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How interventions in master plans affect public transport competitiveness versus cars: a case study of two small and two medium-sized city regions

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ABSTRACT

Many spatial master plans aim at reducing car traffic and increasing public transport use, but whether the plans truly promote such development is not obvious because they may also include conflicting objectives. The purpose of this article is to propose and use a theory-based framework to analyze and discuss the possible effects of planned development in master plans on public transport competitiveness versus cars. Official planning documents and interviews with local planners in the city regions of Stavanger, Trondheim, Hamar, and Haugesund were interpreted using theory on causal mechanisms and previous empirical studies on the built environment and travel behavior. A simple map analysis was also conducted. The study revealed that all the case city regions' master plans contain interventions that are both negative and positive for public transport competitiveness. Conflicting interventions often reduce such competitiveness. The possible effects of interventions also largely depend on their context, dimension, and location.

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Public transport; land use; competitiveness; small cities; medium-sized cities; master plans

1 Introduction

National and regional objectives stress the need to reduce emissions and develop our cities in such a way that growth in population and transport demand can be achieved sustainably. The private car creates several negative consequences that extend beyond transport. Despite the advantages of electric cars, there are issues related to all aspects of car production and use, such as air pollution, dust, noise, extensive land use development because of increased mobility and the demand for space in already packed cities, and subsequent threats to biodiversity stemming from urban sprawl. A possible solution to these problems is developing cities that push toward increasing their inhabitants' use of public transport, cycling, and walking, and at the same time, reduce extensive use of private cars. According to theory and empirical studies, such a push can be generated from integrated land use and transport planning.

When it comes to pushing toward less car use, all may look well in one zoning plan or a single project, but there is evidence that we are far from a fundamental shift away from

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car-oriented planning (Khalaj et al., 2013, 2020). According to research, integrated land use and transport planning for sustainable mobility is difficult to achieve in practice (Hrelja et al., 2013,). In cities with low accessibility and long distances, public transport, walking and cycling are weak when it comes to competing with the flexibility and range of the private car (Banister, 2008).

The cases of this study are two medium-sized and two small city regions: The Trondheim region (hereafter Trondheim), the Stavanger region (hereafter Stavanger), the Hamar region (hereafter Hamar) and the Haugesund region (hereafter Haugesund). Using a theoretically and empirically based interpretation tool, this article aims to investigate whether the planned development in the master plans in Stavanger, Trondheim, Haugesund, and Hamar will contribute to an increase in public transport competitiveness.

1.1 Purpose and contribution

This study explores and analyzes master plans to uncover the ways in which the planned built environment in two small (Hamar and Haugesund) and two larger cities (Stavanger and Trondheim) is likely to affect public transport competitiveness versus private cars. The word competitiveness is defined as the *ability to compete* ('Cambridge Dictionary,' 2020). In the present article, public transport competitiveness versus cars is defined as public transport that is *able to compete* with private cars. Many factors can affect public transport's ability to compete in an area; personal preferences, demographic factors, the speed and comfort of public transport services, cultural, social, and health-related, economic and financial characteristics of travelers, and, not the least, characteristics of the built environment. The focus in this study is on how public transport competitiveness is affected by the built environment which is affected by and is the end result of urban planning. The purpose of this work is to propose and use a framework for analyzing and discussing the possible effects of interventions in master plans on public transport competitiveness. Master plans are plans covering a county, regional, or municipal level. Plans at a zoning plan level are not addressed in this article. Here, interventions are defined as planned development in master plans, such as road expansion, land use development in the form of densification or sprawl, and location of different work- and visit-intensive functions.

Earlier research has shown that the goal achievement potential of plans is affected by the planning practice; organizational structure; and individual planners' and stakeholders' power, knowledge, choices, or preferences (Flyvbjerg, 2002; Hrelja et al., ; Næss et al., 2013; Øksenholt & Tennøy, 2018; Stead, 2009; Tennøy, 2012; Tennøy et al., 2016; Tennøy & Øksenholt, 2018). Earlier studies on land use and transport planning that can contribute to increased use of public transport have been both process and organization oriented, but there is little research on the outcomes of plans concerning travel patterns (Hrelja et al., 2020). There is also little research on bus priority measures (Pettersson & Sørensen, 2020). This article will fill in parts of these knowledge gaps.

Below, I present the research questions, the theoretical framework, and the methods used in this work. The findings and discussion follow before the conclusion of this study is presented.

2 Research questions

The research questions addressed in this article are as follows:

1. How do planned changes in the land use and transport structure in small and medium-sized cities affect the possibility of increasing public transport's competitiveness …
   a. According to existing knowledge and theory?
   b. According to the local planners?
2. What differences and similarities are there between the findings of a and b?
3. How does this phenomenon differ between small and medium-sized cities according to existing knowledge and theory?

3 Theoretical framework

There is a solid theoretical basis for the urban structure influencing transport behavior, both from time geography, location theory, mobility sociology and economic utility theory. At a metatheoretical level, this work is based on the ontology of critical realism (Bhaskar, 2008). Theory regarding causal mechanisms between the built environment and travel behavior forms the basis of the interpretations conducted in this study. Travel (measurable events) is affected by mechanisms (some amplify each other, some reduce other influences) and structures, which can be urban structures, but also political and economic conditions (Næss & Jensen, 2002). Other structures and characteristics affecting travel mode choice include demographic conditions, cultural norms, dominant discourses, as well as the personal characteristics of individuals. This work focuses on how the planned built environment is likely to create a certain travel behavior when and if the plans evolve into a physical form.

3.1 The built environment, travel behavior and causal mechanisms

In this article, the built environment includes the geographical distribution of land use and transport infrastructure presented in master plans. The idea of integrated land use and transport planning is in line with the notion that the built environment affects how inhabitants in an area behave, influenced by causal mechanisms. In line with the critical realist philosophy of science, Næss states

> By determining the distances between locations where different activities may take place, and by providing conditions suitable for different modes of traveling, the urban built environment constitutes a set of conditions facilitating some kinds of travel behavior … and rendering other types of travel behavior less attractive or likely. (Næss, 2016:66)

Thus, according to theory on causal mechanisms, the built environment can contribute to increased or decreased public transport use. Table 1 presents measures that, according to earlier empirical studies, increase either the use of public transport or private cars.

Many factors can affect public transport competitiveness. The studies referred to in this section have not only focused on built environment. Both in-depth interviews and statistical analysis have illuminated how personal preferences, habits and factors such as age, gender and education affect their travel mode choice and habits as well as residential

Table 1. Built environment favoring the use of public transport or the car.

Built environment favoring use of public transport	Built environment favoring use of private cars
Monocentric city structure	Polycentric city structure
Dense and compact cities	Sprawl
Shortcuts and prioritized space for public transport	No shortcuts or prioritized space for public transport
Shortcuts and accessibility measures for pedestrians and cyclists to and from public transport	No shortcuts and accessibility measures for pedestrians and cyclists to and from public transport
Scarce parking capacity	Generous parking capacity
Scarce road capacity	Generous road capacity

location and work location. Although these factors do affect travel mode choice at a personal level, research does show that people's choices of transport modes for travel in cities and metropolitan areas are affected by built environment characteristics. The following presentation of research focuses on how the built environment is found to affect travel mode choice and behavior, as this is the main focus of this paper. Personal preferences and choices have been accounted for in most of these studies.

Research has shown that cities with a monocentric structure have a higher share of public transport passengers compared with polycentric cities, where the share of car drivers is higher (Engebretsen et al., 2018; Næss, Strand et al., 2019; Næss, Tønnesen et al., 2019; Wolday, 2018; Wolday et al., 2019). Dense, compact cities are easier to provide with a good public transport service and have a higher share of public transport passengers, whereas low-density and sprawling urban development tends to increase the use of private cars (Cao et al., 2019; Graham et al., 2018; Næss et al., 2017, 2018; Næss, Strand et al., 2019; Næss, Tønnesen et al., 2019). An exception to this is small cities, where transport in the city center more often involves walking or cycling, while public transport and the car are more attractive for longer trips, such as commutes to other cities (Wolday, 2018).

Empirical evidence from larger cities has shown that making public transport more accessible for pedestrians and cyclists through shortcuts and accessibility measures increases public transport's ability to reach potential passengers (Hillnhütter, 2016; Kager et al., 2016; Kager & Harms, 2017). Public transport services with a high frequency and low travel time due to shortcuts and prioritized space for public transport services also increase public transport competitiveness (Bertolini et al., 2005; Ferreira et al., 2012; Pettersson & Sørensen, 2020; Tennøy et al., 2017; Walker, 2012). Measures that reduce the accessibility of private cars, such as a limited parking capacity (Christiansen, Engebretsen et al., 2017; Christiansen, Fearnley et al., 2017) and small road capacity (Tennøy et al., 2019) have been found to increase public transport competitiveness.

Increasing the cost of traveling by car with parking fees or toll roads is also a measure that can contribute positively to public transport competitiveness. This depends on the inhabitants' ability and willingness to pay for private car use; therefore, it discourages car use among those without the means or willingness to pay for private car travel. In this article, the focus is solely on physical aspects and master plans; price regulations are not included in master plans and are not part of the physical environment, and thus, there is no further discussion on the specific costs of driving or parking a car in the case cities. Still, based on the literature and empirical studies, it can be stated that the cost of car travel is generally underpriced (Cervero et al., 2017).

3.2 Location, dimensioning and context

Although the different types of built environments mentioned above have been empirically proven to have a certain effect on the use of public transport, they are not likely to have identical effects in all cities. According to the ontology of critical realism, different outcomes of the same intervention can be explained by differences in other, simultaneously operating structures and mechanisms. The positive or negative effect of a planning intervention will depend on the design, location, and dimensioning of an intervention and the context surrounding it. Here, the city context is defined as both the existing built environment and other interventions in the plans that can affect whether the planned built environment can help increase public transport's competitiveness when implemented.

