Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Engineering
Department of Civil and Environmental Engineering

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Can Shared Mobility Increase the Use of Public Transport?

Shared Vehicles in Connection with Public Transport

Master's thesis in Civil and Environmental Engineering
Supervisor: Kelly Pitera and Fredrik Solvi Hoen
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Abstract

A large portion of greenhouse gas emissions are from road transport. If countries and cities are to reach national and international sustainability goals, car usage and car ownership needs to be reduced. Shared mobility services have appeared in the city picture, offering a promising solution to sustainable mobility challenges. However, literature shows that they often do not replace car travels, but public transit, walking and cycling. This research aims to better understand shared mobility and its potential use in coordination with public transport. The objective is to identify if and how it is possible to use shared mobility in connection with public transport to replace personal vehicle use by improving the last mile of the commute, from the bus stop to the office. A stated preference survey was disseminated to employees at Sluppen, a corporate area in Trondheim. The respondents were presented with commute choices where the shared mobility options were combined with existing bus services. The share mobility options were electric kick scooters, electric bikes and shuttle buses, where the shared mobility option was combined with existing bus services. Price, availability, preference on type of vehicle, and impact of infrastructure were considered within the survey. Results show that every fifth car commuter would leave the car at home and travel by bus if they were guaranteed a free ride with an e-scooter or shuttle from the bus stop to the office. Price was found to be an important attribute while availability of the vehicle was less important. For half of the respondents, infrastructural improvements would not change their stated choices. E-scooter was the preferred shared vehicle followed by shuttle and then e-bike. Results indicate that shared vehicles would have bigger impacts on mode choice if distances in the case study area were larger. Further research should investigate possible incentives for commuters in Trondheim, and more knowledge is needed to better understand how shared mobility best can be used to replace car commutes.

Key words: Public transport, shared mobility, last mile, travel mode replacement

Abstrakt

En stor del av klimagassutslippene er fra vegtransport. Hvis land og byer skal nå nasjonale og internasjonale bærekraftsmål, må bilbruk og bileierskap reduseres. Delte mobilitetstjenester har dukket opp i bybildet, og tilbyr en lovende løsning på utfordringer med bærekraftig mobilitet. Imidlertid viser litteratur at de ofte ikke erstatter bilturer, men kollektivtransport, gåing og sykling. Denne forskningen har som mål å bedre å forstå delingsmobilitet og dens potensielle bruk i koordinering med offentlig transport. Målet er å identifisere om og hvordan det er mulig å bruke delingsmobilitet sammen med offentlig transport ved å forbedre den siste kilometeren til kontoret fra bussholdeplassen, og dermed erstatte bruk av personlige kjøretøy. En «stated preference» undersøkelse ble gitt til ansatte ved Sluppen, et forretningsområde i Trondheim. Respondentene ble presentert for pendlingsvalg der alternativene for delt mobilitet ble kombinert med eksisterende busstjenester. Alternativene var el. sparkesykler, el. sykler og shuttle busser. Pris, tilgjengelighet, preferanse på kjøretøytype og innvirkning av infrastruktur ble vurdert i undersøkelsen. Resultatene viser at hver femte bilpendler ville latt bilen stå hjemme og reise med buss hvis de ble garantert en gratis tur med en el. Sparkesykkel eller shuttle buss fra bussholdeplassen til kontoret. Pris ble funnet å være et viktig attributt mens tilgjengeligheten til kjøretøyet var mindre viktig. For halvparten av deltakerne ville infrastrukturelle forbedringer ikke endre de uttalte valgene. El. sparkesykkel var det foretrukne delte kjøretøyet etterfulgt av shuttle buss og deretter el. sykkel. Resultatene indikerer at delte kjøretøy ville ha større innvirkning på valg av modus hvis avstandene i case study området var større. Videre forskning bør undersøke mulige insentiver for pendlere i Trondheim, og mer kunnskap er nødvendig for å bedre forstå hvordan delt mobilitet best kan brukes til å erstatte bilpendler.

Stikkord: Offentlig transport, delingsmobilitet

Preface

This article was written during the spring of 2020 as a conclusion to a five-year Master of Science program at the Department of Civil and Environmental Engineering at the Norwegian University of Science and Technology, Trondheim.

This master thesis is written by Hanne Finsveen, with Kelly Pitera and Fredrik Solvi Hoen as supervisors. Any future publications of this study will include Hanne Finsveen, Kelly Pitera, and Fredrik Solvi Hoen as authors.

The thesis consists of an academic paper, followed by extended appendices to present the additional work done within the master thesis that was not presented in the paper. The appendices also present the work done from a pre-study leading up to this paper.

A master thesis is not done in solitary and I would like to express my gratitude towards my supervisor Kelly Pitera for always being available and for the close follow-up that other students only can dream of. A special thanks to Fredrik Solvi Hoen and Ellen Heffer Flaata for your patience and guidance in matters beyond my knowledge. In addition, I want to show my appreciation to Trude Tørset and Alejandra Madero Perez for all the advice and help received. Lastly, I want to thank Hildegunn Gutvik and the rest of the team at Kjeldsberg AS for the help in the dissemination of the survey.

Trondheim, June 2020

Hanne Finsveen

Table of Contents

ABSTRACT .... **V**

ABSTRAKT .... **VII**

PREFACE .... **IX**

1. INTRODUCTION **1**

2. METHODOLOGY **3**

CASE STUDY AREA 3
STATED PREFERENCE SURVEY 3
ANALYSIS 5

3 RESULTS **6**

CURRENT COMMUTE 8
PREFERENCE QUESTIONS AND STATED CHOICE 9
STATED CHOICE AND FAMILIARITY WITH VEHICLES 11
STATED CHOICE AND FIRST MILE 13
STATED CHOICE AND AGE 15
INFRASTRUCTURAL MEASURES 15

3. DISCUSSION **17**

THE RESULTS 18
THE TOTAL TRIP CHAIN 20
THE METHOD 20
FUTURE WORK 21

4. CONCLUSION **22**

BIBLIOGRAPHY **23**

APPENDICES **25**

APPENDIX A – IMPACTS OF COVID-19 .... **26**

APPENDIX B – THEORY **27**

BARRIERS FOR USING PUBLIC TRANSPORT 27
POTENTIAL USERS 27
SHARED BICYCLES AND BARRIERS 28

E-scooters 28
Willingness to use shared mobility services 29
Travel mode replacement 29
Microtransit and shuttles 30
Car sharing and ridesharing 30
Shared autonomous vehicles 31

APPENDIX C – THE METHOD 32

About stated preference 32
Making the survey 33
Dissemination 34
Chi-Square Test of Independence 35
Reflection on the Design of the Survey 36

APPENDIX D – GEOGRAPHICAL PRESENTATIONS 37

APPENDIX E - THE SURVEY 43

APPENDIX F - COMMENTS 52

APPENDIX G – RESULTS 58

List of Figures

Figure 1 – To the left, Map of Trondheim (picture extracted from Google) 3
Figure 2 – To the right, Map of Sluppen with offices marked with small red circles. Metro bus stops are highlighted (picture extracted from Google) 3
Figure 3 - The vehicles used in the stated choices 4
Figure 4 - Demographics 6
Figure 5 – Geographical distribution of respondents. The red circle represents Sluppen 7
Figure 6 – Mode split 8
Figure 7 – Available modes among commuters 8
Figure 8 – Respondents bus and bike habits 11
Figure 9 - Bus usage and perception of the bus system 12
Figure 10 – Familiarity with e-scooter 13
Figure 11 – Time to the bus stop from home 14
Figure 12 – Frequency of buses to work from home 14
Figure 13 – Time to the bus stop from home and stated choice 15

List of Tables

Table 1 - Attributes and levels 4
Table 2 - Infrastructural measures and levels 5
Table 3 – Percentage of respondents who would change mode to bus plus shared mobility 10
Table 4 - Infrastructural measures and their influence 16
Table 5 - Mode splits from different travel surveys 17

1. Introduction

Society is experiencing a revolution in the way we travel. Shared transport modes and alternative transit services are increasing and have changed how we travel from one place to another. Such services have the potential to improve the sustainability of transportation by offering not only an alternative to personal vehicle use, but also a more comfortable and flexible journey with public transportation by serving as a first and last mile solution to/from bus stops and stations. The user usually gains access to the transportation mode on "as-needed" basis through smartphones. Within this study, these vehicles are referred to as shared mobility.

In 2016, the European Commission reported that the transport sector alone contributed to 27 % of GHG in Europe and that 72 % of the transport emissions came from road transport (EEA, 2018). In addition to the current situation, populations have increased, and over-saturated networks lead to more air pollution and congestion in the city. To solve these problems, international and national goals, focused on transportation, have been made across Europe. The United Nations' Sustainable Development Goals include climate action and sustainable cities and communities, with specific targets to be reached by 2030. The environmental goals have led to a new paradigm in urban transport planning where the primary objectives no longer are traffic flow and capacity, but accessibility, sustainability and quality of life.

In Norway, the government is pushing forward sustainable mobility in The National Transport Plan. The cities of Trondheim and Oslo have entered into urban environment schemes with the State where the overall goal is to achieve zero growth in the use of private vehicles as a mean of transport. As a consequence, the mode share of other transport options needs to increase. Shared mobility can play a part in the modal change and has the potential to improve the environmental sustainability of transport, although this is not a given.

For shared mobility to contribute to sustainable mobility, it has to replace travels done previously with car rather than walking, cycling and public transportation. Recent research on shared e-scooters in Oslo found that the vehicles do not replace private car use, but instead walking and public transport (Berge, 2019b). A follow-up study done by the same institute in 2020 concluded the same, but this time more people used the e-scooter as a part of a multimodal trip (Fearnley et al., 2020). Other studies regarding electric bicycles and ridesharing also point to the fact that new mobility services do not lead to fewer car trips (Fyhri and Fearnley, 2015; Shirazi, 2018). At the same time, shared mobility does though have the potential to increase comfort and reduce out-of-vehicle travel time for public transport travels, which are two commonly cited barriers for public transit use.

This research article will address the potential use of shared mobility in coordination with public transport for the last mile from the bus stop to the office. The last-mile journey is chosen because shared mobility at key destination points such as business parks will affect more travelers, compared to attending the first mile for commuters at different home origins. Existing research has identified different drivers and barriers for use of shared mobility, both by looking at cycling in general and recent studies on shared vehicles. In Oslo, a study concerning electric bikes found that insufficient cycling paths, safety and bad weather were important barriers for cycling (Fyhri and Fearnley, 2015). In addition, the study identified travel time and comfort as dominant factors in the mode choice. E-scooterists also valued low risk for accidents, travel time savings and flexibility as important for daily travel, where the e-scooters satisfied the last two factors (Berge, 2019b). In the same study, over half of the reported accidents in the study happened without other road users present. This also stresses the importance of good infrastructure and correct riding behavior for micromobility services. Looking beyond Oslo, a study from Chicago found that if there were parking constraints and other non-auto options competitive to driving, e-scooters were a strong alternative to cars for short trips up to 3 kilometers (Smith and Schwieterman, 2018).

When it comes to who might use shared mobility, one study concluded that higher educated, young travelers are the most likely to adopt shared mobility services (Alonso-González et al., 2019). Other research concluded that the willingness to use a shared bike depended on the experience of the user; if a person had used a shared bike before, the preference for using both the private bike and the shared bike, greatly increased (Arendsen, 2019, Alonso-González et al.). Another multinational project looked at willingness to replace short trips with walking and cycling. The Norwegian data indicated that the potential to change the mode choice depended on the climate, but also the previous habits for walking and cycling (Stangeby, 1997). Together with other studies, it seems that familiarity, experience, education and age are the most important factors to determine willingness to utilize new transport modes.

The objective of this study is to examine if shared mobility can be utilized as a complement to public transport by identifying if and how it is possible to use shared mobility in connection with public transport to replace personal vehicle use. State-of-art literature tells of the potential to utilize shared mobility as an efficient first- and last-mile connection but has found the use of shared mobility to both replace and improve public transport. In regard to public bikesharing, studies have found impacts of increased and decreased public transport usage, depending on the characteristics of the city (Shaheen and Chan, 2016). Few other studies have looked at shared mobility in connection with public transport.

Hence, there are many yet unanswered questions concerning this topic, and this study attempts to fill one of the knowledge gaps by exploring the user preferences for shared mobility and understand if availability to shared mobility would lead to increased public transport use when integrated with the existing public transport network. This is done using a stated preference survey within a considered case study. Several shared transport modes were specifically considered: Electric scooters (e-scooters), electric bicycles (e-bikes) and shuttles. Within the study, attributes of availability, cost, and infrastructure were considered.

2. Methodology

Case Study Area

A case study involving a stated preference survey was chosen as the methodical approach. The area, Sluppen, within the city of Trondheim can be seen in Figure 1, a business park south of Trondheim with around 2000 daily commuters. There are two high capacity bus lines, circled in red in Figure 2, that operate about 0,5-1,5 kilometers from the offices, depending on direction of the bus and location of the office. Some other bus stops are in the area as well, but only operated by less frequent bus lines with smaller capacity. Sluppen is localized close to the national road network, and together with good access to parking facilities, accessibility by car is high. A travel survey conducted at Sluppen from 2017 revealed that 60% drive a private car to work and only 10% use public transport during the commute (Zhupanova and Tørset, 2017). The survey showed that even if there was added a parking fee of NOK750/month, 35% of the car travelers would still drive to work. While an accessibility study indicates good accessibility by bike and public transport (Skjeldsvik, 2019), the proximity to a large road network and lack of bicycle and pedestrian infrastructure around the offices leads to poor walkability. Additionally, Trondheim is also a city with a northern climate and a topography that may make commute by bike less attractive.

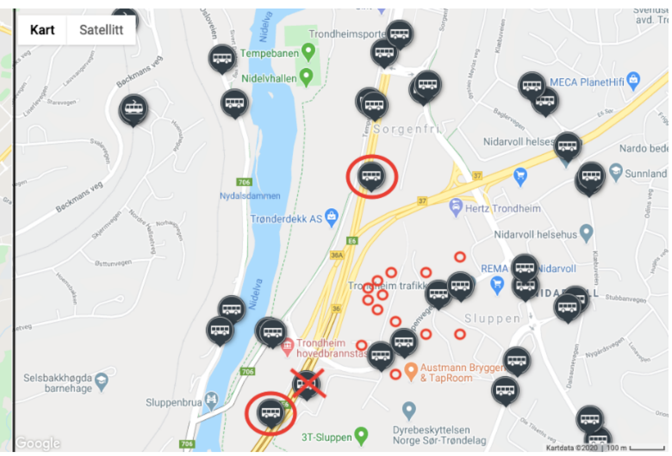

Figure 1 – To the left, Map of Trondheim (picture extracted from Google)

Figure 2 – To the right, Map of Sluppen with offices marked with small red circles. Metro bus stops are highlighted (picture extracted from Google)

Stated Preference Survey

Through the stated preference survey, commuters at Sluppen were asked about potential changes in behavior after an introduction of shared mobility in the area. As dockless e-scooters have become popular in the cities as well as public city bikes, shared electric kick scooters and electric bicycles were examined. In addition, shuttles were chosen as different pilot projects with shuttles connected to public transportation have been tested both in Norway and abroad. The shuttle is used for smaller areas to collect and drop of public transport passengers closer to their destination and origin. It can either have a fixed or flexible schedule or a combination of both. Shaheen et al. (2015) describes the service as small buses that can transport people to and from public transit stations and employment centers. The vehicles from the stated preference survey are shown in Figure 3.

