Institute of Transport Economics
Norwegian Centre for Transport Research

Summary

Public transport and urban development

Improving public transport competitiveness versus the private car in small and medium-sized cities

TØI Report 1860/2021, rev. 1
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Oslo 2021 154 pages Norwegian language

The aim of this project has been to develop knowledge that improves small and medium-sized cities' abilities to plan and develop land use and transport systems in ways that increases the competitiveness of sustainable modes of transport versus the car, and thus reduce car dependence, traffic volumes and greenhouse gas emissions. The project has developed knowledge that helps smaller (than Oslo) cities to develop in ways that improve the competitiveness of sustainable transport modes versus the car. Car shares and commuting distances increase with the distance of homes and workplaces to the city center in smaller cities following the same pattern as in large cities. The average walking distance to public transport stops increases with increasing city size, from 328 meters in Hamar to 528 meters in Oslo. Several small and medium-sized cities have changed their public transport services in ways that have provided simpler, straighter and faster routes with higher frequencies, and reduced the offer on less used routes. In all but one city, this has resulted in increased patronage, in some cases significant increases. The plans in four cities we examined contained some measures that would strengthen the competitiveness of public transport and others that would weaken it. A qualitative method has been developed to identify conflicting measures in plans.

Aim: Developing knowledge for small and medium-sized cities

The main aim of this project has been to develop knowledge that will help small and medium-sized cities in Norway and elsewhere to plan and develop their land use and transport systems in ways contributing to improving the competitiveness of sustainable modes of transport versus the private car, and thus reduce car dependence and traffic volumes. This will contribute to achieving important societal goals, such as zero growth in car traffic, that cities become more climate-friendly, attractive, vibrant and inclusive, that public health is strengthened, and that land consumption is reduced.

Many Norwegian cities seek to develop land use and transport systems in ways that contribute to achieving these goals. They experience that most of the research in the field has been carried out in cities the size of Oslo or larger. Although much of this knowledge is useful and relevant also for the smaller cities (than Oslo), the smaller cities need knowledge based on search conducted in small and medium-sized cities.

The project has contributed novel knowledge about how land use structure and location of dwellings and workplaces affects travel behaviour, walking distances to public transport stops, and how changes in public transport services have affected patronage in small and medium-sized Norwegian cities. Furthermore, the project has investigated how plans for the development of land use structure and transport systems in cities affect the possibilities that ongoing and planned improvements to the public transport system will result in improving public transport's competitiveness versus the private car and shed light on some important explanations why land use and transport plans steer development in directions contributing to reduce the competitiveness of public transport versus the car.

Among the case cities in different studies and analyses we find Oslo, Bergen, Stavanger/ Sandnes, Trondheim, Drammen, Fredrikstad/ Sarpsborg, Kristiansand, Tønsberg, Ålesund,

Arendal, Haugesund, Bodø, Hamar, Lillehammer, Mo i Rana, Kongsberg, Molde, Harstad, Gjøvik, Kristiansund, Alta, Elverum and Levanger.

The project was funded by the Norwegian Research Council's climate research program, and it was carried out in the period 2017–2021.

Results

Relations between urban structure and travel behaviour in small and medium-sized cities

Relations between urban structure factors and travel behavior were investigated in 20 Norwegian cities areas, varying in size from Oslo (980 0000 inhabitants) to Elverum (15 000 inhabitants), through analyses of data from the national travel survey. The results showed lower car shares and higher public transport and walking shares with increasing density (population plus jobs) at city level. The proportion of journeys made by sustainable modes was higher to and from homes and workplaces located in the city centres and inner cities compared to the outer parts of the cities. The commuting distances were clearly shorter among those who live centrally compared to those who live in the outer parts of the cities. There was also a tendency for shorter commuting distances to centrally located workplaces. Travel to and from denser mixed-use zones outside the inner cities was longer and more car-based than to the inner city and city center, and in some cases they were also longer and more car-based than to the outer parts of the cities. One explanation for this seems to be the combination of very good car accessibility and that in many places it is not particularly pleasant to be a pedestrian. The main finding is that travel behavior in smaller cities varies with land use characteristics to the same patterns as in large cities and that the tendencies are weaker in the smaller cities.

