the rural population in the Stockholm region, as well, lives in the sparse car zone or entirely outside densely populated areas.

As regards the rural areas, the figures for the Stockholm and Helsinki regions are not fully comparable. Due to the available material, the examination of the Stockholm region only includes the area of Stockholm County. This means that the area studied for Stockholm is only 30% in size compared to the area studied for Helsinki. The low density numbers for the rural localities in the Stockholm region are also partially a result of the holiday housing included in the data materials.

Table 16: Rural area zones.

Helsinki	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Central pedestrian zone	3,357	7.6	5.3%	-92	-2.7%	↘	2,082	4.7	14.4%
Fringe of pedestrian zone	-	-	-	-	-		-	-	-
Public transport zone	-	-	-	-	-		-	-	-
Car-oriented zone	25,007	2.6	39.2%	+4,288	+20.7%	↗	5,913	0.6	40.9%
Total/average for densely pop. area	**28,364**	**2.8**	**44.4%**	**+4,196**	**+17.4%**	**→**	**7,995**	**0.8**	**55.3%**
Outside the densely pop. area	35,471	0.1	55.6%	+82	+0.2%		6,463	0.0	44.7%
Stockholm									
Central pedestrian zone	3,296	9.5	12.7%	+163	+5.2%	↘	986	2.9	32.4%
Fringe of pedestrian zone	1,343	2.4	5.2%	–205	–13.2%	↘	878	1.5	28.9%
Public transport zone	1,356	3.5	5.2%	+143	+11.8%	↗	105	0.3	3.5%
Car-oriented zone	10,493	0.5	40.4%	+1,164	+12.5%	↗	784	0.0	25.8%
Total/average for densely pop. area	**16,488**	**0.7**	**63.5%**	**+1,265**	**+8.3%**	**→**	**2,753**	**0.1**	**90.5%**
Outside the densely pop. area	9,496	0.07	36.5%	+131	+1.4%		289	0.00	9.5%

Stockholm archipelago

The majority of jobs in the Stockholm archipelago are concentrated in the centres of Sandhamn and Ljusterö. However, the densely built-up Sandham cannot be considered statistically as a densely populated area, since the island has less than 200 residents. Over 50% of the jobs in the archipelago are related to the restaurant and accommodation business.

The number of permanent residents in the archipelago is relatively low, but in the summer season the population is multiplied with the influx of holiday residents. In the 2000s, the number of permanent archipelago residents has increased by approximately 80 people. The residents and tourists are served by numerous public ferry links.

Table 17: Population and jobs in the Stockholm archipelago.

Stockholm	Population 2010	Pop. /ha	Pop. (%)	Pop. change 2000–2010	Pop. change (%)	Relat. change	Jobs	Jobs /ha	Jobs (%)
Localities in the archipelago	2,718	0.38	56.5%	+91	+3.5%	→	207	0.03	32.6%
Outside the densely pop. area	2,092	0.04	43.5%	–12	–0.6%		427	0.01	67.4%

3.4 Summary

The Stockholm city centre presents itself as a strong concentration of population and employment. Although the city region is larger than Helsinki in terms of population and job numbers, the role of the main centre is even more pronounced. Over the course of the 2000s, significant new areas have been developed in the immediate vicinity of the city centre. Almost 50% of the growth in population and jobs has occurred in the core area of the region. In Helsinki, the implementation of large new areas in fringe of the city centre has not commenced until later. During the study period, the increase in population and jobs has concentrated in the outer urban area.

The basic structure of both city regions is formed by corridors extending in finger-like patterns along railways and main roads, with the most significant recreational and green areas between them. In light of the figures, the intensive public transport zone was found to be strong in the core areas of Stockholm, particularly in terms of population concentration. In Helsinki, a considerably larger portion of households live in basic level public transport zones. Furthermore, in Stockholm the public transport zones in the peri-urban areas are more important as residential and employment areas than in the Helsinki region.

The growth of the peri-urban areas has been strong in Helsinki where the absolute population growth numbers of the inner and outer peri-urban areas have eclipsed those of the Stockholm region. The role of sparsely populated areas is also more essential in Helsinki than in the Stockholm region. A clearly higher percentage of the residents and jobs were located outside the localities in Helsinki than in Stockholm across almost all area classes. Sparse construction was found to be prevalent particularly in the peri-urban area, the fringe area of mid-sized towns and the rural areas. The population outside the localities has still decreased in many area classes, which can be attributed to the areas becoming more dense and transforming into sparse, car-dependent localities.

Over the course of the 2000s, new jobs in the core areas of Stockholm have, alongside the city centre, emerged particularly in sub-centres, where the relative increase in job numbers has been the highest. In the Helsinki region, the sub-centres have not shown much growth in job numbers in the 2000s. Instead, new jobs have primarily been created in the fringe of pedestrian zone or the public transport zones.

Info box 3

Helsinki and Stockholm in a phase of new urbanisation

The city regions of both Helsinki and Stockholm are currently in a phase of rapid growth, which is concentrated in the core areas of the regions. Especially with regard to the core cities Helsinki and Stockholm, however, the growth has not been constant and balanced over the decades. Both cities experienced a prolonged phase of negative population development in the 1960s and 1970s, which was a time of particularly strong suburbanisation, accelerated by the increase in car ownership. Since then, the total population change for each decade has been positive for both cities (SCB 2011; SF 2014).

In addition to the development of traffic technology, the factors steering the growth of the city regions between the core and peri-urban areas have included fluctuations in economic trends (e.g. Klaassen et al. 1981; Berg et al. 1982). The role of the core areas has been prominent in the growth of the Helsinki and Stockholm city regions, particularly during the economic downturn following the 2007 financial crisis. In Helsinki, the development has also been affected by the appearance of new areas for expansion, following the completion of the Vuosaari Harbour in 2008. The 2000–2010 time span of the GIS data used for the study does not fully reveal the change in urban development, which is reflected by the distribution of growth between the various parts of the regions.

Figure 20 presents diagrams on the annual changes in population growth in the core and peri-urban areas of the Helsinki and Stockholm city regions between 2000 and 2014. The diagrams are based on municipality-specific population statistics (SF 2015; SCB 2015). As regards Helsinki, the diagram shows a strong period of growth in the peri-urban areas during the first decade of the 2000s. This period ended in 2008. Once the growth of the peri-urban municipalities levelled off, the combined growth of the entire city region began to increase. In Stockholm, the growth rate of the city region has accelerated even faster than in Helsinki in the last ten years, by a significant margin, and the growth forecasts have already been hiked up from the figures listed in the 2010 RUFS development plan (RUFS 2010, 37; SLL/SCB 2014, 43).

In both city regions, the population growth consists primarily of positive migration gain from abroad (Helsinki 42%, Stockholm 48%) and natural population growth (Helsinki 38%, Stockholm 38%). In 2012, positive domestic net migration constituted 21% of the growth in the Helsinki region and 14% in the Stockholm region. (SF 2012; SLL/SCB 2013). The strong population growth is predicted to continue in both regions for the coming decades. In terms of the development of the urban form, the core issue is how residents and jobs are positioned in the new regional structure.

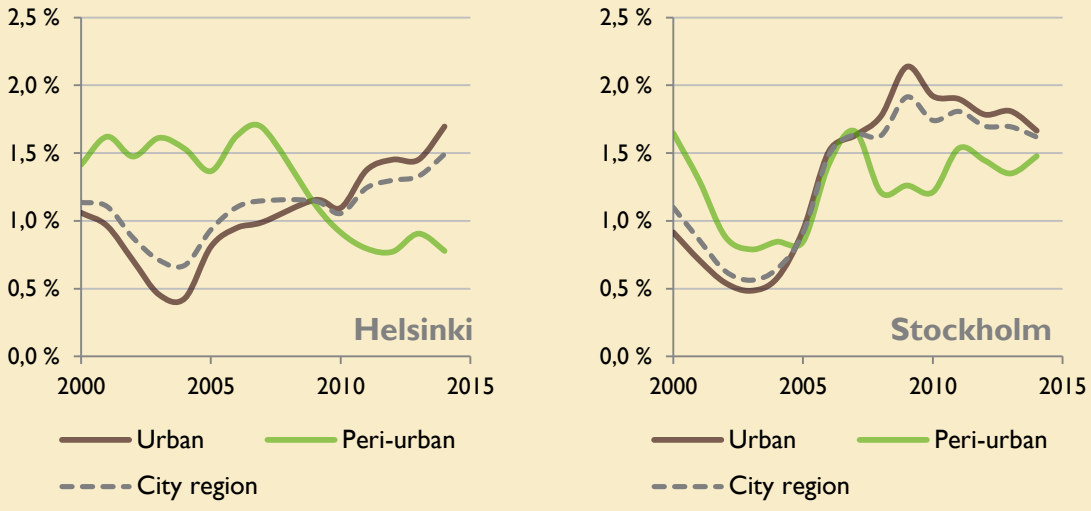


Figure 20: Annual population growth in the core and peri-urban areas of the Helsinki and Stockholm metropolitan areas, according to municipality-specific population statistics.

4 Polycentricity in the city regions

This chapter will focus on the recent developments of the network of centres in the core areas of the city regions. In addition to the traditional centre and sub-centres, business parks and other concentrations of jobs located throughout the regions have a significant impact on their polycentric structure.

The central structures of both Helsinki and Stockholm are dominated by strong centres, which is why both cities have often been construed as fairly monocentric in terms of their structure (Silfverberg 2012; Ståhle 2012). However, an ever-increasing share of jobs and services in the city region has, in recent decades, been positioned outside the main centres – in sub-centres, various job concentrations or other areas.

In both regions, the sub-centres hold approximately 15% of the jobs in the core areas. In addition to the city centre and sub-centres, Figures 21 and 22 illustrate the most important job concentrations in the core areas. Their role in the job positioning is significant particularly in the Helsinki region (16% of the jobs in the core areas). Motorway junctions, areas along orbital roads and other locations that are pivotal in terms of traffic have increased their importance as commercial hubs and as areas where new jobs emerge.

In the Helsinki region, the most significant job concentrations outside the centre are scattered throughout the region, much like the sub-centres. Nearest to the centre, at a distance of approximately 6–8 km, are Otaniemi–Keilaniemi, Pitäjänmäki, the Käpylä station area and the Herttoniemi–Roihupelto industrial area. Karamalmi, Veromies and the airport, on the other hand, are situated further away, some 12–16 km from the centre, and are more reliant on the orbital roads in the region than their proximity to the core city.

In the Stockholm region, the strongest job concentrations outside the centres are, by their nature, more like extensions of the inner city area than separate clusters of offices. The concentrations are located 4–8 km from the centre, and many of them are gradually transforming into parts of the expanding central area of the city. In the core areas of the Stockholm region, five of the seven job concentrations covered here are situated along the orbital light rail line Tvärbanan. This new rail link has tied the focus areas into an even more unified structure than before; to a corridor that surrounds the inner city.

