

# INCREASING URBAN DENSITY IN THE NORTHERN JÆREN REGION



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**INCREASING URBAN DENSITY IN  
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Stavanger, June 15th 2018

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## **Abstract**

The purpose of this thesis is to explore the possible opportunities the Northern Jæren region has for future developments with regards to residential housings, and the location of industries. The compact city concept has become a symbol of sustainable urban development, and the concept is prevalent throughout the thesis.

Firstly, the thesis will explore the background for choosing the theme, and how the concept of a compact city has grown in importance with regards to sustainability. Hanssen, Hofstad and Saglie (2015) explored the opportunities and challenges with a compact urban development, and we have chosen to further explore the benefits of a more compact development, and which barriers the region faces in this work. We have also researched different economic tools the municipalities in the Northern Jæren region can use to promote increased urban density.

In order to examine the research questions, we have used qualitative interviews and previous research literature. We interviewed six individuals with different roles in the private and public sector, in order to get a broader understanding of the issues the region is facing, and the potential opportunities we must take advantage of.

Our main finding is that a strong advocate is needed in the region to push forward a change. Hence, our recommendation is that Rogaland County Council enforce strict guidelines to ensure the region is working towards increasing urban density, and that they follow up to ensure that these guidelines are met.

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# 1 Introduction

## 1.1 Background, and choosing theme and case

The concept of a compact city has been rising in popularity since the Brundtland report, ‘*Our Common Future*’, was released in 1987. The report seeks to balance economic, social and environmental development in order to create a better and more sustainable society for today's and future generations. A proposed solution is compact cities, an urban area where the inhabitants have a short distance between homes, jobs and services. According to Burton, Jenks & Williams (2003) “*The arguments are, by now, familiar: in more compact cities travel distances are reduced, thus fuel emissions are lessened, rural land is saved from development, local facilities are supported and local areas become more autonomous*”.

By 2050, 66 percent of the world's population is expected to live in cities. With more and more people expected to live in urban areas, the importance of clean, safe, resource efficient, resilient, and more inclusive cities will increase (DNV GL, 2017). Compactness is needed for cities to reach a high level of sustainability. Sustainability will be reached at the city level by minimization of area consumption, and that will result in a lower transport and resource consumption (Hanssen, Hofstad, & Saglie, 2015, ch. 1).

According to Norwegian Environment Agency (2007), CO<sub>2</sub> emissions will be 9 million tons higher in 2020 than in 1990 if actions are not made. In the national budget for 2007, the government purposed an annual energy efficiency improvement at 1 percent. In order to meet this goal, the government will target the transportation sector and improve its energy efficiency. With this in mind, this thesis will explore the potential reductions of CO<sub>2</sub> emissions in the Northern Jæren region by living more compact.

We find the topic of compact city interesting largely due to the sustainability aspect of it. ‘*Grønn By*’ approached us with an idea of writing about ways to lower the CO<sub>2</sub> emissions in the Northern Jæren region, by developing a more compact city. Qualitative interviews are the chosen methods of data collection. By interviewing several actors in the society, the thesis will gain information about the challenges the region has with regards to sustainability.



Is the compact city a romantic ideal, or is it in fact the future? This research will look at the benefits of a compact city, examine which barriers must be overcome to have one, and explore the economic tools the municipalities can use to promote urban density.

## **1.2 Objectives and research questions**

The thesis will look at how we can increase urban density at the Northern Jæren region.

In order to examine this, we have three research questions:

*What benefits will higher density bring?*

*What are the barriers for higher population density in urban areas?*

*Which economic tools can the municipalities implement to promote urban density?*

The three questions will be examined and presented separately throughout the thesis.

## **1.3 The area under study**

This thesis will focus on the Northern Jæren region in Rogaland county. The region consists of four municipalities, namely Stavanger, Sandnes, Sola and Randaberg. The main population and industry are located in the two largest municipalities; Stavanger and Sandnes. The Northern Jæren region have a high share of commuting activity across the different municipalities, as people often live and work in different municipalities. Our focus will be on the urban sprawl that have occurred, and to find ways to move towards a more compact region.

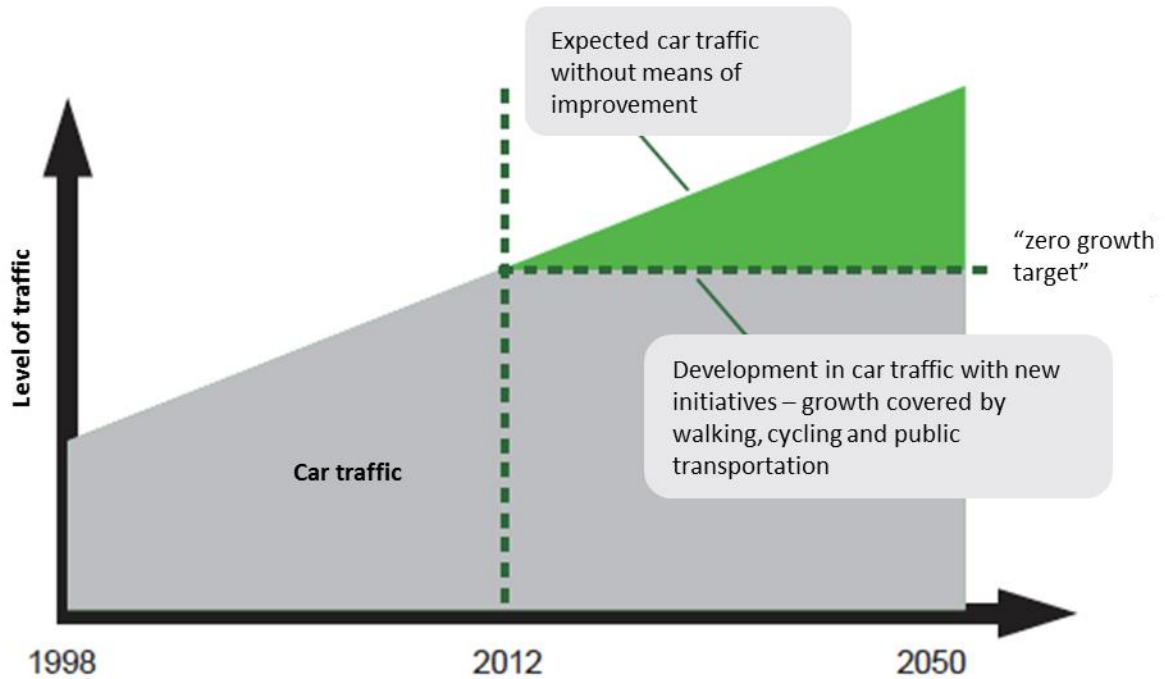


Figure 1.1 – Area under study

(Statens vegvesen, 2017).

Recently, the four municipalities signed an agreement; ‘*Bypakke Nord-Jæren*’, to reach a zero growth target in the transportation sector by reducing CO2 emissions. ‘*Bypakke Nord-Jæren*’ will have its main focus on reaching the zero growth target by using different means, such as putting restrictions on private transportation, area policy, public transportation promotional measures, and measures for cycling and walking (Statens vegvesen, 2017). In this region, a new toll system is enacted, and in fall 2018 it will be implemented. This toll system has a higher price than the current one, a rush hour fee, and there are several toll zones.

The figure below illustrates how the expected zero growth target will be reached if the means are met. However, the figure also highlights the growth if actions are not made (Rogaland County Council, 2015, p. 10). By implementing the new toll system, a decrease from 242 800 vehicles per day to 218 500 vehicles per day is expected. This adds up to a 10 percent decrease of vehicles per day (Samferdselsdepartementet, 2016, p. 18).



*Figure 1.2 – Zero growth target*

(Rogaland County Council, 2015, p. 10).

### **1.3.1 Population and industry growth**

The Jæren region have had a strong population growth over the past years. The region has grown from approximately 70,000 residents in 2000 to approximately 330,000 residents in 2015. The region has had a stronger population growth than Norway as a whole. The annual mean population growth since 2000 has been at 1.7 percent with a higher growth in the first years (Statens vegvesen, 2017, p. 8).

The main reason for the high growth in the population is due to labor migration, partly due to a high growth in the oil and gas industry. The area including the municipalities Stavanger, Sandnes, Sola and Randaberg, is Norway’s third largest city region with a strong growth in both industry and population over the past ten years. Employment growth in Rogaland has been significantly high. In 2006, for example, employment rose with 12,000 people, and 9,000 of these employments were in Sandnes, Stavanger, Randaberg and Sola due to high growth in the oil and gas industry. However, the current employment growth in the region is relatively low due to significant recession in the oil and gas industry (Statens Vegvesen,

2017, p. 8). The region has been very attractive in the past due to the driving oil and gas industry. Now the region needs to find new ways to attract individuals to the region, due to the recession.

Municipality	Population	km <sup>2</sup>	Density population/ km <sup>2</sup>
Sandnes	76 328	286,00	266,88
Stavanger	133 140	68,00	1 957,94
Sola	26 265	69,00	380,65
Randaberg	10 972	24,00	457,17

Figure 1.3 – Population density in Northern Jæren region

(Data from SSB, 2013 and SSB, 2018).

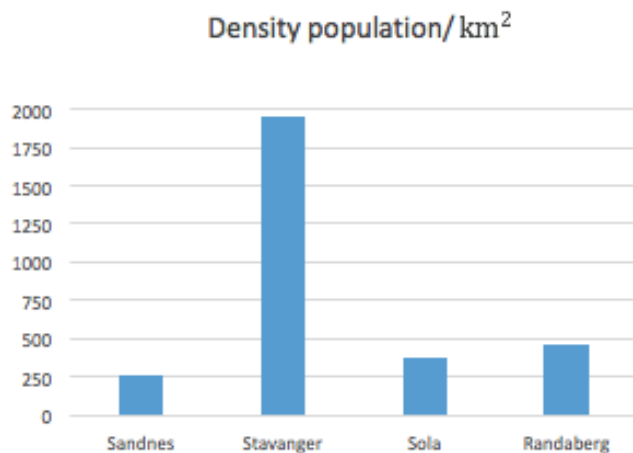
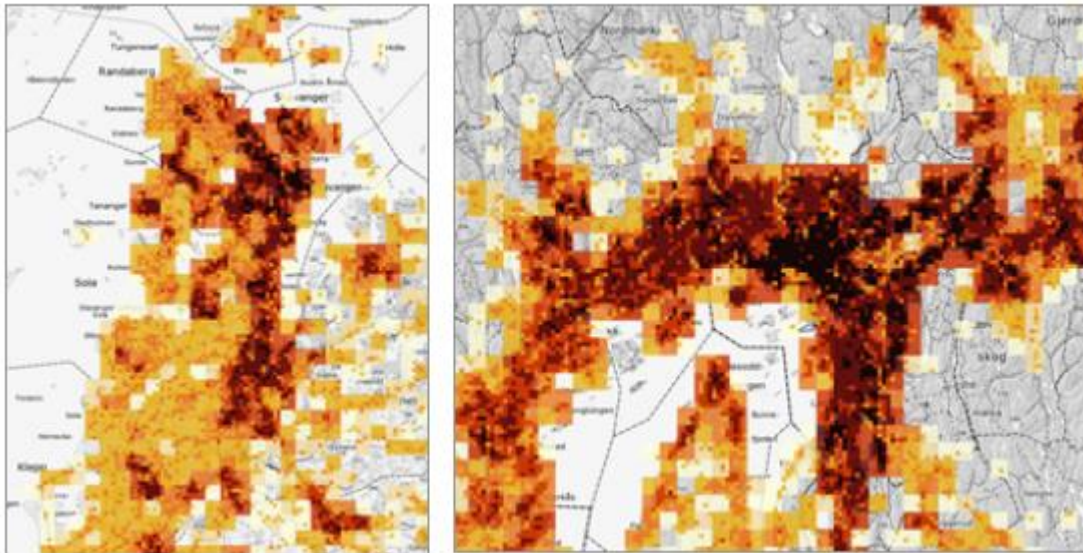


Figure 1.4 – Population density in the Northern Jæren region, shown as a graph

(Data from SSB, 2013 and SSB, 2018).

Over the past decades, the region has expanded. Even though the region now has a focus on better area utilization, the current trend illustrates that the region is still expanding. During the period 2000 to 2012, the urban area in the Jæren region increased by almost 18 km<sup>2</sup>. Consequently, during the same period, the population density increased from 2067 per km<sup>2</sup> to 2219 per km<sup>2</sup>. The figure below illustrates the population density in the Northern Jæren region and Oslo region. It clearly demonstrates that the Oslo region have a much

higher population density, and that the Northern Jæren region have a great potential towards reaching a higher population density (Rogaland County Council, 2015, p. 32).

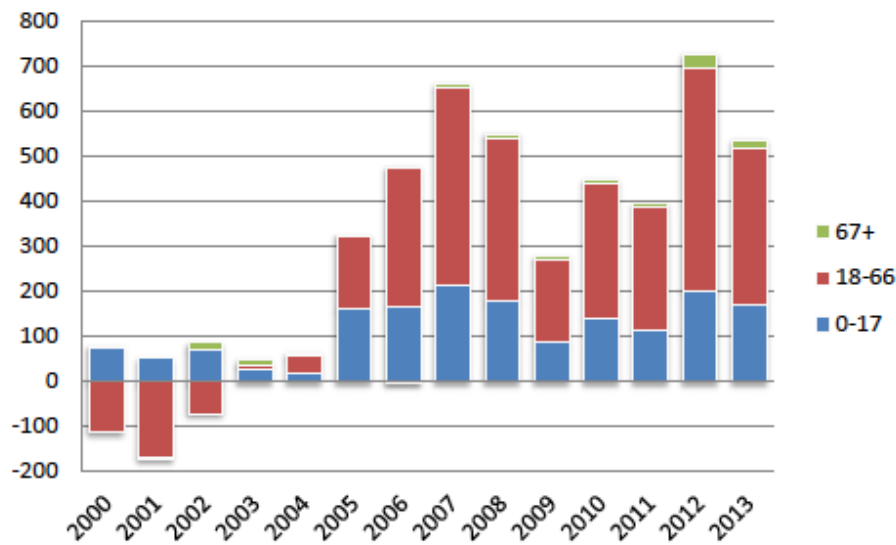


*Figure 1.5 – Population density in the Stavanger region (on the left) and the Oslo region (on the right)*

(Rogaland County Council, 2015, p. 32).

Further, the area utilization in the region is relative low even though the regional plan has been trying to push forward densification. Surprisingly, many of the regions new development areas have a lower area utilization than the older residential areas. Additionally, the regional plan strives to reach a goal of 50 percent of new residential developments to happen through densification. However, during the period 2004 - 2013 the densification of new residential developments were at approximately 45 percent (Rogaland County Council, 2015, p. 31).

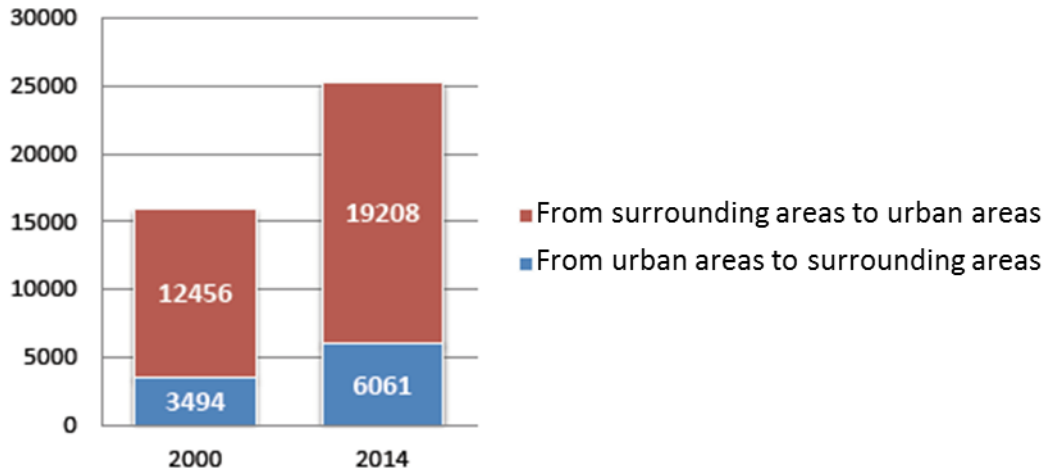
Further, the region has had a tendency in the past decades towards people moving from the city municipalities, and to the surrounding municipalities. The graph below highlights the trend from urban municipalities to suburban municipalities. The trend has been so significant that it is bigger than the population growth in the region.