Figure 3 - The vehicles used in the stated choices

The respondents were divided into three groups based on their current mode; travelers by car, travelers by bus, and other travelers (bike, walk, other). After providing demographic information and information about their current commuting mode, each respondent was asked a series of questions where they could choose whether to take the bus with shared mobility serving as the last mile, or travel as they do today. The groups were presented with the same 12 preference questions, randomized to reduce order bias. Attributes of travel time and cost for the bus were fixed, whilst additional cost for the shared vehicle and availability for the shared vehicle varied. The given levels for each attribute can be seen in Table 1. The fixed travel time was the only difference between the three groups, altered to make the stated travel time in the preference question resemble the current travel time.

Table 1 - Attributes and levels

Attribute	**Levels**
Travel time	Fixed
Price for bus	Fixed
Type of shared vehicle	[E-scooter, e-bike, shuttle bus]
Price for shared vehicle	[NOK0, NOK20]
Availability of shared vehicle *Shuttle bus*	[always, sometimes] *[no waiting time, <5 minutes waiting time]*

Additionally, to research how the infrastructure and current road design at Sluppen affected the stated choice, respondents were asked to rate how five different infrastructure measures would have influenced their previous stated choices. The five measures with the different levels are seen in Table 2.

Table 2 - Infrastructural measures and levels

Measure	Levels
Continuous path for bicycle and scooter (without barriers or obstacles)	[does not affect me at all, affects me to some extent, affects me greatly]
Traffic lights at pedestrian zone with priority for pedestrians/cyclists	
Wider sidewalk	
New asphalt	
Street lighting	

The survey was disseminated by e-mail to around 40 companies located in the case study area. It was also posted on a local social media group specific to those working in Sluppen.

Analysis

SurveyMonkey was both used to design the survey and to analyze the data. In addition, Excel was used for visualization and to perform statistical tests, together with the software SPSS Statistics. ArcMap was used to analyze the geographical distribution of the respondents.

To determine independence between two categorical variables, chi square tests were used to see if there was a relationship between variables, such as age and stated choice. A null hypothesis assumed no association between the two variables and the given p-value from the test represented the probability of the null hypothesis being true. If the chi-square test showed a p-value lower than 0.05, the hypothesis was rejected. Further description of the chi-square tests can be seen in Appendix C.

It is important to note that the chi-square tests in the thesis was performed on the question where the levels were as follows: *E-scooter*, *0NOK* and *always available*. As results will show, many of the stated choice questions had unanimous answers, hence different variables did not affect these questions.

3 Results

From the survey, both descriptive data and choice data was collected. In total there were 223 participants, but 19 were incomplete and therefore excluded from the analysis. The survey had the potential to reach up to 1800 employees at the companies stationed at Sluppen, indicating a response rate of 12% of the entire population.
The gathered data show a good distribution between both age and gender, as seen in Figure 4. 80% of the respondents were between the age of 25 and 54 and none were over 74 years old.

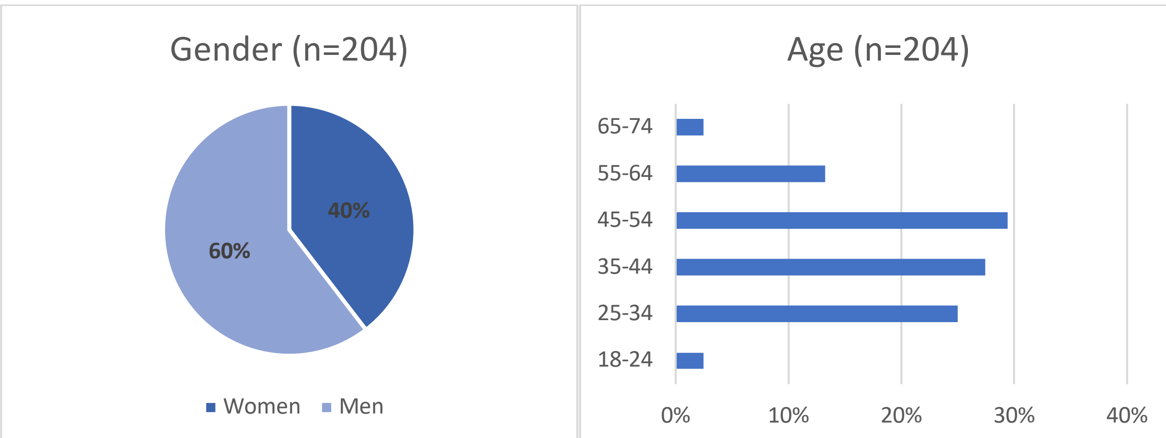

Figure 4 - Demographics

Figure 5 shows the geographical distribution between the respondents. Given a respondent's post code, information such travel time could be visualized using different maps. These maps can be seen in Appendix D.
Havstein, located about 4 kilometers west of Sluppen, had the highest density of respondents with 13 people reporting a home address here. A little under 90% of respondents live within a 10-kilometer radius of Sluppen.

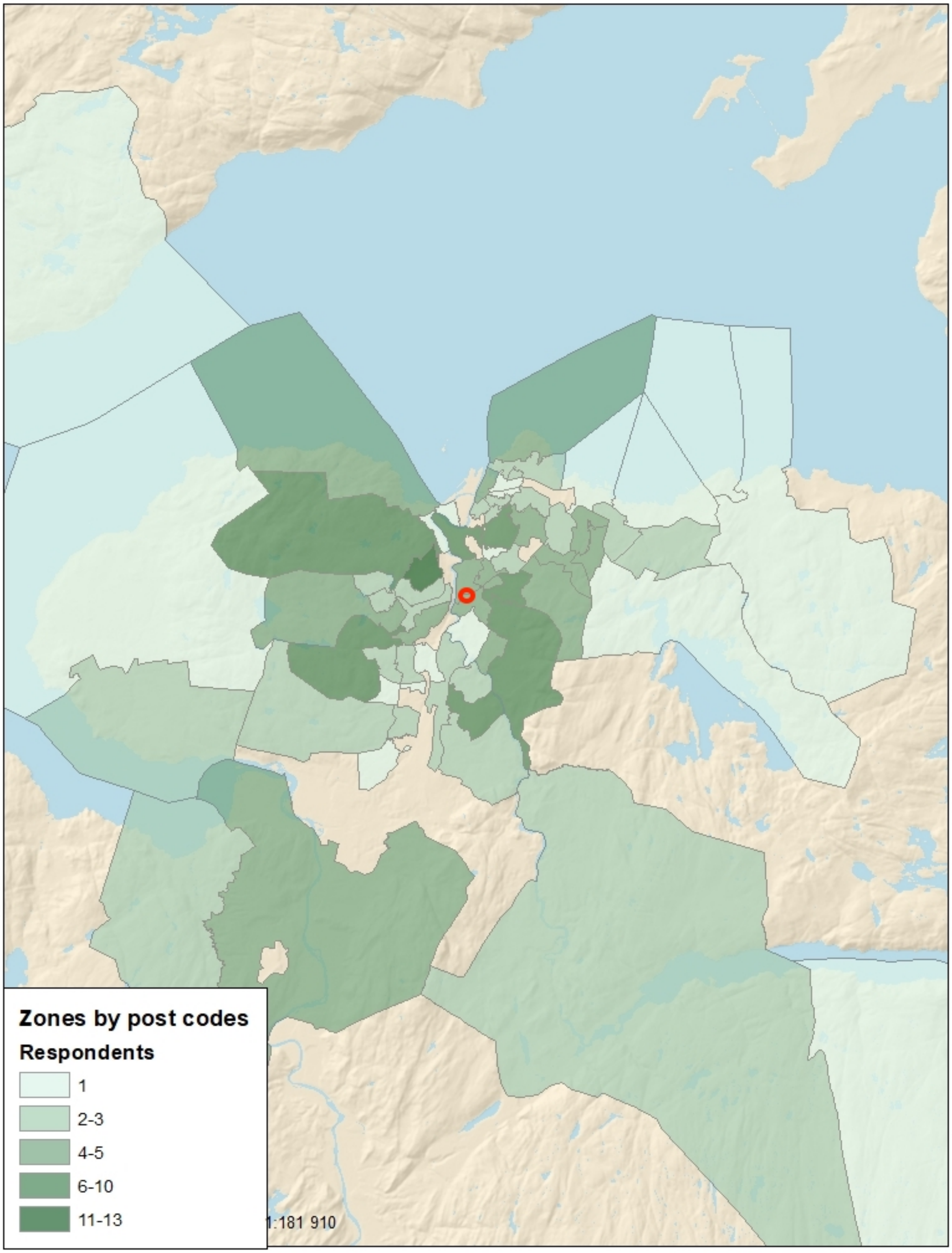

Figure 5 – Geographical distribution of respondents. The red circle represents Sluppen

Current Commute

Further, respondents were asked how they usually travel to work (Figure 6). Results indicate that most people drive to work and the second biggest group travel by bike, either with a regular bike or an electric one.

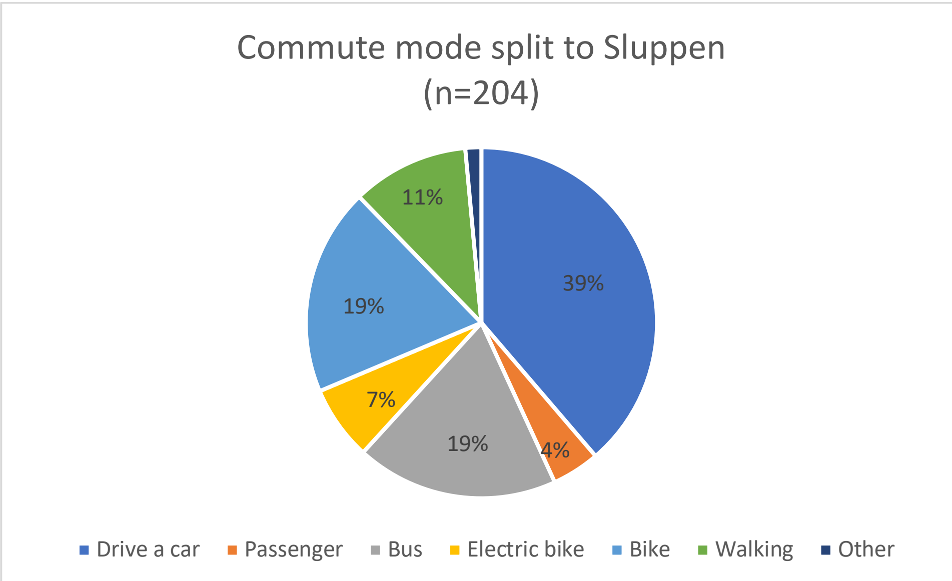

Figure 6 – Mode split

Regardless of current mode choice, almost all respondents had the possibility to bike to work and 70% of the respondents had the option to take the bus, as seen in Figure 7. Interestingly, 77% of the commuters can take the car to work, but only 39% choose to. For those who chose *other*, most people answered that they could jog or run to work.

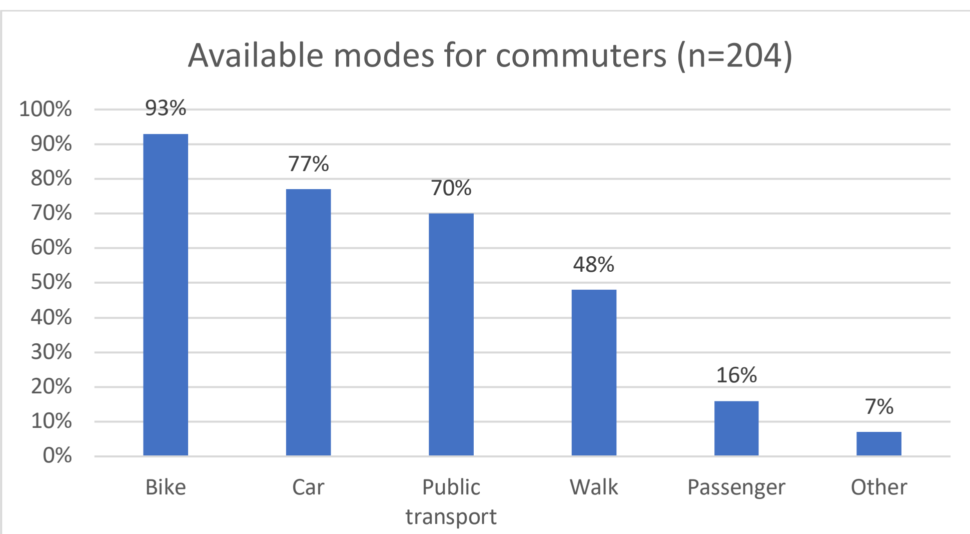

Figure 7 – Available modes among commuters

The respondents who drove to work were also asked about main reasons for choosing the car as means of transportation. They could choose more than one answer and out of 79 respondents, 80% chose *faster travel time* as one of the main reasons for travelling by car. Almost 70% drove a car because it was *easy* and *flexible*. Also, every fourth commuter needed the car during work, or they had to pick up the kids before or after work. Car passengers stated the same but put more weight on the fact that it is cheaper than bus. 67% of car drivers reported the option to take the bus to work and 57% had a bus stop within a 5-minute reach. In addition, many car commutes had a short journey to work; 42% used 10 minutes or less.

Respondents were also asked about parking availability at work and out of 204 commuters, 68% had access to parking. Among these commuters, half of the respondents reported that the employer pays for the total parking fee. 15% have access to a free parking spot and 17% of the respondents pay for the total parking themselves.

The average travel time to Sluppen is fairly low at 20 minutes, where 65% use 20 minutes or less to get to work and only 14% spend more than 30 minutes to work. As mentioned, Sluppen is close to the main road network and accessibility is therefore relatively high. Only two respondents used more than 50 minutes to work.