4 Methods

This is a qualitative case study of four Norwegian city regions. The four city regions are deliberately chosen for this case study as they obtain *'information about the significance of various circumstances'* (Flyvbjerg, 2006:426) that can affect the possibility to increase the public transport competitiveness in small and medium sized cities. The reasons for this is (1) that they are small and medium sized cities, and smaller cities normally have difficulties when it comes to increasing public transport competitiveness, (2) the city regions' master plans have an ambitious outspoken aim to increase public transport competitiveness and (3) the master plans have described and aim to initiate measures to increase public transport competitiveness.

The choice of method is based upon an aim to 'clarify the deeper causes behind a given problem and its consequences … not describe the symptoms of the problem and how frequently they occur' (Flyvbjerg, 2006:425). Previous empirically based research has provided an extensive amount of knowledge on how the built environment affects travel behavior. A deeper analysis of planned development might provide with the knowledge that illuminates why our small and medium-sized cities continuously tend to stay car friendly in spite of our knowledge on how built environment affects travel behavior.

To investigate whether the plans will result in a built environment that contributes to an increase in public transport competitiveness, I have conducted document studies and interviewed planners involved in both the development of master plans and large public transport development projects in the city regions. The interventions described in the plans have not yet been implemented, and thus, the possible effects of the plans on public transport competitiveness are evaluated from a theoretical perspective based on theoretically plausible causal mechanisms identified in former empirical studies (Table 1).

It is a common mistake to believe that case studies cannot contribute with transferable results (Flyvbjerg, 2006). This is a problem that will be further addressed in the discussion section. When addressing the transferability of this study, it is important to mention here that the plausible mechanisms (Table 1) are empirically found to be relevant in many different cities, and the table (Table 1) can therefore be used to interpret the plausible impacts of the planned spatial development in other cities. By taking local differences in location, dimensioning and context is into account, transferability of the method used and findings in this case study is ensured. At the same time, identifying the four cities' local contextual differences

makes a deeper insight into each case possible, which is just one of the strengths of case studies (Flyvbjerg, 1996).

4.1 Presenting the case cities

Location

Figure 1 illustrates the location of the case cities in Norway. The table (Table 2) and maps (Figures 2–5) describe and illustrate the existing built environment and travel behavior. The table also describes the administrative areas the city regions are located in and affected by.

4.2 The existing built environment

The maps (Figures 2–5) illustrate the density of employees in the city regions. The data are collected, owned, and quality assured by Statistics Norway (SSB, 2017). The density of employees illustrates the existing built environment and the areas that have the most work- and visit-intensive functions. The existing built environment influences the existing use of public transport, private car, cycling and walking.

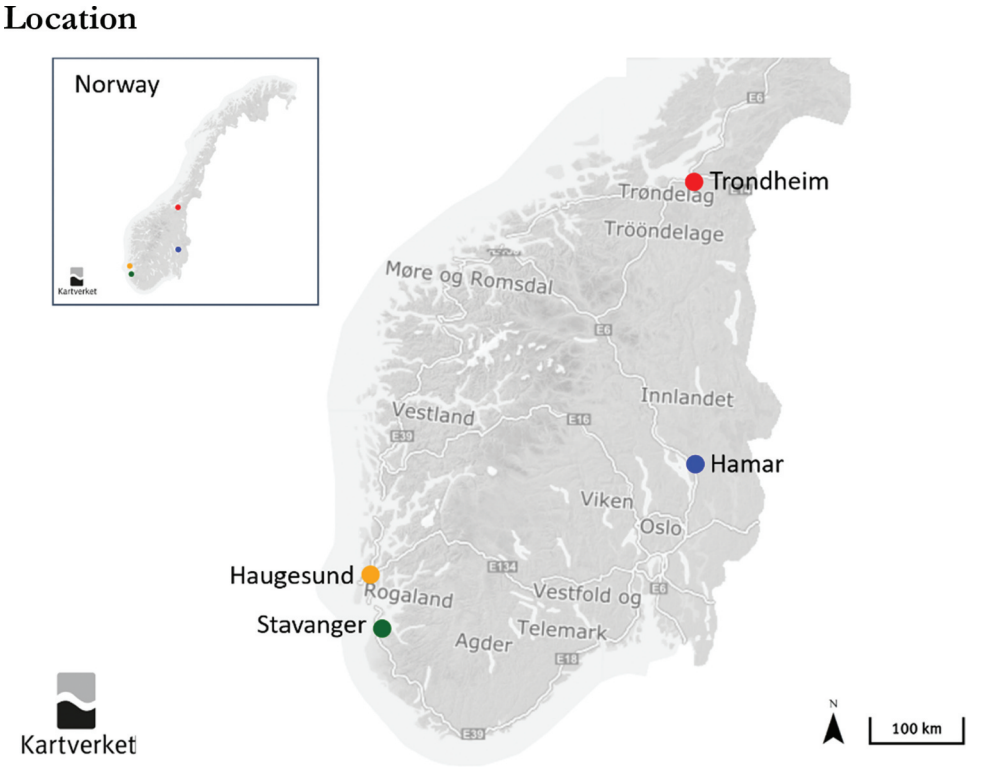

Figure 1. Location of the case cities. The map is based on data from ©kartverket/norgeskart.no (norgeskart.no) Figure/map by the author.

Table 2. Presenting the case city regions.

Case city regions	Formalities	Existing built environment and travel behavior characteristics
Stavanger/ Sandnes	**Inhabitants**: 228 287 (SSB, 2020) **County**: Rogaland **City region municipalities**: Stavanger (city center), Sandnes (second-order center), Sola, Randaberg **Bus company** Kolumbus	Polycentric Three dominant areas: Stavanger, Sandnes, and Forus (dominant work-intensive area in the region) Main transport mode shares (National Travel Survey 2018; (NRA., 2019): Private car driver/passenger: 53/9% Public transport: 10% Cycling: 7% Walking: 20%
Trondheim	**Inhabitants**: 189 271 (SSB, 2020) **County**: Trøndelag **City region municipalities**: Trondheim **Bus company:** AtB	Monocentric Mainly densified city center, some residential areas and workplaces in suburban areas Main transport mode (National Travel Survey 2018; (NRA., 2019): Private car driver/passenger: 46/10% Public transport: 11% Cycling: 8% Walking: 24%
Hamar	**Inhabitants**: 28 434 (SSB, 2020) **County**: Innlandet (previously Hedmark) **City region municipalities**: Hamar **Bus company**: Innlandet Trafikk (previously Hedmark Trafikk) (County)	Monocentric Small, densified city center; some residential areas and workplaces in suburban areas; and dense small cities and villages within commuting distance Based on the National Travel Survey 2014 (Urbanet Analyse, 2018): Private car driver/passenger: 66/9% Public transport: 4% Cycling: 5% Walking: 15%
Haugesund	**Inhabitants**: 45 352 (SSB, 2020) **County:** Rogaland **City regionmunicipalities**: Haugesund (city center), Karmøy **Bus company** Kolumbus (County)	Monocentric Small, densified city center; some work- and visit-intensive functions competing with city center and residential areas in nearby villages within commuting distance County travel survey (Bayer, 2018): Private car driver/passenger: 58/8% Public transport: 3.8% Cycling: 8% Walking: 19%

Figures 2–5 illustrate that each city has a different built environment. Stavanger has a polycentric city structure with less dense central areas, compared to the more monocentric cities of Trondheim, Hamar and Haugesund. According to theory on the influences of built environment characteristics on travel behavior, increasing the public transport competitiveness in Stavanger is more difficult compared to Trondheim. The share of different transport modes in Table 2 confirms a higher car share and a lower share of public transport passengers in Stavanger than in Trondheim. The small cities of Hamar and Haugesund is according to theory likely to have a higher share of pedestrians and cyclists, a high share of car drivers and a very low share of public transport passengers. This is confirmed in Table 2.

Stavanger, Hamar and Haugesund are quite flat cities and the local topography is not likely to have a large effect on the land use and transport development in these cities. Large parts of Trondheim is shaped as a large valley with hills in the east and the west, with an exception for the eastern areas closest to the Trondheim fjord. Work- and visit-intensive functions in the central areas in the city are located in the lowest part of the valley and