In terms of orbital roads and development corridors that adhere to them, the city regions of Helsinki and Stockholm are vastly different. The Helsinki region features three orbital roads, which are located in a clearly suburban environment. Particularly around Ring Road III, a vast string-like car city corridor has formed, which has a significant impact on the total structure of the region and service access within it. Stockholm has only one orbital road that circles the city, and it is located very close to the centre. For this reason, a corresponding string-like car city zone, supported by orbital roads, has not taken shape in the Stockholm region.

4.1 Sub-centres in the city regions

The service offering of many sub-centres that are accessible via public transport and the road network has expanded with the establishment of new shopping centres. Some of the centres also serve as important concentrations of offices. On average, the sub-centres of Stockholm and Helsinki hold 40 and 30 jobs per hectare, respectively. In the Helsinki metropolitan area, there are 11 diverse sub-centres where housing, services and jobs intermingle, whereas zone analyses revealed 10 such sub-centres in the core areas of the Stockholm region (Figures 21 and 22).

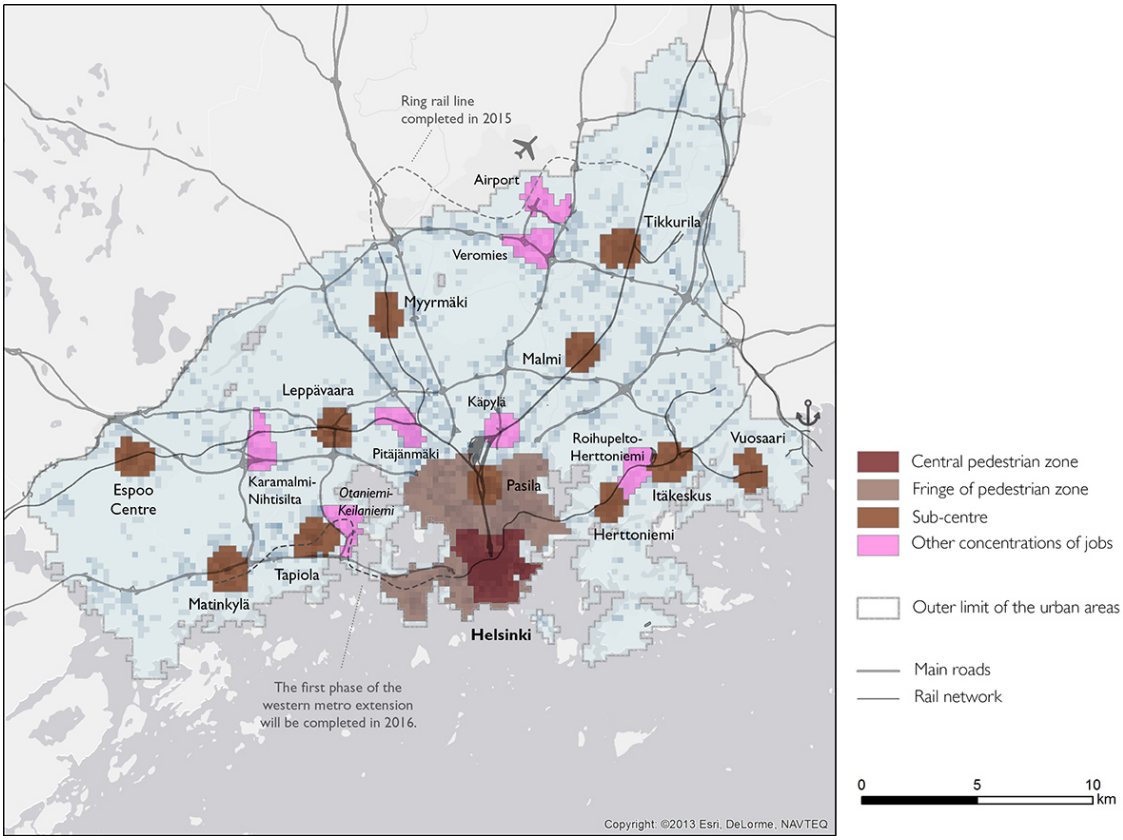


Figure 21: Centres and most important job concentrations in the core areas of the Helsinki region.

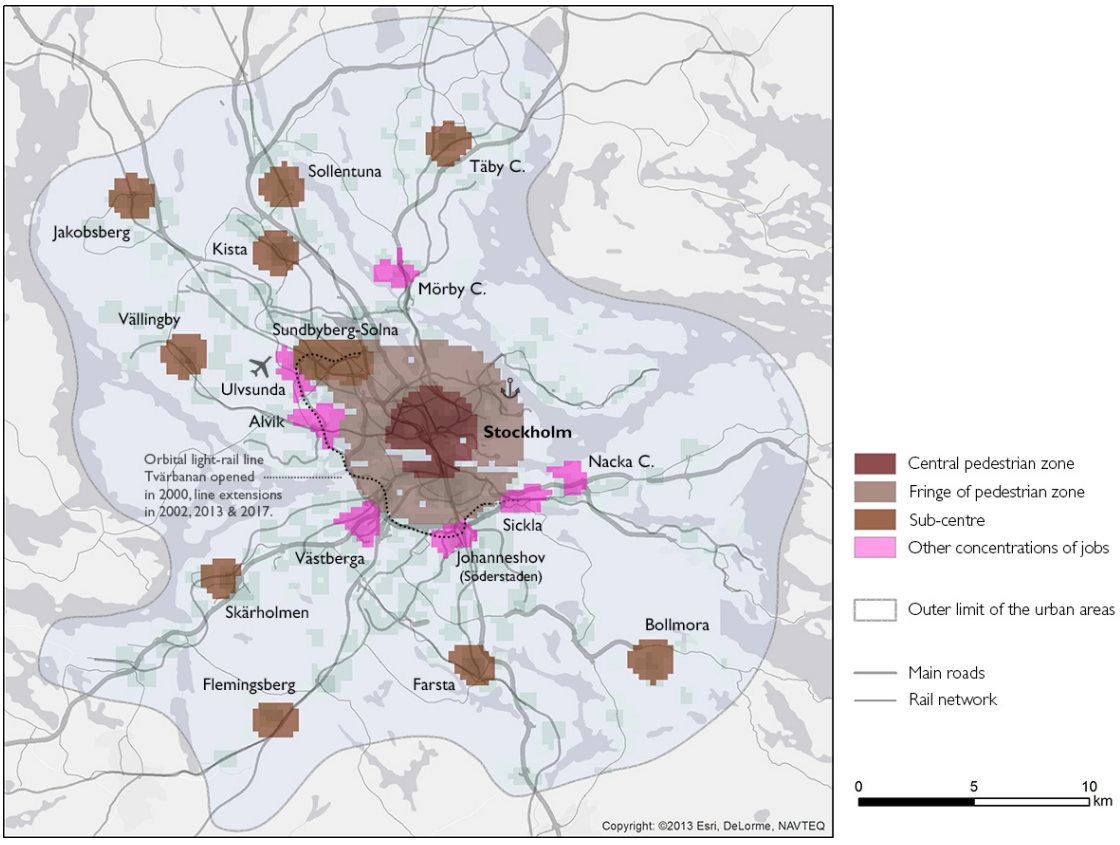


Figure 22: Centres and most important job concentrations in the core areas of the Stockholm region.

Sundbyberg–Solna and Kista, the largest sub-centres in Stockholm with regard to job quantities and densities, are significantly more prominent than the strongest sub-centres in Helsinki. Among the Stockholm sub-centres, the pedestrian zone formed by Sundbyberg and Solna together is the largest of the region's sub-centres in terms of its population, job number and area density. Both centres are independent and old towns within the urban structure of Stockholm. The distance between the centres of the municipalities is less than two kilometres, and they form a contiguous and dense concentration of jobs, services and housing. The area holds the head offices of many Swedish companies as well as state agencies. The central area is served by numerous metro and commuter train stations.

In Helsinki, too, the most dominant sub-centre in the region, Pasila, is located near the centre, at the edge of the inner city. Pasila is situated only about 3 km from the centre of Helsinki, by excellent rail and road links. The region is developing into a second centre for the metropolitan area, which can be compared with the largest sub-centres in Stockholm. A substantial portion of the new construction is concentrated in the area of a decommissioned railway yard, in the middle of a central area that was primarily built in the 1970s and 1980s.

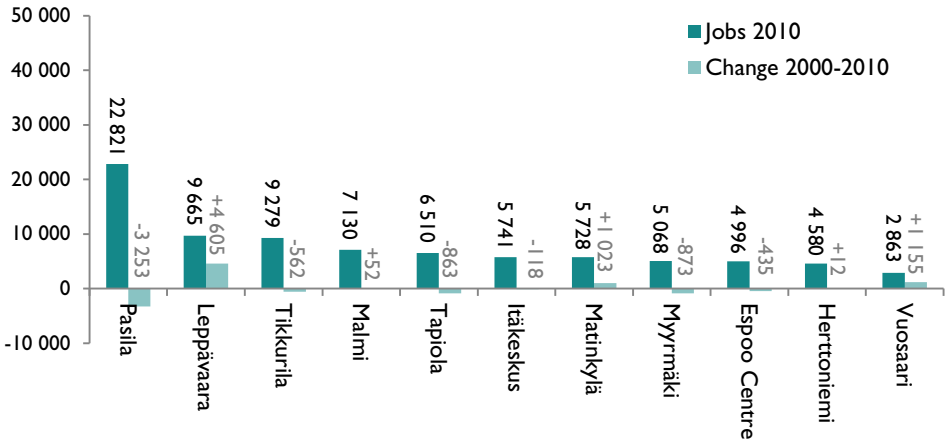


Figure 23: Job numbers and changes in them in the sub-centres of Helsinki, 2000–2010.

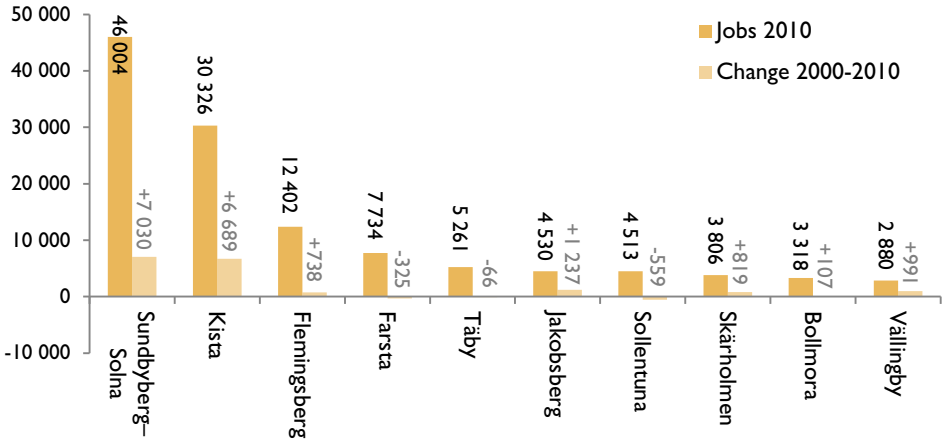


Figure 24: Job numbers and changes in them in the sub-centres of Stockholm, 2000–2010.