Preference Questions and Stated Choice

Moreover, the respondents were presented with the 12 stated choice questions. As mentioned previously, the questions were similar for all commuters, but travel time assumptions were altered between car travelers, public transport users and other travelers in order to define a plausible fixed time for each travel mode group. Each question had different combinations of cost, type of vehicle and availability, and the respondent could either choose to state that they would travel with bus plus shared mobility or travel as they do today.

The results are seen in Table 3. The percentage shows the share of commuters who stated that they would change mode to bus plus shared mobility after an introduction of the shared vehicle at Sluppen. The shared mobility options are seen in the first column and the following columns in Table 3 show the four different combinations of availability and price that were asked for each vehicle. The table shows the aggregated result for all commuters, as well as the results from each travel mode group.

Irrespective of current mode choice, commuters prefer e-scooters as a last mile option, followed by shuttle bus and then e-bike. The results also indicated how price and availability impact respondents' decision. As seen in table, there is less willingness to take use of shared mobility if the service costs NOK20, indicating that price is an important attribute. A decrease in availability does affect the stated choice, but not nearly as much as price.

Table 3 – Percentage of respondents who would change mode to bus plus shared mobility

ALL COMMUTERS (n=204)				
Shared mobility option	Always available, free of charge	Sometimes available, free of charge	Always available, NOK20	Sometimes available, NOK20
E-scooter	24%	15%	4%	2%
E-bike	17%	12%	4%	2%
Shuttle bus	22%	11%	4%	2%

CAR COMMUTERS (n=89)				
Shared mobility option	Always available, free of charge	Sometimes available, free of charge	Always available, NOK20	Sometimes available, NOK20
E-scooter	18%	5%	2%	0%
E-bike	15%	6%	2%	0%
Shuttle bus	19%	12%	3%	2%

BUS COMMUTERS (n=37)				
Shared mobility option	Always available, free of charge	Sometimes available, free of charge	Always available, NOK20	Sometimes available, NOK20
E-scooter	72%	53%	8%	5%
E-bike	45%	39%	8%	3%
Shuttle bus	61%	24%	3%	3%

COMMUTERS BY BIKE, WALKING, OTHER (n=78)				
Shared mobility option	Always available, free of charge	Sometimes available, free of charge	Always available, NOK20	Sometimes available, NOK20
E-scooter	8%	8%	4%	3%
E-bike	6%	5%	5%	5%
Shuttle bus	8%	4%	6%	3%

Table 3 also shows that answers depended on their current mode. Bus commuters were more likely to choose bus plus shared mobility than the other mode groups. The shared vehicles will not attract many of the sustainable commutes over to bus, and the service would mostly be used by commuters who already take the bus. Approximately 1 out of 5 car drivers would choose to travel with public transport, given that either a shuttle bus or an e-scooter was free and always available. Only the shuttle bus can attract over 10% of the car commuters to shift to public transport if the availability is not guaranteed. A chi-square test statistically confirmed the dependency between the three modes groups and the stated choice with a p-value of $1{,}99 * 10^{-20}$.

Interestingly, the results show that even if a shared vehicle was available and free, 30-40% of bus users would prefer to walk the last mile to the office, and not take advantage of the shared mobility option. Individual comments made by bus commuters reveal that the saved travel time at Sluppen is not as crucial as the time spent on the bus and on transfers. Only 46% have a direct bus to work out of the 37 respondents who took the bus to work daily. For those who had a transfer, 70% needed to wait 5 minutes or more on the next bus. The estimated travel time from the bus stop to the office varied with the shortest being 2 minutes and the longest 25 minutes. In total, the average time spent from the bus stop to the office was 7.7 minutes.

Stated Choice and Familiarity with Vehicles

State-of-art literature point to familiarity as one of the factors that can determine willingness to utilize new transport modes. Thus, respondents were asked about familiarity with the bus system, e-scooters and bicycling. Figure 8 shows how often respondents took the bus or cycled outside of work-related travel. The results show a high percentage of respondents that cycle weekly, whilst bus usage varies more.

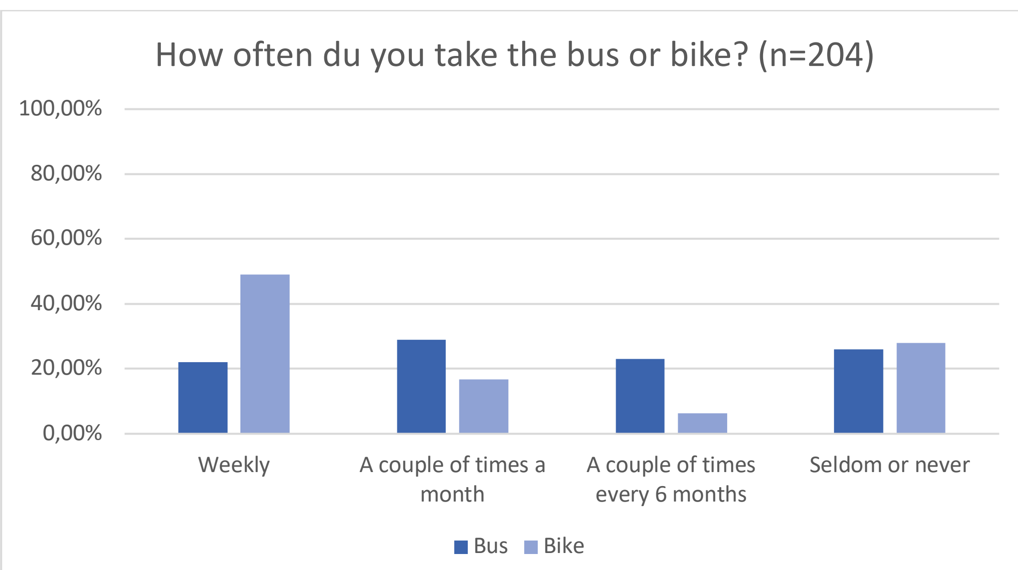

Figure 8 – Respondents bus and bike habits

A chi-square test of independence was performed to see if the stated choices were dependent on the habit of taking the bus. All respondents were divided into two groups;

those who take the bus monthly or more often and those who take the bus more seldom. The test returned a p-value of $4.3 * 10^{-6}$, meaning that how often a respondent takes the bus affects the stated choice. When looking further into one individual mode group instead of all responses, there seems to be the same tendency for car drivers; if you take the bus more often, you are more likely to choose bus plus shared mobility in the stated choice. However, a chi-square test could not exclude the possibility of independence between the variables.

Participants were also asked to rate their impression of the bus system in Trondheim. With a maximum score of 5, the average score was 2.8. As seen in Figure 9, people who seldom take the bus give the bus system a lower score than those who use the bus more often.

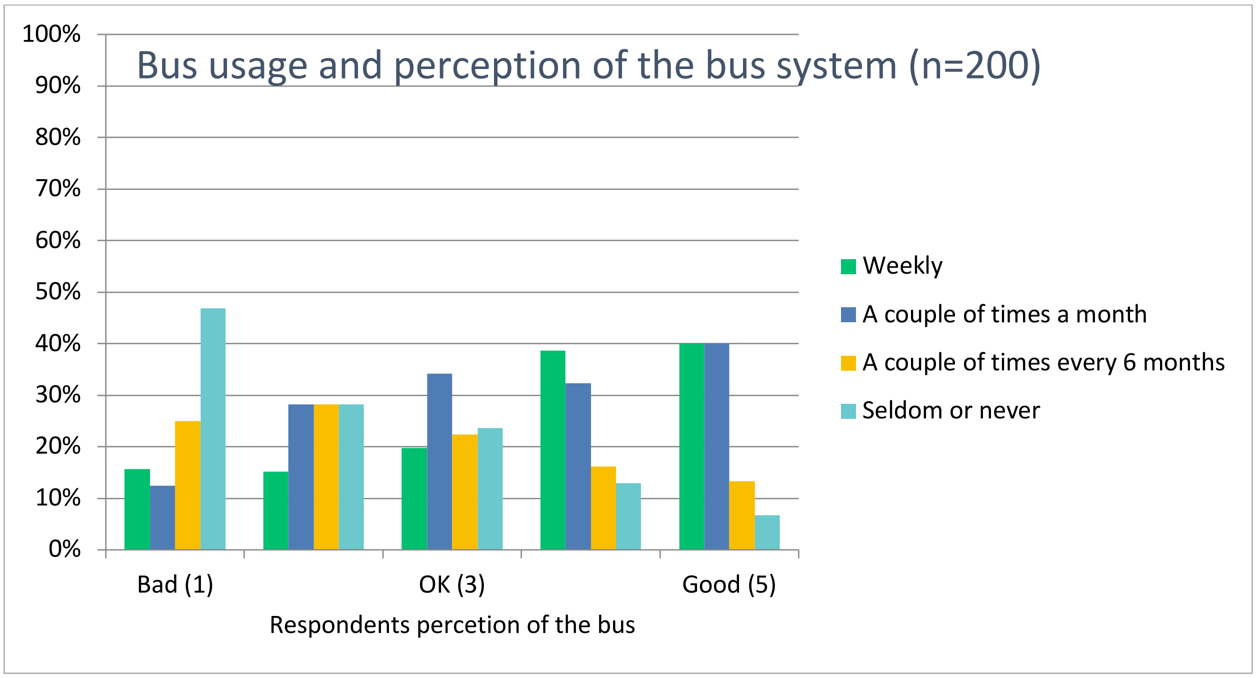

Figure 9 - Bus usage and perception of the bus system

When asked about e-scooters, over half of the respondents have never tried an e-scooter before. Twenty-five percent have tried a couple of times whilst only 18% has tried several times or owns an e-scooter as seen. See Figure 10.

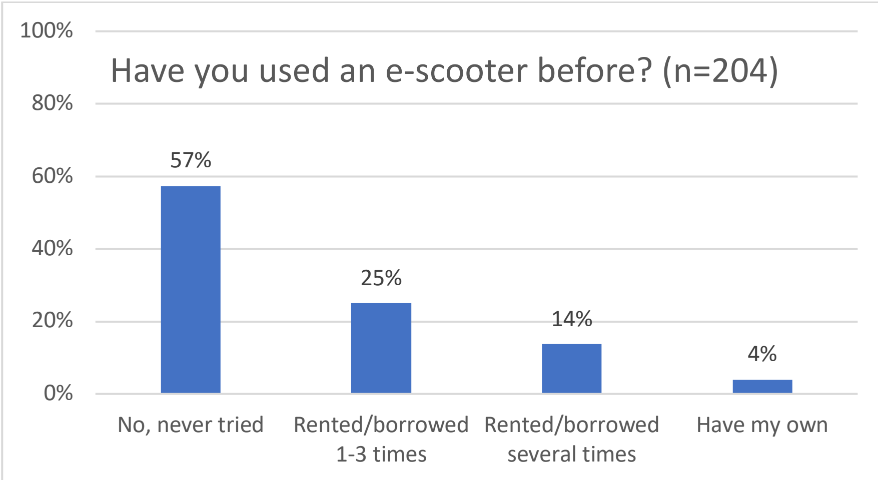

Figure 10 – Familiarity with e-scooter

When comparing familiarity with e-scooter and the willingness to change mode to bus plus e-scooter, the respondents were divided into two groups; those who has never tried an e-scooter, and those who have tried once or more. A chi-square test revealed a statistically significant difference between the two groups with a p-value of 0,0043. Those who have tried e-scooters before are more willing to change mode to bus plus shared e-scooters, than those who have not (38% compared to 10%).

Stated Choice and First Mile

All respondents (n=204) were asked about bus availability from home to see if and how the trip from home to the bus stop would affect the stated choices in the survey. The question was asked independent of travel mode to the bus stop. It is presumed that most respondents would walk, though some areas in Trondheim have park & ride facilities, and some commuters could use their bike to get to the bus stop. Figure 11 shows that over half of the respondents have an available bus stop to work within a 5-minute reach. Only 15% either has a bus stop over 10 minutes from home, or do not know how long it would take them to get to the appropriate bus stop.

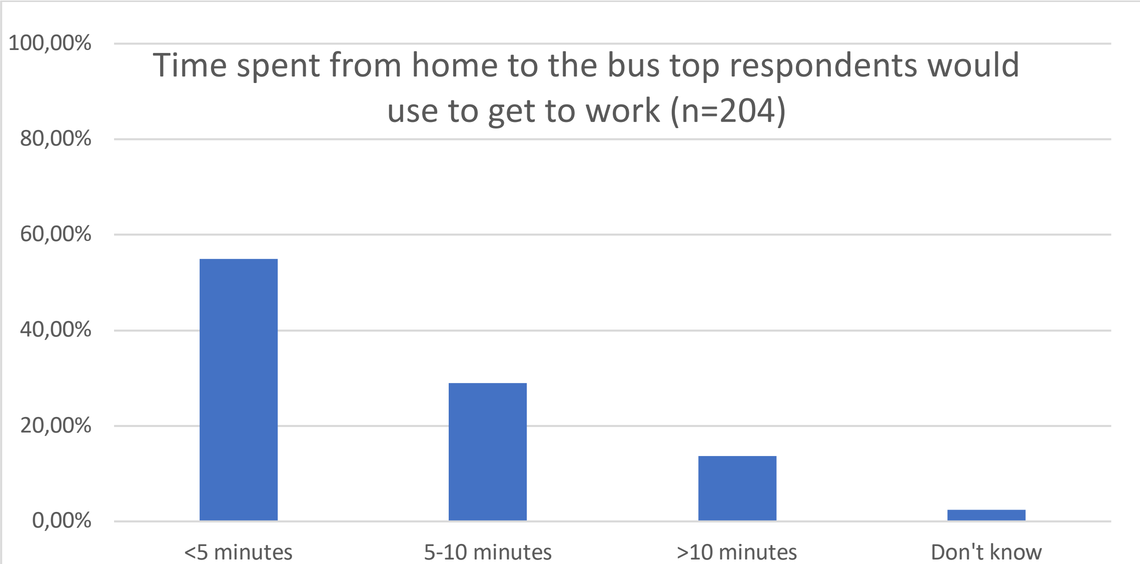

Figure 11 – Time to the bus stop from home

Figure 12 shows what participants answered when asked about the frequency of the bus they would take to get to work. Most people have a bus option with a frequency between 10-15 minutes. 18% have a bus that goes every 20 minutes or less frequent. The respondents were also asked if they have direct bus to work. Out of 204 commuters, 60% needed to make a transfer.