*Figure 1.6 – Net migration from urban areas to surrounding municipalities*

(Rogaland County Council, 2015, p. 9).

Additionally, the region has had a 60 percent growth in work commuting between city municipalities and the municipalities surrounding them. The graph below illustrates the growing trend of living in the suburban municipalities and working in the city municipalities. This has resulted in a society highly dependent on the car as the preferred mode of transportation (Statens vegvesen, 2017, p. 10).



*Figure 1.7 – Total number of work commuting between urban municipalities and suburban municipalities*

(Rogaland County Council, 2015, p. 11).

The urban centers in the region differ from other urban regions in Norway because Jæren region have a large proportion of small houses. The graph below displays the large difference between Stavanger and three other city regions in Norway. For instance, apartment buildings only contribute to 20 percent in the Stavanger compared to 50 percent in the Oslo region (Rogaland County Council, 2015, p. 30).

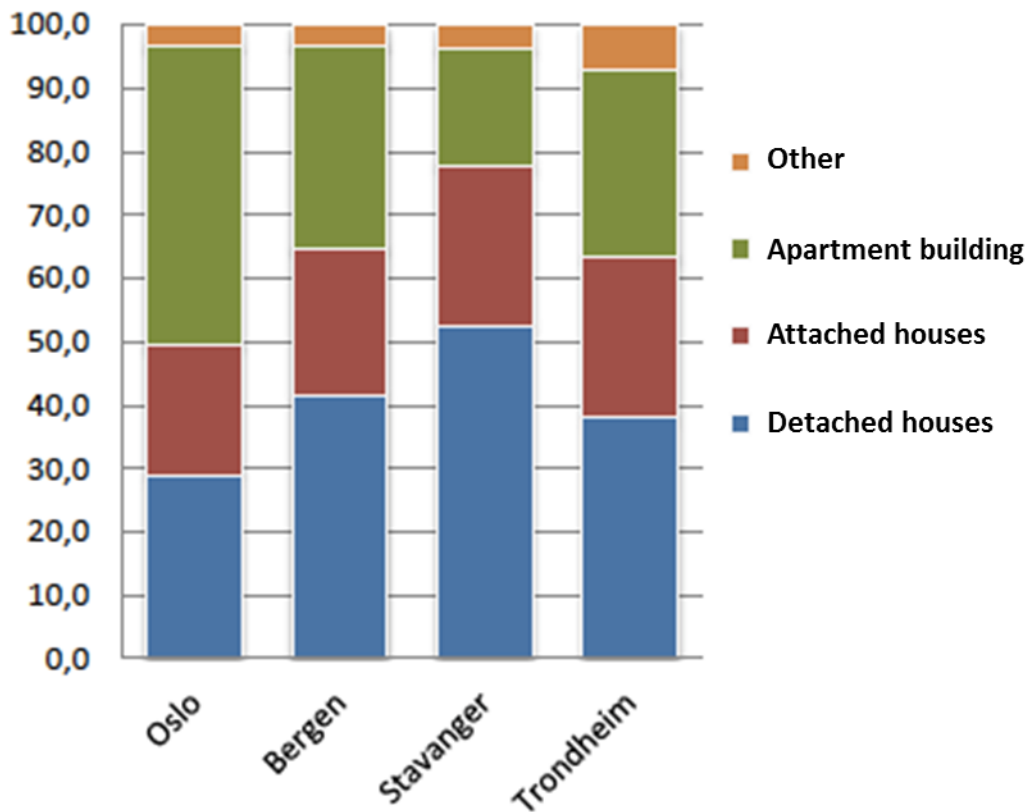


Figure 1.8 – Residential housing structure in the city regions in Norway in 2014

(Rogaland County Council, 2015, p. 30).

Further, over 70 percent of the houses in the city municipalities at Jæren are detached houses, and in the surrounding municipalities 80 percent of the houses are detached houses (Statens vegvesen, 2017, p. 10). The graph illustrates that there has been a small change in the residential housing structure. For instance, more apartments are built, but still a high share of the housing market is detached and attached houses (Rogaland County Council, 2015, p. 29).



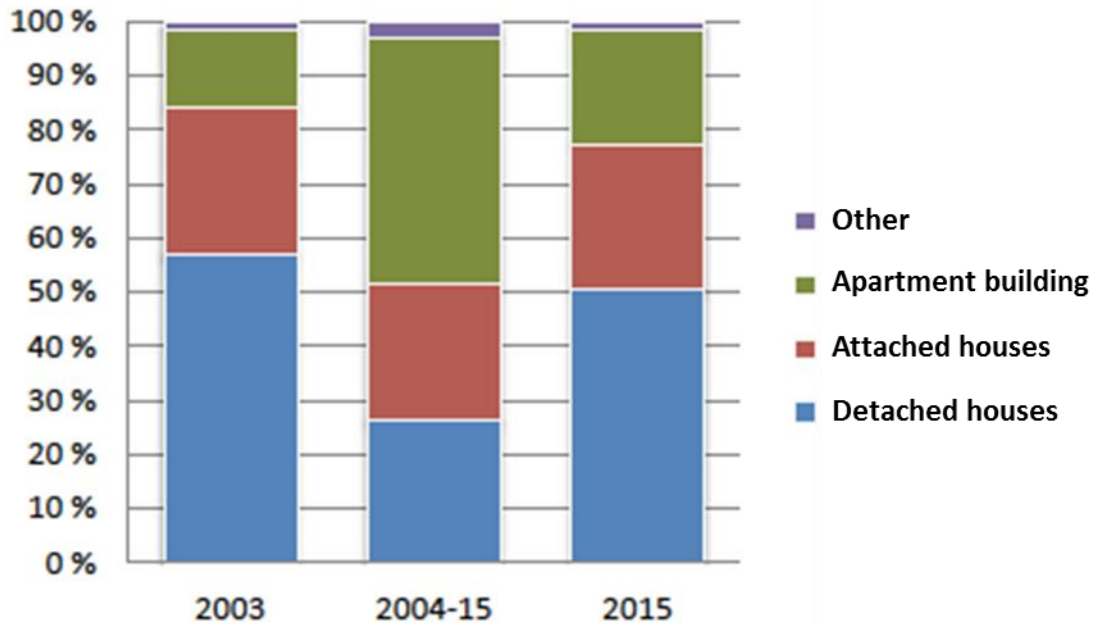


Figure 1.9 – Residential housing structure in Jæren

(Rogaland County Council, 2015, p. 29).

There has been an extreme growth in the number employed in two areas in the region over the past few decades. The first area is Forus, which have gone from employing 3,300 people in 1984 to almost 45,000 in 2014. The force of massive growth has been the driving oil and gas industry. Even though Forus has had a significant growth, the infrastructure is poor. The graph below illustrates that the main mode of transportation to get to Forus is by car, which emphasize that Forus is best reached by car.

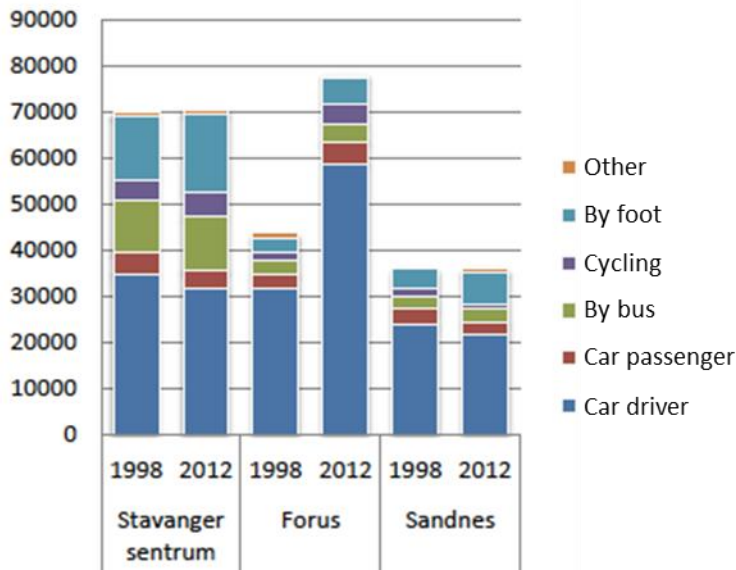


Figure 1.10 – Daily trips to Stavanger and Sandnes city center and Forus

(Rogaland County Council, 2015, p. 17).

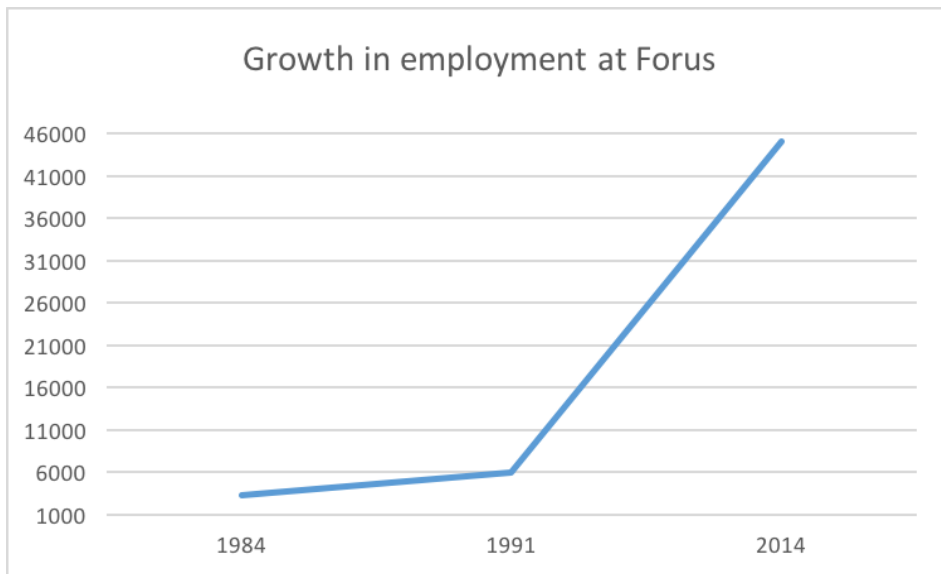


Figure 1.11 – Growth in employment at Forus

(Data from Statens vegvesen, 2017).

Risavika is another high growth area in the region. As many of the jobs are outside the urban centers, where public transportation options are poor, it creates a society based on heavy car use. Additionally, the urban centers have lost its competitive advantage to Forus and Risavika

(Statens vegvesen, 2017, p. 10). The share of workplaces in the city centers have been reduced from 64 percent to 58 percent (Rogaland, County Council, 2015, p. 17). Further, the main urban centers in the region, Stavanger and Sandnes, have not reached the target for trade within the urban center (Statens vegvesen, 2017, p. 10). The graph below illustrates where commerce has grown in the period 2008 - 2014. During the period 2008 – 2014, Stavanger city center have had a negative growth. Lura and Forus are areas where most people drive too (Rogaland County Council, 2015, p. 18).

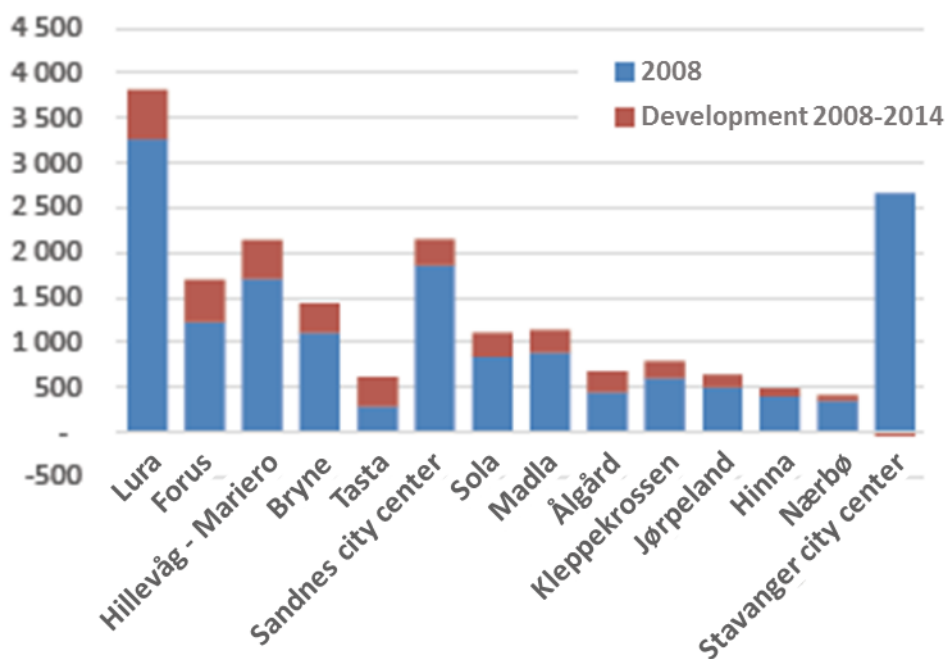


Figure 1.12 – Trade turnover in 2008 (mill. NOK), and change in the period 2008-2014

(Rogaland County Council, 2015, p. 18).

### 1.3.2 Transportation habits in the Northern Jæren region compared to Oslo/Akershus

The Institute of Transport Economics in Norway have studied the travel habits of cities in Norway and have found that 55 percent of the daily travels in the Northern Jæren region are done by car. The Northern Jæren region have one of the lowest uses of public transportation in Norway. Only 8 percent are using public transportation compared to Oslo/Akershus where 19 percent of daily travels are done by public transportation. The higher percentage of daily

travels by public transportation in Oslo/Akershus compared to Northern Jæren is explained by a better supply of public transportation services (TØI, 2013/14)

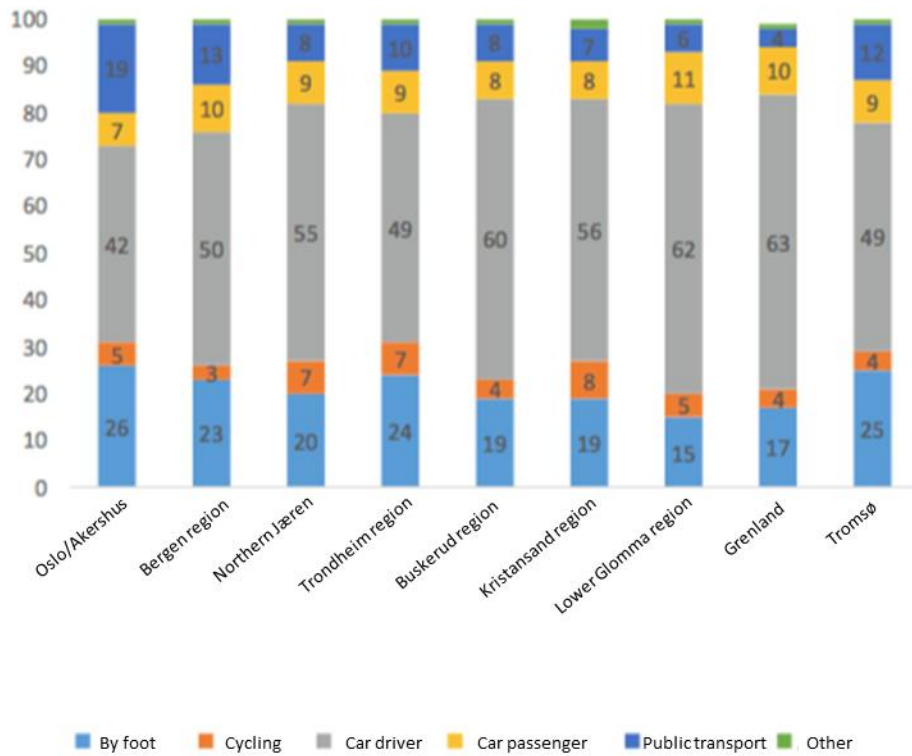


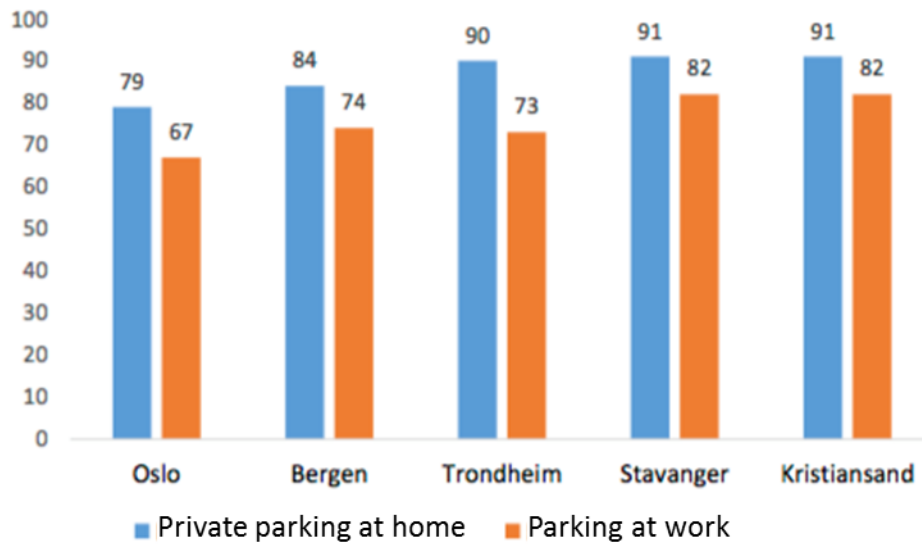
Figure 1.13 – Transportation habits in nine regions

(TØI, 2013/14).