Kista in Stockholm distinguishes itself from the other sub-centres as both a nationally and internationally prominent hub of technology, education and services. The area holds the head office of the mobile phone company Ericsson, facilities of the Royal Institute of Technology and Stockholm University, as well as operations of IBM, Tele2, Fujitsu and Nokia. The area has been erected in a dense pattern around the metro station and large shopping centre, and the urban environment has, in recent times, been developed to be more pedestrian-friendly. It also bears noting that Kista, which is one of the strongest concentrations of competence in Sweden, is located in northwest Stockholm, an area where a large part of the population has an immigrant background.

Leppävaara, which is located in Espoo slightly outside the borders of Helsinki, partially resembles Stockholm's Kista. In terms of the fields represented in the area, jobs in education and IT stand out alongside commerce, but the total number of jobs is less than a third of that in Kista. The public transport solution in Leppävaara is based on a commuter train link, and like in Kista, a regionally important shopping centre that forms the functional core of the centre is situated by the station. However, the majority of office jobs are located relatively far from the core of the area.

Stockholm's Vällingby and Farsta, in turn, represent the Swedish 1950s urban planning principle centring around ABC cities (Arbete, Bostad, Centrum) built on a foundation formed by the metro network. The idea was to position housing, jobs and various services as close together as possible. However, not as many jobs emerged in the centres as was originally planned (Kallstenius 2010, 167). In the Helsinki region, the model of urban planning from the same period has been Tapiola, which is currently implementing extensive reformations to prepare for the opening of the new metro line in 2016. Once this Western Metro Extension is complete, all sub-centres in the region will be located in proximity to railway lines. In Stockholm, the only exception with regard to the rail link is Bollmora, which is supported by bus lines. In addition to metro and commuter train lines, Solna and Sundbyberg are served by the extension of an orbital light rail line.

The job increase in the sub-centres between 2000 and 2010 has been substantially stronger in Stockholm than in the Helsinki metropolitan area (Figures 23 and 25). During the study period, the Stockholm sub-centres grew by almost 17,000 jobs, whereas the job numbers in the sub-centres of the Helsinki region climbed only slightly to the positive (+743 jobs). The growth numbers of the Helsinki sub-centres are diminished by the negative development of Pasila – during the study period over 3,000 jobs left the area. Leppävaara increased its job numbers most notably, with approximately 4,600 new jobs. Furthermore, the new sub-centre Vuosaari and Matinkylä, which has been improved in terms of services, have increased their job numbers in the first decade of the 2000s. In other sub-centres, the job numbers have remained the same or decreased.

In Stockholm, the clear majority of growth in the sub-centres has taken place in the two most prominent sub-centres, Sundbyberg–Solna and Kista. The number of jobs in Jakobsberg, Vällingby, Skärholmen and Flemingsberg has also increased. In Sollentuna and Farsta, on the other hand, jobs have decreased slightly. Increases in population were seen particularly in Solna, where the new Frösunda residential and employment area was constructed on land freed up from the Swedish Armed Forces. The area holds the Swedish or Nordic head offices of numerous companies (e.g. Canon, HP and Eniro).

The population in all sub-centres in Stockholm and Helsinki stands between 10,000 and 15,000. Due to its nature as a twin centre, the Sundbyberg–Solna central area is more expansive than other sub-centres, which partially explains the population exceeding 50,000. Yet, population density in the area (92 residents/ha) is double that of the other sub-centres of the cities. The only one to come close to this density is Vuosaari in Helsinki (83 residents/ha), whose structure is strongly residentially oriented. The average population density in the sub-centres of both cities is approximately 50 residents/ha. Between 2000 and 2010, the population growth in the sub-centres of Helsinki (+15,000) has been slightly higher than in the sub-centres of Stockholm (+12,000).

4.2 Other concentrations of jobs and commerce

The core areas of both cities hold concentrations of jobs and services in varying sizes, even outside the centre and sub-centres. The diagrams in Figure 25 present the job numbers of a few of the most important concentrations and changes in them during the first decade of the 2000s. The job concentrations have been viewed as areas of approximately 200–250 hectares that are comparable to sub-centres.

In the Helsinki metropolitan area, the concentrations outside the diverse central areas form a level of polycentricity that is even more important than the sub-centres, at least when measured based on job numbers. Many of these concentrations hold more jobs than the strongest sub-centres in the entire metropolitan area. In terms of their functional structure, however, these concentrations have not developed into diverse central areas that contain a wealth of housing, services and jobs. In most of these concentrations the pedestrian environment is also poor.

Over the course of the 2000s in the Helsinki region, especially Keilaniemi–Otaniemi and Karamalmi–Nihtisilta in Espoo and the airport and Veromies areas in Vantaa have increased their job numbers. Currently, these areas are primarily inaccessible by rail, and the public environment is dominated by car traffic. However, with the completion of the Western Metro Extension and the Ring Rail Line that will connect Helsinki Airport to the railway network, some of the areas will have rail links within 2015 and 2016.

The significance of the area surrounding the airport in terms of employment is significantly lower in the Stockholm region than in Helsinki. In Stockholm the main airport Arlanda is located outside the core areas of the city region, at over twice the distance from the centre compared to Helsinki Airport. There are approximately 12,000 jobs in the immediate vicinity of the airport, but in contrast to Helsinki, the area is not surrounded by a wider business area. The situation may be changing, however. In the regional development plan, the zone between the airport and the nearby Märsta densely populated area has been indicated as one of the regional urban cores. The development of the area is about to begin.

In the Stockholm region, clusters of offices similar to those in the Helsinki metropolitan area have not formed outside the centres in the core areas. The most important concentrations of jobs circle the inner city, and many of the areas are functionally quite diverse. Västberga, which has the highest number of jobs, is partially an old industrial area, in the vicinity of which housing, offices and trade has emerged. The western part of the area around the Telefonplan metro station has developed into a dense urban environment.

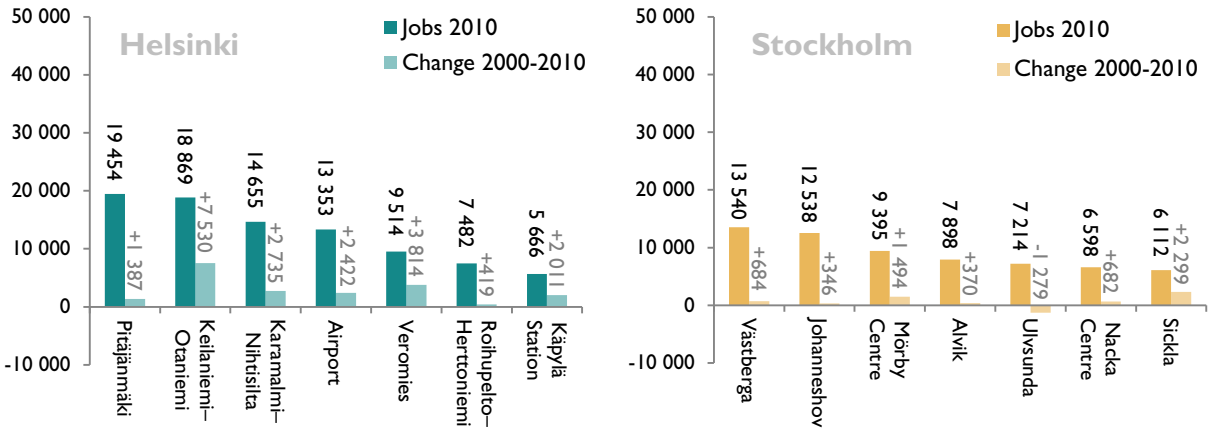


Figure 25: The development of the other job concentrations in the core areas between 2000 and 2010.

Another strong concentration of jobs is located in Johanneshov, near the Stockholm Globe arena. The district is located along excellent public transport links, and it is developing into a diverse centre in the southern part of the core city. It also holds an old slaughterhouse and wholesale area, which is being developed into a district of restaurants, housing and small businesses, taking advantage of the historical environment. The aim of the city is to implement broader efforts to expand the central structure to the vicinity of the Stockholm Globe arena as part of the South City (*Söderstaden*) project.

The Nacka corridor leading east of Stockholm is problematic from the perspective of sustainable urban form. Sickla, which is located immediately outside the border of Stockholm, is a commercial area that has grown rapidly and is strongly reliant on car traffic. With the exception of the Saltsjöbaden sub-urban rail line that passes near the early part of the corridor, the public transport links in the direction of Nacka are based on bus lines. In 2013, however, the municipalities in the area and the Stockholm County Council reached an agreement on new housing production and expansions of the metro network, as a result of which the Nacka area is likely to gain its own metro line in the 2020s.

In addition to the larger job concentrations, numerous smaller service concentrations and various job areas are located outside the central areas in both city regions. Particularly the areas surrounding metro and commuter train stations are important local centres. In many places new retail parks have also taken shape in the vicinity of the sub-centres, but they are, at least currently, fairly disconnected from the pedestrian zones of the sub-centres.

4.3 Summary

In both regions, the role of the main centre as an area where jobs are concentrated is notably strong. The proportion of core area jobs located in the city centre or its fringe zone is 50% in Stockholm and 40% in Helsinki. The sub-centres hold approximately 15% of the core area jobs in both regions. In Helsinki, Pasila (23,000 jobs) is clearly more significant than the other sub-centres, with Leppävaara coming in second (10,000 jobs). In Stockholm, the urban Sundbyberg–Solna (46,000 jobs) and the IT concentration Kista (30,000 jobs) are substantially larger job concentrations than the other sub-centres.

The essential difference in the polycentricity of Stockholm and Helsinki is related to job concentrations outside the centres. The top seven office and job concentrations in the Helsinki metropolitan area hold more jobs than the 11 sub-centres of the region combined, although the areas have not been developed as actual central locations. In Stockholm, no equivalent clusters of offices have developed outside the central areas. The most significant job concentrations outside the centres in Stockholm border the inner city, with many areas situated along the orbital light rail line Tvärbanan.