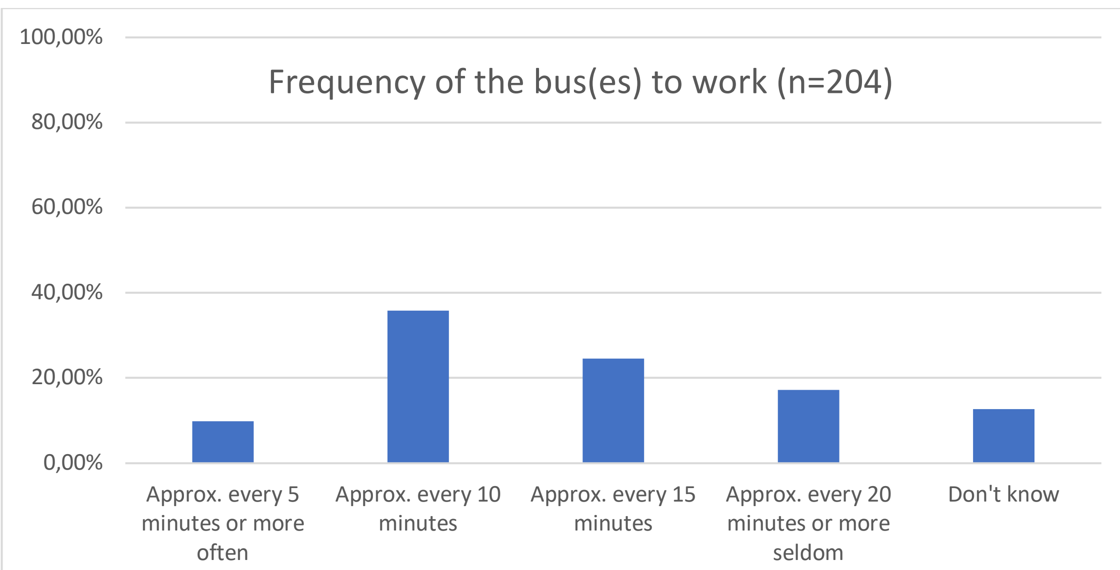

Figure 12 – Frequency of buses to work from home

When comparing the stated choice to the estimated time to get to the bus stop from home, there is a tendency that people with a shorter travel time to the bus stop are more likely to use bus plus shared mobility. A chi-square test with a p-value of 0.17 could not statistically rule out that the result is random, but the findings are still interesting. When doing the same comparison with car drivers only, the same tendency can be found and no respondents with over 10 minutes to nearest bus stop would change mode to bus plus shared mobility regardless of the levels of the different attributes. The sample with car drivers (n=79) is too small to look further into statistical significances. There was not found a dependency between the frequency of the buses and stated choice.

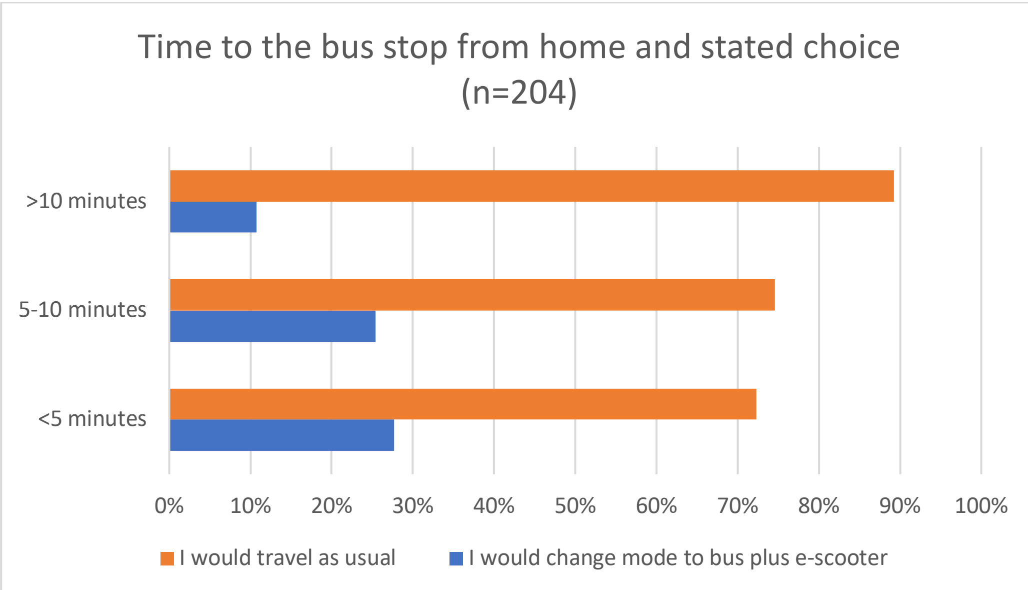

Figure 13 – Time to the bus stop from home and stated choice

Stated Choice and Age

The literature research also revealed that willingness to try new modes could depend on age. Hence, the stated choice was compared with a respondent's age. The age groups were divided into two categories; under 35 years old and older. The chi- square test revealed a p-value lower than 0.05, indicating that age affects the stated choice. 45% of respondents under the age of 35 answered that they would change mode to bus plus shared mobility, compared to 10% of the older respondents. It is therefore reasonable to conclude that younger commuters are more likely to change mode to bus plus shared e-scooter. In this age group, 27% of the respondents drove to work.

Infrastructural Measures

Five different infrastructural improvements were presented, and the respondent were asked if the measure would influence the previous stated choices. For half of the respondents, none of the measures would have made them choose differently. As Table 4 shows, the measure with most influence is the implementation of a separated, continuous path for bicycles and scooters.

Table 4 - Infrastructural measures and their influence

Infrastructural measures (n=204)	Does not affect me	Affects me some	Affects me greatly
1.Continuous path for bicycle and scooter without barriers	52%	24%	24%
2.Traffic lights at ped. Zone with priority for ped. /cyclists	57%	27%	16%
3.Wider sidewalk	55%	25%	20%
4.New asphalt	55%	25%	20%
5.Street lighting	52%	29%	19%

A new chi-square test of independence was performed to examine the relationship between level of influence and current mode choice. All respondents were divided into the three sample groups shown in Table 3 and again the differences found in level of influence between the mode groups were statistically significant with a p-value lower than 0.05. Car drivers are less influenced by the suggested measures than bus users and bike commuters. In general, bus users are more influenced by the measures than the other mode groups. Whilst only 20-40% of all other commuters would be influenced by a wider sidewalk in their decision to travel with bus plus shared mobility or not, the measure would influence 74% of all bus commuters.

3. Discussion

The Survey Sample

The survey had a potential reach of approximately 1800 respondents and yielded 204 responses. Given the small sample size based on the size of the target population, some results may not be representative for the target population. This should be kept in mind when generalizing the results.

Even though the sample size was small, the survey had a good demographic distribution. Since the target group was expected to be largely homogenous with similar income and employment status, only age and gender were asked. As expected, both were evenly distributed where the small overrepresentation of men (60%) is likely explained by the fact that more men work in private sector than women (Fredriksen, 2019).

The responses regarding current travel can be compared to other travel surveys. The mode split in this study showed a low car commute share compared to other travel surveys, both local and national. Table 5 presents mode splits from different surveys and there does not seem to be such a downward trend in these surveys in less car use that could explain the low share in this study. The Sluppen-survey from 2017 indicate that within the same target group, the car share has been reduced by 22% over 3 years. The results of this study also show an increase in bicycle mode share from 2017 to 2020.

Table 5 - Mode splits from different travel surveys

Survey	Private car	Public transit	Bike	Walk	Passenger/ Other
Trondheim, 2014-2017[1]	54%	17%	15%	13%	1%
Sluppen, 2017[2]	60%	9%	18%	6%	7%
National RVU, 2018[3]	60%	16%	8%	11%	5%
Sluppen, 2020	**38%**	**18%**	**26%**	**11%**	**7%**

[1] HOEM, J. 2018. *Mini-RVU – Trondheim* [Online]. Available: https://miljopakken.no/wp-content/uploads/2018/01/Mini-RVU-rapport-2014-2017.pdf [Accessed 02.02.20].

[2] ZHUPANOVA, L. & TØRSET, T. 2017. *Reisevaner og reisemuligheter for arbeidstakere på Sluppen i Trondheim.* Trondheim: Norwegian University of Science and Technology.

[3] BERGE, G. 2019a. *Nasjonale reisevaneundersøkelser (RVU) Utvalgte data* [Online]. Available: https://www.vegvesen.no/_attachment/2859786/binary/1352053?fast_title=Reisevaneunders%C3%B8kelsen+2018+-+utvalgte+data+oktober+2019.pdf [Accessed 13.05.20].

Recent parking restrictions may however have contributed to the lower car share. Considering the previous Sluppen-survey, 81% of respondents had access to parking in 2017 compared to 68% in 2020. Even though there has not been a reduction in the number of parking spots over the last three years, new offices were built in the area in 2019, decreasing number of spots per commuter. In addition, less people payed for the parking themselves in 2017 (4% vs 17%). It is therefore likely that companies have implemented parking fees for its employees over the last three years. One of the larger companies could confirm that they have started charging employees NOK50/day. Additionally, the national RVU form 2018 states 85% of the population has available parking at work and 10% pays for the parking (Berge, 2019a). It is therefore reasonable to believe that the parking restrictions, a common push factor in transport management, have an effect on the car share to Sluppen.

The questions about representativity could also explain the low car share in the results. The survey may have attracted people who feel strongly about mobility and/or improvements at Sluppen and left car users underrepresented, even though there were attempts to reduce such bias.

The results

The results indicated that the e-scooter was the preferred shared vehicle, as opposed to an initial hypothesis that shuttle buses would be preferred given the possibility to sit down in a sheltered environment. However, it could be that e-scooters are preferred over shuttles as they are more flexible and individual. You do not share the vehicle with others, and you can travel in your pace, directly to your office. A bus may be associated with waiting time, crowds and multiple stops. And again, the short travel time from the bus stops to the offices may especially make the shuttle bus seem unnecessary. In addition, shuttles as a last mile alternative are less known to the general public than the other vehicles. The services are not implemented anywhere in Norway except for three pilot projects with autonomous shuttles in other cities (Brakar, n.d; OBOS, 2019; Andersen, 2018), and the unfamiliarity may have influenced the stated choice. The reason for e-bicycles being seen as less attractive, especially compared to e-scooters, is unknown. One reason could be that e-scooters maybe are easier to ride when wearing business attire. Additionally, e-scooters are considered new and trendy within current mobility, which may impact the results.

When reviewing state-of-art literature, there was no clear conclusion regarding the impact of price on the use of shared mobility, but within this research, price was found to be an important attribute. Indifferent of previous travel mode and type of shared vehicle, more people would rather change mode if the shared mobility was free, compared to if it was always available. This is unexpected as access to shared mobility at the bus stop would impact travel time, and previous studies show that reliability during travel with bus is important, especially for commuters (Bhat and Sardesai, 2006). Within this case study, since the distance from the bus stop to the office is relative short for many, using a shared vehicle may not lead to a substantial difference in total travel time and therefore reduce the importance of availability in the stated choice. Also, even if the survey sample is believed to have an income above average, the relatively high public transportation cost associated with the choice to travel with bus plus shared mobility (NOK28/day+ NOK20/ride), could explain the importance of price. Yet, only a few car travelers indicated *car is cheaper than bus* as an important reason for driving, and the added NOK20 should therefore not be a crucial factor. For some commuters it may be a matter of principle, in belief of that such services as shared mobility should be free, indifferent of if they can afford the service or not. Another possible explanation as to why price was seen as more important than availability is that price is easier to understand than availability. It may be hard for a respondent to comprehend the cost of uncertainty and increased travel time if a vehicle is not there when you get off the bus a given day. The cost of increased travel time is less visible, and the respondent may not be fully able to evaluate the attribute.

The current car driver is the most interesting commuter in this research as the overall goal is to achieve more sustainable travel in the city, meaning less personal car use. Roughly 20% of current car drivers indicated they would leave the car at home and take the bus to work if there was a guaranteed ride with a shared e-scooter or shuttle bus, free of charge. Previous of the study, the willingness among car drivers was expected to be lower and the result can be explained by the high degree of education in the target group, an element found in earlier studies (Arendsen, 2019).

The results showed very few commutes by bike and walking would be replaced by bus plus shared mobility when the new scenario with shared vehicles was presented. As these modes are healthy and inexpensive, and most importantly sustainable, these results are considered very positive.

In previous studies (Arendsen) (Alonso-González et al.) familiarity with a vehicle have had impact on willingness to use the vehicle for travel. In this study, there was also found correlations between familiarity with e-scooters, the habits of taking the bus, and the stated choice. However, there are different interactions that have not been tested due to the sample size but should be mentioned. Some commuters might be familiar with shared e-scooters, but seldom or never take the bus. The familiarity can be seen as two levels of interactions; familiarity with the bus and familiarity with the different shared vehicles. With a bigger sample size, the correlations and impacts between the familiarities could have been further tested.

The fact that younger commuters are more likely to change mode to bus shared mobility is positive as young people have more years ahead with daily commutes than the older generations. The higher willingness to change mode among the young commuters can be seen as a consequence of today's cultural shift both in regards to attitudes towards global warming and new mobility services. E-scooters and other shared vehicles have become a part of the city picture and the younger generations may be more open to alternative, sustainable ways of travel.

In regard to infrastructural improvements, those who already are familiar with the environment along the path from the office to the bus stop at Sluppen would be more positively influenced by the implementation of measures than other commuters. People who usually drive to work may not know how the walkability in the area is and therefore not be affected by improvements.

The Total Trip Chain

It is important to acknowledge that the trip from the bus stop to the office is only a part of the whole trip chain to work and back. If, for instance the public transport offer is insufficient and do not meet a commuter's standards, improving last mile would not improve the trip chain as a whole and thus would not be an adequate mobility solution. Other key barriers to public transport, such as direct connections and reliability, will not be reduced by shared mobility. For instance, the results indicated that 60% of the commuters do not have a direct bus to work. Comments from respondents tell of poor public transport connections as the main barrier. Two example comments that are representative of this problem are: "It takes me 12 minutes by car and 54 minutes by bus to get to work" and "There are no direct connections to work, hence it takes too long to get to work by bus".

This study does not address the entire trip chain for various reasons. First, the scope of the master thesis presents a limitation to what data that can be collected. To address both first and last mile in one survey would have made the survey time-consuming for the respondents, risking incomplete answers. Instead, a comprehensive study on one part of the trip chain is better, leading to stronger data to make reliable conclusions. A good study on last mile will make a good foundation for further study on first mile and the rest of the trip chain. Also, it is harder to adjust good first mile solutions for everyone. If the data collected indicate that shared mobility connected to the bus stop would increase public transport use, such services only needs to be implemented in one area when considering the last mile, rather than applying the service at all different home origins. Nevertheless, a couple of questions about the first mile from home to the bus stop were asked which made it possible to see how it affected the stated choices.