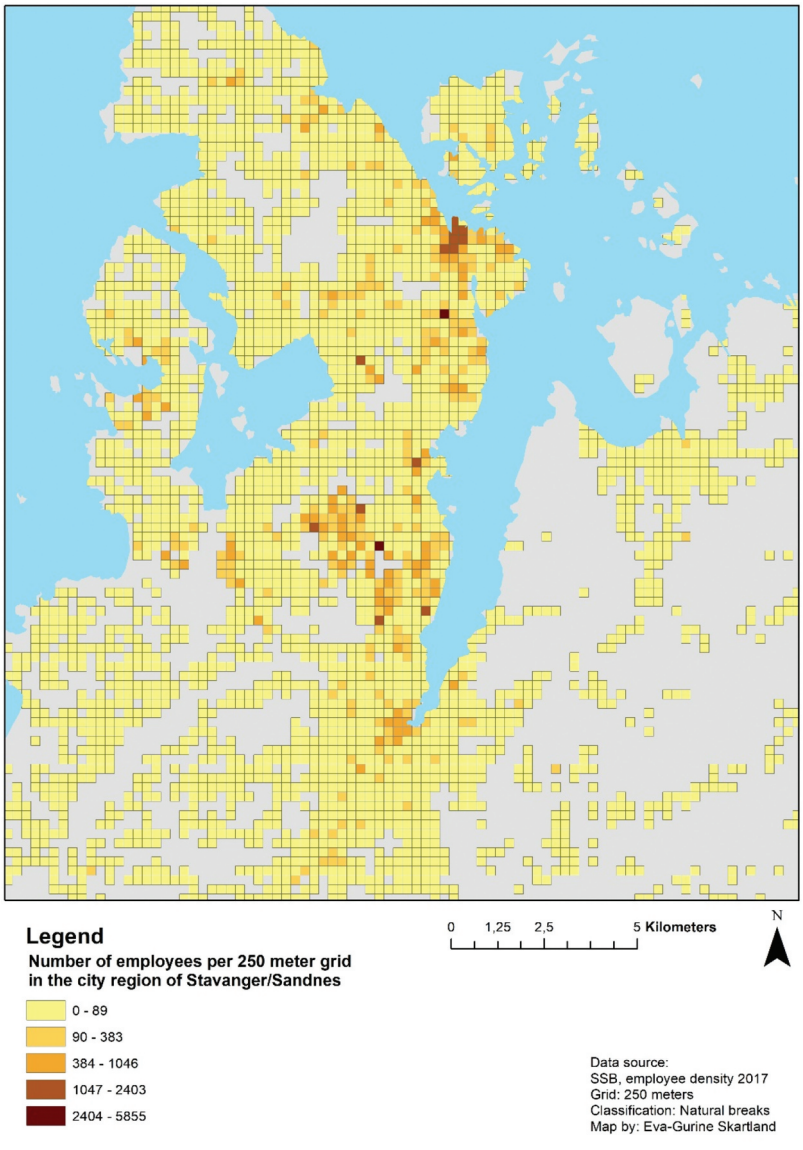

Figure 2. Number of employees per 250-m grid in Stavanger.

follow it from north to south. In addition to this, the river 'Nidelva' in Trondheim surrounds the downtown areas of the city, and the few bridges with a limited capacity function as natural bottlenecks.

In the following, the planned development in the four investigated cities is presented. The planned development can help increase or decrease public transport competitiveness.

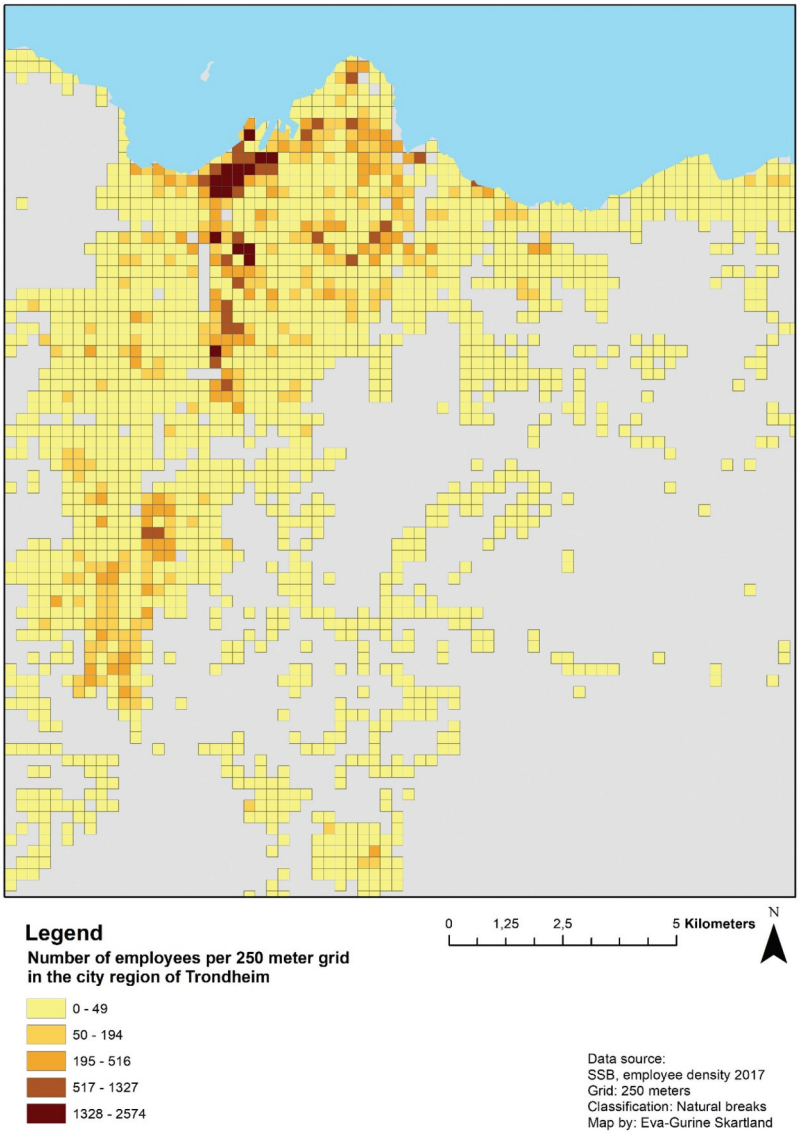

Figure 3. Number of employees per 250-m grid in Trondheim.

4.3 Interviews and document studies

Interviews were conducted that included planners and practitioners with in-depth knowledge of the master plans and public transport plans. These practitioners were deliberately selected from the institutions involved in the development of public transport projects and master plans in the case city regions. The interviews were recorded, transcribed, and interpreted qualitatively using an interpretation scheme. Notes were taken during each interview. The notes were cross-checked among the interviewers and the interviewees to clear up any misunderstandings. Table 3 provides an overview of the interviews.

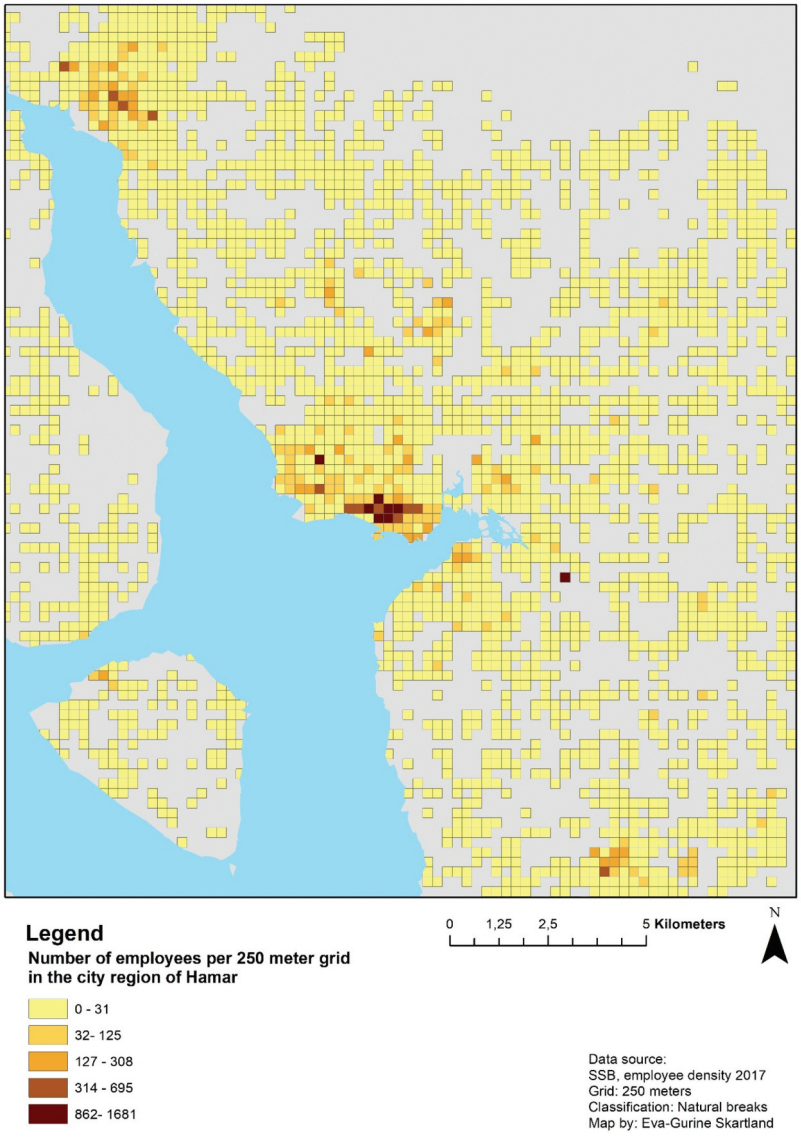

Figure 4. Number of employees per 250-m grid in Hamar.

Table 4 gives an overview of the studied plans, referred to in general as 'master plans.' Information concerning when the plans were politically approved by the county and municipal councils is provided in the appendix (Table A1).