Substantial differences were revealed in the positioning of job increases in the sub-urban areas. In the Helsinki metropolitan area, the sub-centres grew by slightly over 700 jobs between 2000 and 2010, while in Stockholm the growth stood at almost 17,000 jobs. The increases in job numbers in the Helsinki region were highest in office and job concentrations outside centres, which gained over 20,000 jobs. In Stockholm, growth was strongest in sub-centres, with increases in other job concentrations remaining under 5,000 jobs.

Info box 4

Plans aim for a denser city and the development of nodes

The plans of both core cities Helsinki and Stockholm include similar goals with regard to the development of orbital rail links and nodes connected to them. In addition to strengthening polycentricity, both cities are aiming for the expansion of the dense and diverse central area.

A draft of the new local master plan for Helsinki was published in 2014 (KSV 2014). The target year for the plan is 2050, by which the city is expected to increase its population by approximately 250,000 residents. The goal of the plan is to form and extend the diverse urban structure outside the traditional inner city. The intention is to accomplish this by converting urban motorways into multimodal boulevards. The sub-urban areas, on the other hand, will be structured through reliance on the sub-centres, which the primarily rail-oriented public transport ties together also in transverse direction. The plan also includes new fast cycling routes, which are intended to facilitate commuting and service access on bicycles.

The local master plan for Stockholm (Promenadstaden 2010) also aims to form functionally diverse urban cores in the currently fairly scattered sub-urban area. The plan presents a total of nine nodes in the city area, which are hoped to develop into appealing and urban meeting places and service concentrations. The new, primarily rail-oriented public transport links that tie the concentrations together transversally are also pivotal to the plan. In addition to forming new diverse centres, the aims of the local master plan include expanding the structure reminiscent of the city centre to inner sub-urban areas and connecting these districts to the urban city even more tightly than before.

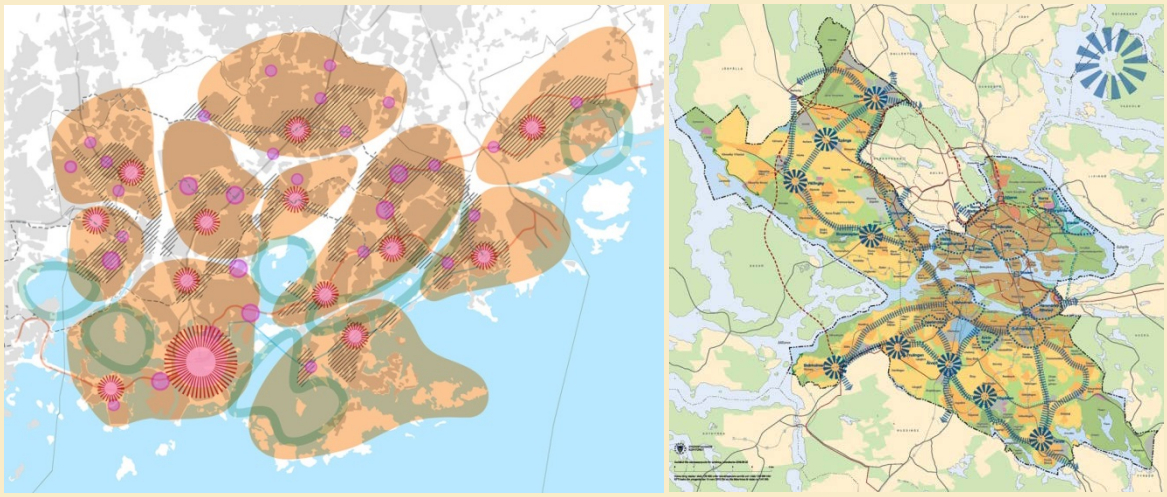


Figure 26: The new master plan for Helsinki (left) will develop the polycentric structure of the city. The map presents a network formed by sub-centres and smaller local centres. The development targets presented in the Stockholm master plan (right) include both the expansion of the central city and the nine sub-urban nodes, between which connections will be developed.

5 Summary and conclusions

The core questions in the development of metropolitan areas are regional in nature. The increase in mobility, particularly the increase in car ownership along with efficient public transport systems, has expanded the functional areas of cities into vast city regions. In the regions, an increasing share of trips is directed to locations other than the traditional city centre. At the same time, the hierarchical structures of governance and planning have been forced to give way to new forms of cooperation that focus on negotiations between different actors in the city regions.

The Helsinki and Stockholm city regions are rapidly growing Nordic metropolitan areas, where information and communications technologies play an important role in the economic structure. Stockholm became urbanised earlier than Helsinki, and it is larger and denser in terms of its population. The regional structures have also developed differently due to factors related to location: The position of the centre of Helsinki on a cape surrounded by water is decidedly different from the location of the Stockholm centre in the inner archipelago where the urban structure can expand into more directions. Especially in Stockholm, the urban structure is shaped by rail traffic, with the metro network that has been developed since the 1940s at its core. The most important corridors of the urban structure in Helsinki also rely on rail traffic, although there are fewer corridors.

On a zone-by-zone basis, growth in the Helsinki region has focused on the car zones of peri-urban areas clearly more than in Stockholm. In the Helsinki region, almost 40% of population growth in the first decade of the 2000s took place in the car zones, while the equal proportion in Stockholm was only 30%. On the other hand, in Stockholm the share of public transport zones as places where new residents settle (39%) was almost 10 percentage points higher than in Helsinki (30%). The differences in the availability of public transport are also evident in the core areas of the regions, where approximately 50% of the residents lived in various public transport zones. In Stockholm, the majority of the population in public transport zones resided in areas with intensive public transport services, which is at least partially explained by the vast metro network of the city. In the Helsinki region, in turn, almost two-thirds of the zones' population lived in areas with only basic level public transport services.

5.1 Stockholm ahead of Helsinki in the development of the core city

In Stockholm, population and jobs were more concentrated in areas near the centre than in Helsinki. Almost 300,000 more people lived in the inner core area, less than 8 km from the centre, than in the corresponding area of Helsinki. In the positioning of jobs, the city centre pedestrian zones were even more prevalent in Stockholm. The pedestrian and fringe zones of the city centre hold 50% of the jobs in the entire city region, whereas in Helsinki, the proportion of jobs in the central area of the city is less than 40%. The dominance of core areas in Stockholm is, in part, explained by the wider land area: There is less land for building in the vicinity of the centre of Helsinki, which is surrounded by sea. Despite the scarcity of land, the population and job densities in the core areas of Helsinki are still clearly lower than in the corresponding areas of Stockholm.

Similar developments can be seen in the core areas of both city regions, with port and industrial operations making way for more active use of the shore areas in the form of urban housing, employment and recreation. Stockholm has a significant lead over Helsinki with regard to the development of new areas. Of the regional population increase in the 2000s, as much as 40% has occurred in the inner core area, while only 15% of the growth in Helsinki has taken place in the corresponding area. The growth of the inner city in the fringe of the pedestrian zone has been a

notable part of the development in Stockholm. This area holds the new districts of Hammarby Sjöstad, Liljeholmen and Lindhagen. In Helsinki, the new phase of expansion in the inner city did not properly take off until the opening of Vuosaari Harbour in 2008. The new harbour released the old inner city harbour areas for new land-uses. Also the financial downturn, which began in the same year, has turned the focus of the growth in the city region towards the core areas.

Many areas of supplementary and new construction in Stockholm have been located along the Tvärbanan light rail line that circles the central area of the city. Especially the junction points of the radial metro lines and new orbital rail links have risen to the fore as peak areas of public transport accessibility. With the expansion completed in the autumn of 2013, Tvärbanan now also reaches Sundbyberg–Solna, the most important sub-centre in terms of population and job numbers, which in this way is even more clearly integrated into the expanding central area of the city. The light rail connects the inner sub-urban areas tightly together. This improves the opportunities for expanding the mixed inner city structure, which is already under way in some areas. In Helsinki, corresponding quality corridors of orbital public transport and land use have so far not been developed.

The dense and diverse inner city offers an excellent framework for developing pedestrian and bicycle traffic. In the core areas of Stockholm, cycling conditions have been improved significantly since the cycling plan completed in 1998 and the considerable increase in allocations to the promotion of cycling (Vaismaa et al. 2011, 40–41). The cycling arrangements implemented in Stockholm using modern planning principles cover the entire area of the core city. In Helsinki, too, bicycle traffic has begun to be arranged according to new planning principles (e.g. KSV 2012). The first one-way cycle tracks and lanes have been completed in the city centre. Also the fast bicycle route *Baana* opened in the railway canyon of the old rail line to West Harbour in 2012. The new connections have had a positive impact on bicycle traffic in the central area. Compared to Stockholm, the efforts to promote cycling are only beginning in Helsinki, but the approved plans pave the way in the direction of the good European practices.

5.2 Diverse sub-centres key to sustainable suburban development

The development of a polycentric and networked urban structure is a topical subject for both research and planning (Oswald & Baccini 2003; Sieverts 2003; Alppi & Ylä-Anttila 2007; Joutsiniemi 2010). Even though the urban network in the Helsinki and Stockholm regions is still dominated by the traditional centres of cities and towns, the proportion of jobs and services located outside the main centres has been increasing in the past decades. The polycentric structure of the city regions is based on the sub-centres covered in the zone division, but also on a network of varying concentrations of jobs and services that have emerged in the public transport and car zones. The role of these concentrations was found to be prominent particularly in the Helsinki region.

The aim of developing diverse sub-centres outside the old central area of the city has been to structure the fragmented sub-urban zone and shorten the distances travelled to access services. The strengthening of regional and local urban cores is a pivotal element in the RUFS development plan of Stockholm County and the city's new master plan. The Helsinki master plan is also aiming to develop a "rail-oriented network city" and bolster the polycentric structure rooted in node points in the network. The idea of a polycentric network city can also be identified in the wider MAL cooperation between the Helsinki region municipalities and in regional planning, although the area delineations are less detailed than in the Stockholm region.

The largest sub-centres in the city regions – Pasila in Helsinki, and the traditionally urban Sundbyberg–Solna and IT hub Kista in Stockholm – have developed into concentrations of tens of thousands of jobs with a significant role in the polycentric structure of the regions. As long as sufficient attention is paid to the quality of the urban environment, these areas have what it takes to develop into diverse environments for employment, housing, service access and recreation that are

comparable with city centres. In the Helsinki region, however, Leppävaara has been the only sub-centre in the 2000s to show substantial growth as an employment area and, in contrast to Stockholm, the numbers of jobs in many sub-centres in the Helsinki metropolitan area have even declined.