Additionally, The Institute of Transport Economics have looked at the difference between how the public transportation is perceived by users, and how it actually is in the municipality Oslo and the Northern Jæren region. The study finds that people in the Northern Jæren region perceived the public transportation offer more negative and poorer than it actually is (TØI, 2016).

Furthermore, parking options in Northern Jæren and Oslo/Akershus differ and will explain further the higher use of public transportation in Oslo/Akershus. Stavanger have a higher percentage of parking options both in private residences and at the workplace (TØI, 2013/14).

As the offer for parking is better at the Northern Jæren, it creates an incentive for driving, and the opposite in Oslo.



*Figure 1.14 – Share of population with parking at home, and parking space at work which the employer provides, in nine city regions in 2013/2014, in percentage*

(TØI, 2013/14).

## **1.4 Delineating and clarifying**

There are several potential angles of approach when considering compact city development. It has been necessary to delineate the thesis, also because of the limited time available.

The analysis throughout the thesis is limited to the Northern Jæren region, in Rogaland county. The development of cities in Norway and around the world have established differently over time. The development of the Northern Jæren region is quite distinctive and is in need of dramatic changes in order to reduce travel distances and the need for transportation. The urban sprawl we have witnessed in this region is to a great extent due of the rapid increase in the number of families owning a car from the beginning of the 60's.

Even though there are variations within this region, the differences are somewhat smaller than if we were to look at a greater area, hence the thesis is focused around the Northern Jæren region.

The thesis is based on research literature, as well as qualitative interviews, and our objective is to look at the benefits a compact city can bring, both socially, economically and environmental. Further, the goal is to conclude on which barriers the region must focus to overcome in order to increase urban density, and which economic tools the municipalities can implement to promote this.

It is important to note early on that we find a strong link between transportation, climate and compactness in research literature (Hanssen et al., 2015, ch. 1). Based on this, our thesis will discuss the different aspects of how compactness will decrease the need for transportation, which will result in a better climate.

## **1.5 Clarifying central concepts**

*‘Grønn By’:*

*‘Grønn By’* is an independent foundation working towards sustainability and environmental awareness in the Stavanger region, which was established in 1993.

*‘Bypakke Nord-Jæren’:*

*‘Bypakke Nord-Jæren’* means *‘city package Northern Jæren’*, and it is based on certain guidelines set by the Norwegian Government in 2012. Zero growth in car traffic was set as the main target, and increased focus on public transport and cycling paths will contribute in making this. Rogaland County Council enacted *‘Bypakke Nord-Jæren’* December 2014.

*‘Forus Næringspark’:*

*‘Forus Næringspark’* is owned by the following municipalities: Stavanger, Sola and Sandnes. Since 1968, they have worked towards developing the Forus area to become one of the largest business parks in Norway.

*'Bysykkelen':*

*'Bysykkelen'* (city bike) is owned by *'Forus Næringspark'* and the municipality of Stavanger. It consists of electric bikes, which can be rented, and they are placed on different locations in the municipality of Stavanger.

*Exemption application cases:*

Meaning cases where it has been given a dispensation from a rule or usual requirement. In this matter, it means cases where it has been given an exception to develop on agricultural land.

*'HjemJobbHjem':*

The mobility project *'HjemJobbHjem'* is a collaboration between *'Kolumbus'*, *'Bysykkelen'*, Statens vegvesen, Rogaland County Council and the municipalities Stavanger, Sandnes, Sola and Randaberg. The goal is to promote workers to use public transport more often to and from the workplace.

*Urban density:*

Urban density refers to the number of people living in a specific urban area (PlanningPhotographyCom, 2018).

*'Stavanger Utvikling KF':*

*'Stavanger Utvikling KF'* is a company owned by the municipality of Stavanger. It is developed to coordinate and implement the municipality's residential housings and real estate politics.

## **2 Research literature**

### **2.1 Introduction**

Throughout this part we have examined theoretical and empirical research literature which gives us knowledge and tools for our analysis. Firstly, the compact city concept is explained and interpreted, and both research on benefits, concerns and barriers to urban density will be presented. Further, compact cities may form in different ways, and we have explained the different methods. A city's attractiveness is dependent on several factors, and an attractive city have several benefits. Both the benefits of, and the factors affecting the attractiveness of a city are looked into in section 2.4. Lastly, we have examined economic tools to promote urban density, including road pricing, parking, cycling and walking, area policy, and public-private partnerships.

### **2.2 The compact city concept**

According to the Organisation for Economic Co-operation and Development (OECD) (2012, p. 17), a compact city is defined as a “*spatial urban form characterized by ‘compactness’.*” Further, compact cities are described as metropolitan areas where the distance between individuals' residence, work and local services is limited, and it is an area which is connected by public transport. Another key characteristic of compact cities is that the development patterns are dense and proximate (OECD, 2012, p. 17). Ideally, compact cities will ensure socially favorable, environmentally robust, and proper economic developments (Hofstad, 2012).

It has become an established fact that we are concerned about the world's resources and the environment in the future. Since the release of the report ‘*Our Common Future*’, developed by the Brundtland Commission in 1987, the concept of a compact city has gradually become a symbol of sustainable development. The compact city seeks to balance economic, social and environmental development, in order to ensure that both current and future generations can cover their needs (Hanssen et al., 2015, ch. 1).



There is a strong link between the concept of a compact city, and a sustainable development. It is proposed that a sustainable city is one where individuals can walk, bicycle or use public transportation, instead of a car, and it is a place which encourage social interaction between individuals (Burton et al., 2003). This description looks like the definition of a compact city above.

Cars are most frequently used in small and middle-sized cities, and the least used in bigger cities with high density of people. The scope of this is dependent on whether or not people work outside the city and where the services are located. Patterns of housing and workplace, land use density, urban transportation, and parking restrictions affect how people choose to move around. Research has shown that urban planning with focus on greater density, combined with an effective urban transportation system, can contribute to reduce the use of cars in the bigger towns (Engebretsen & Christiansen, 2011).

On weekdays, 37 percent of all travels are due to people moving to and from work or school/studies, or because of business travels. Many people do their errands, grocery shopping, or deliver and pick up kids from school or kindergarten, when they go to and from work. The biggest cities in Norway (with at least 100,000 residents) have a higher share of travels on foot or with urban transportation, because these offer a larger proportion of workplaces, services and culture within a short distance. On top of this, the biggest cities have a chance of developing a competitive public transportation system. The effect of the size of the population is further reinforced with higher density in the city (Engebretsen & Christiansen, 2011).

In modern urban planning, higher density is often seen as the ultimate target for area development. Improved use of land is desired, with more houses, services and workplaces close to public transport hubs. The purpose is to reduce the need for transportation and the use of private cars (Engebretsen & Christiansen, 2011).

### ***2.2.1 Benefits of a compact city***

The European Union have studied urban transportation in Europe, and found that urban sprawling is present in many European cities. *“The trend towards suburbanization and urban*

*sprawl lead to low-density, spatially segregated land use. The resulting dispersal of home, work and leisure facilities results in increased transport demand” (EU, 2007).* Therefore, the benefits of a compact city will result in a reduction in energy consumption and pollution from the transportation sector. A more concentrated city will reduce and shorten citizens travel needs greatly, compared to lower density cities. Also, it will lead to a higher use of public transportation as the distance to various facilities are shortened. The public transportation offer will get better as more people use the option. The reduction in car dependency and increased use of public transportation for the majority of citizens in a city, will contribute to a lower energy consumption and pollution from the transportation sector (Hanssen et al., 2015, ch. 1).

Various studies on energy consumption and population density have been carried out over the years. A research by Næss, Sandberg and Røe (1996) studied energy consumption of 22 Nordic cities and found that denser cities have a lower energy consumption per capita, compared to cities with low density. A similar study in Sweden by Næss (1993) shows the same results.

An older research by Newman and Kenworthy (1989), studying gasoline consumption and population density in various cities in the world, finds that the difference in gasoline consumption is due to urban planning, not variations in income and price. From a global perspective, the gasoline consumption is higher in cities in the US compared to European cities, Australian cities and Asian cities. Even though Newman and Kenworthy's study is a little outdated, the same patterns are evident today. A recent article by Rae (2018), a professor in Urban Studies and Planning, looked at urban density in Europe and found that many cities in Europe have a high degree of population density. The importance of these studies are that there is clear evidence that energy consumption and population density correlates, and it is possible to lower energy consumption per capita by urban planning.

The urban sprawl that have presented itself, due to the freedom the car brings, has caused people to own larger homes, since space is not an issue. However, when trying to reduce energy consumption, it is important to look at the different types of housing and how they differ in energy consumption. Høyer and Holden (2001) studied the different types of housings in Norway and the corresponding energy consumption, and they found that single family houses have a significant higher energy consumption on heating and electrical appliances than multifamily houses. Therefore, apartments are a more sustainable living form

that helps reduce the overall energy consumption for private households. Additionally, the figure below illustrates that sprawling have a high environmental impact because the investments and costs associated with infrastructure and public services are divided by a lower number of households (The cost of sprawl, 2013). Even though the example is from Halifax Regional Municipality in Canada, it illustrates how compact cities are cost saving. The example illustrates the effect of economies of scale. Higher density gives a lower cost per unit, which in this case is per capita. Therefore, minimizing urban sprawl is favorable.

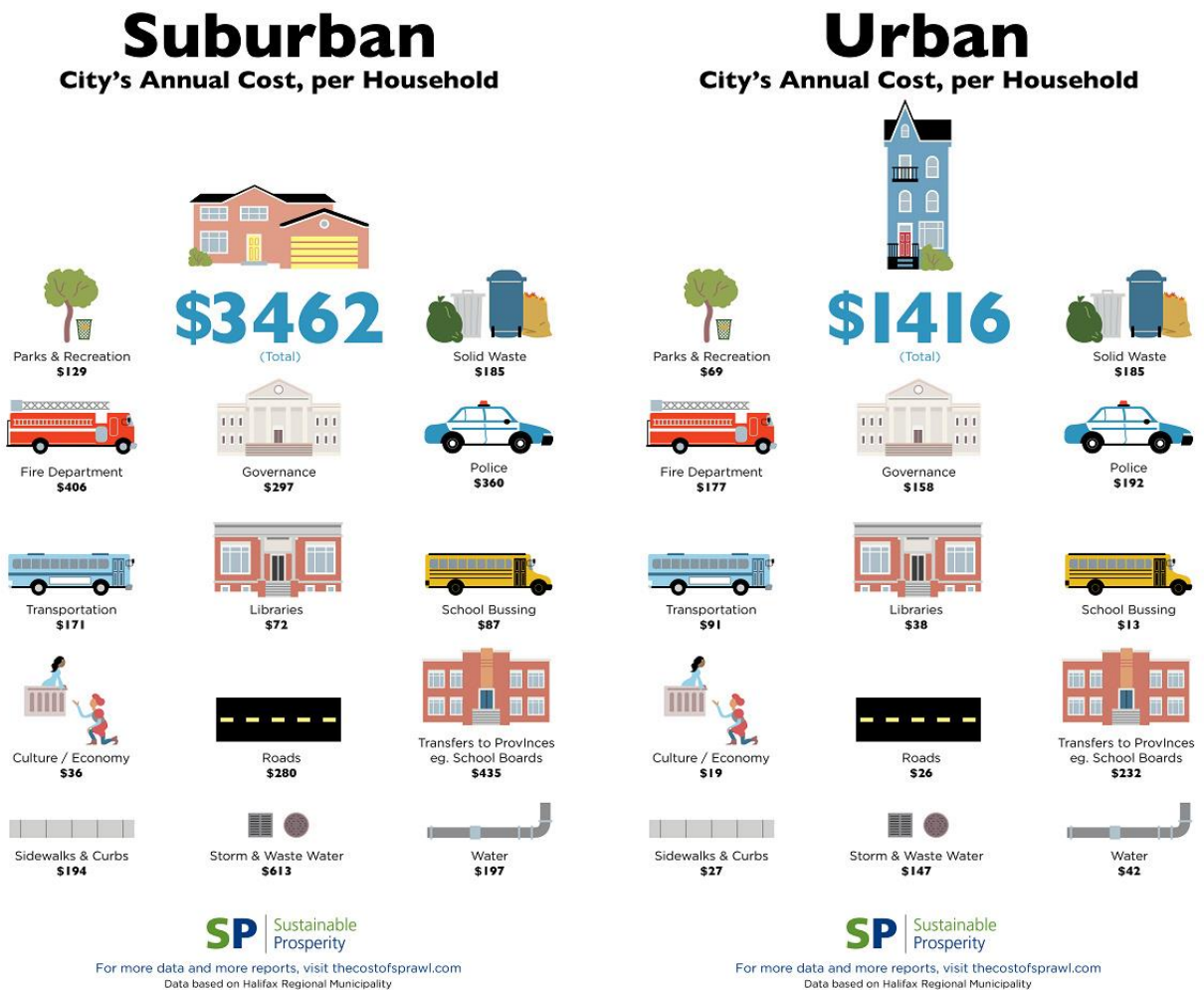


Figure 2.1 – The cost of suburban and urban households

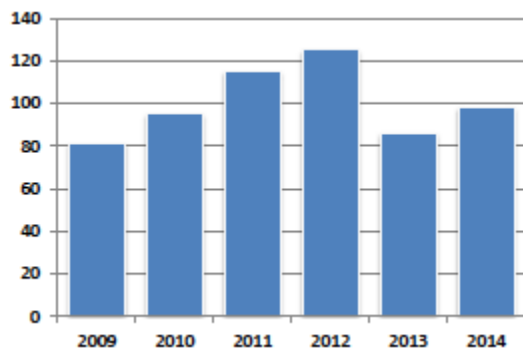
(The cost of sprawl, 2013).

Further, urban density can offer great economic benefits. The formation of agglomeration economies has long concentrated around the idea of closing the distance of travel in order to exchange knowledge easier or gain access to raw material (Caraliu, Dominicis, & Grott, 2015). Naturally, as the cost of travelling is drastically reduced today, firms still cluster together. Hence, it is assumed that being located in close geographical proximity offers other benefits, such as knowledge spillover or attractive labor pool. Industrial clusters, such as Silicon Valley, is one example. Also, an urban region with high population density often offer higher wages due to the high pool of skilled workers it attracts (Glaeser, 2010). As a result, the region has a competitive labor market, which increases productivity in the region.

Living in close proximity to public transportation is a good idea for at least two reasons. Firstly, The National Association of Realtors (2013) found that the value of homes located close to an urban transit was 42 percent higher than homes located elsewhere. Further, living near public transportation saves you money, because you use your car less.

Additionally, a higher population density in city centers involves that urban developments have seized smaller amounts of undeveloped areas and managed to preserve biodiversity. Within a specific region, focusing on area sparsely residential types will increase the possibility to save local ecosystems. When developing new residential and commercial areas, it is important to consider the total effect on biodiversity. Even though developing inside the city center affects biodiversity, the effect is greater outside urban areas. Also, developing new housings and commercial areas, that are not directly linked to existing areas, can contribute to fragmentation of natural areas. Therefore, a compact city will benefit the surroundings (Hanssen et al., 2015, ch. 1).

For instance, the Jæren region has a long trend towards using agricultural land for property developments, both residential and commercial. The graph below illustrates the number of exemption application cases for redistribution of agricultural land. During the period 2009 - 2014 a total of 600 cases were registered. However, the number does not include the total number of cases that were approved, and therefore the approved exemption cases are lower (Rogaland County Council, 2015, p. 37). Still, the graph illustrates that the number is high.



*Figure 2.2 – Exemption applications cases 2009 - 2014*

(Rogaland County Council, 2015, p. 37).