The document study was conducted using the theoretically and empirically based interpretation table (Table 1) to identify interventions in the plans that can contribute to an increase in public transport competitiveness. Interventions that increase car accessibility were also registered. The maps below illustrate the legally binding municipal land use plans covering the cities. These maps show the planned development for the built environment in Stavanger (Figure 7), Trondheim (Figure 8)), Hamar (Figure 9) and Haugesund (Figure 10). According to the theory regarding influences of built

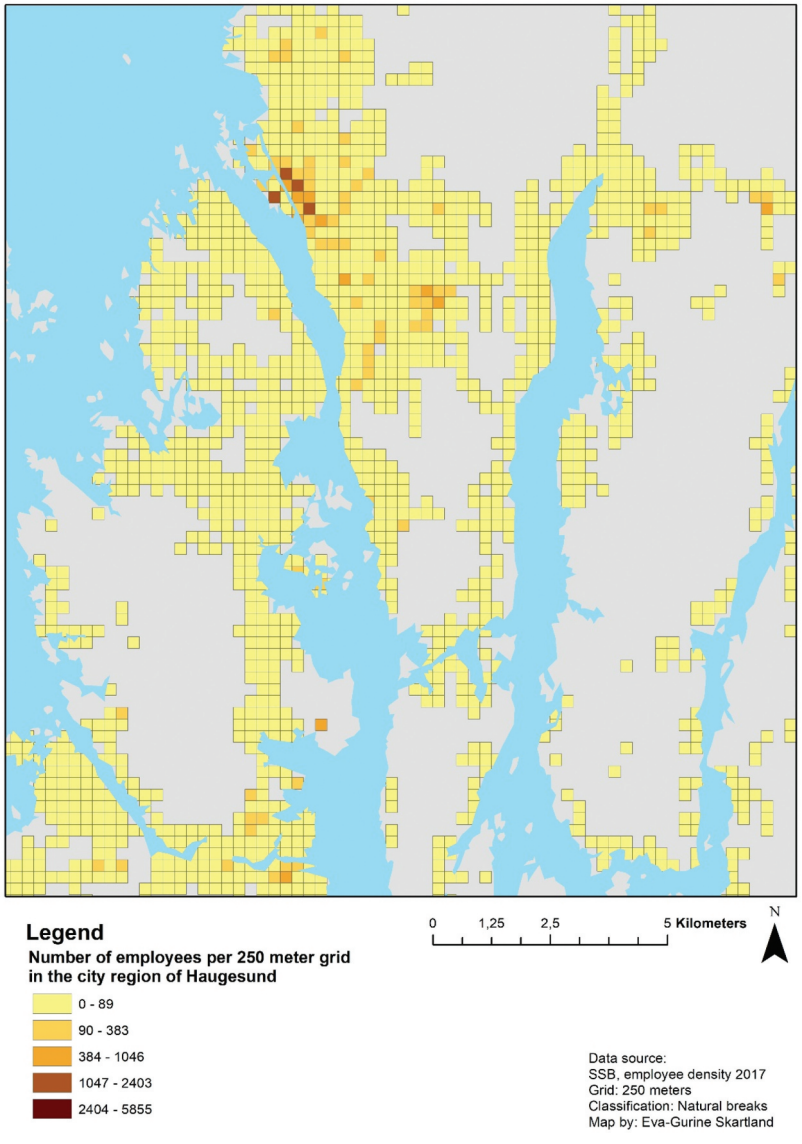

Figure 5. Number of employees per 250-m grid in Haugesund.

Table 3. Overview of interviewees.

Interviewees' formal affiliations			
Chief of transport	Municipal planner	Bus company representative	Project leader
Trøndelag County	Trondheim	AtB	Metrobus
Rogaland County	Stavanger	Kolumbus	Bus road
Rogaland County	Haugesund	Kolumbus	
Hedmark County	Hamar	Hedmark trafikk	

Table 4. Document study.

	Stavanger (Rogaland, Jæren)	Trondheim Trøndelag County (previously Sør-Trøndelag)	Hamar Innlandet County (previously Hedmark)	Haugesund (Rogaland, Haugalandet)
National level	**Action Program NRA 2018–2023**	**Action Program NRA 2018–2023**	**Action Program NRA 2018–2023**	**Action Program NRA 2018–2023**
County level (not legally binding)	**Transport Strategy for Rogaland 2018–2029** **Action Program for County Road Network in Rogaland 2018–2021 (2023)** **Action Program for Public Transport in Rogaland 2018–2023**	The transport strategy for Trøndelag County is divided into five sub-strategies; the strategies for traffic safety and sea transport are not included in this study. **Road Sub-Strategy 2019–2030** **Mobility Sub-Strategy 2019–2030** **Goods Sub-Strategy 2019–2030** **AtB Future Route Structure 2019–2029** Summary report 05.13.16, AtB	**Land Use and Transport strategy for Mjøsbyen (2019)** **County Sub-Plan for Coordinated Environmental, Area, and Transport Development (SMAT)**	**Transport Strategy for Rogaland 2018–2029** **Action Program for County Road Network in Rogaland 2018–2021 (2023)** **Action Program for Public Transport in Rogaland 2018–2023**
Regional level (not legally binding)	**Regional Plan for Jæren 2050**			**Regional Plan for Land Use and Transport in Haugalandet**
Intermunicipal plan (can be binding)	**Intermunicipal Municipal Sub-Plan for Forus 2019–2040**: Municipalities of Sandnes, Sola, and Stavanger (legally binding, not yet approved) **Mediation protocol** Intermunicipal Municipal Sub-Plan Forus 08.23.19	**Intermunicipal land use plan (IKAP)**Goals, strategies, and guidelines for area development in the Trondheim region (Trondheim made the plan binding)	**Regional Transport Plan Hedmark County Municipality 2012–2021**	
Municipal level (all legally binding)	**Land Use Municipal Plan for Stavanger 2019–2034**	**Land Use Municipal Plan for Trondheim 2012–2024**	**Land Use Municipal Plan for Hamar 2018–2030**	**Land Use Municipal Plan for Haugesund 2014–2030**

environment characteristics on travel behavior, the planned land use development can help or decrease the public transport competitiveness. A legend for land use properties is provided in Figure 6.

4.4 Limitations

As mentioned above, this article presents a theory-based interpretation of overall plans that contain interventions that are still to be implemented. Therefore, the results of this case study should be understood as a theory-based interpretation of planned interventions in existing built environments. In urban planning practice, the prediction of the

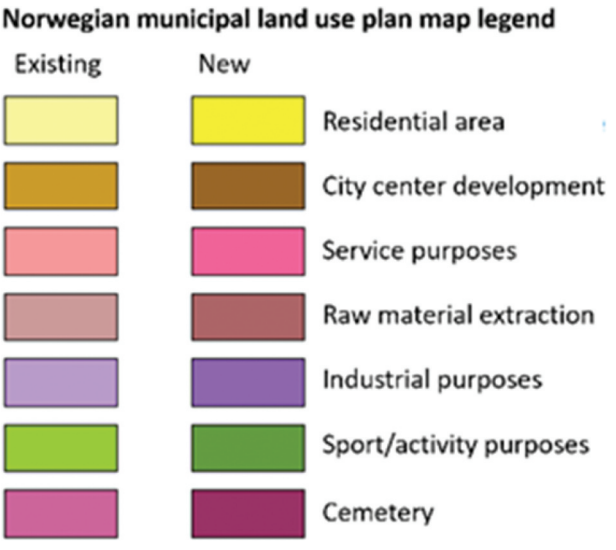

Figure 6. Norwegian municipal land use plan map legend.

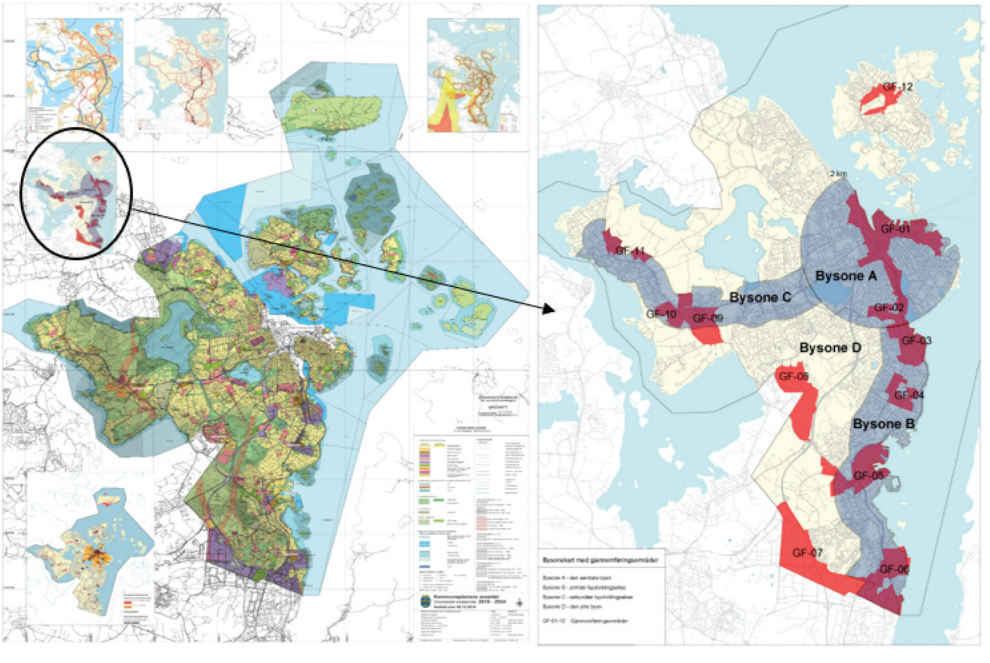

Figure 7. Stavanger; red areas are available for development (industry and residential), no prioritized order.

effect of planned interventions on travel is based on theory and existing knowledge about how land use affects travel behavior. The result of land use plans is also an effect of other causal mechanisms that are ignited by structures and events within politics and planning practice. These structures and mechanisms are not addressed in the present article.

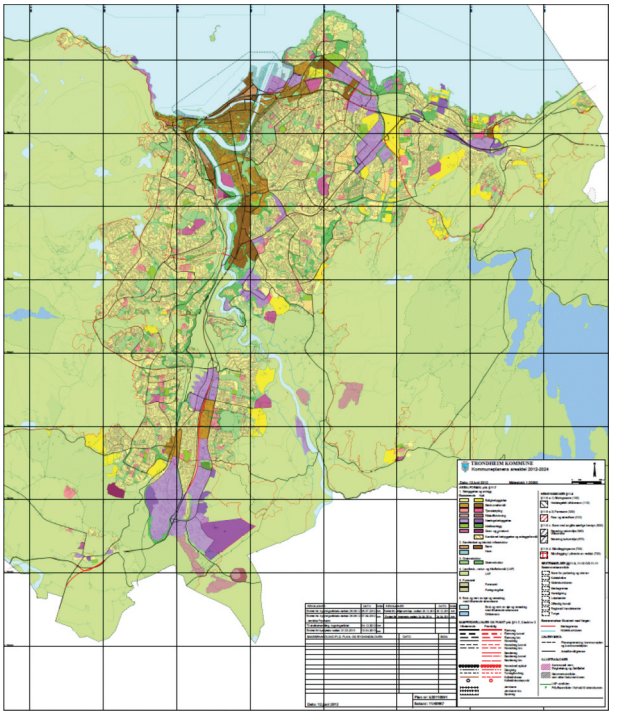

Figure 8. Land use development plan for Trondheim.