Based on these results, non-hierarchical development towards the network city structure has been more prevalent in Helsinki than in Stockholm. Instead of sub-centres, growth in the Helsinki metropolitan area has focused on job concentrations, many of which are clusters of particular fields (Norppa & Schulman 2011). Among these job concentrations, the ones to show strongest growth in the 2000s have been Keilaniemi and Karamalmi (ICT) in Espoo and the areas of Vantaa located near the airport (logistics) and Ring Road III (wholesale and retail trade). The structure that has formed in these areas leans more heavily on the use of cars than in the sub-centres. In Stockholm, the growth of employment areas outside city centres has not been as strong; instead, the growth of the polycentric structure has occurred in sub-centres that have been developed in a more systematic manner. The biggest out of centre concentrations of jobs are also located closer to the central city than in the Helsinki region.

In Helsinki, the central location of the main airport has affected the regional land use. Since it has not been possible to construct much housing in the area affected by aircraft noise, vast employment areas have been included in the plans, supplemented with some commercial services. The current structure of the area is strongly car-reliant. The completion of the Ring Rail Line will improve the competitiveness of public transport in the vicinity of the airport and the northern parts of the employment areas by Ring Road III, but the shopping centre Jumbo, for example, which is one of the largest ones of its kind in the region, will still remain outside the railway network. In Stockholm, the main airport is significantly further away, and the areas affected by aircraft noise have no impact on the development of the core areas.

The differences in orbital traffic links have resulted in the development of different service structures in the Helsinki and Stockholm regions. At present, only one orbital road connecting the northern and southern parts of the region has been completed in Stockholm, and even this runs in the immediate vicinity of the city centre. A corridor of car city services and logistics, akin to the areas along Ring Road III in the Helsinki metropolitan area, has not emerged in Stockholm. Instead, the corresponding operations have been scattered throughout the region in the form of smaller clusters. The new bypass *Förbifart Stockholm*, which has generated much discussion, will not change the situation to any great degree upon its completion in the 2020s, since the road runs mainly in a tunnel.

5.3 Growth in the peri-urban areas requires guidance

In recent decades, the interaction between large cities and the surrounding peri-urban areas has come to be seen in a different light. The fringe areas of cities are subjected to considerable growth pressures (Nilsson 2011; Piorr et al. 2011). The peri-urban areas of the regions play an important role from the perspective of both the urban sprawl and the efforts regarding smart growth.

Over the course of the 2000s in the Helsinki and Stockholm regions, the peri-urban areas have been the strongest focal points of population growth in relation to all other areas. The growth is mirrored by many aspects, from changes in landscape to the price development of housing land. Moreover, there are fairly substantial differences between the urban forms in the peri-urban areas of the regions examined here. In Stockholm, the areas are served by six high-level railway corridors, along which the majority of the jobs and residents in the area have concentrated. Railway corridors have played a lesser role in the growth of the peri-urban areas of Helsinki, although housing has densified also along the tracks.

The growth of the peri-urban areas has been prominent in the Helsinki region where the absolute population growth numbers of the inner (15–30 km) and outer (30–50 km) peri-urban areas have eclipsed those of the bigger Stockholm region. Correspondingly, growth of the core areas has been weaker in Helsinki. Based on analyses, the urban form in the Helsinki region seems to have fragmented more than in the Stockholm region during the 2000s. The proportion of sparse population is also clearly higher in the Helsinki region. In recent times, the sparsely populated areas in the peri-urban sphere have, in many places, increased in density to form localities, which the Finnish Monitoring System of Spatial Structure (YKR) identifies as low-density car zones. Drive-kilometres and carbon dioxide emissions from travel are considerably higher among residents of the car zones in the peri-urban areas than among those living in the core areas of the city or within the commuter rail service area (Ristimäki et al. 2013, 129).

The sparsely built-up and largely car-dependent communities in the peri-urban areas form their own area type, the development of which requires its own solutions. Uncontrolled construction is linked to many factors, such as national legislation, fragmented land ownership, housing preferences and the push and pull factors of migration. The high price of housing in the core areas, the scarcity of sites for single-family homes and increased car ownership all affect the appeal of peri-urban areas, especially when it comes to the housing preferences of families with children.

Although the poor economic climate has hindered the growth of the peri-urban areas in recent years, the planning must also make preparations for different times. Therefore, the development of the peri-urban areas should direct growth to densely populated areas near centres and to areas along public transport corridors. In the Stockholm region, the growth of sparsely populated areas in the peri-urban areas has been significantly weaker than in the Helsinki region. In the Helsinki region, the control of dispersed construction should be tightened so that the goals of defragmentation of the urban form can be realised. International examples of urban defragmentation policies can be found in relation to directing growth according to the *Urban Growth Boundary* model, for example (Abbott 2002; Jun 2004). The idea of the model is to steer growth by clearly separating the parts of the region that are allocated for urban land use that meet certain density criteria from areas that are reserved for agriculture, forestry and recreation.

5.4 Regional land use must be decided at the metropolitan level

In large urban regions, issues concerning land use, traffic, housing and general economic development policies are largely regional, which is why regional decision-making is required to solve them. Currently, the governance of both Greater Helsinki and Greater Stockholm is largely based on guidance through negotiation, but the governance models are different. Decision-making regarding the control of metropolitan-level urban form has been slow and ambiguous in the Helsinki region. This creates uncertainty and makes it harder to predict the development of the area.

The County Council forms a strong regional administration for the Stockholm region. The elected Council has the right to levy taxes. Together with the County Administrative Board, which is part of state administration, it is also responsible for regional development planning. The County Council coordinates community and traffic planning, and is responsible for publically funded health care. The municipalities of Stockholm County, in turn, are responsible for basic public services and land use planning at the level of local master plans and local detailed plans, among other things. The RUFS development plan prepared under the leadership of the Stockholm County Council presents a shared mindset regarding regional development in the future – particularly with regard to a regional network of centres that forms the core of the urban form. The development plan approved by all parties forms a basis for local level planning.

The regional administration in Helsinki is largely based on various consortiums of municipalities. The seven member municipalities of the Helsinki Region Transport (HSL) joint municipal au-

thority handle the planning and organisation of public transport in the area. Helsinki Region Environmental Services (HSY), on the other hand, is responsible for water and waste management in the metropolitan area as well as production of environmental data regarding the region. As regards health care, the 24-municipality Hospital District of Helsinki and Uusimaa (HUS) serves as the joint municipal authority for special health care. The Helsinki Metropolitan Area Advisory Board and the wider 14-municipality Helsinki Region Cooperation Assembly, in turn, are pivotal for the strategic cooperation regarding land use, housing and traffic in the region. The Helsinki-Uusimaa Regional Council works to coordinate the regional development of a wider area, 28 municipalities, with regard to strategic planning, regional planning and cooperation between various operators. In order to enhance the collaboration between the state and the Helsinki region municipalities, a letter of intent procedure has also been developed, which includes a joint land use plan prepared for the Helsinki region (MAL 2014).

In Helsinki, there is no shortage of administrative structures and visions – on the contrary, there would seem to be an oversupply of both (e.g. Acher 2010, 118–120). Efforts have been made in recent years to unify the fragmented administration of the metropolitan area, but the results have been slim. The metropolitan administration, which was planned to be instituted in 2017, would have been tasked with making decisions on land use, housing and traffic in the region, but the project gave rise to strong opposition in some municipalities in the region. In addition to this, the extensive municipal consolidations suggested for the region, which included a proposal for organising local governance for parts of municipalities, will not be implemented, at least for now.

Based on this study, the metropolitan areas present themselves as polycentric and functionally networked systems whose governance requires both cooperation between the various actors involved and regional decision-making. The county-level decision-making in the Stockholm region is one example of organising metropolitan administration, and the experiences gained in Stockholm can also fuel considerations regarding the administrative model of the Helsinki region. Naturally the governance in Stockholm is not free of problems, but there the metropolis seems to better identify itself as a regional strategic actor, which also leaves room for the self-governance of municipalities and local democracy.

5.5 Final words

This study expands the zone-based examination established in the monitoring of the development of urban form in Finnish city regions to the Nordic scale, which enables correlating the development of Helsinki with another Nordic capital. The experiences gained in Stockholm provide comparable information to support planning and decision-making in the region. At the same time, we hope that the study will give readers living in other areas a general view of the recent developments of Nordic metropolises like Helsinki and Stockholm, from the perspective of urban form.

The interest shown by the Finnish Environment Institute and the Department of Geosciences and Geography at the University of Helsinki towards international comparison projects is, first and foremost, related to urban research from the perspectives of land use, urban form and the development of planning tools. The goal is to increase the use of GIS data, take part in the development of materials and methods, and promote international research cooperation along with researcher and trainee exchange.

Many city regions also share the interest of continuing and intensifying the zone model-based international comparison between city regions. The urban zone model provides a functional framework to serve as a foundation for comparative research of urban form in different city regions. In addition to the metropolitan areas, the other large and mid-sized city regions can form interesting international comparisons to support regional development.

The closest points of comparison for Finnish and Swedish cities can be found in other Nordic countries, where there are many similarities with regard to the planning systems and the development histories of the cities themselves. The large cities and city regions in the Nordic countries are still growing rapidly, and the international comparative data provides important tools for managing the regional growth challenges.

REFERENCES

Abbott, Carl (2002). Planning a Sustainable City: The Promise and Performance of Portland's Urban Growth Boundary. *In* Squires, Gregory D. (ed.): *Urban Sprawl: Causes, Consequences & Policy Responces*, pp. 207–235. Urban Institute Press, Washington, DC.

Acher, Peter (2010). Tila on ylellisyyttä – Suomessakin? *In* Timo Hirvonen & Kaisa Schmidt-Thomé (ed.). ESPONin ytimessä ja ympärillä, pp. 111–123. *YTK:n julkaisuja* B 100. Centre for Urban and Regional Studies, Aalto University, Espoo.

Alppi, Samuli (2008). Kauppa ja kaupunkien keskukset. *Rakennettu ympäristö* 2008: 3, pp. 10–12.

Alppi, Samuli & Kimmo Ylä-Anttila (2007). Verkostourbanismi. *Yhdyskuntasuunnittelu* 2007: 2, pp. 10–26.

Andersson, Ola (2012). *Vykort från Utopia: maktens Stockholm och medborgarnas stad*. 179 pp. Dokument press, Årsta.

Berg, vann den Leo, Roy Drewett, Leo H. Klaassen, Angelo Rossi, Cornelis H. T. Vijverberg (1982). *Urban Europe: A study of growth and decline*. 162 pp. Pergamon Press, New York.

Bertolini, Luca (1996). Nodes and places: Complexities of railway station redevelopment. *European Planning Studies* 1996: 3, pp. 331–346.

Bertolini, Luca (1999). Spatial Development Patterns and Public Transport: The Application of an Analytical Model in the Netherlands. *Planning Practice and Research* 1999: 2, pp. 199–210.