Consequently, the government's goal nationally is to lower the redistribution of agricultural soil in order to preserve biodiversity. In 2015, the government put forward a new strategy for agricultural soil conservation where the goal is to limit the redistribution of agricultural land use to 600 hectares. During the period 2007- 2009, comparing the counties in Norway, the municipalities in Rogaland had the highest redistribution of agricultural soil. The municipalities in Rogaland redistributed approximately 800 hectares in this period (Rogaland County Council, 2015, p. 39).

### ***2.2.2 Concerns regarding urban density***

Having looked at the benefits of a compact city, we cannot avoid mentioning the issues which generates debate. The criticism is often expressed as a doubt to whether the strategy has such positive impacts as previously assumed.

Some argue that compact city policies do not result in strong, positive effects on urban sustainability targets. In fact, it is argued that there are considerable negative impacts, and that these outweigh the positive ones. Examples of negative influences of compact cities are increased air pollution in the area, reduced green spaces (OECD, 2012), and problems with water draining (Kringstad, 2009, p. 39). Further, many Norwegians want a detached home rather than an apartment or a townhouse. Hence, urban density can result in a development opposed to what the inhabitants want (Guttu, Nyhuus, Saglie and Thorén, 1997, ch. 1).

Even though there are considerable challenges with compact cities, the concerns will not be the main focus of this thesis. However, we must be aware of the potential dangers urban density may bring, and be realistic about the benefits (Betanzo, 2007, p. 39).

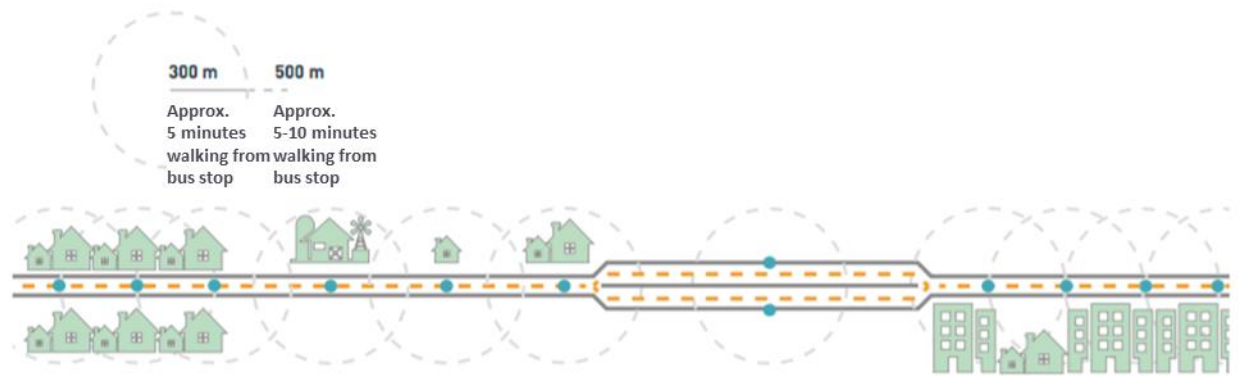
### ***2.2.3 Barriers to higher density***

To the public, the term “*high density*” is associated with being a barrier, partly because there is a belief among citizens that higher density in an area will not make the area a better place to live. For instance, if more inhabitants have to compete for the same number of parking spaces, people will see the disadvantages of higher density in the area (Cabe, 2005, p. 16).

In 1960, the sales of cars were deregulated and the number of cars in Norway increased rapidly. Together with few regulations related to developing on agricultural land, the increase in the number of households owning a car resulted in urban sprawl. Further, the urban sprawl increased the need for transportation. Detached houses was the preferred housing (Hanssen et al., 2015, ch. 3), and with the lack of regulations, people could build their houses in suburban areas. This urban sprawl characterized the development of housing areas in the Northern Jæren region for a long period of time. In this region, the number of inhabitants has doubled since 1960, whereas the land used for housing rose fivefold in the same period (Skundberg, 2018). Urban sprawl and detached houses with private lawns has been preferred among Norwegians for long (Guttu et al., 1997, ch. 1), hence this can be seen as a potential barrier when the government and municipalities wants the residents to live in closer geographical proximity.

Further, preservation is a potential barrier to higher density because of the conservation value (Guttu et al., 1997, ch. 1). An example of an area in Stavanger which is preserved is the old town with the white, wooden houses.

A potential barrier in choosing public transportation is if they live too far from a bus stop or train station. According to research from Agder, the distance from home to a transit stop needs to be within 300 meter, because most people are willing to walk this distance. A distance of 300 meters is approximately a 5 minutes’ walk. Further, some people are willing to walk 500 meter to the closest transit stop, which is approximately 5 to 10 minutes’ walk (Agder kollektivtrafikk, 2016, p. 16).



*Figure 2.3 – Distance to transit stops*

(Agder kollektivtrafikk, 2016, p. 17).

The Institute of Transport Economics (2016, p. I) found that the main factors in making the users satisfied with the journey are high punctuality of the public transport, and a short travel time. Considering the issue with transfer between modes or carriers, the design of the stops, the surroundings and the safety of the area are important factors. Further, if the users must change carriers or modes, the distance between the two stops should be within short walking distance. Having that said, the main factors affecting the transfer between modes or carriers are how easy it is to switch between them, and how easy it is to navigate the interchange, as this affects how stressful the transfer is perceived (TØI, 2016, p. I).

For instance, the graph below shows that the Stavanger region has the highest resistance to transfer between modes or carriers compared to other regions in Norway. To avoid transferring between modes or carriers, people are willing to pay a high price (Ellis, 2014).

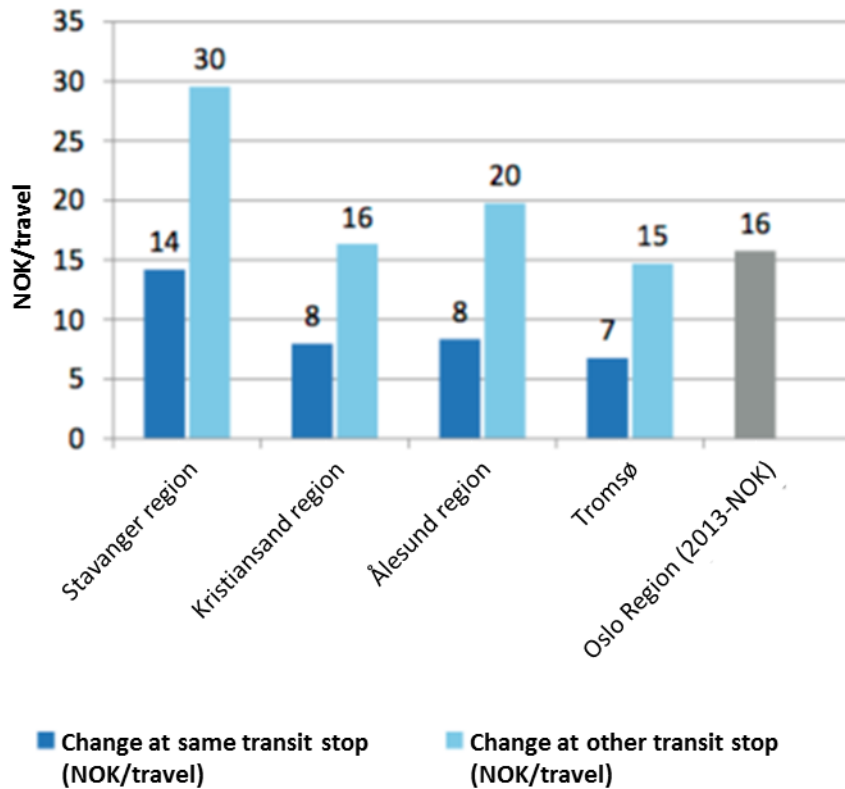


Figure 2.4 – Resistance to transfer between modes or carriers

(Ellis, 2014).

### 2.3 How compact cities form

Compactness in a city can occur in different forms, however, the main types are through transformation, intensification, and expansion. Compactness through transformation happens when commercial areas or industrial areas are transformed into new areas of housing. Often the service industry builds up around the transformed neighborhoods, as service industries are less area demanding. Also, there has been a paradigm shift from industrial and manufacturing industries to service industries. As these new types of industries have emerged, less space is needed, and therefore, more industrial areas have been transformed (Hanssen et al., 2015, ch. 1).

Secondly, intensification of existing land within the urban area is another example of how compactness can occur. It can happen by urban infill, which means building more compact



between already existing settlements. In addition, it can occur by increased utilization of established urban structures, through construction in height. Often this is done near transportation hubs. Further, intensification can happen by dividing properties in scattered neighborhoods (Hanssen et al., 2015, ch. 1).

Lastly, density in a city can occur through expansion of unused land. Turning undeveloped land into land for properties. The importance of converting an urban area into a compact city is to reduce the travel time between people's daily activities (Hanssen et al., 2015, ch. 1).

## **2.4 Attractiveness**

The concept of an attractive city has become an increasingly important topic in regards to urban developments of cities in Norway. According to the Norwegian government, an attractive city has a high focus on sustainability, a driving city center, public green areas, and creates an attractive living environment (Regjeringen, 2017 - 1). The driving force behind the focus on attractive regions and cities comes from a project called *'The Nordic Countries in Transition'*, which is focused on urban sustainability. In order to transition into a green, and low-emission economy, urbanization is needed, and that is what the Nordic towns and regions will be focusing on (Regjeringen, 2018).

According to The School of Life (2015), there are six fundamental rules in making a city attractive, namely order and variety, visible life, orientation and mystery, right scale city, distinct character, and a compact city center. The thesis focuses on compact cities, hence this will also be the focus when describing what makes an attractive city. With the previous lack of focus on urban density, most parts of the Northern Jæren region is everything but compact. Great distances have arisen over the years, and according to The School of life (2015) these distances are not creating attractive cities.

Reputation plays an important factor for immigration to a city, hence it is important for attractiveness. The quality of the amenities the city offers, such as cultural offers, sport and leisure activities, schools, and so on, will attract individuals to move to that city. Also, the culture within the city may increase the attractiveness. Individuals feel intrigued by the local identity, hospitality, and so on. Additionally, the types of housing will impact people's

willingness and desire to relocate. All factors combined contribute to an increase in a city's attractiveness (Kobro, Storm & Vareide, 2013).

As the Norwegian government wants to promote the growth of innovative and attractive cities, they announced a competition to find the most attractive city in Norway. In 2017, Fredrikstad won due to their initiative to increase commerce in the city center, by using a free ferry as a driving force, to attract the public to the city center. The ferry also connects the city center with surrounding districts. By binding the urban areas together, it increased the mobility of the public. After the municipality made the ferry free of charge, the number of travelers increased from 300,000 to 1,25 million each year (Regjeringen, 2017 - 2). Fredrikstad is an example of how a municipality has succeeded in attracting people back to the city center, by using a sustainable solution.

## **2.5 Economic tools to promote urban density**

High density of buildings improves the use of land, it creates cities with higher interaction both socially, cultural and economic, urban activity is increased, and the need for transportation is reduced (Pedersen, 2011, p. 18). This part will present and examine the different economic tools the government can utilize and implement in order to enhance denser urban areas.

As mentioned earlier, the Norwegian Environment Agency (2007) reports that actions are needed in the transportation sector in order to meet the goal to lower emissions. However, some of the initiatives proposed by the agency have low or medium feasibility, such as higher use of public transportation, reduced car dependency, or increase in the frequency of biking or walking as a mode of transportation. The car dependency in Norway, especially in the Northern Jæren region is very high, and therefore, strong incentives need to be implemented. A higher price for driving is an example of an economic tool used by the government to promote alternative methods of transportation. Also, by adding a cost for the driver, it is the driver who pays the price for polluting.

### **2.5.1 Road pricing**

Car pollution is a negative externality, and a tax is often introduced to make the polluters pay for the environmental harm they inflict on the society (Rødseth, 2012). Further, a common practice many governments use in order to try to limit car use is to implement tolls.

Economist Pigou started to propose road pricing in 1925 as a mean to improve overall welfare in a country. For the individual it is hard to see how the toll price can benefit the society as a whole, hence tolls are often met with resistance from many groups in the society (Immers, 2007, ch. 3). Also, for the politicians, it is hard to find the optimal tax the consumers must pay (Rødseth, 2012).

Road pricing affects different groups in a society. The different groups are:

- Drivers that will accept the price, and drive regardless
- Drivers that are not able pay the price and will stop driving
- The group of people that are affected by the toxic external environmental effects caused by driving
- The government which experience a revenue from the toll

The four groups experience the effects differently. Firstly, the drivers that pay the toll will experience a decrease in travel time (compared to other modes of transportation), but will experience a loss of welfare due to the increased cost of travel. Secondly, drivers that are not able to pay the price will experience an increase in travel time, but they will save money by choosing other forms of transportation, which are less costly. Further, the group of people greatly affected by toxic external environmental effect will have an increased welfare, due to the fact that reduced traffic reduces the environmental impact. The drivers that continue and stop driving experience a welfare loss, however the overall effect on society will be a total increase in welfare. The government will benefit from road pricing because of the increase in revenue.

The resistance of road pricing is explained by the two groups that experience a welfare loss. Therefore, in order for the government to gain support for toll price, they need to reinvest the revenue gained by tolls into the transportation sector (Immers, 2007, ch. 3). Research conducted by Sælen and Kallbekken (2011) finds that if the revenue from fuel taxation is earmarked for sustainable purposes, it gains a wider support from the public. However, such

earmarking may result in inefficient use of the revenue. Hence, one must find a balance between efficiency and political feasibility.

Various experiments have been performed on adding a toll for driving, as a tool to reduce car use. In Stockholm the government regulated the car traffic by adding an extra toll for driving in rush hours in the morning and afternoon, in 2006. The results highlight a significant drop in car traffic during the test period compared to the same period the previous year.

Additionally, CO<sub>2</sub> emissions were reduced. However, when the experiment was over, the car traffic increased immediately (Norwegian Environment Agency, 2007).

A similar experiment was performed in London in 2003. During the first months of the project, the car traffic decreased by 20 percent, which summed up to 20,000 cars less per day. Before implementing the project, many were opposed to the chosen method of reducing car traffic, such as politicians. However, as the project had a high success rate, the use of tolls was generally accepted by politicians and the public (Norwegian Environment Agency, 2007).

Further, when implementing tolls as a means to reduce car dependency, it needs to be followed by other initiatives in order to increase its efficiency on the car traffic. Other positive instruments need to follow, such as improving the public transportation offer, and facilitate for walking and biking. Also, other restrictive instruments need to be used, such as limited parking options (Norwegian Environment Agency, 2007).

### ***2.5.2 Parking options***

The likelihood to use a car on daily travels is dependent on the number of parking spaces available, and the parking fee for using these. The effect on car usage is greatest when parking spaces are limited where you live. Reduced parking spots both at work and at home reduces the possibility to use a car significantly (TØI, 2015, p. I).

The Norwegian public roads administration (Statens vegvesen) (2017) has performed qualitative analyses on different parking scenarios in the Northern Jæren region to see how different approaches reduce private transportation. The different scenarios are based on the current parking space availability. The study finds that increasing parking fees and reducing

free parking at the workplace has a significant effect on private transportation usage. Additionally, the research studied the effect in combination with a better area utilization policy in the region (a more compact city) and finds that the effect on private transportation is even greater.

The Institute of Transport Economics (2015, p. III) finds that most employers in the city municipalities in Norway offers free parking. Sandnes is among the city municipalities with the highest share of employers offering free parking for employees. Stavanger is not far behind. Interestingly, paying for parking is not common practice in other city municipalities in Norway.