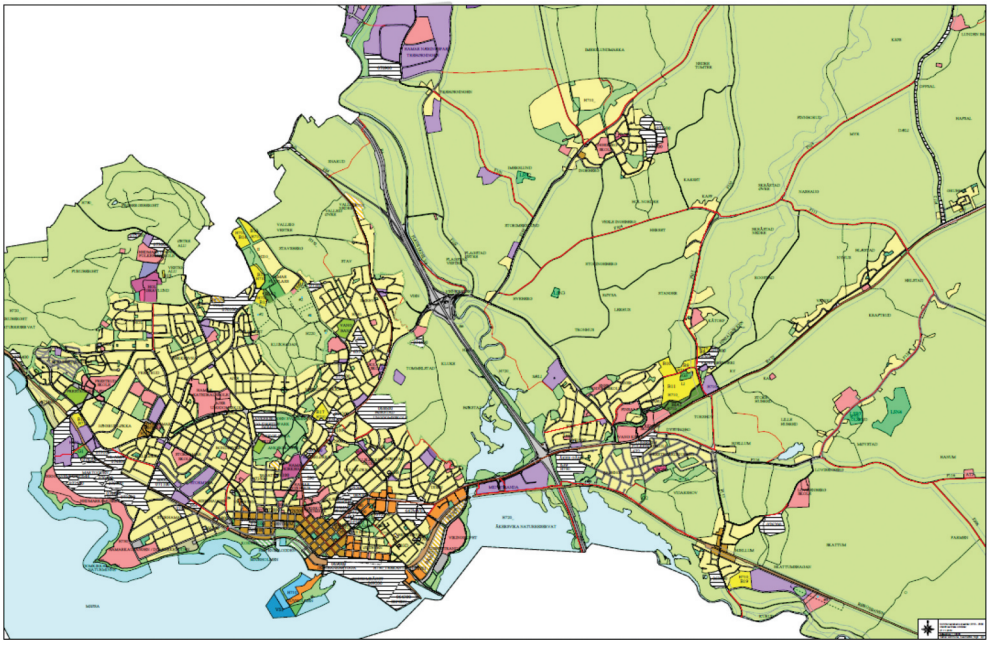

Figure 9. Land use development plan for Hamar.

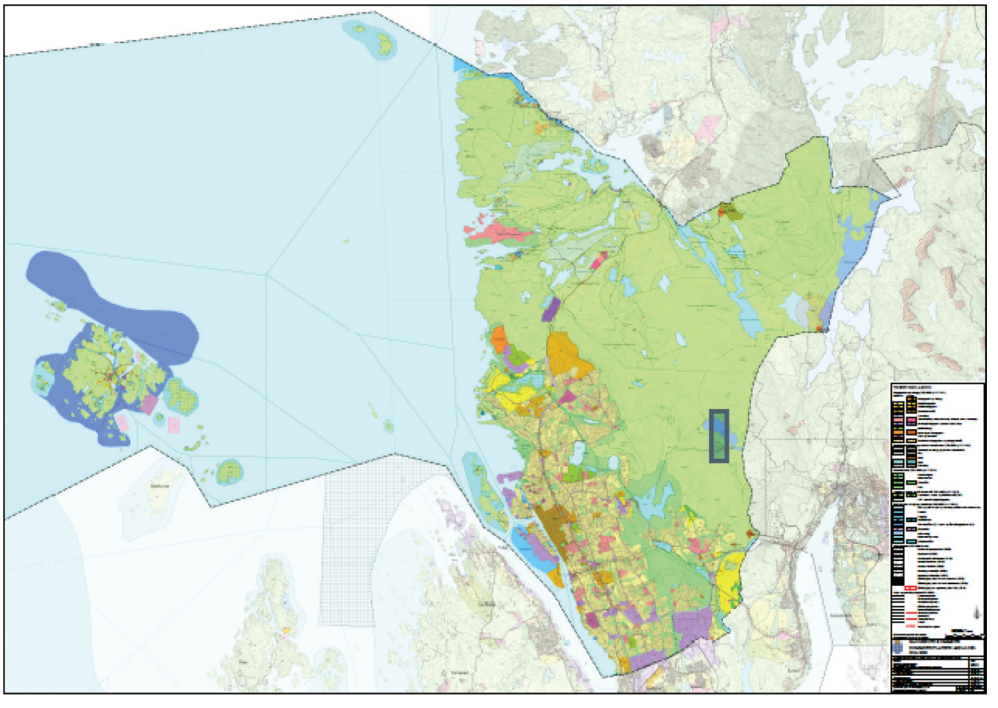

Figure 10. Land use development plan for Haugesund.

5 Findings

The theoretically based interpretation of the master plan documents reveals that all the cities plan both positive and negative interventions for public transport competitiveness. Below, the findings are presented, explained, and summarized in a theoretically based interpretation table (Table 5).

5.1 How master plan implementation will affect the possibility of increasing public transport competitiveness

a) According to existing knowledge and theory

The planning documents in Stavanger consist of objectives and measures that can increase public transport competitiveness. The master plans support a continuous polycentric development, where Stavanger and Sandnes, as well as Forus, are areas that are targeted for further development (Action Program for Public Transport in Rogaland 2018–2023, Regional Plan for Jæren 2050, Municipal Land Use Plan for Stavanger 2019–2034, Intermunicipal Municipal Sub-Plan for Forus 2019–2040). The plans describe a development with strict parking regulations in the city center and densification of residential areas located within the catchment area of parts of the public transport system (Action Program for Public Transport in Rogaland 2018–2023, Regional Plan for Jæren 2050, Municipal Land Use Plan for Stavanger 2019–2034, Intermunicipal Municipal Sub-Plan for Forus 2019–2040). Still, the planning documents also include

measures that can potentially reduce public transport's competitiveness. The municipal plan includes a generous parking capacity close to parts of the public transport system and the university and hospital area (Municipal Land Use Plan for Stavanger 2019–2034). In Rogaland, an aim of the plan is to increase the accessibility in the region by providing inhabitants with a more generous road capacity and fewer ferries along the western coast. The Rogfast and Ryfast road projects go through the city center of Stavanger and reduce travel time to suburban areas surrounding the city (Action Program for County Road Network in Rogaland 2018–2021 [2023], Action Program NRA 2018–2023 [2029]). These projects increase accessibility primarily for drivers who travel to and from sub-urban and rural areas, but they can also influence land use development and traffic in Stavanger.

The hospital in Stavanger is currently located close to the Stavanger city center and is to be relocated to the area of Ullandhaug, where the parking regulations are twice as generous and the bus frequency is lower. Such a development will result in work- and visit-intensive land use in suburban areas that are more car based (Regional Plan for Jæren 2050, Municipal Land Use Plan for Stavanger 2019–2034). The plans do not appear to be consistently supportive of public transport competitiveness, and restrictions aimed at cars are mostly concentrated in the city center of Stavanger (Municipal Land Use Plan for Stavanger 2019–2034). The Stavanger city center has work- and visit-intensive functions, but it is the area of Forus that is the most work-intensive area in Stavanger/Sandnes, with 45,000 jobs. According to the plans, the area of Forus will be serviced by a high-quality public transport provision (Bus Road Planning Program, 2016), but the area has extensive parking capacity at present.

The intermunicipal sub-plan for Forus suggests a stricter parking capacity for private parking spaces in the area, but it also opens for deviations from these restrictions when the parking spaces are open for public use. The plan has a mobility focus and contains several measures that increase the accessibility to public transport stops for pedestrians and cyclists. There are also regulations that ensure density close to the public transport service (Intermunicipal Municipal Sub-Plan for Forus 2019–2040). The plan is not yet approved by the municipal councils. Protocols show that the municipalities have had difficulties in agreeing on parking restrictions in the area. Forus is described as having an overcapacity of parking spaces; still, Sandnes and Sola are reluctant to meet the standards Stavanger municipality recommends to reduce car use (Mediation Protocol, Intermunicipal Municipal Sub-Plan Forus, 08.23.2019).

Trondheim has a long history of densifying in central areas, and the public transport axes have been an integrated part of the master plans for many years. Consequently, many work- and visit-intensive functions are located centrally and close to the main public transport axes (IKAP, Municipal Land Use Plan for Trondheim 2012–2024). The ruling land use plan (2012–2024) will be replaced in 2021. The land use and parking regulations in the ruling municipal plan are adapted to the former route structure of the public transport axes. Therefore, recent substantial changes in the public transport route structure (AtB Future Route Structure 2019–2029) are not integrated into the ruling land use plan. Measures that would normally not be allowed close to the public transport system can be allowed within the short timeframe where the land use plan is not adapted to the new route structure. Although the master plans in Trondheim contain several interventions that are supportive of public transport competitiveness

(Road Sub-Strategy 2019–2030, Mobility Sub-Strategy 2019–2030, IKAP, Municipal Land Use Plan for Trondheim 2012–2024, AtB Future Route Structure 2019–2029), some measures are likely to contribute to increased car use. The 'E6 Trøndelag' project includes road expansion in rural and suburban areas in the eastern and southern parts of the city region (nyeveier.no., 2020b). The road expansion is especially problematic when it comes to public transport competitiveness in the eastern area of Trondheim and neighboring urban settlements in the east within commuting distance (Malvik, Hell, Stjørdal). This part of the urban region has poor public transport services, and there are large areas available for residential development (Road Sub-Strategy 2019–2030, Goods Sub-Strategy 2019–2030, Municipal Land Use Plan for Trondheim 2012–2024).