Bertolini, Luca (2008). Station Areas as Nodes and Places in Urban Networks: An Analytical Tool and Alternative Development Strategies. *In* Bruinsma, Frank, Eric Pels, Hugo Priemus, Piet Rietveld & Bert Van Wee (ed.): *Railway Development: Impacts on Urban Dynamics*, pp. 35–57. Physica-Verlag, Heidelberg.

Bertolini, Luca & Frank le Clercq (2003). Urban development without more mobility by car? Lessons from Amsterdam, a multimodal urban region. *Environment and Planning A* 35: 4, pp. 575–589.

Bertolini, Luca & Martin Dijst (2003). Mobility Environments and Network Cities. *Journal of Urban Design* 2003: 1, pp. 27–43.

Bertolini, Luca & Tejo Spit (1998). *Cities on Rails: The Redevelopment of Railway Stations and their Surroundings*. 256 pp. Taylor & Francis, Lontoo.

Calthorpe, Peter (1993). *The Next American Metropolis: Ecology, Community, and the American Dream*. 175 pp. Princeton Architectural Press, New York.

Calthorpe, Peter & William Fulton (2001). *The Regional City: Planning for the End of Sprawl*. 304 pp. Island Press, Washington D.C.

Cervero, Robert (1998). *The Transit Metropolis: A Global Inquiry*. 467 pp. Island Press, Washington DC.

Cervero, Robert & Cathleen Sullivan (2011). Green TODs: marrying transit-oriented development and green urbanism. *International Journal of Sustainable Development & World Ecology* 18: 3, pp. 210–218.

Claesson, Åke (1998). Från första T-banan till tredje spåret. *Teoksessa* Gullberg, Anders ym. (ed.): *Stockholm blir stor stad*, pp. 189–232. Byggförlaget, Stockholm.

COMMIN (2007). Planning Systems, National Planning Systems, Sweden. <*http://commin.org/en/planning-systems/national-planning-systems/sweden/1.-planning-system-in-general/* > [2013, February 26].

Davoudi, Simin (2003) Polycentricity in European Spatial Planning: From an Analytical Tool to a Normative Agenda. *European Planning Studies* 11: 8, pp. 979–999.

Dupuy, Gabriel (2008). *Urban Networks: Network Urbanism*. 296 pp. Island Press, Washington, DC.

EEA (2006). Urban Sprawl in Europe: The Ignored Challenge. *EEA Report* 2006: 10. 56 pp. European Environment Agency, Copenhagen.

Fastpak (2010). Property tax register (Fastighetstaxeringsregistret). Statistics Sweden / TRF Growth and Regional Planning Administration, Stockholm.

Florida, Richard (2002). *Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*. 434 pp. Basic Books, New York.

Framtida Stockholm, Det (1945). Riktlinjer för Stockholms generalplan. 108 pp. Beckman, Stockholm.

Företagsregistret (2011). Company register. Statistics Sweden / TRF Growth and Regional Planning Administration, Stockholm.

Gehl, Jan (2010). *Cities for People*. 269 pp. Island Press, Washington D.C.

Hall, Peter (2002). *Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century*. 553 pp. Blackwell, Oxford.

Howard, Ebenezer (1965). Garden Cities of To-morrow. [Originally published in 1898 as To-morrow: A Peaceful Path to Real Reform.] 165 pp. M.I.T. Press, Cambridge.

HSL (2014). Helsingin seudun liikennejärjestelmäsuunnitelma HLJ 2015 -luonnos. 89 pp. *HSL:n julkaisuja* 2014: 16. Helsinki Regional Transport Authority, Helsinki.

Joutsiniemi, Anssi (2010). *Becoming Metapolis: A Configurational Approach*. 349 pp. Tampere University of Technology, Department of Architecture, Tampere.

Jun, Myung-Jin (2004). The Effects of Portland's Urban Growth Boundary on Urban Development Patterns and Commuting. *Urban Studies* 41: 7, pp. 1333–1348.

Kallstenius, Per (2010). *Minne och vision. Stockholms stadsutveckling i dåtid, nutid och framtid*. 279 pp. Max Ström, Stockholm.

Kanninen, Vesa, Panu Kontio, Raine Mäntysalo, Mika Ristimäki (ed.) (2010). Autoriippuvainen yhdyskunta ja sen vaihtoehdot. *YTK:n julkaisuja* B 101. 160 pp. Centre for Urban and Regional Studies, Aalto University, Espoo.

Klaassen, Leo H., Willem Molle, Jean H. P. Paelinck (1981). *Dynamics of Urban Development*. 267 pp. Gower, Aldershot.

Kloosterman, Robert C. & Sako Musterd (2001). The Polycentric Urban Region: Towards a Research Agenda. *Urban Studies* 38: 4, pp. 623–633.

Kosonen, Leo (2007). Kuopio 2015: jalankulku-, joukkoliikenne- ja autokaupunki. *Finnish Environment* 2007: 36. 100 pp. Ministry of the Environment, Helsinki.

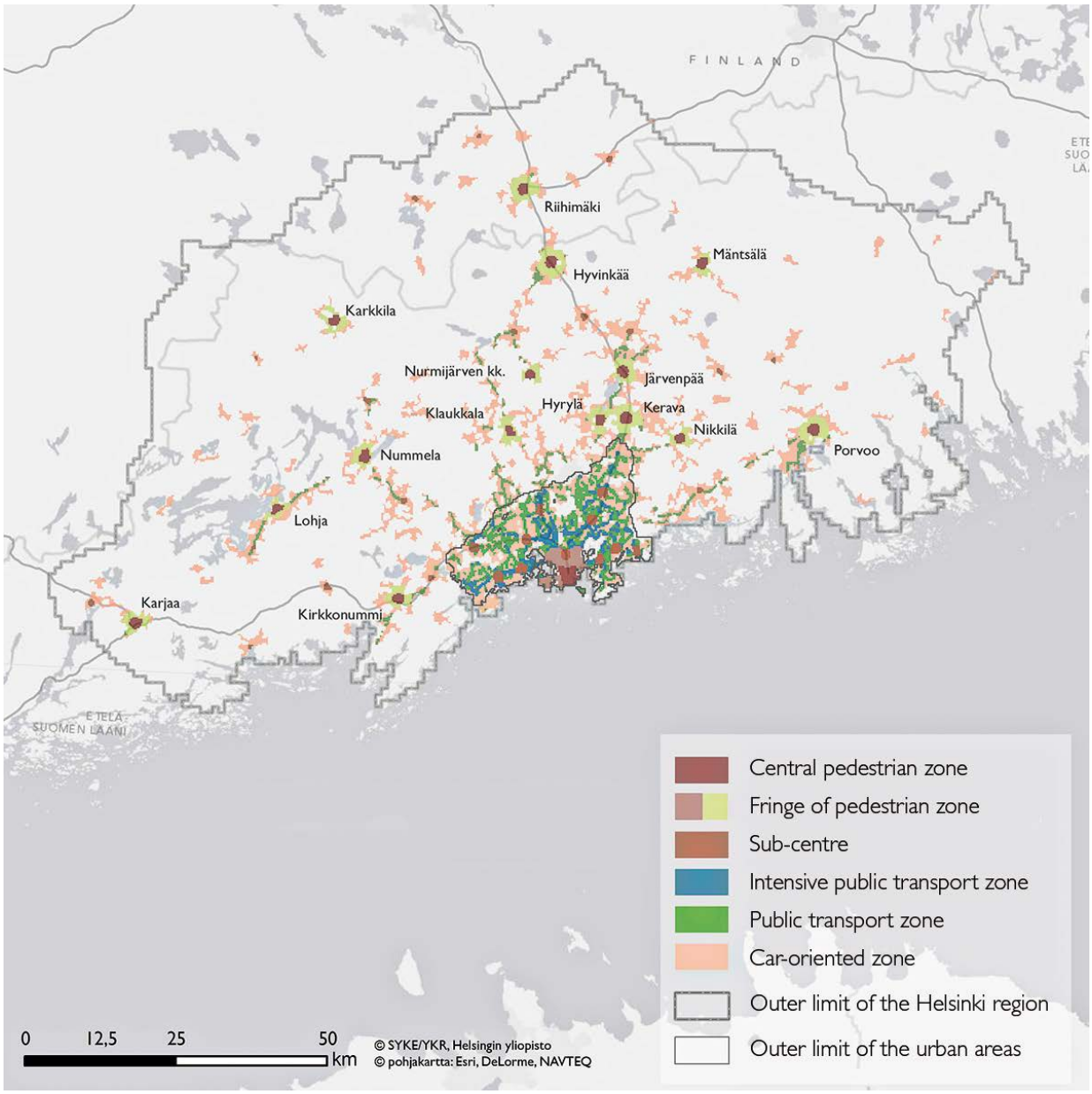
Kosonen, Leo (2013). *Model of Three Urban Fabrics: Adapted for Finnish Intermediate Cities*. <*http://urbanfabrics.fi/*> [2014, March 13].
KSV (2012). Pyöräliikenteen suunnitteluohje: Osa 1(2). 25 pp. Helsinki City Planning Department, Helsinki.
KSV (2013). Urban Plan: The New Helsinki City Plan: Vision 2050. Reports by the Helsinki City Planning Department general planning unit 2013: 23. 83 pp. Helsinki City Planning Department, Helsinki.
KSV (2014). Kaupunkikaava: Helsingin uusi yleiskaava. Luonnos 25.11.2014. KSV:n yleissuunnitteluosaston selvityksiä 2014: 44. 151 pp. Helsinki City Planning Department, Helsinki.
MAL (2012). MAL letter of intent between the state and the municipalities in the Helsinki region 2012–2015 (in Finnish). 20 pp. Helsinki, 20.6.2012.
MAL (2014a). Helsingin seudun maankäyttösuunnitelma 2050. Draft. 19 pp. Greater Helsinki municipalities.
MAL (2014b). Helsingin seudun asuntostrategia 2025. Draft. 48 pp. Greater Helsinki municipalities.
Manninen, Rikhard, Anne Karlsson & Susa Tulikoura (2011). Innovaatioinfrastruktuuri ja kaupunkirakenteen suunnittelu. *In* Sculmann Harry & Pasi Mäenpää (ed.): *Kaupungin kuumat lähteet: Helsingin metropolialueen innovaatioympäristöt*, pp. 210–224. City of Helsinki Urban Facts, Helsinki.
Marchetti, Cesare (1994). Anthropological Invariants in Travel Behavior. *Technological Forecasting and Social Change* 47, pp. 75–88.
Meijers, Evert & Arie Romein (2003). Realizing potential: Building regional organizing capacity in polycentric urban regions. *European Urban and Regional Studies*, 10: 2, pp. 173–186.
Newman, Peter & Jeffrey Kenworthy (1996). The land use – transport connection. *Land Use Policy*. 13: 1, pp. 1–22.
Newman, Peter & Jeffrey Kenworthy (1999). *Sustainability and Cities: Overcoming Automobile Dependence*. 442 pp. Island Press, Washington D.C.
Newman, Peter, Leo Kosonen & Jeff Kenworthy (2015). Theory of Urban Fabrics: Planning the Walking, Transit and Automobile City. Manuscript submitted to Town Planning Review.
Nilsson, Kjell (2011). *Peri-urban land use relationships: Strategies and sustainability assessment tools for urban-rural linkages: Final activity report*. 44 pp. University of Copenhagen, Kööpenhamina.
Norppa, Miika & Harry Schulman (2011). Helsingin seudun yritysklusterit. *In* Schulman, Harry & Pasi Mäenpää (ed.): *Kaupungin kuumat lähteet: Helsingin metropolialueen innovaatioympäristöt*, pp. 182–209. City of Helsinki Urban Facts, Helsinki.
ODB (2000; 2010). Area database of Regional Planning Administration (Regionplanekontorets områdesdatabas). Statistics Sweden / TRF Growth and Regional Planning Administration, Stockholm.
OECD (2003). Helsinki, Finland. *OECD Territorial Reviews*. 235 pp. OECD Publications, Paris.
OECD (2005). Finland. *OECD Territorial Reviews*. 216 pp. OECD Publications, Paris.
OECD (2006b). Stockholm, Sweden. *OECD Territorial Reviews*. 216 p. OECD Publishing, Paris.
OECD (2010). Sweden. *OECD Territorial Reviews*. 272 pp. OECD Publications, Paris.
Oswald, Franz & Peter Baccini (2003). *Netzstadt: Designing the Urban.* 303 pp. Birkhäuser, Basel.
Piorr, Annette, Joe Ravetz, Ivan Tosics (2011). *Peri-Urbanisation in Europe: Towards European Policies to Sustain Urban-Rural Futures*. 144 pp. University of Copenhagen, Copenhagen.
Promenadstaden (2010). Översiktsplan för Stockholm (Available in English: The Walkable City: Stockholm City Plan). 88 pp. City Planning Administration, Stockholm.
Ravetz, Joe, Christian Fertner & Thomas Sick Nielsen (2013). The Dynamics of Peri-Urbanization. *In* Nilsson, Kjell, Stephan Pauleit, Simon Bell, Carmen Aalbers, Thomas Sick Nielsen (ed.): *Peri-urban futures: Scenarios and models for land use change in Europe*, pp. 13–44. Springer, Berlin.
Rehunen, Antti & Mika Ristimäki (2012). *Yhdyskuntarakenteen toiminnalliset alueet Suomessa*. 64 pp. Finnish Environment Institute, Helsinki.
Ristimäki, Mika, Hanna Kalenoja & Maija Tiitu (2011). Yhdyskuntarakenteen vyöhykkeet: Vyöhykkeide kriteerit, alueprofiilit ja liikkumistottumukset. *Publications of the Ministry of Transport and Communications* 2011: 15. 97 pp. Ministry of Transport and Communications, Helsinki.
Ristimäki, Mika, Maija Tiitu, Hanna Kalenoja, Ville Helminen & Panu Söderström (2013). Yhdyskuntarakenteen vyöhykkeet Suomessa: Jalankulku-, joukkoliikenne- ja autovyöhykkeiden kehitys vuosina 1985–2010. *Syke reports* 2013: 32. 141 pp. Finnish Environment Institute, Helsinki.
RUFS (2010). *Regional development plan for the Stockholm region: How we will become Europe's most attractive metropolitan region*. 261 pp. Stockholm County Council, Stockholm.
SCB (2005). Geografin i statistiken: regionala indelningar i Sverige. *Meddelanden i samordningsfrågor för Sveriges officiella statistik* 2005: 2. 42 pp. Statistics Sweden, Stockholm & Örebro.
SCB (2015). Folkmängden i Sveriges kommuner 1950–2014. Statistics Sweden, Stockholm & Örebro.
Schulman, Harry & Ari Jaakola (2009). KARA – Kaupunkirakenteen kehityspiirteet. Esitutkimus Helsingin ja Turun työssäkäyntialueilta. *Tutkimuskatsauksia* 2009: 6. City of Helsinki Urban Facts, Helsinki.
Sieverts, Thomas (2003). *Cities without cities: An interpretation of the Zwischenstadt.* 181 pp. Spon Press, London.
Silfverberg, Leena (2012). Traffic planning, Helsinki City Planning Department. Interview 2012, September 12.
SLL (2000). Coordinate-based GIS-data about population in 2000. TRF Growth and Regional Planning Administration, Stockholm.
SLL/SCB (2013). Befolkningsutvecklingen 2012 i Stockholms län. *Demografisk rapport* 2013: 1. 24 p. Stockholm County Council & Statistics Sweden.
SLL/SCB (2014). Stockholms län: Huvudrapport. Befolkningsprognos 2014–2023/45. *Demografisk rapport* 2014: 04. 87 pp. Stockholm County Council & Statistics Sweden.
Stockholmsöverenskommelsen (2013). Överenskommelse om finansiering och medfinansiering av utbyggnad av tunnelbanan samt ökad bostadsbebyggelse i Stockholms län enligt 2013 års Stockholmsförhandling. <*http://stockholmsforhandlingen.se/accounts/10965/files/262.pdf*> [2015, April 21].