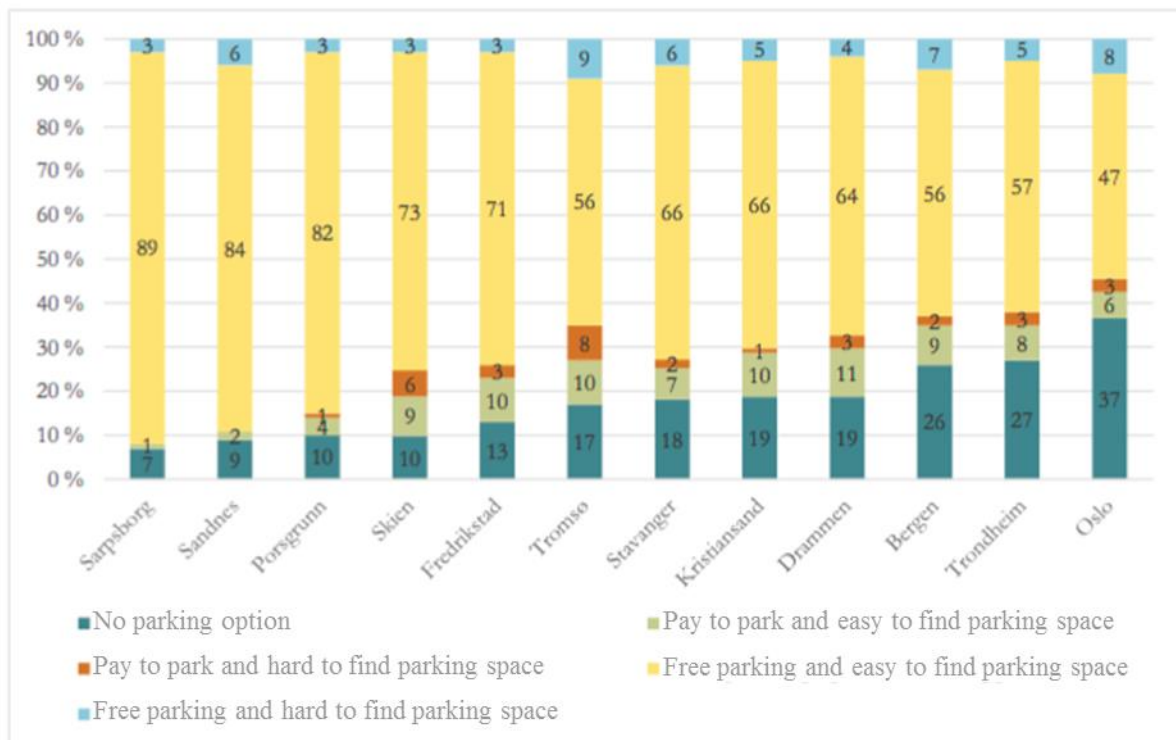


Figure 2.5 – Different parking situations

(TØI, 2015, p. III).

Moreover, the Institute of Transport Economics (2015, p. IV) finds that if parking at the workplace is easy, 64 percent of workers will choose private transportation. However, if there are no parking options, the share of workers that choose private transportation is reduced to 17 percent. The easier it is to park at the workplace, the more workers will choose to use

private transportation and less of public transportation (TØI, 2015, p. IV). Hence, restricting parking options for employees will have a positive effect on reducing private transportation, and forcing more individuals to use public transportation.

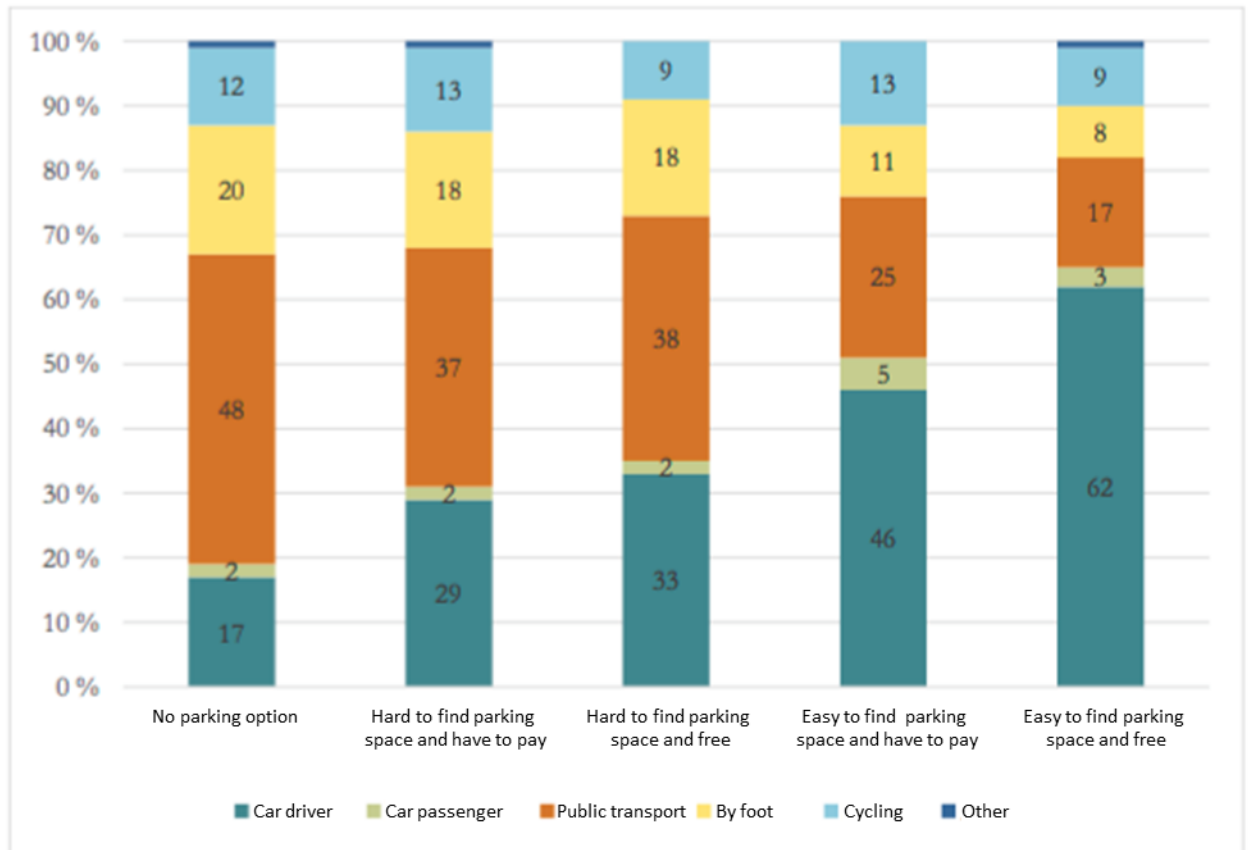


Figure 2.6 – Transport distribution separated between parking options at work, among those who work in Norwegian city municipalities 2013/2014. In percentage.

(TØI, 2015, p. IV).

Pay for parking at the workplace is not a common practice used by employers. However, what if municipalities forced employers to pay for parking? The Institute for Transport Economics researched the effect on parking fees imposed on workers, and whether monthly, daily or hourly payment had different effects. The study found that monthly payment has the least effect on car dependency. Therefore, if pay for parking is used as an economic tool to reduce car dependency, the greatest effect is when the worker needs to pay per day or by the hour (TØI, 2015, p. V).

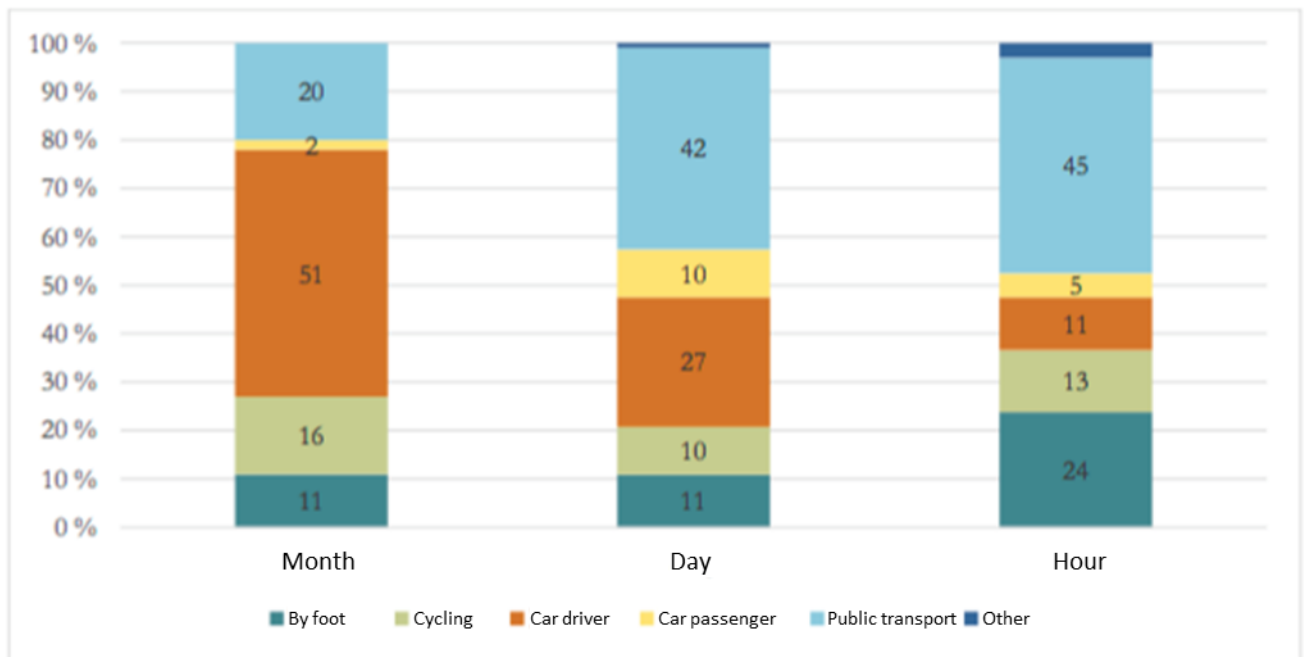


Figure 2.7 – Transportation mode to work among those who have to pay at work, divided into payment arrangement, among those who work in Norwegian city municipalities 2013/2014. In percentage.

(TØI, 2015, p. V).

### 2.5.3 Cycling

In ‘Bypakke Nord-Jæren’, cycling is one of the main alternative modes of transportation the package offers opposed to driving. The package will develop a cycling lane from Stavanger to Sandnes via Forus (Statens Vegvesen, 2017, p. 35). A challenge with cycling is to keep the number of people cycling high in the winter months. By looking at the graph below, it clearly demonstrates that the number of trips with ‘Bysykkelen’ greatly decreases during the winter months. A study performed in Sweden found that if the cycling lanes are maintained during the winter months, the share of individuals cycling can increase with 18 percent and reduce the number of car trips by 6 percent (Bergstrøm, 2003).

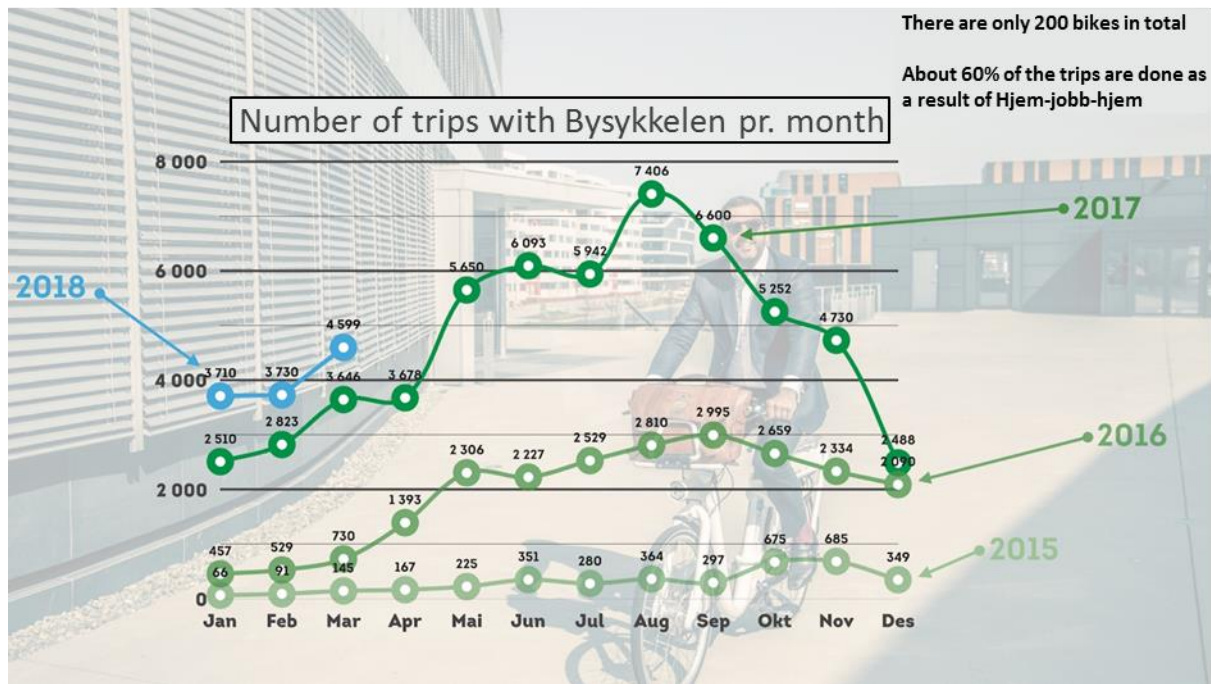


Figure 2.8 – Number of trips with ‘Bysykkelen’ per month

(Data received from Stein R. Grødem, 2018).

Additionally, the use of electric bicycles can contribute to an increase in cycling and enables people to reach greater lengths by cycling. ‘Bysykkelen’ is an initiative by ‘Forus Næringspark’ and Stavanger municipality to offer a sustainable transportation option. By looking at the graph above, there is a clear trend towards using these bikes. From 2015 to the beginning of 2018, the number of trips have steadily increased. Interestingly, the number of trips are divided between only 200 bikes. This is surprisingly few bikes compared to the high number of trips. Also, the graph displays that there actual is a demand for electric bikes in the region.

#### 2.5.4 Area policy

The Norwegian Public Roads administration (2017) have performed calculations on the effect of reducing parking availability in the region. The calculations find that parking restrictions have a considerable effect on lowering vehicle kilometers.



Equally important is the greater effect if the parking restrictions are in combination with an urban area policy in the region. The Norwegian Public Roads administration (2017) found three area policy scenarios and the effect of them. The three scenarios and corresponding results are:

Scenario 1 keeps the existing area policy and development pattern. Scenario 1 is the control group for scenario 2 and 3.

Scenario 2 involves an urban region with multiple local centers. The purpose is to shorten the inhabitants' distance to daily needs, in order to increase the likelihood of walking and/or using a bike for transportation. New workplaces are located close to the urban local centers, and new residential housings are located near the center. Scenario 2 gives a 3 percent decrease in vehicle kilometers by 2030.

Scenario 3 involves developing a compact city where the growth is concentrated in zones where it gives the best possibility to walk, bike or use public transportation to reach daily tasks and the workplace. The growth is located without consideration to municipality borders. Scenario 3 reports a 7 percent decrease in vehicle kilometers by 2030.

Combining parking restrictions and the two different area scenarios, shows a larger effect than the two strategies separately (Statens Vegvesen, 2017, p. 46).

### ***2.5.5 Public-private partnerships***

Public-private partnerships (PPP) can be described as “... *a joint cooperation between a public authority and private companies, created to carry out a specific project. They can take on a number of forms, and can be a useful method of capturing property value gains generated by transport infrastructure.*” (AFD & MEEDM, 2009, p. 76). From this definition, it seems clear that such partnerships can be used as an economic tool to promote urban density. PPP can be seen as a mechanism to collect funds for a project, but it is not only a source of funding. Sharing of the risks is mentioned as a potential advantage of PPP (AFD & MEEDM, 2009, p. 79, 84).

## 3 Method

### 3.1 Introduction

This chapter describes and presents the methodological approach we have used in the thesis. Method is a tool to give a description of reality, and how to collect the empirical data (Jacobsen, 2015, ch. 2). It is a systematic approach which is based on assumptions of how the world is, and of how we best can describe this world (Kvale, Brinkmann, Anderssen, & Rygge, 2015, p. 140). By clarifying the methodological techniques used, you ensure that the study is testable and hence has a higher validity.

This thesis seeks to find answers to the following questions:

*What benefits will higher density bring?*

*What are the barriers for higher population density in urban areas?*

*Which economic tools can the municipalities implement to promote urban density?*

We distinguish between several different methodological techniques when collecting data (Gripsrud, Olsson & Silkoset, 2010). In order to shed light upon these questions, qualitative data is the chosen approach. It is focused around uniqueness and it has a greater closeness to what is being examined (Jacobsen, 2015, ch. 8).

### 3.2 Qualitative method

Qualitative research implies exploring human processes or problems in a real life setting (Postholm, 2010, p. 9). Traditionally, the qualitative approach was associated with research which entailed close contact between the researcher and what was examined, like interviews and observations. The close contact between the researcher and what is researched, involves methodological and ethical challenges (Thagaard, 2013, p. 11). The ethics of the thesis will be examined more closely in chapter '3.4 Ethics'. An important objective with the qualitative approach is to achieve an understanding of social phenomena, hence interpretation of the research is of great importance (Thagaard, 2013, p. 11). When working with qualitative

research, the researcher must be open to what the participants do and say, and further foster the viewpoint (Postholm, 2010, p. 9).

