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Summary

Density or accessibility?

A study of population density, accessibility and travel behaviour

Densification in central areas is an important measure in the development of sustainable cities. However, high density often leads to poorer lighting conditions in homes, more noise and lower residential stability. It may therefore be interesting to take a closer look at the importance of density for transport and whether there are other factors that can also contribute to environmentally friendly travel habits. We have found that the share of public transport is higher than the car share only in the 20 percent neighborhoods with the most dense population (in Viken and Oslo) We also find that the competitiveness of public transport is highly correlated with the choice of public transport over car on daily trips. This indicates that it could be beneficial to investigate further how improved public transport accessibility can contribute to lower car use, without the need for densification.

Densification is an important strategy

Both in Norway and internationally, research shows a strong connection between the built environment and travel behaviour. With higher density, there is less car use and more use of public transport, cycling and walking on daily trips. In many Norwegian municipalities, including Viken and Oslo counties, densification has been a central strategy for several years, as a mean to reduce car use and transport related greenhouse gas emissions.

Densification is thus an important strategy for achieving goals of more environmentally friendly transport. But does increased density contribute to reduced car use in all urban contexts? And is it likely that other instruments can also contribute to the achievement of this goal? In this report, we examine this, by answering the following research questions:

- What is the connection between density (of residents and jobs) and accessibility (access to public transport stops) in Viken and Oslo? To what extent do these properties covariate, and to what extent do they differ from each other?
- What degree of density is necessary to achieve "environmentally friendly" travel habits?
- What is the relative importance of accessibility for choosing public transport over car on daily journeys?

Strong connections between density and public transport accessibility

To map the relationship between density and public transport accessibility, we have used data from Statistics Norway (SSB). We have mainly looked at the density of residents, but also at workplace density and the density of grocery stores. Public transport accessibility is measured in the distance to the nearest public transport stop with at least two departures per hour. The results show that the correlation between density and public transport is

relatively strong in Viken and Oslo. It is mainly in the most densely populated areas that public transport is good, as shown in Figures S-1 and S-2. At the same time, we have not gone into the causal mechanisms here, whether the public transport service is good because there are many people living there, or whether there are many residents because of the high quality public transport service. There are probably many different mechanisms at play here, in several directions.
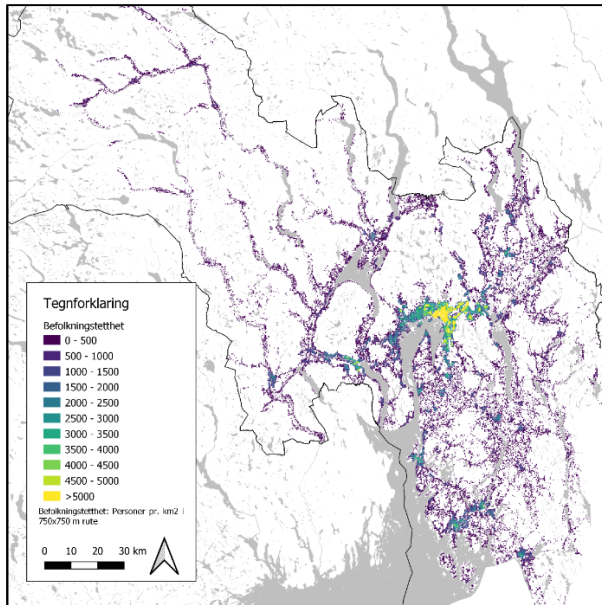

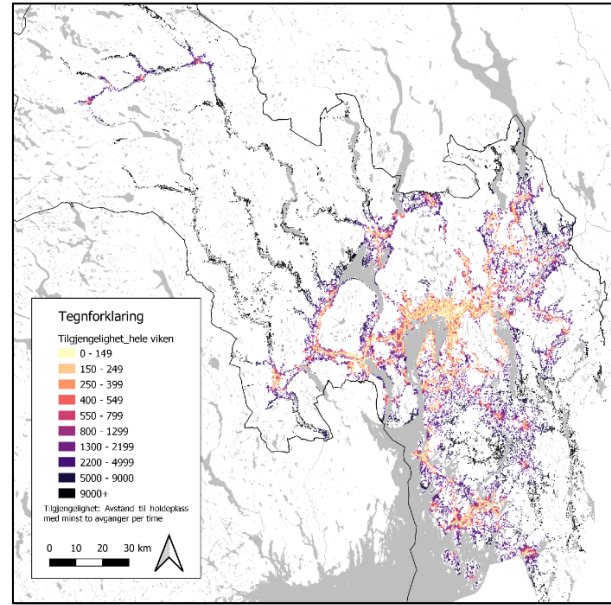*Figure S-1: Residential density[1] in Viken and Oslo*

Figure S-2: Public transport accessibility[2] in Viken and Oslo

How dense should it be?