Ståhle, Alexander (2012). Researcher, landscape architect: Spacescape & Royal Institute of Technology. Interview 2012, September 11.
Szalai, Alexander (ed.)(1972). Use of Time: Daily Activities of Urban and Suburban Populations in Twelve Countries. 868 pp. Mouton, Hague.
Söderström, Panu (2012). Elävät kaupunkikeskukset: Kaupunkiympäristön monipuolisuus ja laatu verkostokaupungin keskuksissa. *Finnish Environment* 2012: 32. 132 pp. Finnish Environment Institute, Helsinki.
Söderström, Panu; Harry Schulman & Mika Ristimäki (ed.) (2014). Pohjoiset suurkaupungit: Yhdyskuntarakenteen kehitys Helsingin ja Tukholman metropolialueilla. Syke publications 2. 312 pp. Finnish Environment Institute, Helsinki.
SF (2012). Population changes 2001–. Statistics Finland & Helsinki Region Infoshare, Helsinki.
SF (2015). Population of the Helsinki region by age brackets 1.1. 1976. Statistics Finland & Helsinki Region Infoshare, Helsinki.
Tillväxtanalys (2011). Typologisering av FA-regioner utifrån ett stad-land perspektiv. *Working paper* 2011: 47. 28 pp. Tillväxtanalys, Stockholm.
UL (2007). Uudenmaan maakuntakaava: Selostus. *Uudenmaan liiton julkaisuja A* 17. 220 pp. Helsinki–Uusimaa Regional Council, Helsinki.
UL (2013). Uudenmaan 2. vaihemaakuntakaava. Selostus. 172 pp. Helsinki–Uusimaa Regional Council, Helsinki.
Vaismaa, Kalle, Jorma Mäntynen, Pasi Metsäpuro, Terhi Luukkonen, Tuuli Rantala & Kaisa Karhula (2011). *Parhaat eurooppalaiset käytännöt pyöräilyn ja kävelyn edistämisessä*. (Available in English: Best European practices in promoting cycling and walking). 269 pp. Transport Research Centre Verne, Tampere University of Technology, Tampere.
VAT (2008). National land use guidelines (in Finnish). <*http://www.ymparisto.fi/vat*> [2015, April 21].
van Wee, Bert; Piet Rietveld, Henk Meurs (2006). Is average daily travel time expenditure constant? In Search of explanations for an increase in average travel time. Transport Geography 14: 2, pp. 109–122.
WSP (2008). *Greater Helsinki Vision 2050: "Emerald"*. WSP Finland Oy, Helsinki.
Ylä-Anttila, Kimmo (2010). *Verkosto kaupunkirakenteen analyysin ja suunnittelun välineenä*. 227 pp. Tampere University of Technology, Department of Architecture, Tampere.
YKR. Finnish Monitoring System of Spatial Structure. Finnish Environment Institute & Statistics Finland, Helsinki.