When looking at qualitative method, we commonly separate between four methods of collection, namely the open, individual interview, focus group interview, observation and research data. The source of collection affects the validity of the data, because it can be discussed whether or not the chosen method is appropriate when examining a certain question. The method will also affect the reliability of the research, because important information may be left out, and because the chosen method can affect the results in a particular way (Jacobsen, 2015, ch. 8).

One of the strengths with qualitative method, is that we can study phenomenas which are hard or impossible to get insight into with other methods (Thagaard, 2013, p. 12). In this thesis, qualitative interviews are our primary source of information, both through interviews and previous research data. In the next section we have described how the interviews are prepared, conducted and analyzed.

### ***3.2.1 Interviews***

Interviews are well suited to give the researcher an understanding of a person's perspectives, point of view and self-understanding. Those interviewed can share their experiences and viewpoint (Thagaard, 2013, p. 12), which will help us understand and analyze the answers. In this thesis, interviews are our main source of information, supplemented with previous research data. We chose to use qualitative interviews because we wanted the participants to be able to elaborate, and we wanted to ask follow-up questions when needed. Quantitative method would not have given us the same level of depth and understanding of this complex topic.

Prior to the interviews, we have read and interpreted papers and previous research in order to have a better understanding of what is being examined, and in order to find precise questions to ask.

The participants in the interviews are the following:

Stein R. Grødem	CEO at <i>'Forus Næringspark'</i>
Kari Raustein	Head of municipal council for urban development
Stine Haave Åsland	Head of <i>'Bypakke Nord-Jæren'</i>
Elin Schanche	CEO of <i>'Grønn By'</i> /Head of Working committee
Jarl Endre Egeland	Developer and politician
Gareth Doolan	Senior advisor, regional planning department in Rogaland County Council

The participants were chosen based on their roles in the working life. We wanted to interview people from both private and public sector, in order to get a wider variety of opinions and knowledge.

Prior to the interviews, the interviewees did not receive any of the interview questions, we simply presented the topic and main questions of examination. This was done because we wanted to capture their immediate responses.

### *3.2.1.1 Types of interviews*

We commonly separate between three types of interviews, namely unstructured, semi-structured, and structured. In this research, a mix of unstructured and semi-structured type of interviews were used. Unstructured interviews are interviews with few or no interview questions. The interview is often structured as a normal conversation, even though the research topic is underlying. Next, semi-structured interviews use a prepared interview protocol, in order to support the researcher through the interview. Similar to the unstructured interview, the semi-structured interview contains aspects of a conversation, even though it is mostly a guided conversation between the interviewee and the interviewer (Statistics Solutions, 2018). Before the interviews, we prepared questions to ask the participants, and we asked follow-up questions when we felt it was needed. The interview with Stein R. Grødem

started out as an unstructured interview, before it turned into a semi-structured interview. The preceding interviews were mostly semi-structured interviews.

### **3.3 Validity and reliability**

Different researchers argue that the quality of the research should be considered based on credibility. Reliability and validity are both central in this assessment (Thagaard, 2013, p. 193).

Validity is related to interpretation of data. It includes looking at the credibility of the interpretations the researcher concludes. We consider the validity of the research by examining whether the research gives a precise picture of the reality (Thagaard, 2013, p. 204-205), hence validity can be defined as whether a method is appropriate to examine what it is meant to examine (Kvale et al., 2015, p. 276).

As mentioned, interviews and previous research were the chosen methods in this research. Previous research was chosen because there is a lot available both from public research, for instance the Institute of Transport Economics, and other relevant literature about the concept of a compact city. Qualitative interviews were chosen in order to achieve a broad understanding of how the region makes strategic decisions regarding urban planning. We wanted to gain knowledge about the driving forces behind previous strategies in the region and to see the mechanisms behind the urban sprawl we have witnessed over the past decades. Qualitative interviews gave us the possibility to get new knowledge on this topic.

Reliability is associated with questioning how reliable the research is (Thagaard, 2013, p. 23), and how the researcher explains how the data is developed. This includes that the researcher separates between information acquired from fieldwork and the researcher's own opinion of this information (Thagaard, 2013, p. 194).

In order to separate between previous research and new knowledge we have divided these findings into two different chapters, namely '*2 Research literature*' and '*4 Empirical findings*'. In the discussion chapter and the conclusion, we will refer to the two types of methods in order to keep them separated. Further, our goal has been to render the findings from the interviews and previous research correctly.

### 3.4 Ethics

Interviews might touch upon sensitive topics, and protecting the confidentiality of the participants, and also individuals and companies mentioned in the interview, is important. Storing recordings of the interviews may be helpful during the research, but the recordings must be deleted immediately when they are no longer relevant. Also, if desired by the company or individuals interviewed, they should be kept anonymous (Kvale et al., 2015, p. 213).

To ensure that the participants understood the goal of the interview, how their answers would be used, and to open up for confidentiality, we prepared a paper containing information regarding this, see appendix 2. All participants freely signed the paper, and no one wanted to be kept anonymous, see appendix 3. Further, we have done our best to render the results as completely and in the right context as possible. This is because the participants are entitled that the results are correctly rendered (Jacobsen, 2015, ch. 3). It is not in our intention to use the results in a way that is favorable for someone specific, or for future research.

#### *3.4.1 Criticism of the source*

Criticism of the source is a method used both to consider if the sender of the information is credible and whether the information is reliable. By asking the following questions we assess the quality and relevance of the information:

Credibility: Can you trust the source?

Objectivity: Is the source neutral?

Accuracy: Do you find any traces of carelessness or cheating?

Suitability: Do you find the answers you need?

(Orgeret, 2017).

It is important to consider the quality of the sources used, mainly because knowledge and competence affect how credible the source is. Individuals and institutions with a personal interest in presenting a specific image of a situation, have a lower credibility than sources without this interest. The first type of source has to be treated with caution. Further, we can never trust only one source (Jacobsen, 2015, ch. 9). Hence, we have interviewed a total of six

individuals, with different knowledge, competence and background in the work field. The participants are individuals from both private and public sector, and it is interesting to see if the answers coincide.

Those interviewed might have a personal opinion on the topic of interest, and this may affect the reliability of the study. We considered this when we were interpreting the research. For instance, throughout the study we realized that several of the participants are associated with one city council party. We did not ask questions related to their political viewpoint, but the fact that several of the participants were related to one city council party may affect the study.

Further, one might question why we did not transcribe the interviews, and if this was carefully thought through. Together with our supervisor, we concluded that if we were able to use and draw conclusions from the interviews without a transcript, we would not need to transcribe the interviews. During the interviews, one was taking notes, and the other one focused on asking prepared questions, and follow up questions. Hence, we had useful, written notes from the interviews. We also had the interviews on record and listened to them whenever needed, and we felt that we had what we needed in order to present the findings and further analyze them.

A lot of the research literature on this topic was, naturally, in Norwegian. Hence, figures and tables used in the thesis has been translated into English. Even though we have tried to render the figures and tables as correctly as possible, the translation of the figures and tables involves a potential source of error.

### **3.5 Interview guide**

Before our interviews, we prepared questions to ask the participants, and we asked follow-up questions when we felt it was needed. We developed different interview guides to all six participants. The reason why we developed different interview questions to all interviewees was because all participants have different employment positions. In order to encourage our participants to elaborate and add input wherever they felt it was needed, we chose a semi-structured interview style.

All prepared interview questions are found in appendix 1, which clearly demonstrated that questions were given based on our participants' roles in both the public and private sector. In appendix 3 we have included all signed requests to participate in the research project. These requests are all in Norwegian, but we have translated one of the requests into English in appendix 2. The six requests only deviate because of the different employment positions the participants hold.



## 4 Empirical findings

### 4.1 Introduction

This section of the thesis will present the empirical findings from the interviews. In order to make it as clear as possible, this section will be structured into three main categories, based on the research questions. We will present the benefits urban density can bring to the region, which we gained access to through the interviews. Also, the purpose is to gain insight into the barriers to urban density the region has, perceived by different actors in the society. Lastly, we seek to understand which economic tools can be useful to promote urban density in the region. The thesis will start by presenting the different participants.

### 4.2 Presentation of the participants

In order to gain insight into the different aspects of the topic this thesis discusses, the participants are chosen based on their background. For this thesis to have depth, it is important to have participants with different roles and backgrounds. Therefore, we have included people from the private and public sector. Participants, and their corresponding roles, are listed below.

#### Participants:

Stein R. Grødem	CEO at ' <i>Forus Næringspark</i> '
Kari Raustein	Head of municipal council for urban development
Stine Haave Åsland	Head of ' <i>Bypakke Nord-Jæren</i> '
Elin Schanche	CEO of ' <i>Grønn By</i> '/Head of Working committee
Jarl Endre Egeland	Developer and politician
Gareth Doolan	Senior advisor, regional planning department in Rogaland County Council

### 4.3 Benefits to population density

In this segment, it is desirable to capture the benefits of urban density, which was expressed by the participants in the interviews. The disclosed benefits will be compared and analyzed in this section, and in the next chapter we will compare the findings to research literature, which was presented in '*2 Research literature*'.

Firstly, the greatest benefits of urban density is a better climate. Schanche, from '*Grønn By*', works towards promoting sustainable solutions in the region. The ultimate goal is to make the region a low-emissions society. From Rausteins political agenda, increasing urban density in the region will lead to a reduction in the need for transportation. According to our participants, the need for private transportation will decrease as a result of the location of new homes, and because of the construction of the bus road. Decreased need for using private cars will result in lower CO2 emissions.

Further, higher population density close to the bus road, will make it easier for the inhabitants to use public transportation. This was mentioned as a benefit by several of the participants. With the increased demand, this will result in a better public transportation offer, which is an important benefit of compact cities. Related to this, when more people are using the public transportation system, we will see less traffic jams, and this was mentioned by the participants as another benefit of urban density.

Also, a denser city will reduce the need to build bigger roads. Schanche acknowledges that the region has a trend towards using valuable agricultural land for housing developments and road developments. If the region continues to sprawl out, more roads are needed. However, if the region focus on compactness, less land is consumed for road developments.

Another benefit of urban density is the social aspect. Raustein expressed a belief that building more public green areas will make a more collective society. Further, when people live in closer geographical proximity, there is more room for new inhabitants. Schanche adds in the same perspective, that she believes density will bring people closer. Doolan also concludes that a more compact city will result in healthier citizens as a result of more walking and less car use. Additionally, Doolan elaborates that a compact city will bring socioeconomic benefits, such as an increased productivity. Further, Doolan express that when people live in

close geographical proximity, it is easier, less costly and possibly more effective to offer public services.

#### **4.4 Barriers to population density**

During our interviews, it became evident that the first problem for population density in the region is bureaucratic regulations issued by Rogaland County Council and the local municipalities. Grødem from *'Forus Næringspark'* explains that it is too time consuming, and expensive, for the developers to get a project approved by the municipality, especially when it involves transformation of an existing area. This problem is also evident for Raustein, as the head of municipal council for urban development. She has experienced that developers are resilient for rezoning areas due to the magnitude of the regulations, which is an undesirable outcome of this barrier.

Equally important is the past behavior for urban planning in the region as a barrier for a greater population density. Raustein elaborates that there has been a trend for spreading out in the region. There have been few regulations about using agriculture land for residential growth, which has resulted in a great sprawl in the region. Doolan adds that even though the regional plan has guidelines for optimal density in an area, the municipalities can offer areas with housing with a lesser degree of density than what is recommended. Egeland finds the regional plan too broad to fit all municipalities in the region as the municipalities differ greatly.

Moreover, another interesting barrier which Grødem mentions, is the resistance individuals have on transfers between modes and carriers. In the Northern Jæren region, it is likely that travelers by public transit need to change to another public transportation vehicle or mode. Grødem finds that when individuals need two or three transit changes, it increases the likelihood of not using public transportation because of the inconvenience. Therefore, Grødem reasons that it must be a higher focus on how to reduce the resistance individuals have of changing public transportation vehicles. Grødem further express that the non-attractive waiting areas is a barrier for changing mode of transportation. Raustein agrees that the resistance individuals have when changing means of transportation is a barrier for the public transportation system, hence it becomes a barrier to develop a more compact city.

Additionally, Raustein argues that in the region, individuals are used to owning a large house and to enjoy a large, private, green space. The mindset of the inhabitants can be seen as a barrier for urban density. Therefore, a mindset change is needed in the region. While working with the new regional plan, some municipalities have reported to Doolan that they find some areas, which have a greater degree of population density, are too dense. Schanche and Doolan agree that there is also a need for a change in the mindsets in the construction industry. Schanche further elaborates that the construction industry has both the knowledge and experience needed to build on agricultural land. Construction companies in the region have less experience and knowledge on how to build on transformation areas. Doolan adds that a paradigm shift is needed both in the private and public sector to promote developments on transformation areas.

Another important barrier, which became evident when interviewing Schanche, was the limited ability to implement the regional plan for increased urban density. Politicians in the region have been talking about this for a long time. Schanche proves that there has been a lot of talking and limited action, with regards to increased urban density, by showing us the regional plan for Jæren from 1991. Looking at the regional plan from 1991, it became clear that Rogaland County Council has been targeting urban density, but it has never been utilized efficiently.

From Grødem's experience with the different municipalities, he finds that some of the municipalities are afraid to lose commerce and business to Forus. In addition, Schanche elaborates that the different municipalities in the region have different motives. The different municipalities want growth in their center, hence they want workplaces and public transportation to grow in their municipality. Based on this, the municipalities' borders can be a barrier for density in the region due to conflicting interests.

Many of our participants mentioned the high growth at Forus. However, there are few good public transportation options. The old Forus station was mentioned as a potential transit hub to connect Forus to surrounding areas. Further, our interviewees find that there are conflicting interests and many actors involved in the decision making regarding reopening the station. The comments some of our participants have heard regarding this, is that the train is a regional train, not a local one, and that adding more stations will increase the travel time. Also, as the decision involves a lot of different actors, the decision process require a great

amount of time.

#### **4.5 Economic tools to promote urban density**

Firstly, Raustein explains that the main economic tool the municipalities use to promote urban density, is road pricing. Åsland reports that the region will use road pricing to reduce traffic now, and a large part of the revenue gained from tolls will be used to improve the public transportation system. Further, Åsland express that real estate agents in the region has seen an increase in individuals looking for homes close to their workplace, hence the increased road tolls, which will be introduced fall 2018, can be seen as an economic tool to promote urban density.

Secondly, there is increased focus on building a better and smoother public transportation system in the region, and this was expressed as another economic tool to promote urban density. The municipality will focus on a few main bus roads, and it is likely that people will see the benefit of living close to these major bus roads. *'HjemJobbHjem'* is a tool to promote the use of environmentally friendly transportation modes, which was mentioned by almost all our participants.

Another important tool the municipalities in the region is working on, is safe lanes for cycling and walking, and also separated roads for the two modes of transportation. This was stated by Raustein. Further, *'Forus Næringspark'* is, together with the municipality of Stavanger, offering electrical bikes, which can be seen as an attempt to solve the climate issue. The electric bike is an environmentally friendly solution to solve the transportation need.

Many of our participants purposed that in order to reduce the risk of rezoning, the municipalities should minimize the risk for the private developers by taking some of the risk themselves. *'Stavanger Utvikling KF'* was mentioned as a specific tool to reduce this risk.

## **5 Discussion**

### **5.1 Introduction**

This section of the thesis will examine the research literature and the findings from the interviews. Our interview participants, namely Stein Grødem, Kari Raustein, Stine Haave Åsland, Elin Schanche, Jarl Endre Egeland and Gareth Doolan, are all referred to with their surname.

The section will be divided into two segments. The first section presents the benefits. The second includes both barriers to, and economic tools to promote, urban density. We chose to combine barriers and tools, because the economic tools will be presented as possible solutions to the barriers we found through our interviews.

### **5.2 Benefits of increased urban density**

One benefit of compact cities is that it shortens the distances between home and different amenities such as schools, kindergarten, stores, workplace and recreational centers. This will lead to less time spent on transportation, and the likelihood of more people walking and cycling. Further, from a socioeconomic perspective, a compact city is cost saving for the municipalities. An urban region, compared to suburban ones, cuts the cost per household by more than 50 percent, according to research from Canada (The cost of sprawl, 2013). In our region, an urban sprawl has been prevalent over the past decades. Hence, many inhabitants live and work in different municipalities. Also, many of our local services are scattered throughout the region. In order to reduce the need for transportation, and create valuable centers within each district, it would be beneficial if the municipalities have a greater understanding of where to locate, and politics to promote where to establish, residential housings, services, workplaces and other amenities.