The Method

There are both advantages and disadvantages by collecting data using a case study. By examining a selected geographical area, in this case Sluppen, more data can be obtained beforehand, opening up to the possibility to gather in-depth data and to present feasible measures both in the survey and as a solution to the information gathered from the survey. The alternative, to disseminate the survey to the general public, would have lead to more uncertainty in the question to why a commuter chooses to travel as he or she does.

However, there is a challenge to generalize data collected from a case study. Different business parks have different characteristics that will influence the mode choice. In this case study, the distance to the office from the bus stops is short, therefore time saving when using shared mobility is smaller, potentially leading to less willingness to change mode and use shared mobility compared to longer distances. Fearnley et al. (2020) found that most trips with shared e-scooters in Oslo were 1 kilometer in overhead line. At Sluppen the average distance is shorter, approximately 0.3 to 0.6 kilometers. Other considerations when generalizing the results are: Public transport offer, size of the business park, current infrastructure for all modes, climate, facilities at work, incentives from municipality and employer (e.g *hjem-jobb-hjem*), and price and availability to parking.

Future work

The thesis has used stated preference to collect data about shared mobility in combination with public transport. However, further research could add to the results and lead to stronger conclusions. Other methods such as revealed preference and in-depth interviews could supplement the findings in the paper. A trial period with one of the shared vehicles will enable the possibility to see if the stated choices match the actual behavior. If so, it is important that the trial is scientifically evaluated to determine how many who use the service and the satisfaction of the service. Interviews with car drivers can collect information that the survey cannot pick up and further evaluate the importance of availability and the importance of the rest of the trip chain, like the first mile. Another way to address first mile is by a similar stated preference survey to complement the results in this thesis. It is also possible to do a vehicle count at Sluppen to assess if the car share found in the study is correct.

Some respondents have also given their street addresses, and these can be used further do assess the bus travel time and connectivity as this was not covered due to the scope of the master thesis. If home addresses for the rest of the commuters were gathered as well, selected areas with good bus connectivity could be located and reasonable incentives could be made to increase bus usage there. Since price is an important attribute, future research could also look into different business models and possible ways to finance the shared mobility services and evaluate which measures that can be implemented in the nearest future.

Other alternatives to increase mobility at Sluppen can also be reviewed. It is expected that city bike racks will be installed in the area this year. How these bikes will affect the commute share to Sluppen is difficult to say. Langfeldt (2011) did a state-of-art literature review on city bikes and studies indicated that the bikes often are used by previous walkers and bus users. City bikes may substitute car commutes, but literature agrees upon one thing: If city bikes are going to lead to fewer car trips, the measure needs to be complemented by other measures as increased accessibility for bikes and road pricing.

The real estate developers at Sluppen, Kjeldsberg, have expressed their interest in improving the mobility in the area, and they are willing to invest in measures that would improve the current mobility. However, there is an on-going project to build a new bus stop which would determine where to invest. In the end, the development at Sluppen is dependent on local government and public authorities.

Lastly, this research has only looked at the sustainable benefits of increased bus usage with shared mobility, and other aspects as economy and health are not covered by the scope of the thesis. E-scooters and e-bikes are also not ideal for use wintertime and the necessary winter maintenance has not been discussed. This could also be addressed by future research.

4. Conclusion

Shared mobility enablers users to gain short-term access to transportation modes on an as-needed basis. The objective of this research was to investigate if shared mobility could increase public transport use by facilitating the last mile from the bus stop to the office. A small business park in Trondheim was used as a case study area and commuters were given a stated preference survey with attributes of type of vehicle, and cost and availability of the vehicle. Infrastructural measures were also proposed to see if they influenced the stated choices. Socio-demographic information, information about bus availability from home and familiarity with vehicles was also gathered.

Shared vehicles were found to attract up to 24% of commuters over to bus if there was not a charge to the service. Results show that 19% of car commuters would leave the car at home and travel by bus if they were guaranteed a free ride with an e-scooter or shuttle. The results therefore indicate that financial incentives need to be in place in order to reduce the cost for the user and make shared mobility a success. Additionally, those who are familiar with the public transport system or e-scooters are more likely to change mode to bus plus shared mobility, hence incentives to encourage more public transport use or free trials with e-scooters could lead to more bus commutes as well. Younger commuters were also more likely to change mode to bus plus shared mobility.

For car commuters, it was important that the shared mobility service is reliable, meaning that there should always be a vehicle available when getting of the bus. This can be a challenge for e-scooter and e-bike services as they usually depend on natural circulation of the vehicles by users. Shuttles were however the preferred vehicle among current car commuters and 12% were willing to wait for five minutes for a shuttle to arrive.

Still, results indicate that for most car commuters, the total travel time with bus is too long for bus to be attractive, indifferent of last mile improvements. The distance from the bus stop to the office is relative short, and travel time savings are minimal. The first mile did not seem to be a challenge either, and comments from respondents emphasize bus connectivity and transfers as key barriers in Trondheim.

To conclude, by implementing shared vehicles at mobility hubs and key destination points, the services can complement the public transportation and offer decreased travel time from the bus stop to the workplace. The results show that current bikers and walkers will not change mode if shared vehicles were to be implemented in the case study area, whilst every fifth car driver would leave the car at home if there was a shared shuttle or e-scooter available free of charge. In this study, it was determined that there were other, likely more important barriers for use of public transport than the last mile, and the percentage of possible new bus commuters can only be expected to rise if the other barriers are solved. When generalizing the results, it could therefore be stated that shared mobility will increase bus usage, especially for larger business parks with longer distances and a good public transportation system in place. Further research is needed to better understand how shared vehicles can be put into use in a way that decreases personal vehicle ownership.

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Appendices

Appendix A – Impacts of Covid-19

This thesis was written during the outbreak of the coronavirus. The virus was first discovered in January 2020 and in March, several national measures were taken to reduce further dispersal of the virus. In this appendix the impacts of the restrictions on the thesis are discussed.

As a part of the measures, home office was implemented for employees where possible. This meant that the number of commuters at Sluppen drastically decreased and all meetings and communication was done over the internet. In addition, it was advised to avoid all unnecessary travels and contact with people. These measures started in the beginning of March and were still ongoing when the thesis was finished.

The restrictions affected the dissemination of the survey and had the situation been different, additionally distribution channels would have been used. The plan was to use information screens in the office buildings and disseminate flyers in the morning rush hours to promote the survey. Instead, the survey was only distributed by e-mail and posted on a local social media group.

As all communication went electronic during this time period, it is likely to assume that there was a message fatigue within the target group. There was also a lot of uncertainty during the dissemination period with messages and counter messages to employees, and as a consequence, the e-mail with the survey may not have been prioritized and less people may have taken the time to participate in the survey.

It is impossible to say how the coronavirus has affected the results, but it is probable that the sample size would have been bigger if the other dissemination channels were used, and if the daily communication and situation was normal. The survey was originally meant to be closed before Easter holidays, but the time frame to collect data was prolonged with four weeks until the 30th of April to increase the possibility of more responses.

Since the survey was electronic, the methodology was still viable despite of the outbreak of Covid-19 and the associated restrictions. During the thesis, meetings and communication with supervisors and other people of interest have been held online and the computer has been connected to a remote desktop to access software for analyzation purposes. Even though the sample size was smaller than expected, the gathered data has been sufficient to perform analysis and get results.

Appendix B – Theory

The state-of-the-art literature sets the foundation for research. To use shared mobility services as a supplement to public transport, it is important to know the existing barriers. Not all drivers are willing to shift transport mode and the potential travelers need to be identified. The existing literature on sharing services and relevant trends are also presented.

Barriers for using public transport

To understand how to make the bus more attractive, the barriers for using public transport was researched to understand which obstacles shared mobility needs to overcome and which effect they could have. A general important factor is the number of transfers; travelers prefer direct connections (Yan et al., 2019). The survey done at the case study area (Sluppen) in 2017, confirms this; the people with a direct bus connection were more likely to use the public transport (Zhupanova and Tørset, 2017). In the same study the respondents were asked which measures would increase their use of transport: Shorter travel time and higher frequency were the most important factors, in addition to direct connections. Lower fares would have less of an impact, but some travelers would make the shift from car to bus with subsidized tickets.

Also travel time and reliability are important factors, especially for the commuters. A study in the US researched traveler responses for a proposed transit system at a campus. Wait time and out-of-vehicle travel time (OVTT) were valued more than in-vehicle travel time (IVTT) in the choice process (Yan et al., 2019). This indicates that people are willing to accept detours on the bus and more bus stops along the journey to avoid waiting at transfers, and to reduce the distance from/ to the bus stop.

The new bus system in Trondheim has changed the network so that there are more transfers for travelers with three new main lines and several transit points. In such cases, the transit points need to be effective. A study done by the Norwegian Institute of Transport Economics found that few delays, travel time, access, stress, shelter, safety and environment were all important attributes for passengers at a transit point (Krogstad et al., 2016). The same research also identified high punctuality and total time spent travelling as the most important explanatory factors for whether passengers were satisfied with their journey. It could be noted that this level of service is not only a physical level, but is also influenced by people's perception, attitude and habits (Beirão and Cabral, 2007). By enhancing the reputation of the service, the barriers to public transport could be lowered, without making physical improvements.

Potential users

The different barriers should be solved for potential users. Some commuters are dependent of a private car for various reasons; travel during work, errands after work or lack of access to public transport. In the previous Sluppen-report, 35% of the car travelers would still drive, even if there was added a parking fee of NOK750/month. If there was a subsidization of bus tickets, half of these travelers would still use the car (Zhupanova and Tørset, 2017). The researchers found the potential public transport users to be the respondents who had a direct bus connection. This percentage was 34% when asked in the winter and 40% in the summer. Only 10% and 8% used public transport in the survey, including both people with and without access to direct connection. Over half of the respondents drove to work. Beirão and Cabral (2007) also looked at attitudes towards public transport and private car. The study found the potential users to have either less attachment to their car, be tired of driving, or have positive attitudes towards public transport.

Shared bicycles and barriers

A big part of the state-of-the-art literature regarding micromobility has looked at shared bicycles and their barriers. The data is relevant for the other shared vehicles as well. A study concerning electric bikes in Oslo asked for barriers for cycling in general. There were 5460 respondents and the three most important barriers were insufficient cycling paths, safety and bad weather (Fyhri and Fearnley, 2015). In the same study, travel time and comfort were influential factors in the mode choice. To make the use of mobility services more attractive, the results indicate that there should be a sufficient and safe infrastructure from the bus stop to the office areas. The journey will also be more comfortable and travel time could be reduced by giving priority to the vehicles along the path.

In other countries, the barriers for using a shared bicycle are different. In Beijing, travel distance was the most important factor in the mode choice (Campbell et al., 2016), and in Montreal the distance to nearest bike was the critical factor (Bachand-Marleau et al., 2012). A third study from the Netherlands found another key factor; usage costs (Van Heijningen, 2016). This finding was also recognized by van der Nat (2018) in her study.

E-scooters

E-scooters are a hot topic in media, but research on their utility and pot28ntail to supplement public transport is limited. The Norwegian study on experiences with e-scooters in Oslo asked the interview objects about their daily travel needs and if the e-scooters satisfied those needs (Berge, 2019b). The pilot study had 431 answers, where most respondents were interviewed at one of the main transit stations in Oslo. The results showed that low risk for accidents, travel time savings and flexibility were the most important factors for daily travel, where the e-scooters satisfied the last two factors. Ten percent of e-scooterists had experienced one accident or more, but most e-scooterists (72%) perceived the interaction with other road users as "smooth". The most demanding user to interact with was the pedestrian. Over half of the reported accidents in the study happened without other road users present. This also stress the importance of good infrastructure to improve shared mobility services. A study in Chicago looked at public shared e-scooters' potential to fill mobility needs (Smith and Schwieterman, 2018). They used Chaddick Institute's multimodal travel model to find e-scooters were a strong alternative to cars for short trips up to 3 kilometers, if there were parking constraints and other non-auto options competitive to driving. They also found that the vehicles would make 16% more jobs reachable within 30 minutes, but the benefits varied strongly between areas that were only a few blocks apart, dependent of availability to transit lines and bus routes. As stated in the report, only benefits were considered, and challenges related to safety in dense environments and the possibilities of the scooters working as complementary or competitive to public transit were not considered. In Atlanta, a unique research project was given raw data from Bird, a micromobility company that operates shared e-scooters. They also discovered that e-scooters were rarely used in connection with transit, and pointed to the additional cost as a possible reason (Espinoza et al., 2019). Business to business trips and business to parking trips were significant and in their opinion, financial incentives would increase the share of business to transit trips as technical limitations were not an issue. The United States have more road infrastructure and different driving habits than Norway, and infrastructural factors seem to have bigger influence in Norway.

Willingness to use shared mobility services

There have also been studies that discuss the willingness to use shared mobility services for the first and last mile. The willingness among travelers gives an indication of potential users. One study concluded that higher educated young travelers are the most likely to adopt shared mobility services (Alonso-González et al., 2019). A Dutch study showed that elderly, lower educated and less frequent train travelers were most unlikely to switch to a shared transport mode (Arendsen, 2019). This research also concluded that the willingness to use a shared bike was depended of the experience of the user. If a person had used a shared bike before, the preference for driving both the private bike and the shared bike, massively increased. Fyhri and Fearnley (2015) concluded the same when researching willingness to buy an e-bike; knowledge and previous bicycle use were one of the important variables. The study on e-scooters in Oslo confirms the findings; 67% of the users were under the age of 30 (Berge, 2019b). Another project looked at willingness to replace short trips with walking and cycling, and the Norwegian data indicated that the potential to change the mode choice depends on the climate, but also the previous habit for walking and cycling (Stangeby, 1997). All the data collected indicate that if you get the travelers to test a shared mobility service, for instance offering a free trial of the service, it could lead to more micromobility users. The demographics from the previous study at Sluppen shows that 78% of the respondents are between the age of 25 to 54 years old, and many of the respondents represent companies with high qualifications. It is therefore reasonable to believe that there are potential users for shared mobility in the case study area. In general, it seems that familiarity, experience, education and age are the most important factors to determine willingness to utilize new transport modes.

Travel mode replacement

An important aspect of the sustainability of a new transport mode is to determine the travel mode replacement. If a transport mode replaces walking or public transport, the mode may not be a contribution to sustainable mobility. In Oslo, the majority of trips by e-scooters (58%) replaced walking (Berge, 2019b). Only 1 in 10 had used an e-scooter to or from a bus stop or train station, and 26% of the trips were a replacement for public transport. Data concerning electronic bikes in Norway shows that the use of e-bikes led to fewer public transport trips and only slightly affected car trips (Fyhri and Fearnley, 2015). Campbell et al. (2016) concluded that e-bikeshare in Beijing was an attractive replacement for the bus, but could not say if it was an attractive first- and last-mile solution. Even though the city has different characteristics compared to Norway, the same question has yet not been answered in Norway either. The current literature suggests that the micromobility services today does not integrate well with public transport and could rather make the transit more attractive by increasing the capacity of the existing network and give room to more users.