The master plans for the city region of Hamar steer development toward densification in central areas, as well as along the public transport axes (Land Use and Transport Strategy for Mjøsbyen [2019], SMAT 2012–2021, Municipal Land Use Plan for Hamar 2018–2030). The planned parking regulations are restrictive in central areas (Municipal Land Use Plan for Hamar 2018–2030). It is important to mention here that the existing parking capacity in the city center of Hamar is extensive. In the city region of Hamar, there are plans to expand the road capacity on a national highway. The 'E6 Innlandet' highway project connects Hamar with nearby villages and suburban areas (nyeveier.no., 2020a). It is problematized in the regional transport plan that increasing the accessibility for cars will limit the possibilities to have centralized development in the region (Regional Transport Plan Hedmark County Municipality 2012–2021).

In Haugesund, the master plans consist of interventions that enable development in both central and suburban areas (Regional Plan for Land Use and Transport in Haugalandet, Municipal Land Use Plan for Haugesund 2014–2030). The plan's objectives state that development should be concentrated centrally and close to the public transport service, but there is land available for development in areas that are less central as well (Regional Plan for Land Use and Transport in Haugalandet, Municipal Land Use Plan for Haugesund 2014–2030). Of all the cities, Haugesund has the most generous parking capacity when it comes to private housing and work- and visit-intensive functions (Municipal Land Use Plan for Haugesund 2014–2030).

According to theory (Hillnhütter, 2016; Kager et al., 2016; Kager & Harms, 2017), some interventions for cyclists and pedestrians can benefit public transport competitiveness as well. Still, it would be misleading to interpret measures for cyclists and pedestrians in the municipal plans of Haugesund (2014–2030) and Hamar (2018–2030) as generally beneficial for public transport. The shares of cyclists and pedestrians in these cities are larger than the shares of public transport passengers. It has been found that, in small cities, intra-urban distances are mainly traveled by walking or cycling unless by car, while public transport is mainly used for longer commutes (Wolday, 2018). Due to this, it is likely that measures that are positive for pedestrians and cyclists in small cities will be mainly beneficial for walking and cycling and not have a large effect on public transport competitiveness.

b) According to local planners

The planners in all the city regions were aware of what could be considered negative or positive interventions for public transport competitiveness. When asked about what was done to improve public transport competitiveness, the planners answered in line with

what was found to be positive and negative in the document analysis. In addition, planners referred to politics and conflicting objectives as reasons for interventions that may reduce public transport competitiveness in the plans. They also pointed out that accessibility for private cars is valued and considered necessary for many city region inhabitants; thus, there is reluctance to be too restrictive towards car use. This reluctance was mentioned in all the city regions, but it was especially problematized in the interviews with planners in Stavanger. They made clear that the parking regulations are too generous, and they are working toward less accessibility for cars in their forthcoming municipal land use plan.

5.2 How planners interpret the effect of the plans versus the interpretation based on theory and existing knowledge

The interviews provided information about how the existing built environment and plans in neighboring municipalities affect public transport in all city regions. The planners stated that land use and transport development outside the municipal border affected the transport pattern in the city centers. Neighboring municipalities develop residential areas where the public transport service is poor, resulting in car dependency among the inhabitants. These inhabitants visit and commute to the work- and visit-intensive areas in local centers and city centers. In Trondheim, the intermunicipal land use plan, IKAP, is meant to ensure the development of residential areas and work- and visit-intensive areas centrally to reduce car use.

The other city regions do not have intermunicipal land use plans covering the whole municipal territories, but Stavanger, Sandnes and Sola have produced an intermunicipal plan for the Forus area to ensure development that accommodates the interests of the three municipalities. In the interviews, the planners stated that coming to an agreement on further development in the area is important to meet local and regional objectives. It is an aim to reduce the use of private cars, but the planners revealed that there is reluctance among politicians to reduce car accessibility in the Stavanger city region. It was emphasized that the municipality of Sandnes and other surrounding municipalities have a car-friendly political climate. This makes planning for less car use a challenge in the city region of Stavanger, especially in Stavanger municipality.

In the interviews with the planners in Trondheim, the land use development in the eastern part of the city region was emphasized as a challenge. In the east, there are areas of farmland separating the existing residential areas from each other. Large areas are available for development, and the public transport service is poor. In the western part of the city region, the public transport service is of high quality, and the residential areas are cohesive. Developers push for building residential areas in the east because the properties are cheaper. As the parking regulations are not as strict in the eastern suburban areas, with the poor public transport service, residential areas become car dependent. The planners pointed out that it is likely for car-dependent residential areas to appear because a high-quality public transport service depends on customer demand and takes years to develop.

The planners had different takes on their understanding of how the master plans could increase the use of public transport. For instance, one of the planners interviewed repeatedly stated that the municipal land use plan 'is just a strategic document; it does not contain specific plans and projects.' This statement is interesting because the municipal land use plan

is the municipal planners' tool to approve or reject interventions that are not in line with planned development. The municipal land use plan is indeed a plan, and developers are legally obliged to follow the regulations laid down to steer the land use and transport development in a certain direction. In another city region, the interview revealed that, formerly, some master plans regarding sustainable development were implicitly not to be used. This could be considered controversial, but in the present case, it must be considered that some master plans are not legally binding. The planners stated that this changed in later years because it has become more economically fruitful for municipalities to start sustainability interventions. That said, it was pointed out that interventions that increase the accessibility of the car are also considered economically fruitful. The planners argued that this could explain why there are conflicting measures in the master plans.

In some interviews, it was clear that certain topics were not to be discussed, representing a lack of transparency, although these issues were heavily documented in official documents and newspapers. Some planners prepared manuscripts before the interviews and were reluctant to speak freely about specific topics.

5.3 How the findings differ between small and medium-sized cities

Public transport demand normally depends on city size. With a low existing share of public transport passengers, it is more likely for Haugesund (3.8%) and Hamar (4%) to double their share of public transport passengers compared with Trondheim (11%) and Stavanger (10%). The two larger cities have met their demand for public transport to a greater extent. The city centers of Hamar and Haugesund are small, and the distances between residences and work- and visit-intensive areas are short. Cycling and walking are better competitors with private cars than public transport is in small cities, at least in the central parts. Inhabitants of suburban areas largely depend on driving private cars, and public transport is a more realistic alternative to cars for longer trips or commuting to other central areas in the small city regions (Wolday, 2018). Hamar and Haugesund plan to densify in central areas and along the public transport axes; this is positive for public transport competitiveness. There are also plans to develop residential areas in suburban parts of the city regions; some of these are not located close to the public transport system and will not contribute to an increase in public transport competitiveness.

In the interviews, it became clear that the small city regions are not as focused on competing with private cars as the larger city regions as the public transport demand in Hamar and Haugesund is very low. Still there is an aim to strengthen the competitiveness of public transport in the small city regions, which can contribute to a reduction in the share of pedestrians and cyclists. However, because the public transport service in both these cities focuses on commuters who travel longer distances, a reduction in pedestrians and cyclists in the city center area is not necessarily a probable consequence. At the same time, it is improbable that an improvement in the public transport service in Hamar and Haugesund will decrease car use to a great extent, considering that the shares of car drivers are 66% in Hamar and 58% in Haugesund. Improving the public transport service in these city regions may provide commuters and inhabitants who cannot drive with an alternative to the car, but it is a stretch to say that the public transport services here will be able to compete with cars in the same manner as in larger cities. This is due to a lack of

Table 5. Identified interventions in the plans that favor the use of public transport or private cars.

Case cities	Built environment interventions in master plans favoring the use of public transport	Built environment interventions in master plans favoring the use of private cars
Stavanger	Densification in city centers and public transport axes Prioritizing pedestrians and cyclists Less generous parking capacity than before	Planned development steers toward a polycentric city structure Generous parking capacity along public transport axes Generous road capacity Tendency toward sprawl
Trondheim	Planned development steering toward a monocentric city structure Densification in the city center and along public transport axes Prioritizing pedestrians and cyclists	Generous road capacity toward neighboring villages Some development in car-based suburban areas
Hamar	Planned development steering toward a monocentric city structure Densification in the city center and along public transport axes Less generous parking capacity than before	Work- and visit-intensive functions in suburban areas Generous road capacity Tendency toward sprawl
Haugesund	Planned development steering toward a monocentric city structure Densification in the city center and along public transport axes	Work- and visit-intensive functions in suburban areas Generous parking capacity Generous road capacity Tendency toward sprawl

demand among inhabitants, the small city size, and the short distances between suburban residential areas and the work- and visit-intensive downtown areas.

The master plans in Stavanger and Trondheim affect public transport competitiveness differently. Although the master plans in Stavanger include planning interventions that contribute to public transport competitiveness, they also contain planning interventions that continue the already high accessibility for private car drivers. A surprising finding in this study is that the master plans for the city region of Stavanger are more like the master plans for Hamar and Haugesund when it comes to interventions that ensure accessibility by private car. The master plans for the city region of Trondheim are much more restrictive toward private cars and use both the carrot and stick approaches to increase public transport competitiveness.

6 Discussion

This case study has shown connections that there is reason to believe will be found in many Norwegian (and Nordic) cities and towns. The urban area statistics of Statistics Norway show that the largest cities and towns have increased their population density much more in the later years compared to the smaller settlements (Reid, 2020). This has contributed to an increasing gap between medium-sized and small cities in the provision of public transport services. In addition, there have been and are ongoing several road constructions that will increase road capacity in many Norwegian urban areas (nyeveier. no., 2020c). Such road construction, which is common also in other Nordic countries, is likely to compromise the opportunities for Norwegian (and Nordic) small as well as medium-sized city regions to increase public transport competitiveness.