LIST OF FIGURES

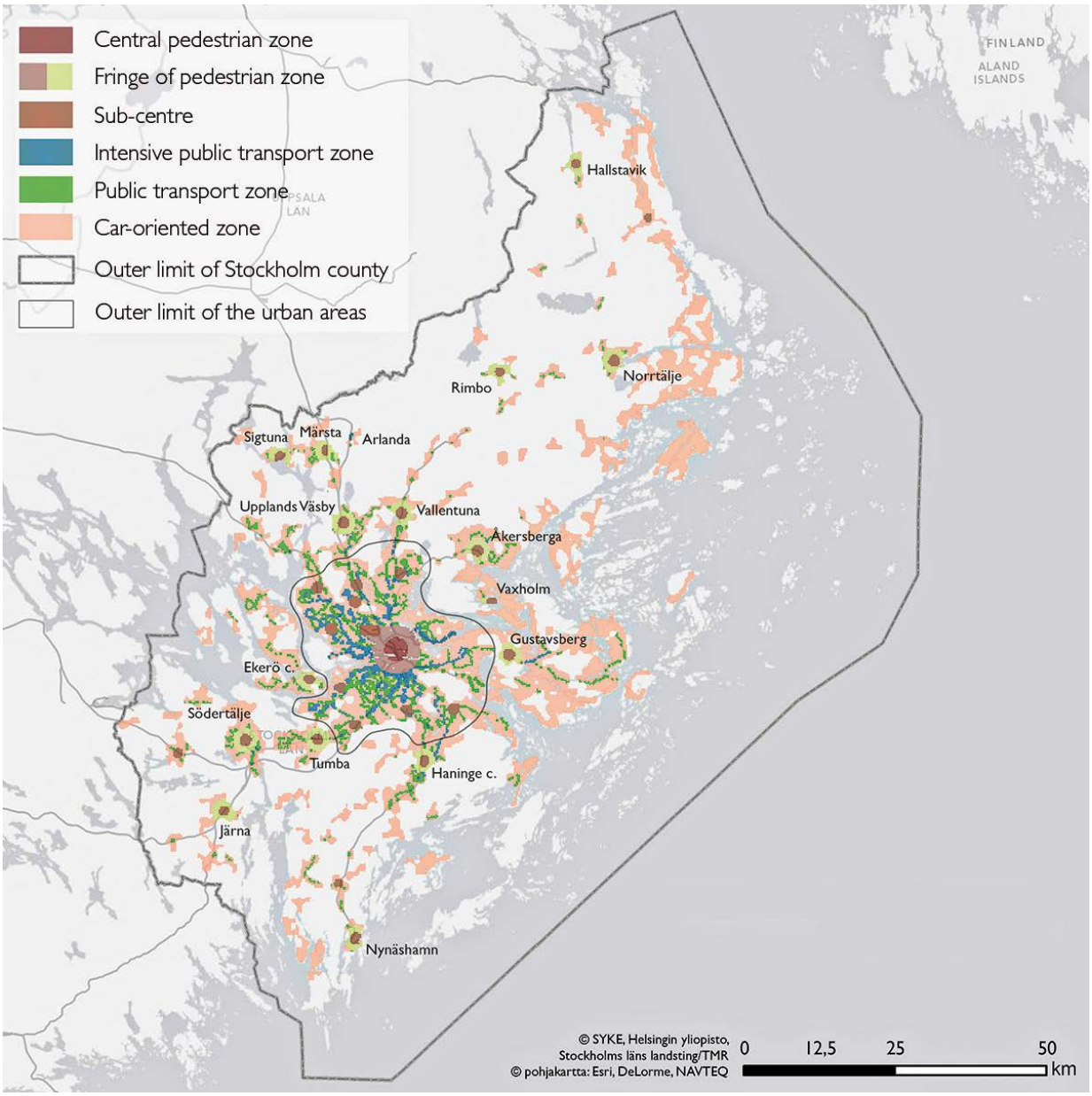
APPENDIX 1

Zone division of the urban form in the Helsinki region



APPENDIX 2

Zone division of the urban form in the Stockholm region



DOCUMENTATION PAGE

Publisher	Finnish Environment Institute	Date May 2015
Author(s)	Panu Söderström, Harry Schulman and Mika Ristimäki	
Title of publication	Urban form in the Helsinki and Stockholm city regions: Development of pedestrian, public transport and car zones	
Publication series and number	Reports of the Finnish Environment Institute 16/2015	
Theme of publication		
Parts of publication/ other project publications	The publication is available in the internet: www.syke.fi/publications | helda.helsinki.fi/syke	
Abstract	The study focuses on differences and similarities of land use patterns, regional and urban structures and traffic systems in the Helsinki and Stockholm city regions. The viewpoint of the study is connected to the theory of three urban fabrics (walking city, transit city, car city). The fabrics differ from each other in terms of their physical structure and the travel alternatives they offer. In the GIS analyses, the studied metropolitan regions are divided into urban, peri-urban and rural areas, which are further classified into travel-related zones (pedestrian, transit and car-oriented). Statistical data about the amounts and densities of population and workplaces can thus be compared in a rather detailed spatial level between different parts of the metropolitan areas. Finnish city regions have been studied using the travel related zone model quite widely. However it has not been possible to compare Helsinki region to any other city region in Finland, because Helsinki region is the only international level metropolitan area in the country. In this report the zone analyses is extended to a comparison of two Nordic capital regions. The results of the study indicate that Stockholm has managed to channel the growth of the metropolitan area more inwards, densifying the inner areas of the city region. In the Helsinki region the growth has turned from the peri-urban areas to the core areas notably later, but since 2008 the growth of the core areas has been dominant also in Helsinki.	
Keywords	urban form, urban regions, transport, Helsinki, Stockholm	
Financier/ commissioner	Helsinki Metropolitan Region Urban Research Program, Finnish Environment Institute (SYKE)	
	ISBN (pdf) 978-952-11-4494-3	ISSN (online) 1796-1726
	No. of pages 68	Language English
	Restrictions public	
Financier of publication	Finnish Environment Institute (SYKE), P.O. Box 140, FI-00251 Helsinki, Finland Phone +358 295 251 000	

KUVAILULEHTI

Julkaisija	Suomen ympäristökeskus	Julkaisuaika Toukokuu 2015
Tekijä(t)	Panu Söderström, Harry Schulman ja Mika Ristimäki	
Julkaisun nimi	Yhdyskuntarakenne Helsingin ja Tukholman seuduilla: Jalankulku-, joukkoliikenne- ja autovyöhykkeen kehitys	
Julkaisusarjan nimi ja numero	Suomen ympäristökeskuksen raportteja 16/2015	
Julkaisun teema		
Julkaisun osat/ muut saman projektin tuottamat julkaisut	Julkaisu on saatavana vain internetistä: www.syke.fi/julkaisut | helda.helsinki.fi/syke	
Tiivistelmä	Tutkimuksessa syvennytään Helsingin ja Tukholman kaupunkiseutujen eroihin ja yhtäläisyyksiin maankäytön, yhdyskuntarakenteen ja liikennejärjestelmän kehityksen näkökulmasta. Tutkimuksen näkökulmaan liittyy kiinteästi ajatus kolmesta kaupunkijärjestelmästä, jalankulku-, joukkoliikenne ja autokaupungista, jotka eroavat toisistaan niin fyysiseltä rakenteeltaan kuin myös alueiden tarjoamien liikkumisen vaihtoehtojen suhteen. Alueiden tarkastelussa sovelletaan kaksitasoista aluejakoa. Tarkasteltavat kaupunkiseudut on jaettu yleisellä tasolla erityyppisiin ydin-, kehys- ja maaseutualueisiin. Tarkemmalla tasolla tarkastelua jäsentää alueiden jaottelu yhdyskuntarakenteen vyöhykemenetelmää soveltaen jalankulku, joukkoliikenne- ja autovyöhykkeiksi. Suomalaisia kaupunkiseutuja on tutkittu yhdyskuntarakenteen vyöhykenäkökulmasta laajasti. Suomen kaupunkiseutujen joukosta ei kuitenkaan ole löydettävissä sopivan kokoluokan vertailukohtaa Helsingin seudulle, joka on maan ainut kansainväliset mitat täyttävä metropolialue. Tässä tutkimusraportissa vyöhyketarkastelua laajennetaan pohjoismaiseen vertailuun, joka mahdollistaa myös Helsingin kehityksen peilaamisen toiseen pohjoismaiseen pääkaupunkiin. Tutkimuksen tulosten perusteella Tukholman seudulla kaupunkiseudun kasvu on saatu kanavoitua Helsinkiä voimakkaammin sisäänpäin, tiivistäen seudun ydinosien rakennetta. Helsingin seudulla kasvun painopiste on kääntynyt kehysalueilta kohti seudun ydintä selvästi myöhemmin, mutta vuodesta 2008 lähtien myös Helsingin seudulla on painottunut ydinalueiden kasvu.	
Asiasanat	yhdyskuntarakenne, kaupunkiseudut, liikenne, Helsinki, Tukholma	
Rahoittaja/ toimeksiantaja	Kaupunkitutkimus- ja metropolipolitiikka -ohjelma, Suomen ympäristökeskus (SYKE)	
	ISBN (pdf) 978-952-11-4494-3	ISSN (verkkoj.) 1796-1726
	Sivuja 68	Kieli englanti
	Luottamuksellisuus julkinen	
Julkaisun kustantaja	Suomen ympäristökeskus (SYKE), syke.fi PL 140, 00251, Helsinki Puh. 0295 251 000	

PRESENTATIONSBLAD

Utgivare	Finlands miljöcentral	Datum Maj 2015
Författare	Panu Söderström, Harry Schulman och Mika Ristimäki	
Publikationens titel	Samhällsstruktur i Helsingfors och Stockholms stadsregioner: Utveckling av gång-, kollektivtrafik- och bildominerade zon	
Publikationsserie och nummer	Finlands miljöcentrals rapporter 16/2015	
Publikationens tema		
Publikationens delar/ andra publikationer inom samma projekt	Publikationen finns tillgänglig på internet: www.syke.fi/publikationer | helda.helsinki.fi/syke	
Sammandrag	I undersökningen fördjupar man sig i skillnader och likheter mellan Helsingfors och Stockholmsregionen ur markanvändningens, samhällstrukturens och trafiksystemets synvinkel. Undersökningens synvinkel anknyter starkt till idén om tre olika stadstyper: gångstaden, kollektivtrafikstaden och bilstaden. Dessa stadstyper skiljer sig från varandra såväl till den fysiska strukturen som till de alternativ områdena erbjuder för människors dagliga rörelsemöjligheter. Vid granskningen av områdena tillämpas en regionindelning bestående av två nivåer. De granskade stadsregionerna har på en generell nivå indelats i olika typer av stadsmässiga, peri-urbana och landsbygdsmässiga områden. På den mer detaljerade nivån har områdena strukturerats genom att tillämpa samhällsstrukturens zonindelning i gång-, kollektivtrafik- och bildominerade områden. Stadsregioner i Finland har i en stor utsträckning analyserats ur samhällsstrukturens zonperspektiv. Bland de finska stadsregionerna finns det dock inte en jämförbar stadsregion i passande storleksklass, eftersom Helsingfors är landets enda metropolområde som uppfyller internationella mått. I rapporten zongranskningen har expanderats till nordisk jämförelse, som möjliggör att jämföra Helsingfors utveckling till en annan nordisk huvudstad. Forskningsresultaten antyder att i Stockholmsregionen man har lyckats kanalisera stadsregionens tillväxt mer inåt än i Helsingfors, så att de innersta delarna av regionen har blivit tätare. I Helsingforsregionen peri-urbana områden har vuxit kraftigt i början av 2000-talet, men efter 2008 tillväxten har också i Helsingforsregionen kantrat alltmer mot urbana kärnområden.	
Nyckelord	samhällsstruktur, stadsregioner, trafik, Helsingfors, Stockholm	
Finansiär/ uppdragsgivare	Stadsforskning och metropolpolitik -program, Finlands miljöcentral (SYKE)	
	ISBN (pdf) 978-952-11-4494-3	ISSN (online) 1796-1726
	Sidantal 68	Språk engelska
	Offentlighet Offentlig	
Förläggare	Finlands miljöcentral (SYKE), PB 140, 00251 Helsingfors Tel. 0295 251 000	

This publication compares the development of the Helsinki and Stockholm city regions from the perspective of urban form and the traffic system. The viewpoint of the study centres on the notion of three urban fabrics – walking city, transit city and car city – which differ in terms of their physical structure and the travel alternatives they offer.

Based on the results of the study, growth in the Stockholm region has been channelled inward more strongly than in Helsinki, which has increased the structural density of Stockholm's core areas. During recent years, however, the Helsinki region has followed suit with the direction of migration turning from the peri-urban municipalities towards the city at the centre.

SYKE

UNIVERSITY OF HELSINKI

HELSINKI METROPOLITAN REGION
URBAN RESEARCH PROGRAM

ISBN 978-952-11-4494-3 (PDF)
ISSN 1796-1726 (ONLINE)

URBAN FORM IN THE HELSINKI AND STOCKHOLM CITY REGIONS
DEVELOPMENT OF PEDESTRIAN, PUBLIC TRANSPORT AND CAR ZONES

FINNISH ENVIRONMENT INSTITUTE