We have also investigated the relationship between density on travel behaviour in Viken and Oslo. By linking statistics on density (of residents and workplaces) on data from the National Travel Survey (NTS), we have been able to see how residents in different neighborhoods make their daily travels. We are studying what degree of population density would be required to reduce car use to a level where it accounts for less than half of the daily journeys, and for the car share to be lower than the public transport share.

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[1] Residents per km[2]

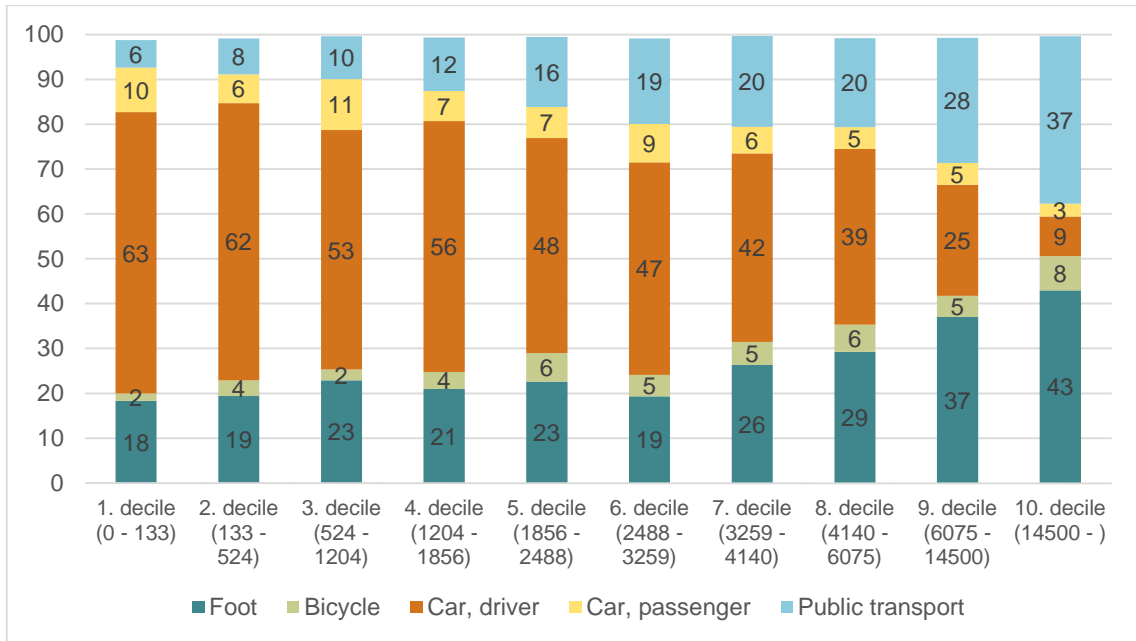[2] Distance to public transport station with at least two departures per hour

Figure S-3: Modal split and population density at the residential location (residents per km² in the basic statistical unit). Trips under 100 km starting in the residential location. The sample is ranked based on density (deciles).

Figure S-3 shows that it is in the seventh decile that the car share fall below 50 per cent. This means that cars make up less than half of the journeys in the 40 per cent most densely populated neighborhoods in Viken and Oslo. The density in these areas is at least 3,200 residents per km². We must reach an even higher density in order to achieve a higher public transport share than car share. Not until the ninth decile - the 20 percent densest basic circles - do we reach this tipping point.

Accessibility is an important factor in explaining transport mode choice

Finally, we have investigated the significance of accessibility for the choice of public transport over car on daily trips. We have measured accessibility in various ways, but the method that gave the greatest effect in the models was network accessibility, measured in travel time ratio (between car and public transport) and route frequency. The results show that when we control for other factors, accessibility has a substantial effect on the models' explanatory power, which means that accessibility is a key factor in the choice of transport mode. This finding suggests that it may make sense to look at measures other than just densification to achieve the goal of reduced car use and increased use of public transport.