Today, the concept of attractive cities has been formed by the government. Attractive cities focus on sustainability and an attractive living environment. A dynamic city center also makes a city more attractive. As a result, the quality of the amenities the city offer is an important factor in making a city more attractive. The Norwegian government promotes

initiatives which enforce attractiveness in cities. In this region, individuals have been attracted by the labor market. As the labor market is recovering after the recession, the region needs to find new ways to attract individuals. During our interview, Raustein emphasized that there is a need for smaller, lively centers throughout the region in order to reduce the need for transportation and build a more attractive region. We find Raustein's statement to be a realistic view of compact city development in this region. The region has several smaller centers, hence it is unrealistic to assume that the region can create one large and influential city center.

All of our interviewees adds that the ultimate benefit of a compact city is a better climate. A reduced energy consumption per capita is greatly needed, and a compact city will contribute to this by avoiding long travel distances, higher public transportation share, smaller residential homes, and it might lead to an economy of scale effect. Also, the different types of residential housing have different energy consumption (Høyer & Holden 2001). This region has a high share of single family houses, which has the highest energy consumption. If the region manages to lower the number of single family houses, it will reduce its overall energy consumption. However, compact cities do not arise without its negative impacts.

As mentioned in the literature section of the thesis, Hanssen et al. (2015) reports that one of the benefits of a high population density is that it is requiring less agricultural land, and managing to preserve the biodiversity. Also, developing properties through transformation in urban centers reduces the fragmentation of natural areas. Interesting enough, in the Jæren region, the redistribution and downsizing of agricultural soil is extremely high. All our participants find a strong trend towards using agricultural land for property developments. Further, they experience that this trend needs to stop, as it is not consistent with compact city development and to preserve biodiversity. Even though research highlight that a compact city will preserve agricultural land, this region has gone the opposite way.

Preserving biodiversity has been a focus both nationally and regionally, specifically in the regional plan for Jæren, but the focus has not been prevalent due to the high consumption of agricultural land (Rogaland County Council, 2015, p. 37). Evidently, the Jæren region does not manage to follow the national goal towards minimizing the use of agricultural land. On the contrary it is understandable that the region wants to take advantage of the unlimited resource they have been given, namely agricultural land. But, now the region needs to lower its dependence on agricultural land.

When interviewing Schanche, the high use of agricultural land was mentioned as a disadvantage of today's, and the past's, strategy for developing new housing areas. Partly because a lot of agricultural land is used for building houses, but also because a lot of rural land is used to build new roads to connect the new neighborhood to existing ones. Further, as new roads are necessary to create a needed infrastructure, with a greater focus on developing a compact city, less land is needed for infrastructure.

Additionally, a higher share of people using public transportation will result in a higher demand for a better public transportation system. Because of the sprawl we have witnessed in the region, it is hard to build a good public transportation system. With an increased focus on urban infill and transformation within a short walking distance from the bus road, more people are living closer to different transit options. Further, part of the problem in this region, compared to other regions, is that the residents perceive the public transportation system as worse than it is. Hence, a higher utilization of the system will give the residents a more realistic view of the transit system.

### **5.3 Barriers to, and economic tools to promote, urban density**

Area politics and transportation is closely linked in a compact city perspective. Hence, this part will be separated into two main segments, namely area policy and transportation, because the barriers and tools are either related to area politics or transportation.

#### ***5.3.1 Area policy***

The limited focus on urban density in this region is a known barrier to our interview participants. Schanche finds that densification has been on the agenda, but not really utilized properly. Due to this, a sprawl has dominated the region for a long period, even with an increased focus in the regional plan on urban density. The region has had unlimited supply of agricultural land, and taken advantage of this resource. This has turned into a great disadvantage for future urban developments in the region. Further, the region has had high work immigration to the oil and gas industry in previous decades, and this created a high demand for property. Since developing on agricultural land is easier and less time-consuming



than transformation, it is reasonable to understand the driving forces behind sprawling out. The high demand for housing resulted in a high focus on providing residential housings fast. Now, as the region is recovering after the recent recession, the demand for houses are lower than in the expansion period, and this gives the municipalities a greater opportunity to densify the region without using agricultural land. Future developments needs to have a greater focus on building a compact city.

In order to increase the focus on developing a more compact region, the regional plan needs to enforce density in the region as they have been talking about for the past few decades. The regional plan from 1991 states that densification of the region is needed. However, little has happened and higher efforts are needed. One might assume that lack of knowledge is the reason for limited focus on densification, but Doolan mentioned in the interview that the problem is rather the focus and lack of experience in this area. Hence, a paradigm shift is needed in both the public and private sector, and at the individual and business level. A paradigm shift is needed in order to change the mindset for all actors in the society. Through a paradigm shift, the region will gradually become more open to a higher degree of population density and prevent a further sprawl of the region.

As well as enforcing a paradigm shift, the region needs to densify by transformation of areas and intensifying area usage. More specifically, the area between Stavanger and Sandnes, where the new bus road is planned, is the preferred areas for transformation of former industrial areas and intensifying already existing residential housing areas. In order for developers to move in the preferred direction, the risk of rezoning needs to be minimized.

Talking to our participants, we found that one of the reasons for low area optimization is found in the time spent regulating transformation areas. Raustein is experiencing that the regulating system is too time consuming, as it takes a long time to get a project approved by the municipality. This leads to a huge regulation risk, and many developers are not willing to take the risk. Our participants feel that change must be made, in order to make it easier and profitable for private development companies to re-regulate an area.

One possible solution to reduce the risk, is to have the municipalities take on some of the risk themselves. *'Stavanger Utvikling KF'* was mentioned by some of our participants as a potential tool to reduce the risk of regulating. If Stavanger municipality uses *'Stavanger*

*Utvikling KF*’ to rezone preferred transformation and intensifying areas, it is more likely to move the region in a direction for higher density.

Even if the municipalities would start using public developing companies, such as ‘*Stavanger Utvikling KF*’, to minimize the regulation risk for private developers, it is still a high risk that the municipalities will focus on expansion by using agricultural land. As mentioned by Doolan during our interview, the municipalities have a high degree of autonomy in choosing which areas they will develop on. The region plan recommends higher density, but does not enforce strict guidelines. For example, Doolan mentions that some of the municipalities in the region finds the recommended guidelines for population density in an area are too dense. Since the guidelines are only recommendations, the municipalities have the autonomy to choose a lower density in new areas. As a result, it is reported that the new housing areas have a lower degree of density than some of the older residential areas, such as Våland and Storhaug. As a tool to avoid a low density in new residential areas, Rogaland County Council should enforce a requirement that ensures a minimum degree of density.

In addition, Raustein expressed during our interview that developers should gain a higher degree of autonomy in regards to planning, which will result in time savings. By this she meant that when a project is approved by the municipality, and a needed change occurs, the municipalities need to trust that developers have qualified people controlling that the change is reasonable. This will save time, as it prevents that the project needs to be re-approved.

Equally important are the existing municipality borders the region have. Municipality merging has been on the agenda, and from an urban density perspective such a political tool is likely to benefit the region as a whole. Our interviewees concluded that the municipality borders are a great barrier to higher density in the region due to the conflicting interests of the municipalities. The conflicting interests are specifically regarding where the economic activity in the region should be. More specifically, all municipalities want to attract businesses, commerce and individuals, from a profit seeking perspective. This will benefit the interests of the municipalities, rather than the interests of the region. Also, based on calculations from the Norwegian Public Roads administration (2017) the region will experience a higher decrease in vehicle kilometers with an area strategy that looks beyond municipality borders.

### 5.3.2 Transportation

Now that the problem with urban sprawl is present, the municipalities in the Northern Jæren region is forced to put unfavorable practices in place as a means to make people live in closer geographical proximity. Such economic tools can be road pricing and parking restrictions. However, the effect of the tools can be reinforced by positive incentives, such as better public transportation system, and lanes for cycling and walking.

The transportation sector is one of the main contributors to the high CO<sub>2</sub> emissions. National climate politics states that a reduction is needed in the transportation sector. One economic tool the region is implementing to reduce the growth in the transportation sector, is implementing an extensive road pricing agreement across the region. '*Bypakke Nord-Jæren*' was created as a response to reach the zero growth target the region has enforced. When interviewing Åsland, she explained that in order to reach the zero growth target, strong means are necessary, and the current road pricing system is not enough. Based on previous research done in Stockholm and London the implementation of road pricing has an effect on both CO<sub>2</sub> emissions and overall car traffic. In Stockholm they experienced that the car traffic went back to normal when the rush hour fee was removed after the test period (Norwegian Environment Agency, 2007). '*Bypakke Nord-Jæren*' has a time horizon from fall 2018 until 2030, which is a significantly longer period than the test period in Stockholm. As a result, we might experience a change in habits in this region, which is needed for a permanent change. It is hard to implement strict road pricings due to the resistance from the public. Hence, politicians find it hard to follow up on the theoretically attractive benefits road pricing brings.

As this region is mostly car based, reducing some of the car traffic will greatly benefit the environment and the time spent in traffic jams. '*Bypakke Nord-Jæren*' expects that the new toll system will reduce the number of vehicles per day by 10 percent. However, the drivers will experience a significant welfare loss due to the higher price, which was explained in the research literature. Individuals in this region is highly sensitive to changes in toll prices due to the high car dependency. Overall, we expect that the society will have a net social benefit from the new toll system because driving will become more expensive, hence less people is expected to drive.

A large part of the toll revenue will be used to improve the public transportation system of the region by building extensive bus lanes. Recent studies find that if the toll revenue is allocated to sustainable purposes, such as improving the public transportation offer, the public is less resistant to pay the toll (Sælen & Kallbekken, 2011). Therefore, Rogaland County Council, the municipalities of the Northern Jæren region and *'Bypakke Nord-Jæren'* must communicate the environmental aspect more clearly to gain support. Part of the reason why the bus is an unfavorable choice today, is due to the fact that it is time consuming. Further, the bus is often stuck in traffic. The bus lanes are developed to increase the mobility of the bus by reducing interference by other road users. However, the most crucial point in making the bus lane successful, is by increasing the urban density of residential housings surrounding the bus road. Research shows that if people live within a radius of 300-500 meters from the nearest transit stop, they are more likely to choose public transportation (Agder kollektivtrafikk, 2016, p. 16). Therefore, urban infill and transformation needs to happen within a radius of maximum 500 meters of the bus lane. On the contrary, more people living in close geographical proximity means less private space and potentially a higher degree of unfavorable noise. As previously stated, a mindset change is in need in order for people to look past the need for large private residential areas.

Having that said, little considerations are focused on the regional railroad tracks. The train was mentioned as a potential tool to promote the use of public transportation, both in the regional plan from 1991, and by our participants. The train manages to connect people within a larger area due to the speed and ease of travel. In this region, many workers live in suburban municipalities, and work in the city municipalities, hence the train can be a great substitution for the car on these longer travels. Surprisingly, instead of focusing on increasing the number of individuals using the train, stations were shut down. Several of our participants adds that Forus station should be reopened, and become a transit hub for Forus. It is surprising that Rogaland County Council push forward a new bus road instead of pushing forward new stations on the already existing railroad between Stavanger and Sandnes.

During the interview with Grødem, it became evident that transfers between modes or carries play an important factor when choosing mode of transportation. Grødem express the need to transform the waiting areas, and also reduce the waiting time for the next bus or train, in order to make the latency feel less meaningless. Grødem's statement is enforced by research conducted on public transportation by Ellis (2014). The punctuality and a short travel time

are two of the main user satisfaction factors. In this region, it is evident that the travel time is greatly affected by the long distances. Therefore, a low satisfaction with the public transportation is apparent. It is reasonable to believe that punctuality also affects the users' resistance to transfer between modes or carriers. Research also shows that Stavanger as a region is willing to pay the highest price to avoid transferring between modes or carriers. Hence, it is hard for public transportation to compete with the car as a means of transportation.

Further, '*Bypakke Nord-Jæren*' has a great focus on reducing car use by building a cycling lane from Stavanger to Forus, and to build a separate walking lane. Raustein hopes that the cycling lane will contribute to an increase in the share of people using cycling as their main mode of transportation. With today's technology, bicycle-sharing systems are increasing in popularity. Data from '*Bysykkelen*' highlights that electric bikes are growing in popularity by each year. '*HjemJobbHjem*' is a tool to promote the use of public transportation and shared electric bikes. The arrangement is used by employers throughout the region. Research from Bergstrøm (2016) shows that there is a significant drop in the winter months if the cycling lanes are not properly maintained. This region is known for having all sorts of weather. In order for individuals to find cycling as an all year alternative, the cycling lanes need to be maintained, especially in the winter months.

The use of electric bikes is a tool to promote cycling to a broader audience, due to the longer reach and lower physical constraint. With the increased toll prices, it is likely that more people will consider other modes of transportation. The electric bikes, both private ones and '*Bysykkelen*', can be seen as an improved option compared to regular bikes, because the ease of travel and travel time is improved. The combination between increased cost of driving, and the greater focus on public transportation, cycling and walking, may increase the likelihood of not using the car as the only means of transportation.

As mentioned earlier in the thesis, reducing parking options is a common instrument used to limit car dependency. Studies have found that easy access to parking increases the likelihood of driving, especially at the workplace (TØI, 2015). The Northern Jæren region have a notably high car dependency, and parking at the workplace is very common. Additionally, as the inhabitants in the region are used to having access to free parking, it is expected to see a resistance from the public. Further, the region has a trend towards working in the suburban municipalities and commuting to work in the city municipalities. These factors have created a

society mostly based on using the car. Research shows that in order for parking restrictions to be useful in this region, it has to be followed by an area policy that promotes a compact city.

Furthermore, the government have pushed forward the use of parking restrictions as a means to lower car traffic. According to the regional plan, parking politics were addressed 15 years ago in the long term urban development plan for the region, however, the work has not been addressed yet. When interviewed, Doolan mentioned that the municipalities have the liberty to enforce parking restrictions themselves. Schanche elaborates on this during our interview with her, and she told us that because the municipalities are afraid to lose commerce in the city centers to surrounding areas, they may not enforce tough parking restrictions. Having that said, the region is focusing on building a better public transportation system through the regions city centers. If the public transportation system manages to attract more users, and the main transit hubs are in the region's city centers, there may not be reason of concern to lose commerce to Forus and Lura. Cutting the number of parking spaces at once might be a dramatic move which can reduce the liveliness of the centers, and commerce. But reducing parking spaces gradually, together with an improved urban transportation system, may in fact save the city centers as there will be more space for shops and residential housings.

Fredrikstad is a perfect example of strategic decision making which improved the city center, by offering an improved public transit (Regjeringen, 2017 – 2). Hence, the Northern Jæren region needs to find a solution that will bring people to the city center. During several of our interviews, the need for ground floors to offer service amenities was mentioned as a way to create a driving city center. However, the feasibility of these suggestions may not be realistic due to the fact that regulations and other guidelines for new buildings are strict. Our participants mentioned the possibility to deviate from some of the guidelines in order to densify further.

## 6 Conclusion

After '*Bypakke Nord-Jæren*' was enacted, a more distinct goal towards zero growth in the transportation sector, and a goal to transform the region to a sustainable and low emission society, was set. In this region, we have had a trend of urban sprawl. The different economic tools the municipalities can implement to increase urban density are parking restrictions, road pricing, and subsidizing public-private partnerships. Equally important is the area utilization policy for the region. The region needs to tighten the area policy to become a more sustainable region. The region faces several obstacles in order to make it more compact, and with these obstacles in mind we have concluded on the following.

Firstly, the region has experienced a high growth in demand for properties in previous years. Today, the demand is stabilized, and the municipalities and Rogaland County Council needs to take advantage of this in future urban planning. The focus must be on transformation and urban infill, rather than building on agricultural land. Through our interviews, it became evident that the region is in need of a strong advocate to promote densification of the region. We find that Rogaland County Council must have stronger presence in the work of densification of the region by enforcing strict guidelines to follow. Rogaland County Council looks beyond the municipalities' borders, which is a barrier to densification, and therefore Rogaland County Council might help reduce the conflicting interests of the different municipalities in the region. However, the risk of regulating, especially on transformation areas, is large. As a result, developers are hesitant to push forward projects on transformation areas, due to the high financial risk. We find that public-private partnerships may be an important tool in order to minimize the risk of regulating. Further, stately or municipality owned developing companies might also be a tool to help reduce this risk. '*Stavanger Utvikling KF*' is an example of such a developer.