Table 6. Document study detailed list.

	Stavanger (Rogaland, Jæren)	Trondheim Trøndelag County (previously Sør-Trøndelag)	Hamar Innlandet County (previously Hedmark)	Haugesund (Rogaland, Haugalandet)
National level	**Action Program NRA 2018–2023 (2029)**: Follow-up of Whitepaper 33 (2016–2017), National Transport Plan 2018–2029	**Action Program NRA 2018–2023 (2029)**: Follow-up of Whitepaper 33 (2016–2017), National Transport Plan 2018–2029	**Action Program NRA 2018–2023 (2029)**: Follow-up of Whitepaper 33 (2016–2017), National Transport Plan 2018–2029	**Action Program NRA 2018–2023 (2029)**: Follow-up of Whitepaper 33 (2016–2017), National Transport Plan 2018–2029
County level (not legally binding)	**Transport Strategy for Rogaland 2018–2029** Approved by County Council 06.13.2017 (FT case 43/17) **Action Program for County Road Network in Rogaland 2018–2021** (2023): Part 1: Strategy for the planning period, Part 2: Action program for the planning period 2018–2021 (2023) **Action Program for Public Transport in Rogaland 2018–2023**: Approved by County Council 04.24.2018 (FT case 40/18) **Strategy 2019–2030**: Not yet approved by County Council **Goods Sub-Strategy 2019–2030**: Not yet approved by County Council	The transport strategy for Trøndelag county is divided into five sub-strategies; the strategies for traffic safety and sea transport is not included in this study **Road Sub-Strategy 2019–2030** was approved by County Council in October (case 140/18). **Mobility Sub-** **Land Use and Transport Strategy for Mjøsbyen (2019)**: Approved by Innlandet County Council April 2020 (case 2020/33,802) **County Sub-Plan for Coordinated Environmental, Area and Transport Development (SMAT)** in 6 cities and towns and 2 business areas in the Hamar region 2009–2030 (2009)	**Transport Strategy for Rogaland 2018–2029** Approved by County Council 06.13.2017 (FT case 43/17) **Action Program for County Road Network in Rogaland 2018–2021** (2023): Part 1: Strategy for the planning period, Part 2: Action program for the planning period 2018–2021 (2023) **Action Program for Public Transport in Rogaland 2018–2023**: Approved by County Council 04.24.2018 (FT case 40/18)	

(*Continued*)

Table 6. (Continued).

	Stavanger (Rogaland, Jæren)	Trondheim Trøndelag County (previously Sør-Trøndelag)	Hamar Innlandet County (previously Hedmark)	Haugesund (Rogaland, Haugalandet)
Regional level (not legally binding)	**Regional Plan for Jæren 2050**: Joint plan for a sustainable and changeable region; approved by County Council 06.12.2019		**Regional Transport Plan Hedmark County Municipality 2012–2021** (2012): County Council's decision 11–13 June 2012 (case 40/1)	**Regional Plan for Land Use and Transport in Haugalandet**: Approved by Rogaland County Council 06.15.2016, Hordaland County Council 10.5.2016, Ministry of Local Government and Modernization 06.21.2017
Intermunicipal plan (can be binding)	**Intermunicipal Municipal Sub-Plan for Forus 2019–2040**: The municipalities of Sandnes, Sola, and Stavanger, dated Stavanger, 04.13.2018, revised 05.31.2018. Updated in accordance with the Council's decision 05.31.2018, public consultation and inspection (legally binding, not approved by Sandnes) Mediation Protocol Intermunicipal Municipal Sub-Plan Forus, Statens hus, 08.23.2019, county governor of Rogaland: https://ikdpforusdotcom.files.wordpress.com/2020/04/14-protokoll-meklingsmc3b8te-230819.pdf	**Intermunicipal land use plan (IKAP) Goals, Strategies and Guidelines for Area Development in the Trondheim Region**, approved in the Trondheim region 02.13.2015 (only binding for Trondheim)		
Municipal level (all legally binding)	**Land Use Municipal Plan for Stavanger 2019–2034**: Regulations and guidelines; approved version, in accordance with the City Council's decision of 12.9.2019 **Bus Road Planning Program** for Sundekrossen/ Stavanger sentrum/ Hillevåg, Stavanger municipality 2016	**Land Use Municipal Plan for Trondheim 2012–2024**: Adopted by the City Council 03.21.2013; revised after City Council decision 04.24.2014. The plan is outdated; a revised land use plan is under development	**Land Use Municipal Plan for Hamar 2018–2030**: Approved by the Municipal Council in meetings 05.30.2018 (case 42/18) and 06.20.2018 (case 76/18)	**Land Use Municipal Plan for Haugesund 2014–2030**: Approved by City Council 09.09.2015; minor changes adopted by the Planning and Environment Committee 03.31.2016, 09.22.2016, 10.20.2016, 02.16.2017 and 04.06.2017

The following discussion is based on a theoretical interpretation of the findings in this case study and aims to illuminate how the planned built environment will contribute to increasing or reducing public transport competitiveness in the two small and the two medium-sized city regions considered in this study. The discussion below illuminates how making reference to plausible mechanisms (Table 1) to interpret planned development must take city context, dimensioning and location of planned measures into account. The combination of referring to plausible mechanisms to interpret the plans as well as taking contextual measures into account ensures transferability of the interpretation method. Here, it is important not to confuse transferability with generalization. The qualitative interpretation of the four case city regions has provided insight into local strengths and weaknesses that can make or break the cities' ability to increase public transport competitiveness. The fact that local contextual differences have the power to override the expected effects of measures that are meant to increase public transport competitiveness is of high importance to decision-makers, planners and researchers. It should also provide important information to those working with technical interpretation tools based upon quantitative data, as these tools are often based on generalized rules and stand weak when it comes to taking local causal structures and mechanisms into account.

An increase or decrease of public transport competitiveness stemming from causal mechanisms that are activated through the planned interventions can be projected as a result of the combination of contextual differences, location, and the dimension of the interventions. When using the theoretically and empirically based interpretation table (Table 1), it became clear that a direct generalization of what was previously empirically found to increase public transport competitiveness is not, and should not be, directly transferable to every city due to differences in conditions influencing the situation in different cities. Contextual differences must be taken into account in the analysis.

Below, I discuss how, in combination, context, location, and dimension have the power to override an expected effect of a measure that former empirical studies have demonstrated to be positive or negative for public transport competitiveness in other cities of different sizes and with distinct contexts, locations and dimensioning of measures.

6.1 Context

The existing built environment creates the baseline for planned interventions to be implemented in the four city regions. It contributes to or minimizes the effects of the interventions that are included in the investigated master plans. When interpreting the data from the document studies and interviews, it became clear that the contextual differences between the cities affect the possibility of increasing public transport competitiveness in different ways. In Hamar, the strict parking regulations in the plan will become effectual as the city region grows and the number of inhabitants increases. The existing amount of parking spaces and accessibility for cars do not decrease but delay the effect of measures aiming to limit private car accessibility. Still, it must be considered as positive that the plans do not allow further generous expansion in the parking capacity.

Stavanger is more like the two small cities than Trondheim when it comes to the existing accessibility by car. The parking regulations of the ruling land use plan ensure continuous accessibility for private cars in areas with work- and visit-intensive functions. Stavanger aims to reduce the parking capacity in their forthcoming municipal plan. The

effect of such a measure will depend on their land use development in areas where the parking regulations are generous. Strict parking restrictions are regulated in areas where inhabitants are effortlessly able to walk, cycle, or travel by public transport. The problem is that many planned and existing work- and visit-intensive functions are located in areas where the parking capacity is generous. The new hospital and the university are not centrally located. There is also a prevalent reluctance to include strict parking regulations in the area of Forus, where the current parking capacity is extensive.

In the interviews, the planners stated that the accessibility by car is good in Stavanger, and the political climate supports car drivers. Consequently, parking regulations are generous, and land use is spread after years of planning for inhabitants who mainly travel by car. Due to the high accessibility by car, there is little reason to believe that a fair share of the inhabitants of Stavanger that work at and visit the planned hospital, the university, or Forus will use the bus if their habit is driving a private car. The statistics show that this is the habit of 53% (car drivers) and 9% (car passengers) of Stavanger's population. Stavanger can safely be more restrictive toward the car drivers than they are in their current master plans without initiating social exclusion because they can provide their inhabitants with an effective and accessible public transport system. To increase public transport competitiveness in Stavanger, the plans need to be a lot more restrictive toward the car. This includes locating work- and visit-intensive functions in areas where car restrictions towards the car are valid.

In small cities, there is a need to ensure accessibility for inhabitants who travel by car from suburban and rural areas to avoid social exclusion. A more generous parking regulation is to be expected, although increased parking fees in the downtown area may encourage some suburbanites to change from car driving to biking.

In Trondheim, the restrictions on the private car and development of the city region have been supportive of the use of public transport for longer. Consequently, restrictive measures toward cars are more likely to contribute to an increase in public transport competitiveness within a shorter timeframe compared with the three other city regions in this study.

6.2 Location

In all four cities' master plans, the planned location of work- and visit-intensive land use functions, as well as residential areas, can push towards both use of the private car or public transport. This depends on, among other things, planned parking capacity, accessibility, and road capacity. Therefore, the potential effect of the plans on public transport competitiveness in city regions depends on the relationship between interventions that increase public transport competitiveness, interventions that reduce this competitiveness, and the location of land use functions that generate transport to a small or large degree. The positive effect of development in central areas with good public transport services is reduced by the amount of land use development in suburban areas with poor public transport services. The positive effect of strict parking regulations in central areas is reduced by locating work- and visit-intensive functions in areas with generous parking regulations and poor public transport services.