Walking distance to public transport stops in cities of different sizes

We also conducted surveys among employees in companies and among public transport passengers at stops in Oslo, Stavanger, Kristiansand and Hamar to find walking distances to and from public transport stops used on commutes. The average walking distances to local public transport stops increased with city size, from 328 metres in Hamar to 520 metres in Oslo (4,1–6,0 minutes). On trips to and from railway stations, the distances varied from 528 metres (6,6 minutes) to 688 metres (8,6 minutes). In discussions about what is acceptable walking distance, the 75th percentile, which shows how long 75% of passengers walk shorter than, may be more interesting. Here, the figures varied from 400–560 metres for local public transport, while they were 800 metres to railway stations. See Tables S1 and S2 for details.

Table S1: Distances to local public transport stops. Mean and 75-percentils, on trips to and from home and to and from workplace. Metres.

	To/from home		To/from workplace	
	Mean	75-percentil	Mean	75-percentil
Hamar	328	464	344	400
Kristiansand	368	400	328	400
Stavanger	384	400	384	400
Oslo	520	640	408	560

Table S2: Distances to railway stations. Mean and 75-percentils, on trips to and from home and to and from workplace. Metres.

	To/from home		To/from workplace	
	Mean	75-percentil	Mean	75-percentil
Hamar	656	800	584	800
Oslo	688	800	528	800

In the surveys in Hamar and Kristiansand, it emerged that those who knew the public transport route they used or would use on their commute thought that the walking distances were short enough, and that higher frequency and fewer transfers were what was needed if they were to use public transport more frequently on commutes instead of car.

Effects of public transport improvements on patronage

This is in line with what we found when we examined the effects of changes in public transport systems in a number of Norwegian cities that have implemented changes in public transport services to increase the competitiveness of public transport and attract more passengers. Nine Norwegian cities that had experienced stagnation and reduction in patronage had redesigned their bus services to simpler, straighter and faster routes with a higher frequency, and at the same time reduced the services in areas with lower passenger potential. We have collected data on whether this has had the intended effect, mainly obtained from public transport authorities in the counties. In some cases, we have obtained descriptions and data from evaluations carried out by consultants and researchers. The results showed that the changes in public transport services resulted in an increase in passenger numbers in all but one city (where data were uncertain, and this city is not included in Figure S1). The passenger growth was between 3,3 and 17,1% per year, see Figure S1. Several of the cities have used information and campaigns as tools, often in connection with the reorganization of the systems. Some have used fare reductions to attract new passengers, often combined with information campaigns and media attention.

