

Social sustainability and mobility

A study of social and spatial differences in Viken and Oslo

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The purpose of this project has been to gain more knowledge on the relationship between social sustainability, accessibility and mobility outside of the large city regions in Norway. We have used data from the National Travel Survey (NTS) and Viken and Oslo counties as a case. The results show that the population outside of the large cities are prone to a double vulnerability related to accessibility and mobility. First, accessibility to the labor market and other services is lower in these places. Second, a relatively higher share of the population (outside of the cities) are of lower income and lack flexible working hours. Because of this, we see a slightly higher chance of transport poverty, that is poor possibilities for participation in society because of poor accessibility and mobility chances.

The concept *sustainable development* is meant to cover environmental, economic and social sustainability. The social dimension has, however, received less attention than the other two. While there is more or less agreement in the literature and among governments on how to define environmental and economic sustainability, an unambiguous definition of social sustainability is not in place. Moreover, in the transport sector there is some uncertainty related to whether measures to secure environmental and economic sustainability are also socially sustainable.

In this project, social sustainability is defined as *equality in the opportunity to partake in different activities*. A socially sustainable development will, in this definition, be a development that secures these equalities. A hypothesis is that there exists inequalities in the opportunity to participate in out-of-home activities among different social groups. With that said, it should also be noted that social sustainability in the transport sector should also cover people with disabilities and other health challenges, as well as traffic safety. From previous research, we know that access to employment opportunities are highly correlated with access to other services, such as education and health services (Baraklianos, mfl. 2020).

The purpose of this study is to gain insight about the relationship between social class, transport resources, accessibility and mobility. Traditionally, this type of studies have

focused on urban regions. In this study, we shift the attention towards areas and people residing outside of large cities, and we use Viken and Oslo regional municipalities in Norway as the case area. This report answers the following research questions:

1. What is the level of *accessibility* to employment opportunities and other services and activities in Viken and Oslo?
2. Which factors explain the opportunities to shift from private car to public transport in smaller cities and settlements in Viken and Oslo? How do these opportunities vary geographically (internally and between places) and socially (between social groups)?
3. How does access to transport resources, mobility patterns and transport mode use vary geographically and socially in Viken and Oslo?

This study utilizes data from the Norwegian National Travel Survey (NTS) from 2018 and 2019. In the analysis, the study area is divided by centrality based on the centrality index defined by Statistics Norway (see Figure S.1).

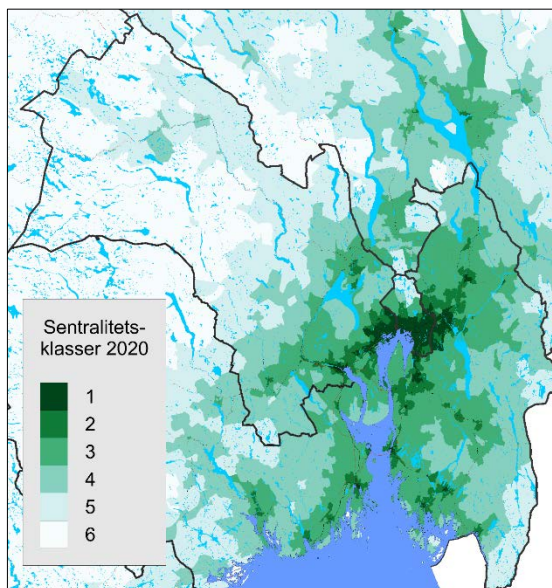


Figure S.1: Centrality index by census tract. 2019/2020. Statistics Norway.

Access to employment varies both geographically and by transport mode use

We have used data on travel times between census tracts in Norway, with car and public transport, to measure accessibility to employment opportunities for the population in Viken and Oslo. We have measured how many workplaces are accessible from each census tract, based on how far commuters are willing to travel. Figure S.2 show how accessibility varies depending on whether one travels by car or use public transport.