Further, the regional plan has set a moderate target for developing on transformation areas. Even with a moderate target, the region fails to fulfill it. We find that this target should be higher in order to meet state requirements on area utilization, but a stronger follow-up on the target is crucial. As the region does not manage to fulfill a moderate target currently, strong means are necessary to meet the target. Rogaland County Council must enter as a distinct actor and work towards fulfilling the goals enacted in the regional plan.

However, change in individuals' mindsets are necessary. By mindset we refer to how an individual perceive a smaller living space and living closer to other individuals, but also their attitude towards public transit. As research highlights, individuals are resistant to use public transit as a daily travel mode. Fall 2018, the toll prices will increase in the region. Hence, individuals are forced to reconsider their mode of transportation. It is assumed that individuals will rethink where they live and work, hence a mindset change might occur in the long run. It might shift the trend from moving to the suburbs, into living closer to their workplace, which mostly is in the city municipalities.

Failure to acknowledge that the public transportation usage and area politics is closely connected, will not lead to a reduction in the use of private cars as the preferred mode of transportation. '*Bypakke Nord-Jæren*' have made several improvements to promote a better public transportation offer and the ability to use cycling and walking as an alternative. However, the initiatives must be followed by an area policy that promotes a more compact city in order for it to be successful. The region should focus on transformation and urban infill in areas where the public transit offer is well functioning. More people living close to the public transit lanes is likely to increase the demand for a better offer. If the region continues to sprawl out, it will be hard to reach the zero growth target in the transportation sector. Further, the municipalities and Rogaland County Council must gain a better understanding of where to locate homes, workplaces and leisure facilities. By connecting the daily tasks for individuals with closer proximity, less time is spent on travelling, which is beneficial for the individual, the environment, and from a socioeconomic perspective.

Additionally, we find that parking restrictions have a large effect on the use of private car as the preferred mode of transportation. In Northern Jæren, individuals are highly dependent on the car, hence enforcing tough parking restrictions too early might damage the attractiveness of the region's city centers. Tough parking restrictions should be enforced gradually combined with an improved public transportation system to avoid death of the city centers.

It became obvious during our interviews that many of the participants felt that the train, especially the double tracks between Stavanger and Sandnes, were not utilized to its full potential. It was expressed that Forus station should reopen as a transit hub for the future. A reopening of Forus station will connect the train with Forus business park, and we recommend the municipalities at the Northern Jæren region to work towards a better



utilization of the railroad tracks. Further, the area around old Forus station was mentioned as a potential residential area with high quality, if Forus station is to be reopened.

Our findings indicate that there has been little action with regards to densification in the past. The evidences are clear; compactness creates a more sustainable region. However, the region has several barriers to overcome in order to become more sustainable, attractive and compact. We find that Rogaland County Council should lead the work in overcoming the barriers previously described, because the municipality structure at the Northern Jæren region is dysfunctional, and the municipalities cannot see beyond their own interests.

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# Appendixes

## Appendix 1 – Interview questions

All interview questions were written and asked in Norwegian. Hence, all questions are translated into English in this appendix.

### Interview with Kari Raustein

Can you tell us what you do in your job?

The government has decided that the municipalities will work for compact urban development (higher density of residential housing and businesses). How does the municipality work to implement this?

- Do you have any specific examples of how the municipalities are working on this?
- The municipalities have a lot of autonomy in their municipality. Could this result in a lower focus on density?

What benefits do the municipality consider that compact urban development will cause?

Do the municipality actively work to increase the density of housings?

- In what areas?

What kind of tools do the municipality consider to be important for higher density?

What do you think is the optimal region in terms of residential housings and businesses?

Where do the municipality stand in regards to which residential housing types should be developed? For example, apartments versus houses/semidetached houses?

On what knowledge is the idea of increased density and means of transportation based on?

- What is the reason for not building higher than five floors in residential apartment buildings?
- What data is this requirement based on, and what is the reason behind it?



- Do you think that the municipality's requirements for density are an obstacle to higher density in the region?

How do the municipality calculate the chosen mean of transportation for individuals?

- Where is the gap between the use of car and public transport / bicycle / time, regarding price?
- Has the municipality made any calculations on how much cheaper it must be to use public transportation for individual to choose it over private car?
- How about the travel time? How much do people save by using the car instead of taking public transportation?
- Do you have any calculations on this?

Have you made any calculations on the individuals' resistance to change mode or vehicle?

Free parking at the workplace is tax deductible, but if the employer offers free use of public transport, the employee must tax from this. Do you think this is the right way to promote the use of public transport?

Large parts of the investments the municipalities make go to road construction, while there is a focus on creating zero growth in traffic and making people use the public offer. Isn't this a little contradicting?

Larger roads mean more noise. The municipality is obviously careful about building in noisy areas. This means that more and more areas are not considered suitable for housing construction, and settlement becomes difficult. What thoughts do the municipality have about this problem?

There is a great risk of re-regulating of land. Do you think this obstacle is too large for the developers?

## **Interview with Stine Åsland**

Can you tell us what your job is about?

- Do you work with road development as well as locating residential housing projects and commercial buildings?

*'Bypakke Nord-Jæren'* involves the municipalities of Sandnes, Stavanger, Sola and Randaberg. Do you experience that Stavanger, Sola and Sandnes meet the means differently?

- If so, how?

The government has decided that the municipalities should work for compact urban development. How do you think the municipality is working to implement this?

- Do you have any specific examples of how the municipalities / you are working on this?
- Do the municipality have too much autonomy to not impose the guidelines given by the government?

What barriers do the region have for increased density?

What effects do you think we will see from the new tolls?

- Do you have any data on this?
- Do you think the region will experience an increase in density due to the toll?
- Do you think there will be a migration of the population because of the toll?
- What potential challenges do you think will happen if the population density increases in the region?
- Do you think there will be a reduction in car usage because of the toll? Do you have data on this?

Why is it hard to make individuals live in closer geographical proximity to each other?

- What tools are used to make people live closer to each other?

What means do Statens vegvesen enforce to increase the population density around the bus road?

What effects do you see from increased density?

What benefits do you think that compact urban development will cause?

What knowledge is '*Bypakke Nord-Jæren*' based on?

How do Statens vegvesen calculate the chosen mean of transportation for individuals?

- Where is the gap between the use of cars and public transport / bicycle regarding price?
- Has the municipality calculated how much cheaper the public transportation needs to be for individuals to choose public transportation over the car?
- What about time spent on public transportation instead of private car?
- Do you have any calculations on this?

Have you calculated the expected increase in the number of people using public transport because of the new bus road?

- Where was the focus when the bus road was determined? Housing or business area?

Do you have any calculations on the inhabitants' resistance to transfer between modes or carriers?

One of the obligations of '*Bypakke Nord-Jæren*' is that the region is planning to develop residential areas where the public transportation will be more frequently used. What specific measures do you work to ensure this?

There is a great risk of re-regulation of land. How can this risk be reduced?

## **Interview with Elin Schanche**

What does '*Grønn By*' work for?

What role does '*Grønn By*' have in the efforts to densify the region?

What benefits do you see that a compact city will bring?

- Some specific examples?

What barriers or challenges do you think is prominent in regards to creating a more compact city in the region?

Which barriers are most challenging?

What tools (both economic and not) can the municipality use to work for compact urban development?

Do you think the municipality has enough knowledge about the densification of the region?

- Why / why not?

Do you know any specific measures the municipality do?

Do you know anything about the municipality's commitment to building apartments versus detached houses and townhouses?

The regional plan states that some of the old neighborhoods in the region has a higher density than new housing projects. What do you think is the reason for this?

## **Interview with Jarl Endre Egeland**

Can you tell us a little about what you do in your job and what roles you have?

What benefits do you see that a compact city will bring?

- Some specific examples?

What barriers or challenges do you think is prominent in this work for a compact city in the region?

Which barriers are most challenging?

What tools (both economic and not) can the municipality use to work for compact urban development?

What obstacles have you met in the municipality as developer of properties?

Do you think the municipality has enough knowledge about the densification of the region?

- Why / why not?

The Stavanger region is characterized by areas with many homes and other areas with many jobs. Do you think it could cause some challenges?

How do you consider an optimal region in terms of housing and workplace structure?

What areas do you think it should focus on densifying?

Do you know anything about the municipalities' commitment in building apartments versus detached houses and townhouses?

The regional plan states that some of the old neighborhoods in the region has a higher density than new housing projects. What do you think is the reason for this?

## **Interview with Stein R. Grødem**

Can you tell us what you do in your job?

Does the municipality actively work to increase the density of housings?

The government has decided that the municipalities must work towards compact urban development (higher density of housings). Do you know how the municipalities in this region works to implement this?

- Do you have any specific examples of how the municipalities work towards this?
- Do the municipalities have too much power to disregard requirements set by the government, which leads to lower focus on compact city development?

Areas with many homes and other areas with many workplaces characterize the Stavanger region. What challenges and benefits do you think this causes?

- How do you think an optimal region is in terms of housing and business structure?

Do the municipalities have enough knowledge and insight into how to best densify the region?

The municipalities has submitted some guidelines for densifying. Among other things, buildings with more than five floors are not allowed in densely populated areas. Do you think this prevents the densifying which is necessary in the region?

How does the municipality calculate the choice of means of transportation?

- Where is the gap between the use of car and public transport / bicycle, looking at the cost?
- Have the municipalities calculated how much cheaper public transportation must be in order to make this the preferred means of transportation?
- How about time spent on public transportation versus the car?
- Do you have any calculations on this?

How is the investment in building apartments versus attached / detached houses?

Free parking at work is tax free, but if the employer offers free use of public transport, the employee must tax from this. Do you think this is the right way to promote the use of public transport?

- Why is it like that? Why is nothing done with the number of parking spaces and free public transport?

Large parts of the investments go to road construction, while there is a focus on creating zero growth in traffic and making people use the public transportation offer. Aren't these very conflicting strategies?

What economic tools do the municipalities use to increase density?

What challenges are there in the ways the municipalities choose to densify the region?

In what way do '*Forus Næringspark*' work towards developing Forus?

- Are you focusing on developing Forus as a business park and residential area?

Is '*Forus Næringspark*' working to make it easier to get to Forus by bike or public transport?

How are the different areas at Forus regulated?

## **Interview with Gareth Doolan**

Can you start by telling what you do in your job?

What benefits do you think a compact city brings?

- Do you have any examples?

What barriers or challenges do you think is prominent in this work?

- Which barriers are most challenging?

What instruments (both economic and not) can Rogaland County Council use to work for compact urban development?

What specific actions are included in the regional plan to increase the density of the region?

- Does this apply to both homes and workplaces?

Regulation risk is a major concern for developers and the reason why many projects are not being carried out.

- To what extent is it emphasized to minimize the regulation risk for developers?
- What results do you think we will see if the regulation risk is minimized for developers?

The bus road is a specific initiative to get individuals to use public transport more. Several places along this axis have great potential for new homes, but very little has been done. The regional plan states, among other things, that "the growth of passenger transport in the metropolitan areas is to be taken by public transport, bicycle and walking". What specific actions have been taken / are being implemented to achieve this goal?

- The bus road is an important element in this work. But why are so few homes built in the 500-meter zone from the bus road? There are still areas to build homes (Paradis, Hillevåg, Mariero, Jåttåvågen, Gausel).
- How can the railway contribute to the goal of zero growth? Is Rogaland County Council looking at these possibilities? (transit stop at Forus).



- Which areas do you think should be in focus as residential areas?

Do Rogaland County Council make any calculations on which means that can contribute to changing travel habits?

The regional plan states that parking can be used as a means of increasing the use of public transportation, walking and cycling, but that this work has not begun. What is the reason why the work has not started?

- Research shows that reduced parking spaces are an important tool in order to reduce the number of drivers. How does Rogaland County Council consider using parking as an instrument? And in what areas?

In the regional plan, it is stated that "urban structure, settlement pattern and length of travel have an impact on how the expected transport growth can be divided between public transport, bicycle and walking." Rogaland County Council has the opportunity to influence where people settle down, is it used as a means of reducing the need for transportation?

- Do you have any examples?
- Ask follow-up questions regarding densifying the area around the bus road if necessary.

Why is the goal for transformation in residential areas only at 50%?

- Do you think Rogaland County Council should work towards increasing the efficiency of areas further, in order to reduce urban expansion?

In the regional plan, it is stated that several of the region's newer development areas are less efficient, with regards to the number living in the area, than older residential areas. How can Rogaland County Council let this happen, when the focus is on densifying?

- Are decisions regarding densifying based on too little knowledge?

In the regional plan, there are few specific areas for development of new housings. This applies to both transformation and agricultural land. What is the reason for this?

- Do the municipalities not possess enough knowledge to say something about where to build new housings?

## **Appendix 2 – Request to participate in research project**

The request to participate in our research project, which is translated into English, will be found below. The original documents (in Norwegian) will be found in appendix 3. The only difference between the documents are the professional titles.

### **Request to participate in research project**

***What are the barriers for higher population density in urban areas, which economic tools can the government implement to promote this, and what benefits will higher density bring?”***

#### **Background and purpose**

The purpose of this study is to gain a better insight into how densification in the Northern Jæren region can contribute to reduce the need for transportation and further reduce the CO<sub>2</sub>-emissions. Simultaneously, the thesis will discuss the roles the municipalities have in urbanization.

The project is a master thesis, and it is completed by two students at the Business School at University of Stavanger. You are asked to participate based on your professional title as head of ‘*Bypakke Nord-Jæren*’.

#### **What does the participation in the study imply?**

We will conduct an interview of approximately 1 hour. The interview will focus on your experience with densification in the Northern Jæren region, and what plans ‘*Bypakke Nord-Jæren*’ have in order to densify the region. The interview is open for new suggestions on the subject. The interview will be recorded.

#### **What happens with the information?**

We would like to use the information you give us in our work with the master’s thesis, together with your name and your professional title. If you wish to be kept anonymous, we will comply with this.

The project will be finished June 15<sup>th</sup> 2018. When the project is finished, and censorship has been registered, all data gathered will be deleted.

### **Voluntary contribution**

It is voluntary to participate in the study, and you can whenever you want withdraw your consent, without appointing a reason why. If you wish to withdraw, all information regarding you will be anonymized.

If you wish to participate, or if you have any questions to the study, please do not hesitate to contact Karianne Norland, email: kariannenorland@gmail.com, phone: 99101040 or Ida Riege, email: idariege@gmail.com, phone: 95040647. Our supervisor is Ragnar Tveterås, email: Ragnar.tveteras@uis.no.

### **I consent to participate in the study**

I have received information regarding the study, and I am willing to participate

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(Signed by participant, date)

### **Appendix 3 – Signed requests to participate in research project**

One the next pages we have included all six requests to participate in our research project, signed by the participants. The documents are in Norwegian, but we have translated the document into English above.

## Forespørsel om deltakelse i forskningsprosjektet

*What are the barriers for higher population density in urban areas, which economic tools can the government implement to promote this, and what benefits will higher density bring?"*

### Bakgrunn og formål

Formålet med denne studien vil være å få mer innsikt i hvordan fortetning av regionen Nord Jæren vil bidra til å redusere transport behovet og dermed få lavere CO2-utslipp. Samtidig vil oppgaven diskutere kommunes rolle i forhold til fortetning.

Prosjektet er en masterstudie som gjennomføres av to studenter ved Handelshøyskolen ved UIS. Du er forespurt om å delta på bakgrunn av din rolle som bypakkesjef.

### Hva innebærer deltakelse i studien?

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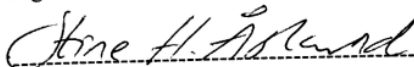
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### Samtykke til deltakelse i studien

Jeg har mottatt informasjon om studien, og er villig til å delta

 6/4-18  
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(Signert av prosjektdeltaker, dato)

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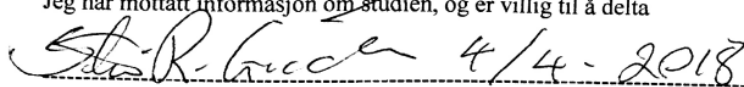
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 4/4 - 2018

(Signert av prosjektdeltaker, dato)



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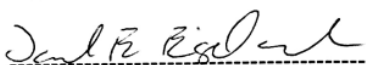
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 02/05/18

(Signert av prosjektdeltaker, dato)

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 2/5 - 18

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