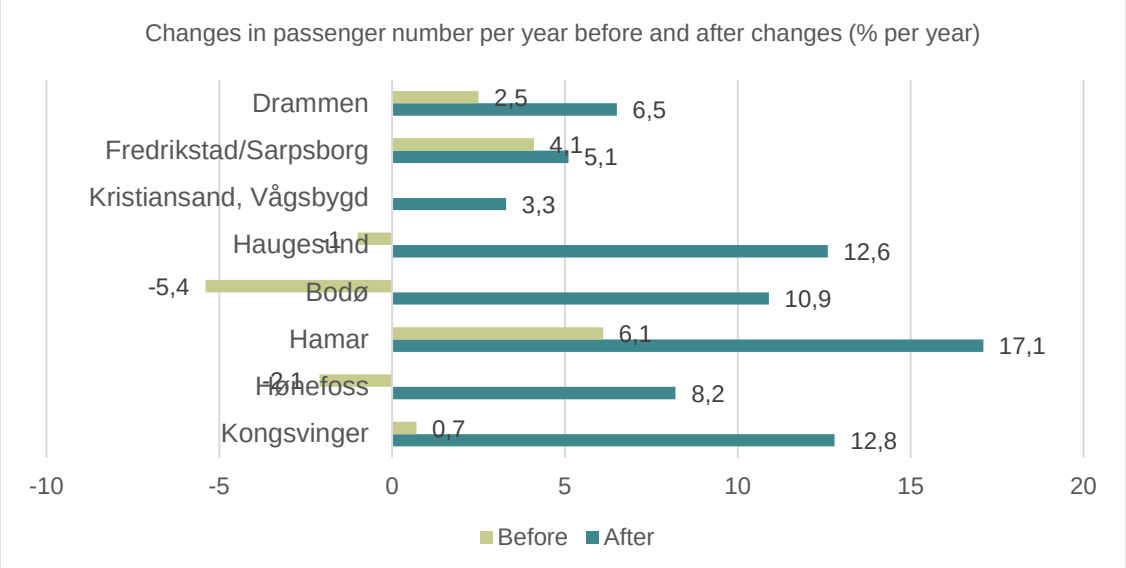

Figure S1: Changes in passenger numbers in the years before and after changes to the public transport services. Percentages per year.

Levanger experienced a passenger increase of 42% only with the help of a campaign combined with a price reduction. Surveys related to some of the cases indicate that many of the new passengers previously used their car on the same journeys. We also found that measures to improve the speed and punctuality of public transport by reallocating converting car lanes to public transport lanes in Trondheim and reducing the number of electric vehicles in the public transport lanes in Oslo have had the intended effects. We concluded that cities that improve their public transport services to attract more passengers can succeed, and that this also applies in smaller cities. The findings indicate that this also helps to reduce car dependence and car use in cities.

Pilot database for sharing experiences with public transport improvements

As part of the project, we developed a pilot for a database for sharing knowledge and experiences related to the effects of changes in public transport systems on passenger numbers, accessibility and more. The knowledge that has been systematized in the database so far is the same as that referred to in the section above. The plan is that all actors who see the benefit of such a database will contribute to its growth and improvement by reporting changes and effects that we can enter into the database. Such knowledge is not gathered and shared in systematic ways in the current situation. Our view is that such a database can contribute to more efficient planning and decision-making processes, less uncertainty and a greater degree of goal achievement.

How other plans affect the opportunities to improving public transport competitiveness

We studied documents and interviewed planners in Trondheim, Stavanger, Hamar and Haugesund to find out how processes related to land use and transport plans affect the possibilities of improving public transport competitiveness versus the car. We took as our starting point existing knowledge of what characteristics of land use structure and transport systems contribute to improving public transport's competitiveness versus the car and evaluated existing plans in the four cities against this. The main finding was that the plans in all cities contained some measures that would strengthen the competitiveness of public transport (such as densification and improvement of public transport) and others that would weaken it (such as urban sprawl and increased road capacity). The work has also resulted in a qualitative method for plan analyses that clarifies which measures support and counteract each other in achieving defined societal goals. The method can be used by planning experts and used in a simplified form in workshops with political participation. The purpose of the method is to get a comprehensive overview of planned development, but it can also be used to provoke discussions about what one wants to prioritize in urban development.

Some explanations for why plans pull in the 'wrong' direction

We found that the planners in the four cities had good state-of-the-art knowledge regarding how public transport systems and route structure should be developed to increase patronage, and that they proposed interventions in line with this. This led us to the questions about why plans are being adopted for land use and transport system development, which will reduce the chances for achieving defined goals. We found that this was not due to a lack of knowledge on the part of the planners, nor to a lack of cooperation across sectors. The main explanation is that it is due to political goal conflicts. In a study of how politicians in Trondheim reflected on the fact that they adopted measures that they

knew would reduce the chances of achieving the goals they had set, we also found that political goal conflicts were an important part of the answer. They focused mostly on local and short-term problems and hoped that they could reduce the traffic growth that would come due to increased road capacity through mitigating measures.