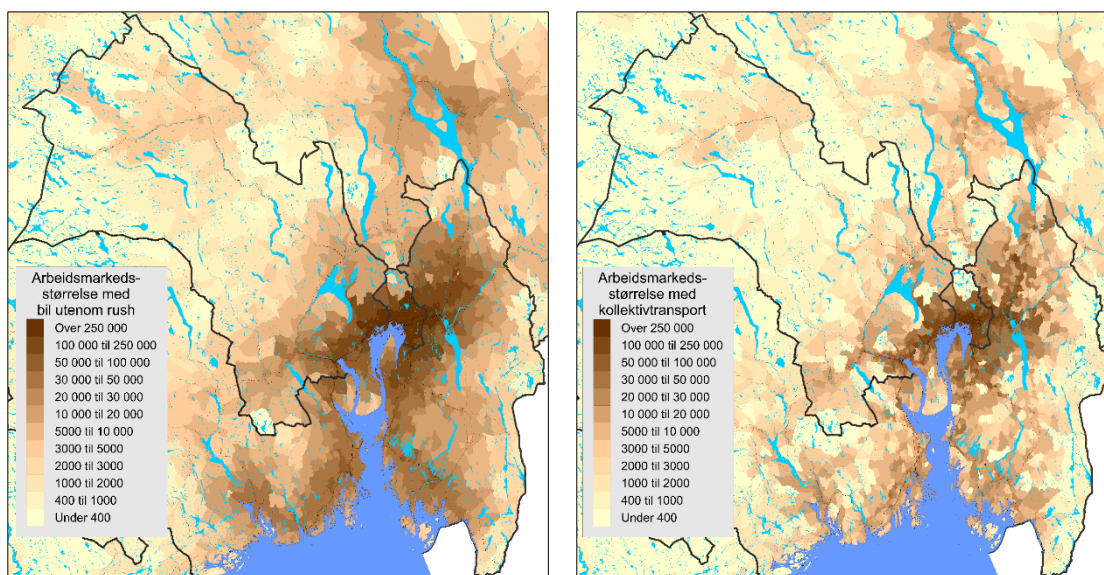


Figure S.2: Workplaces accessible by car (outside of rush hour, left) and public transport (right) by census tract. 2019.


The figures above show that the difference in accessibility to workplaces between being able to travel by car and being dependent on public transport are quite substantial. In the peripheral regions of the study area, the differences are not that large, which is explained by the relatively low accessibility both by car and public transport.

More difficult to shift from car to public transport in less central areas

We have investigated how the possibility to shift to public transport use varies among the population in Viken and Oslo. Unlike traditional travel behavior studies which focus on single trips, we study *trip chains*. By doing so, we get a better understanding of how the possibility shift away from car use is affected by people's daily travel needs. We have developed a logistic regression model, which measures the likelihood of choosing public transport over private car on trip chains, conditional on individual characteristics, urban form and access to employment.

The results show that the probability of using public transport is higher on weekdays, and that women have a higher probability of using public transport than men. Moreover, we find that access to employment has the largest effect on choice of transport mode, especially when we combine the variables on travel time differences between car and public transport, waiting time and limitations in parking opportunities. Together these factors have a substantial effect on the probability of choosing public transport on daily trip chains.

Based on the model results, we estimate how an improvement in the public transport service will influence the public transport share, and how this effect varies geographically. The estimation shows that more time-efficient public transport trips, shorter waiting time, as well as more limited parking opportunities (at the workplace) increases the competitiveness of public transport. Relatively speaking, this increase is



largest in the least central parts of the study area, while the absolute increase in largest in the most central areas.

Social differences in mobility

We have also investigated how the access to transport resources, transport mode use and activity levels vary between social groups in the least central parts of the study area. Inspired by sociological theory on social capital and class, we have defined the following four social groups:

1. Persons with *high* education and *high* income
2. Persons with *high* education and *low* income
3. Persons with *low* education and *high* income
4. Persons with *low* education and *low* income²

In certain areas there are relatively large differences between these groups. Especially among those residing outside of the large cities. In the least central areas, most of the working population has access to a car, which is partly explained by the poor public transport service. However, the access to electric cars, which benefit from lower usage costs than conventional cars, vary substantially by social groups.

Another important finding is that, in less central areas, many use the private car daily, while the general activity levels (number of trips) is somewhat lower than in more central areas. At the same time, we know that the population composition in the less central areas is quite different from that in the large cities. Flexible working hours are less common in less central areas, and the share of immigrants is lower. The variation in the social groups are, however, even larger. In the large cities (centrality index 1), over three quarters of the working population have higher education. In less central areas (centrality index 4-6), less than half the working population have higher education.

The population in less central areas experience more transport *disadvantage* than those living in the large cities. This is explained by a combination of *who lives in less central areas* (more often persons with low education, low income and lack of flexible working hours), and *characteristics of the transport service* (poorer public transport service and higher dependency on the private car).

² High income equals over 500,000.- NOK in personal income (before tax). High education equals education from college/university. The sample consists of working adults (over 18 years).