Microtransit and shuttles

Microtransit and shuttles have already been implemented in different cities, a successful example is Bridj in Sydney (Dovey, 2017). The service has virtual stops with on-demand vehicles that drives in fixed routes, one of them connected to the ferry. In the US, the microtransit company Chariot operated for five years, providing users with transit routes based on user demand, but the service was shut down earlier this year due to lack of revenue (Hawkins, 2019). Unlike Bridj, Chariot replaced public transport in San Francisco as the vehicles drove the same routes as the buses. Bridj is a part of the public transport system with goals to optimize public transit, whilst Chariot did not provide a solution for first- and last-mile mobility. There are also many on-going microtransit pilot projects in the US with different designs, like EmGo in Eugene, Oregon where five vehicles that drive flexible routes with over 70 different pick up/drop-off locations in the downtown area (KEZI, 2019). Next summer the service will be evaluated to determine its viability.
In Norway, there are currently three alternative transit services in operation that all run autonomously. In 2018, a shuttle bus was launched as the first of its kind in Norway to drive in real traffic (Andersen, 2018). The vehicle worked as a last mile solution at Forus, an area in Stavanger with high concentration of employment (40 000 employees), and the test period lasted for half a year. The evaluation and results of the project is yet not available, but as the area has similar characteristics to the case study area, the findings from the project will be relevant contribution to the results in thesis. In Kongsberg, Brakar, the company in charge of bus transport in the county, is operating two small autonomous buses that replace the regular buses during the day when there is little traffic (Brakar, n.d). The goal is to make the new buses a supplement to the existing buses, with a focus on first and last mile mobility. So far, there is only updates on results concerning winter challenges. At Fornebu however, a test pilot from last year with two self-driven shuttles, released data on people's perception of the service. The use was mostly a result of curiousness and only one percent said that they travelled differently with the service available (OBOS, 2019). Eight percent of road users said they had experienced dangerous overtaking, but a majority had not experienced any dangerous situations at all, and people were positive to the project. The shuttles drove the whole summer of 2018 from Fornebu S to a popular bathing spot 2 kilometers away.

Car sharing and ridesharing

Car sharing and ridesharing services are already operating in many countries. The proposed shuttles in the survey can be seen as a ridesharing service, but most often it is associated with carpooling and Uber and Lyft who offer cheaper rides when you share the ride with other users travelling in the same direction. Ridesharing has been studied as means of transportation to work, but not as a supplement to public transport. For instance, a small Norwegian study (134 answers) looked at ridesharing during commute and its potential to reduce congestion through an electronical survey (Shirazi, 2018). The results show that ridesharing passengers previously used non-driving modes, and the desired effect on traffic reduction was not as big as previously assumed. The report concluded that there is a traffic reduction potential, but that it could be exploited better by integrating ridesharing with public transit.

Carsharing services are also starting to emerge in the city picture where the service either has free-floating cars or offer roundtrips services. The free-floating services have bigger potential to facilitate connectivity to public transport, as the vehicles do not need to be returned at the same spot you collected it. Roundtrip car sharing could be used together with public transport as well if the user is prepared to pay for rent of the car for the whole day. In addition, roundtrips carsharing services have stronger positive impact on car ownership and car mode replacement. Members of a free-floating service use less public transport and the service has less net effect on car usage (Namazu and Dowlatabadi, 2018, Becker et al., 2017). With designated parking areas at mobility hubs, in this case the bus stops along E6, the services could be used together with public transit, resembling the park & ride service located further south of Trondheim.

Shared autonomous vehicles

In the future, vehicles are likely to operate autonomously, and some studies have investigated the effects of shared autonomous vehicles (SAV), similar to the pilot project running in Norway. Research also emphasize the fact that the vehicles should be integrated with other mobility modes, and not as a replacement (Ohnemus and Perl, 2016). The authors found that SAVs work best in low density areas where the demand is too low, and the distances too long for other alternatives to be cost-effective. Many low-density areas lack an all-day transit service, and the SAVs could offer a guaranteed ride at the off-peak hours, whilst reducing the chance of missed connections at peak hours. The article also underlines that if people have private Avs, car ownership will not decline, and public transport’s modal share will not increase. Another study also underlines that SAVs could lead to less public transport usage if not regulated (Lazarus et al., 2018). The behavioral changes are more difficult to predict as studies have found different results, and Lazarus et al. (2018) state that further understanding of the dynamics are important to influence the behavior so that SAVs have a positive impact for the society an environment.

In **conclusion**, there is a potential to increase public transport usage with integrated shared mobility services, and there are different vehicles to choose from. However, literature indicates that these services, as used today, may not replace the private car use. The future magnitude and effect of shared mobility is uncertain and further research is needed. This study attempted to fill in one of the gaps by exploring the user preferences for the services and see if they can be integrated with the existing network in a business park to increase public transport use.

Appendix C – The Method

The appendix presents theory on stated preference methods. It also gives a description of the design process of the survey and explains how the chi-square tests of independence were done. In addition, reflections about the survey design and dissemination are made.

About stated preference

As a part of the pre-study in the fall semester, a literature study was done on stated preference methods. Stated preference methods identify preferences based on decision-making in hypothetical choice situations. The methods were first presented in the early 1970s and became widely used after 1978 (Kroes and Sheldon, 1988). The collected data made it possible to forecast impacts before implementing them. In the transport sector the methods are often used to determine impacts on traveler mode choice. This is of great help for decision-makers when they must prioritize and decide which projects to invest in.

Before the development of stated preference methods, revealed preference (RP) was used. The data was collected by direct observations and surveys that asked what travelers actually do. Besides being unable to evaluate demand under conditions that does not exist, it can also be challenging to obtain sufficient variation in RP data (Kroes and Sheldon, 1988). SP methods can study more variables and the researcher can control the environment and conditions in the choice mode. However, the controlled environment also leads to restrictions; a respondent may not be able to express her preference with the given choice set. The context and format of the hypothetical choice sets can also affect the responses, and it is therefore important to make the survey as neutral as possible and not lead respondents in one direction or another.

One other disadvantage with SP surveys, referred as hypothetical bias, is that people do not always do what they say. It is easier to say what you would have done, without the need to commit to the choice. Hensher (2010) found different ways to reduce the hypothetical bias and improve SP surveys. The findings were addressed in the design phase of the master thesis and the most relevant results from Hensher were: 1) Include a well-scripted presentation of the objectives, 2) Include a null alternative to avoid a forced choice setting, 3) Reference an experiment relative to a real experience, 4) Identify constraints that might impact on real choices to reduce choices without commitment. In other words, to minimize the gap between stated preference and actual behavior, one need to provide familiar and realistic hypothetical situations. For this research, respondents were given hypothetical questions to a journey they do almost every day. As mentioned, compared to asking the general public, data from a case study will have more realistic alternatives as the researcher knows the available options in the area. The bias can also be reduced by combining the SP survey with another method, for instance RP (Kroes and Sheldon, 1988, Hensher, 2010). Due to the scope of the master thesis, the data was only collected through a SP method. Kroes and Sheldon (1988) underlined that when SP methods are used in the transport sector, the relative utility weights, meaning how important an attribute is compared to the other suggested attributes, are more important than the actual values. Furthermore, it has been found that SP methods that use a conjoint model, where the survey examines combinations of service attributes, the results of willingness to pay were biased upwards (Stevens et al., 2000). Kroes and Sheldon (1988) also give examples of similar findings, but as the relative utility weights are more important, the over-statements are less important.

There are different SP techniques, and this thesis used a simple form of choice modelling, also known as conjoint analysis or discrete choice experiment. The respondent is faced with a choice set where inputs are divided into attributes and levels. Attributes describe the service, and levels describe a valuation of that attribute. A respondent then makes a choice between different pre-made combinations of the levels. If the results were to be modelled, the model typically assumes that the decision maker chooses an alternative based on utility-maximizing behavior, and different types of discrete choice models decide assumptions of unobservable factors (Train, 2009). As an illustration, a standard logit model has constraints that a mixed logit model can solve 'by allowing for random taste variation, unrestricted substitution patterns, and correlation in unobserved factors over time' (Train, 2009).

Making the survey

The design of the survey started late January and was completed in March. From the literature study, mode choice characteristics and barriers were uncovered to determine inputs in the game. Price, travel time, availability of shared vehicle, type of shared vehicle and infrastructure was chosen. Each attribute had initially three levels and for every game the combination of levels was different. During the process, a question was raised whether the attributes and levels could be reduced and presented as stated choice, rather than a game. The greatest challenge was to minimize the number of games for each respondent and by simplifying the design, the total number of questions could be reduced. As a consequence, the data could not be modelled, but due to the scope of the thesis, this was not considered a loss. Most likely, only attempt of modelling could have been made, demanding future work in the model. Most importantly, changing the design would not affect the objective, and the necessary data to answer the research questions would still be collected.

As the decision to change from game sets to stated preference was made, the number of attributes and levels were reduced. Each respondent ended up facing twelve stated preference questions; three types of shared vehicles, two price categories and two availability categories. The survey is shown in Appendix E. Travel time was determined in the introduction of the questions and questions regarding infrastructure was asked separately after the respondent had answered about mode choice.

When designing the survey, several shared mobility options were considered based on the previous literature study. The final three vehicles were chosen based on the possibility to function as a last mile option, and the possibility to implement the service. Shared e-scooters already exist in Trondheim and the municipality has (regular) shared bikes operating in the city center. For the survey, the bikes were decided to be electric to increase comfort. A shuttle bus was chosen as the third shared vehicle because of its use as a last mile solution compared to the other alternative transit services. Also, different national and international pilot projects are already testing shuttle buses together with public transit, both autonomous and regular driven.

Another matter was the valuation of availability. The initial goal was to find the threshold for how often a shared vehicle needed to be available for commuters to take use of the service. For valuation both percentage and number of days during a week could have been used. Even though "2 out of 5 days" would have been the most intuitive valuation, the levels were reduced to two, making it difficult to obtain the threshold. Instead, "always" and "sometimes" were chosen, allowing for comparison between price and availability, and to determine the importance of uncertainty during commute, presenting a guaranteed ride or not.

Implementation of infrastructure in the survey was also a challenge, not only during the process of reducing the number of questions, but also in the definition of levels. As stated, bicycle and pedestrian infrastructure was originally an attribute with three different levels, but instead respondents were asked how different measures would affect the previous mode choices. The quality of infrastructure could either be presented as pictures, service levels or specific measures. Even though pictures are very descriptive, and could possibly eliminate uncertainty for the respondent, to find a picture that could describe a possible solution at Sluppen was difficult. In the end, rather than describing a service level for the area, a list of measures was used, resulting in the final design. As noted, regardless of the description of levels, some respondents may not know how the level of service is today, presenting a challenge for the analysis.

Besides the stated preference questions, the survey consisted of demographics, travel habits, familiarity with different vehicles and public transport availability at home. The start base for the questions was the previous travel survey from 2017. As the design of the survey developed, more questions from the travel survey were excluded, focusing only on the questions that were directly relevant for the research questions. Examples of questions that were removed are: Yearly income, number of cars and driver licenses in the home, assessment of kilometers travelled, number of car related trips during work and measures to increase use of bus or walking. Even though many of the questions would have worked as complement to the paper, questions were restricted by the estimated completion time. Nonetheless, if a question from the previous travel survey was used, the question was duplicated to allow comparison between the travel habits today and travel habits in 2017.

Dissemination

Before the dissemination of the survey, a pilot survey was sent to 10 people both researchers and commuters. The feedback lead to further improvements and it was important to see how people not working with mobility understood the questions, eliminating uncertainty and unnecessary assumptions from the respondent. The study collected personal data and consequently it was necessary to apply for permission at the Data Protection Services (NSD). The application was sent and approved in February, a month before the dissemination. Permission to stand at the entrances of the office buildings and to use information screens was also obtained, even though the channels were not used. The dissemination of the survey depended on a third party, Kjeldsberg. The dependency contributed to time uncertainty and an uncertainty in the number of people reached. When the survey was ready, it was sent by e-mail to a contact person at Kjeldsberg which then sent the survey to a contact person at the individual companies. It is not possible to know if all the individual companies did in fact forward the survey to their employees. The survey had to go through three channels before reaching the target group, and it is uncertain how many people it actually reached out of the approximately 1800 commuters.

Together with the link to the survey, a title and a short text was written. Since there was a low response from car drivers, the text was altered in a reminder e-mail to encourage more car drivers to participate. As a result, 54% of the last 50 respondents were car drivers.

Chi-Square Test of Independence

The chi square test is a statistical test of independence between two categorical variables and is used to determine if there is a statistically significant difference between the expected and the observed frequencies in a contingency table. When using chi-square tests, there was a challenge of drawing conclusion from sparse data to be able to determine if there is a relationship between two variables. To obtain enough observed values to determine statistical significances, response categories were merged together. For instance, rather than comparing the different age groups, respondents were divided into two categories; 34 years old and younger, and over 34 years old.

The tests were done by using the chi-square function in Excel. As an example, the comparison with familiarity with e-scooter and the willingness to change mode to bus plus e-scooter (when always available and free), is used. Table B.1 shows the data put into Excel to perform the test. The observed numbers represent how many respondents who would take use of bus plus e-scooter based on their response to familiarity with e-scooters. Again, the responses were merged into two groups; those who had never tried an e-scooter before and those who have tried once or more. The expected numbers show the anticipated responses if familiarity and stated choice were independent of each other gathered from Table 3, namely 24%. As a result, the chi-square test revealed a statistically significant difference between the categories with a p-value of 0,0043. It therefore no coincidence that those who never have tried e-scooter are less willing to change mode to bus plus shared e-scooters.

Table B.1 – Willingness to change mode given familiarity with e-scooters

Observed	Never tried	Have tried	Total
Change mode	22	27	49
Travel as usual	95	60	155
Total	117	87	204
Expected	Never tried	Have tried	Total
Change mode	28,08	20,88	49
Travel as usual	88,92	66,12	155
Total	117	87	204

Reflection on the Design of the Survey

Even though the design process was prioritized in the project and a pilot study was used, there is always room for improvements. In hindsight, a couple of changes could have enhanced the survey. When asked about how different infrastructural measures would influence the stated choices, a null alternative should have been added to avoid a forced choice setting. By adding the possibility to answer *I do not know*, the respondents who did not know the impact of the measure would have been identified. In addition, the order of the measures was not randomized, opening up to the possibility of order bias.