Similarities and differences between smaller and larger cities

The main finding is that the mechanisms we know from studies of large cities work in the same way in the smaller cities. The patterns are the same, but the effects are somewhat weaker and less consistent in the smaller ones than in the larger cities. The results showed, un-surprisingly, increasing car driver shares and lower public transport and pedestrian shares with decreasing city size (population). The results confirmed the significantly stronger role public transport plays in a metropolitan area such as Oslo compared with the smaller cities, and the significantly stronger role the private car plays in smaller compared to larger cities. The international research literature, based on studies in large cities in many countries, has been clear on how public transport systems should be designed to achieve the highest possible number of passengers: fewer and straighter lines with higher frequencies and speeds, although this also means longer walking distances to stops. Data and experiences from small and medium-sized cities that have followed these strategies showed that this resulted in increased patronage in all but one city, and that the growth was significant in several cities. The advice based on studies of larger cities thus worked for smaller Norwegian cities as well.

Recommendations for small and medium-sized cities

Based on what we have found, the most important recommendation for small and medium-sized cities is that they can safely lean on the recommendations that have been developed over many years, based on studies conducted in major cities around the world:

- Locating new housing, workplaces, shopping, etc. as densification and transformation in the center and inner city, stopping new development in outer parts of the urban areas
- Improving public transport - fewer and straighter lines with higher frequencies and speeds
- Improving conditions for walking and cycling
- Implementing restrictive measures against car traffic

Our studies showed that locating housing and workplaces in the Norwegian version of TOD, detached from the dense inner-city structure, is not a good strategy for reducing car dependency and traffic volumes.

The recommendations above also apply when cities work to increase the competitiveness of public transport versus the car. Reorganising the services to fewer, straighter, faster and more direct lines with higher frequency results in increased patronage, despite somewhat longer walking distances and reduced services in some areas. It should not be planned for walking distances to a stop longer than 400-500 meters. This emphasizes that how land use is developed will strongly affect the competitiveness of public transport versus the car. The possibilities for increasing the competitiveness of public transport are strengthened if spatial planning steers the development of new housing to areas within 400–500 meters from existing high-frequency public transport stops. Direct public transport lines between home and workplace can be achieved by locating workplaces and other activities that attract many people in and close to the city center, because the city center is normally the place to which most other areas of the city have direct public transport connections.

The investigations of plans in four cities showed that land use and transport plans both provide interventions and changes that contribute to strengthening public transport competitiveness and to weakening it. This reduces the potential chances to achieve the goal of increasing the competitiveness of other modes versus the car, and to reach the zero-growth objective. The recommendation that follows from this must be that the relevant authorities refrain from planning for and implementing measures and developments that improve the competitiveness of the private car versus other means of transport.

Concluding remarks

Developing cities in ways that reduce car dependency, car use and traffic volumes have many benefits, such as: reduced noise, local pollution and greenhouse gas emissions, more efficient urban transport systems and greater satisfaction with business travel, better public health, and not least more attractive, pleasant and lively streets, neighbourhoods, city centres and cities. It is therefore not surprising that both large and small cities have goals related to sustainable urban development and mobility high on the agenda. In Norway, this is reinforced by the long-term goal of zero growth in car traffic, goals for sustainable cities and urban regions, the national walking strategy and the UN sustainability goals.

Many cities need to steer their land use development and the development of urban transport systems in other directions than they do today if they are to achieve such goals. This will often require changes in the priorities between means of transport, where car traffic must be given lower priority than today, for example in terms of how much money is spent on facilitating car traffic, how much space is set aside for driving and parking cars in cities, where and how fast cars can drive, etc. Such changes often meet resistance, especially in smaller cities and in the outer parts of larger cities, where most people own and drive a car, and where driving is the norm and a habit. However, several studies show that attitudes, travel behaviors and mobility cultures can change if circumstances change. We have seen this, for example, in studies of how employees' travel behaviour changes when their workplace relocates and the conditions for travel choices change.

Cities that succeed in steering their land use and transport systems development in directions that reduce car dependency and traffic volumes will also achieve goals related to more climate-friendly, attractive and vibrant cities, more attractive centres, better public health, etc. It can also contribute to several of the UN sustainability goals, such as sustainable cities and societies (No. 11), good health and welfare (No. 3), reduced inequalities (No. 10) and reducing greenhouse gas emissions (No. 13). We hope the knowledge developed in the project will be helpful for cities pursuing such goals.