Although the plans contain regulations that ensure interventions aimed to increase public transport competitiveness in limited areas and zones, there are few regulations in

any of the plans that ensure a holistic development steering toward less car use and more use of public transport. In the master plans for Stavanger and Trondheim, an order of land use development is suggested to ensure growth from within the city areas, but this is not legally binding. Whether it should be binding is a question that requires a democratic process, which is not within the scope of this article. Still, according to theory, an order of development that ensures growth close to the public transport services and in central areas would help increase public transport competitiveness (Engebretsen et al., 2018; Næss, Strand et al., 2019; Næss, Tønnesen et al., 2019; Wolday, 2018; Wolday et al., 2019).

The interviews revealed that the local plans ensure densification in central areas, but the neighboring municipalities build large residential areas along the municipal borders to provide their inhabitants with a short commute to work- and visit-intensive functions located in the center of the city regions. This development does not necessarily reduce public transport competitiveness. In Hamar, the public transport route structure has been adapted to cover dense areas in neighboring municipalities. Urban development in neighboring municipalities mainly reduces public transport competitiveness when residential areas are located in a car-based area. Therefore, residential development in municipalities that mainly have suburban and even rural characteristics, such as the municipalities surrounding Hamar, should locate new residential areas close to the public transport structure that leads toward the regional center. Intermunicipal plans, such as Trondheim's IKAP, can help steer toward such development.

6.3 The dimensioning of interventions

The generous capacity for land use development in the plans seems to increase the chance of land use development in car-based areas. Without a strict order of development, developers tend to suggest the development of residential areas and work- and visit-intensive functions in areas that lack good connections to the public transport system. To have a generous amount of land available for development is not positive for public transport competitiveness unless the areas are serviced by public transport before development takes place. In all four city regions, there are areas available for development in car-based areas. Building demand for public transport takes time, whereas constructing a parking lot takes a few days and is legally required when developing residential areas in suburbia.

The ability a parking lot or road has to affect public transport competitiveness depends on both its location and dimension. It is arguable that the road expansion in the Hamar region is an intervention that provides private cars with space and speed; according to theory, this provision has a negative effect on public transport competitiveness in the city region. Still, there are weaknesses in this argument because a large share of the later increase in public transport passengers in Hamar comprises commuters from nearby villages who travel to and from locations along highways with a generous road capacity. The planners in Hamar have improved the public transport service to and from these villages. Road expansion can lead to further land use development along the highway instead of in the city center, but the new residential areas may not become completely car-dependent if a public transport route can service them. Still, it will probably be difficult to provide inhabitants with a public transport service that can compete with private cars. The road expansion is mainly designed for cars, and there is no

infrastructure for bus lanes or bus stops in the ongoing project. In this case, it is difficult to say that road expansion will directly affect local public transport competitiveness in a negative way. Still, it is certain that road expansion will increase the accessibility of private cars in general, and in areas where public transport has less accessibility (Tennøy et al., 2019). A likely development in this area as the public transport competitiveness improves is that the share of cyclists and pedestrians will be compromised by longer distances between new residential areas and the city center. There is no indication that the planned urban development in the city region of Hamar will cause the share of car drivers to be reduced if the number of public transport passengers increases. However, the share of public transport passengers may increase as the share of pedestrians and cyclists is reduced due to land use development in suburban areas.

In Stavanger, the plan to increase the road capacity is likely to influence public transport competitiveness because the public transport service mainly provides for inhabitants within the city area. The road expansion connects the city with suburban and rural areas, and it is likely to increase the amount of car traffic from, to, and in the city area. Due to road expansion and the development of residential areas and work- and visit-intensive functions in areas with a generous parking capacity, Stavanger is unlikely to achieve a large effect of the positive measures that are included in the master plans compared with a scenario where the city region included more restrictive interventions aimed toward cars in the plans.

In Haugesund, the dimension of existing and planned parking capacity limits the chance of increasing public transport competitiveness. There is barely any field of competition between cars (58%) and public transport (3.8%) in this city region. That said, the devised land use development in Haugesund's municipal plan is not necessarily a negative factor for public transport competitiveness. Instead, land use development in car-based areas in neighboring municipalities is a larger threat to the share of public transport passengers. In the city region of Haugesund, it is as much of a goal to be able to keep the public transport service as it is to increase its use. The existing road capacity toward the city center is not yet extended, and there are possibilities to decrease the accessibility for cars in this city region to a greater extent. If an extensive reduction of accessibility for private cars were to be implemented here, then the social exclusion of inhabitants living in suburban areas with a poor public service would be a probable effect. An increase in public transport competitiveness can occur by continuous integrated land use and transport development, but it will probably not be substantial until the accessibility by car is and can be reduced.

7 Conclusion

This study set out to investigate how planned development in master land use plans in four medium-sized and small Norwegian cities are likely to affect the competitiveness of public transport versus the private car. Our theory-informed analysis of the master plans of the four city regions and interviews with planners offers the following answers to the research questions presented in the introductory section.

1. How do planned changes in the land use and transport structure in small and medium-sized cities affect the possibility of increasing public transport's competitiveness ...

a.*According to existing knowledge and theory?*

The planning documents contain interventions that according to theory are positive as well as negative for public transport competitiveness. The positive measures for public transport competitiveness are counteracted by other measures that are likely to reduce public transport competitiveness. Conflicting interventions in the master plans are thus likely to result in a reduction of the possibility of increasing public transport competitiveness.

b.*According to the local planners?*

The planners were well aware of what kind of urban built environment development that could contribute to an increase of public transport competitiveness. They were also aware of and could point out the conflicting measures in the master plans and how these affected each other. Measures likely to increase the use of the car, and hence negative for public transport competitiveness, were pointed out as initiated to meet other regional goals than increasing public transport competitiveness. It was stressed that a holistic way of planning with a focus on integrated land use and transport planning was needed in order to meet goals such as increasing public transport competitiveness and sustainable development in general.

2.What differences and similarities are there between the findings of a and b?

The planning documents are to a great extent purely descriptive of the future planned development in the city regions, as this is their main purpose. Still, the plans do point out existing challenges related to public transport competitiveness in the existing city environment and aim to meet these challenges. At the same time, the plans also contain interventions that aim to meet other challenges. Interventions such as road capacity expansion, tendencies to sprawl and generous parking capacity provide traffic flow, accessibility for car-driving inhabitants and new, more spacious residential areas. The planners pointed at the conflicting interventions as elements in the plans weakening the positive contribution of the interventions that could increase public transport competitiveness. The planning documents did not problematize conflicting interventions.

Some contextual information on location and dimensioning of measures was provided in the planning documents, but it was not elaborate. The planners had 'hands-on' knowledge on contextual properties that affected how the plausible mechanisms due to interventions could be expected to play out locally. The planners could in depth describe how dimensions and location of planned interventions affected land use and transport development in their respective city region. The lack of focus on dimensioning of measures, location and context in the planning documents can be a contributory factor explaining why there are many conflicting measures in the master plans that reduce the possibility to increase public transport competitiveness in the city regions.

3.How does this phenomenon differ between small and medium-sized cities according to existing knowledge and theory?

The small cities have ambitious goals and strategies in their master plans when it comes to increasing public transport competitiveness. At the same time, the private car is scarcely limited. In the small cities, there is a prevailing opinion that one must allow some accessibility for private cars to avoid social exclusion. However, alternative measures, such as subsidized transport for vulnerable groups combined with flexible on-demand bus services in sparsely populated areas, could clearly accomplish greater social

inclusiveness. The effort to increase public transport competitiveness is an important investment in the future development of small cities. Developing a built environment that support the use of public transport contributes to a less car-based and more socially inclusive city in the future. Such an effort is also necessary for inhabitants who cannot drive due to age, lack of finances, or impairments. Judged from the low shares of public transport passengers in Haugesund and Hamar, it seems very difficult for public transport to compete with the car in such small cities. Still, it is possible to increase the public transport competitiveness to a considerable degree through integrated land use and transport planning.

It is more likely in medium-sized cities than in small cities that public transport can capture modal shares from the private car. With a larger population and normally denser urban areas, medium-sized city regions have large potentials to increase public transport competitiveness. Still, these cities are challenged by land use development in areas with generous parking and road capacity, which counteracts public transport competitiveness. Investments in public transport in Stavanger have a large potential to affect the use of private cars in the city region if accessibility by car is reduced to a greater extent and land use development is concentrated in central areas or close to public transport services. The master plans for the Trondheim city region support public transport, and the existing built environment in the city region, which is the result of long-term development to increase sustainability, gives grounds for the planned interventions to push toward increased use of public transport.

The theoretically and empirically based analysis in this paper showed that interventions that support the use of public transport may not always increase the use of public transport to a great extent.

The likely effects of the planned development in master plans on public transport competitiveness (and other objectives) should be discussed and analyzed holistically. Empirically based knowledge on how the built environment affects travel behavior should not be uncritically generalized. How much the different kinds of interventions can affect public transport competitiveness can vary to a considerable degree between different city regions. Therefore, the generalization of previous findings from other city regions must be interpreted through a contextual lens (context, location, dimensioning). Analyses and discussions on planned development at a master plan level can be interpreted by using theory and empirical knowledge, but the findings must be adapted to specific city regions because each city region will undoubtedly be affected differently by distinct types of measures as a result of different structures and mechanisms in their built environment. There is scientific evidence that certain structures and mechanisms do affect our behavior. Not the least, this applies to the constraints and enablement's afforded by the urban built environment. By identifying these mechanisms and leaning on existing empirical knowledge, it is possible to holistically interpret the possibility of master plans to meet specific goals. The method this case study is based upon can be applied by planning practitioners and does not require technical skills or quantitative measurements.

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Appendix