The stated choices went through the most changes in the design process. With twelve similar questions, there was a chance that the survey was perceived as repetitive and motivation could be lost. However, the survey had a 91% completion rate, indicating that the final design had the necessary variations.

Before presenting the stated choices, assumptions and fixed attributes were introduced. Nevertheless, there is a risk that the respondent may have made own assumptions as a consequence of too much information or insufficient information. If a respondent did not know how a bus commute would look like, they were told to assume a frequency of 10 minutes and a specific travel time which may be a mismatch to the actual travel time with the bus. Twelve people did not know if they had a direct bus to work, which was not explained in the introduction. Which respondents who made their stated choice based on bus travel time experience, and those who made the choice based on the given information is also unclear. In general, most commuters knew how their bus offer to work was and half of the respondents took the bus a couple of times a month or more.

Appendix D – Geographical presentations

All the maps in the appendix are made in ArcMap. Since all respondents gave their post code and less than half of the respondents gave their street address, it was decided to use post code zones to show the geographical distribution of respondents. The background maps are retrieved from Geonorge.

Figure D.1 is also presented in the paper. The map shows how many respondents who live in each post code zone.

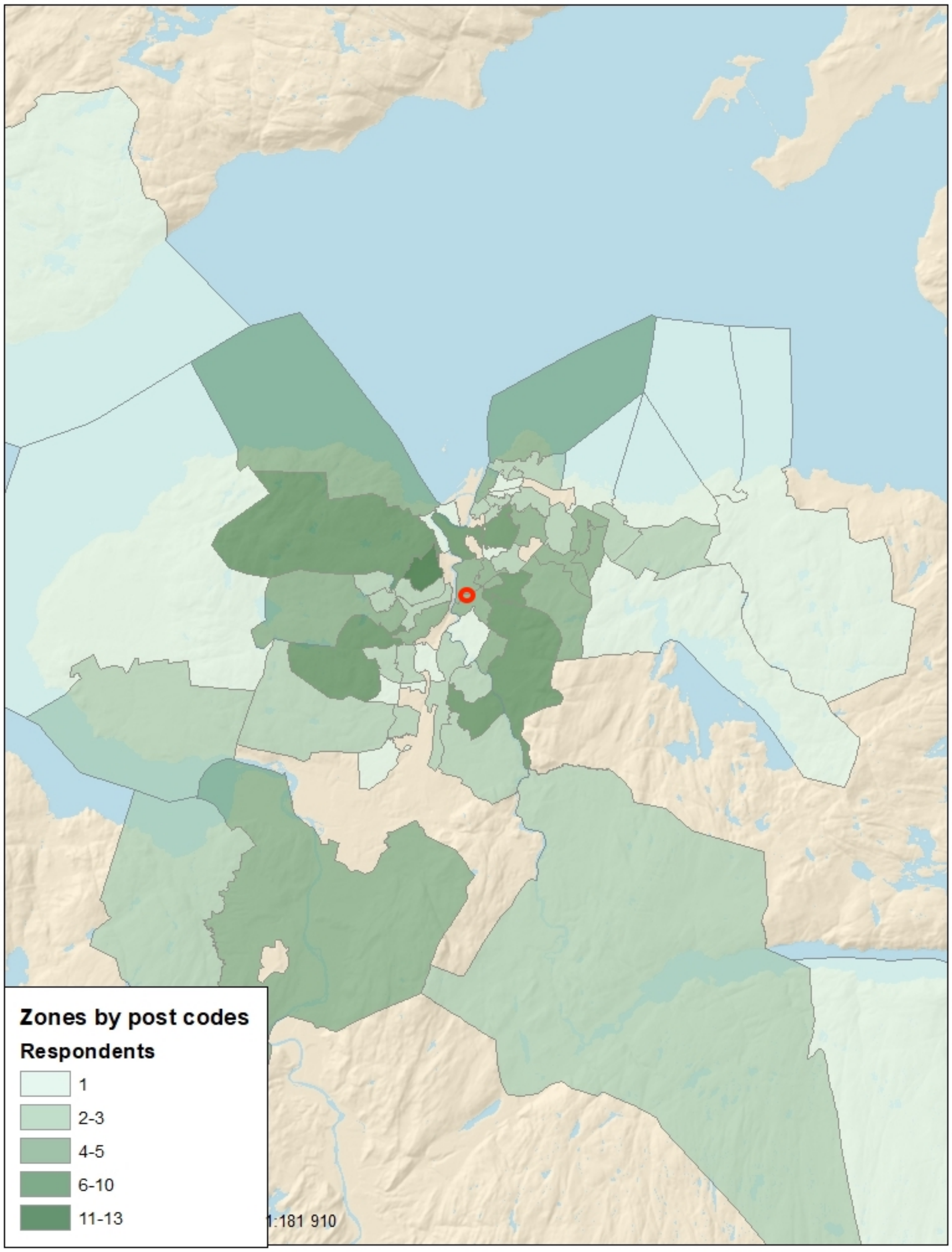


Figure D.1 – Number of respondents in each post code zone

Figure D.2 shows what respondents (n=204) answered when asked if they had a direct bus connection. In one post code, the bus offer could vary between respondents and these zones were marked with yellow or red. Respondents could choose to answered *yes*, *no* or *I do not know* and respondents in red zones, have answered either *yes* or *no* in combination with *I do not know*.

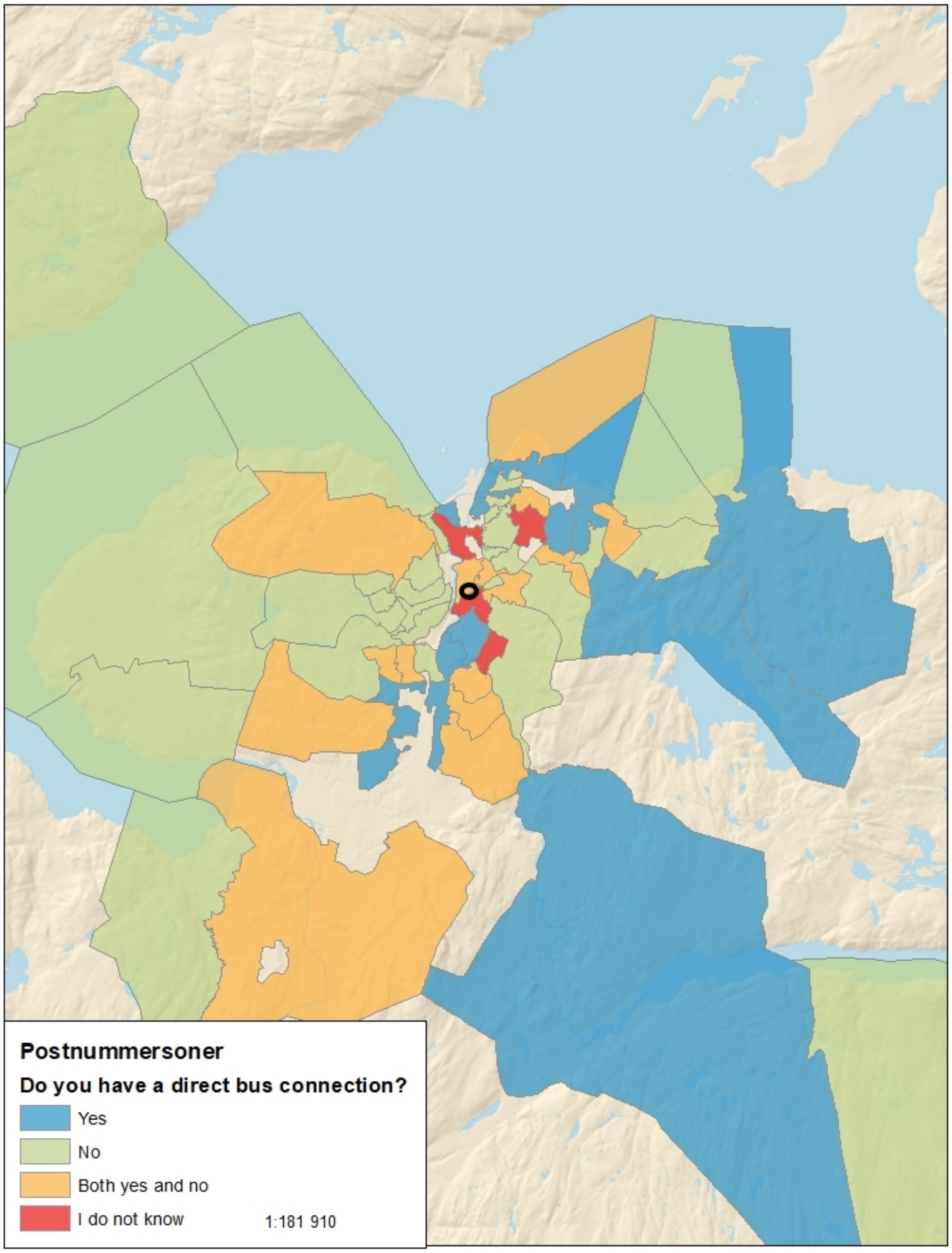
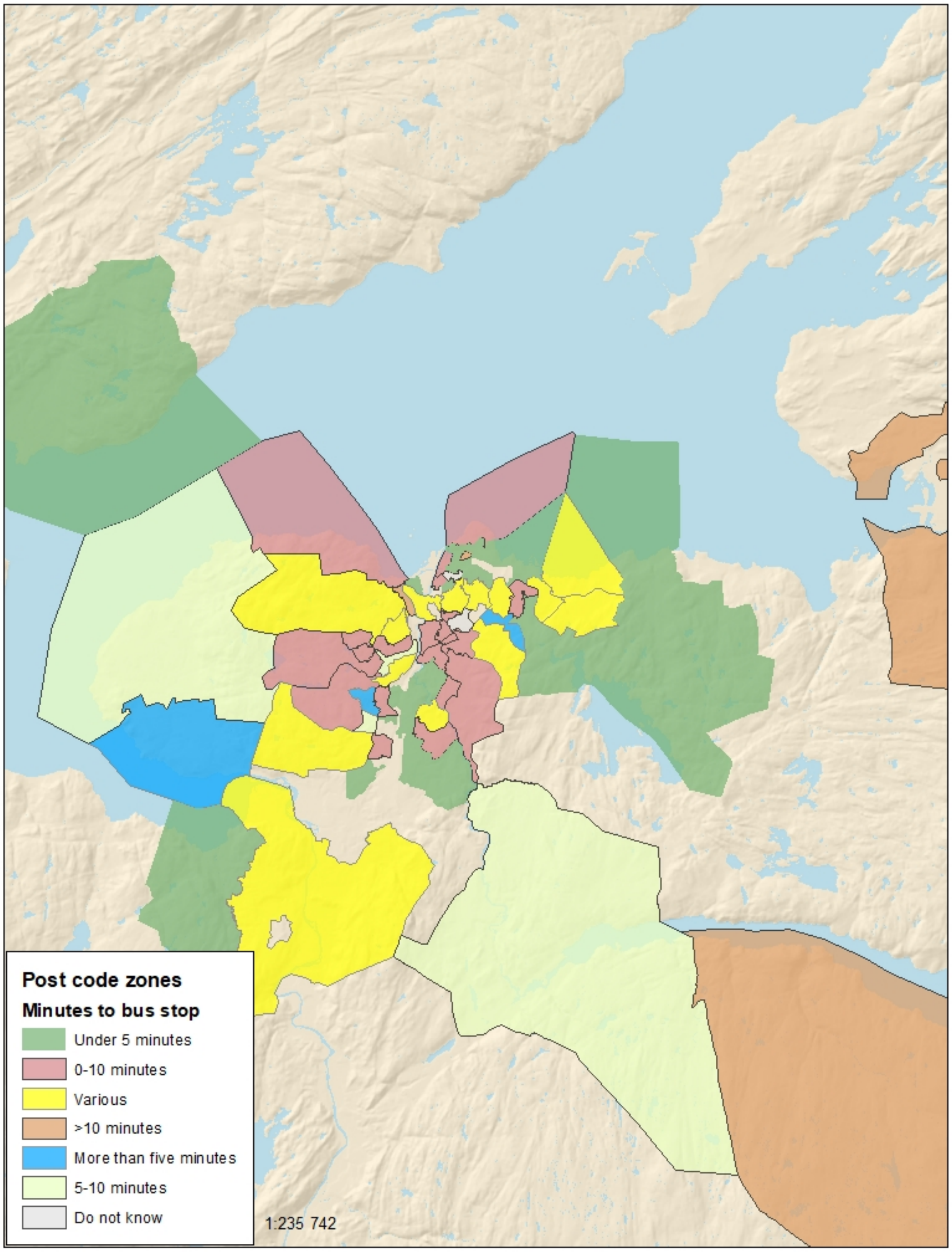


Figure D.2 – Geographical distribution of direct bus connections

Also, figure D.3 shows what respondents have answered when asked about travel time to nearest bus stop to work. Again, the availability varied between respondents in the same zone.



D.3 – Minutes to bus stop from home

In the following figures, travel time for different mode groups are shown. In zones with multiple answers, the average travel time was used in the geographical presentation. In table D.1, the mode split for zones with 8 or more respondents is shown.

Table D.1 – Travel mode splits in dense zones

Post code	Car driver	Bus user	Cyclist	Car passenger/ walkers/other	Total average travel time (minutes)	Total respondents
7020	4	2	3	1	22	10
7021	3	2	5	3	22	13
7052	-	1	8	-	19	9
7091	4	2	1	1	16	8

Figure D.4 shows the estimated travel by car drivers (n=79). The shortest given travel time was 4 minutes and the longest was 65 minutes. Twelve respondents used less than 10 minutes to drive to work.

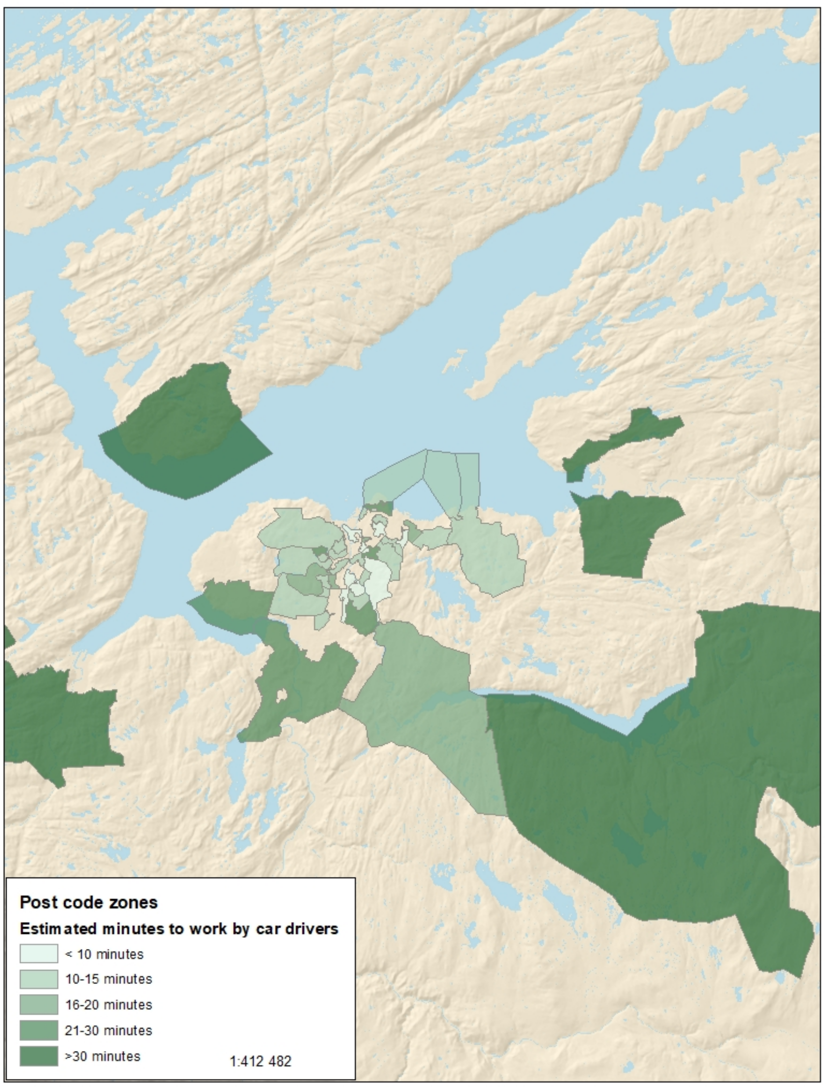


Figure D.4 – Estimated travel time to work by car drivers

Figure D.5 shows the estimated travel time by current bus commuters (n=38). The shortest given travel time given was 20 minutes and the longest was 60 minutes.

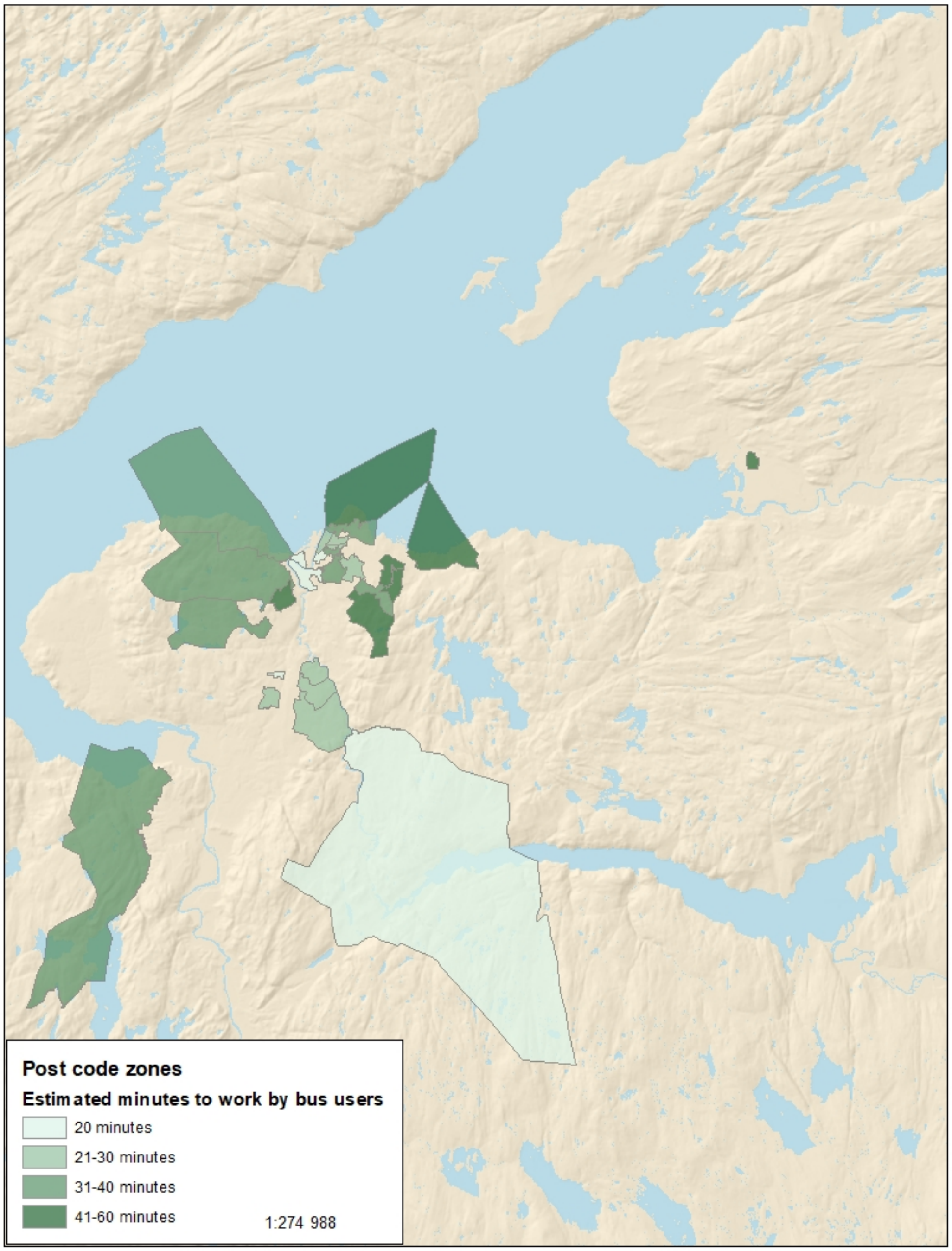


Figure D.5 – Estimated travel time to work by bus users

In figure D.6, the given travel times are both from respondents who use a regular bike (n=39) and respondents who travel with electric bicycles (n=19). Shortest travel time was 8 minutes and the longest travel time was 45 minutes.

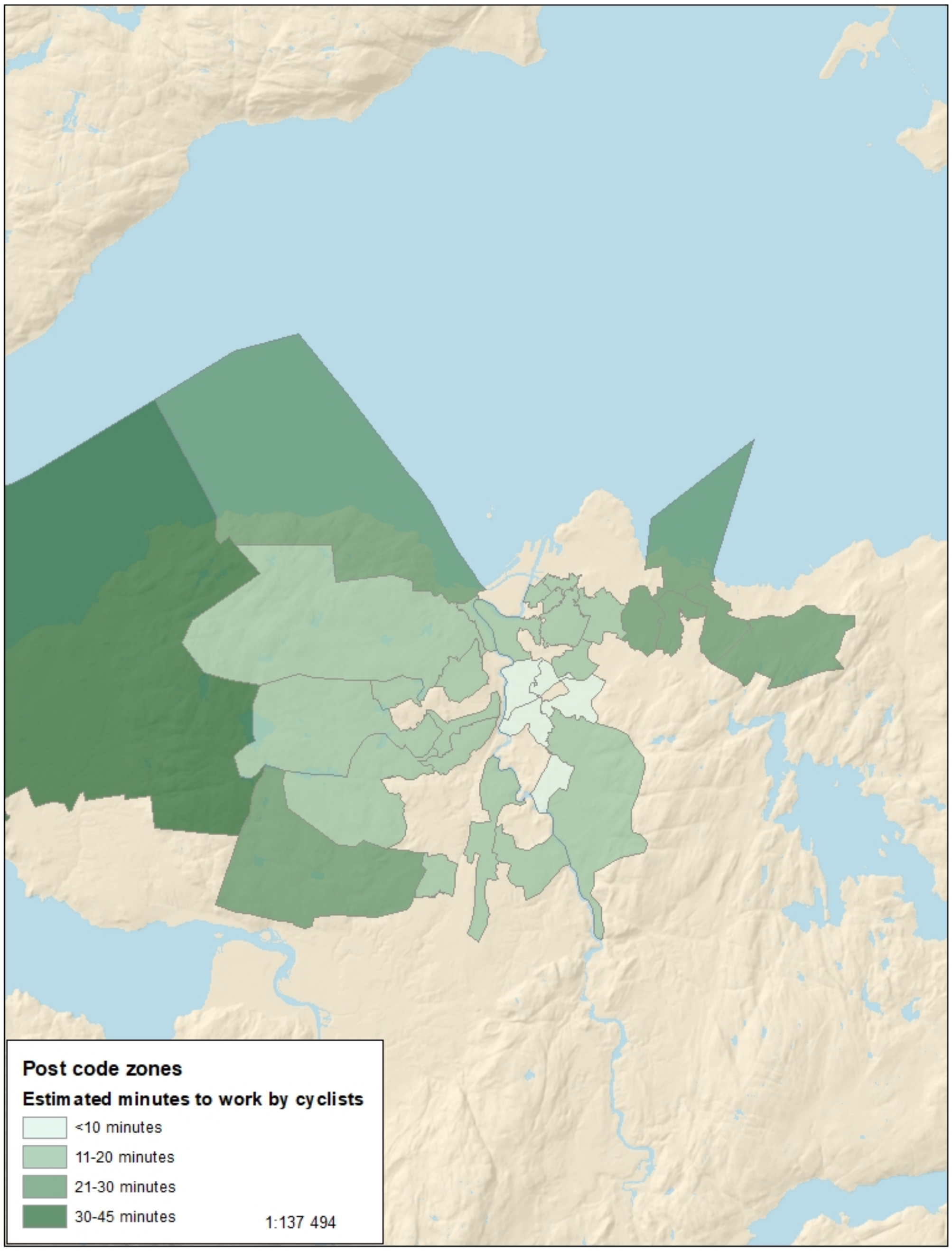


Figure D.6 – Estimated travel time to work by cyclists

Appendix E - The Survey

Velkommen til spørreundersøkelsen om delingsmobilitet på Sluppen!

Før vi setter i gang må du samtykke til å delta i spørreundersøkelsen. Dette er fordi du får muligheten til å oppgi personlig informasjon som gatenavn og e-postadresse, men du kan fullføre undersøkelsen uten å oppgi denne informasjonen. E-postadressen bruker vi kun til premieutdeling.

For å lese mer om prosjektet og hva det innebærer for deg og dine personopplysninger, klikk HER.

Har du noen flere spørsmål, ta kontakt på hannfi@stud.ntnu.no eller på telefon: 98874285

1. Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet «Delingsmobilitet på Sluppen», og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ○ å delta i spørreundersøkelsen

Takk for at du tar deg tid til spørreundersøkelsen. Da kjører vi i gang!

Vi starter med et par generelle spørsmål før du blir spurt om reisevaner og presentert ulike reisevalg til jobben.

2. Kjønn

- ○ Kvinne
- ○ Mann
- ○ Ønsker ikke oppgi

3. Alder:

- ○ 18-24
- ○ 25-34
- ○ 35-44
- ○ 45-54
- ○ 55-64
- ○ 65-74
- ○ >75

4. Hva er postnummeret der du bor?

Ved å fortelle oss hvilket område du bor i, hjelper du oss å analysere fremkommelighet og mobilitet i ditt område.

5. Hva heter gaten der du bor? (Valgfritt)

6. Hvilke av følgende reisemidler har du mulighet til å benytte til jobb? (Her kan du velge flere alternativer)

- ☐ Bil som jeg kjører selv
- ☐ Bil som passasjer
- ☐ Kollektivtransport
- ☐ El. sykkel
- ☐ Sykkel
- ☐ Gå
- ☐ Annet (vennligst spesifiser)

Tenk om du skulle tatt bussen til jobb:

7. Ca. hvor lang tid tar det å gå hjemmefra til bussholdeplassen du ville brukt til jobb? (Hvis du hadde syklet eller kjørt til bussholdeplassen, velg tiden det tar å sykle/kjøre)

- ○ <5 minutter
- ○ 5-10 minutter
- ○ >10 minutter
- ○ Vet ikke

8. Hvor ofte kommer det buss(er) du kan ta til jobb på denne bussholdeplassen?

- ○ Ca. hvert 5. minutt eller oftere
- ○ Ca. hvert 10. minutt
- ○ Ca. hvert 15. minutt
- ○ Ca. hvert 20 minutt eller sjeldnere
- ○ Vet ikke

9. Har du direktebuss til Sluppen-området?

- ○ Ja
- ○ Nei
- ○ Vet ikke

Muligheter for parkering på jobb

10. Har du tilgang til en parkingsplass på Sluppen?

- Ja
- Nei
- Vet ikke

Parkeringsavgift

11. Hvem betaler parkeringsavgiften?

- Arbeidsgiver betaler alt
- Arbeidsgiver betaler en andel
- Jeg har tilgang på en gratis plass
- Jeg
- Vet ikke
- Annet (vennligst spesifiser)

Hvordan reiser du oftest hjemmefra til jobb?

Ta utgangspunkt i din vanligste tur til jobb når du besvarer spørsmålene nedenfor. (Hvis du reiser på ulike måter, velg én).

12. Ca. hvor mange minutter bruker du hjemmefra til jobb?

13. Hvilket reisemiddel benytter du?

- Bil som jeg kjører selv
- Bil som passasjer
- Kollektivtransport
- Elsykkel
- Sykkel
- Går
- Annet

14. Hovedgrunner for å velge bil som transportmiddel (her kan du velge flere alternativer):

- Raskere reisetid
- Enkelt/praktisk
- Må levere eller hente barna på...
- Trenger bil i arbeid
- Gratis eller subsidiert parkering
- Annet (vennligst spesifiser)
- Trenger bil etter arbeid (annet enn levering/hente barna)
- Billigere enn buss
- Har ikke kollektivtilbud
- Har ikke andre alternativer

14. Hovedgrunner til å reise med bil som passasjer (her kan du velge flere alternativer):

- ☐ Raskere reisetid
- ☐ Enkelt/praktisk
- ☐ Billigere enn buss
- ☐ Har ikke kollektivtilbud
- ☐ Har ikke andre alternativer
- ☐ Annet (vennligst spesifiser)

14. Ved bussbytte, hvor mange minutter må du normalt vente mellom avgangene?

- ◯ Jeg må ikke bytte buss
- ◯ Mindre enn 5 minutter
- ◯ 5-10
- ◯ Over 10 minutter

15. Ca. hvor mange minutter bruker du fra bussholdeplassen til arbeidsplassen (etter at du har gått av bussen)?

Car drivers

Vil tilgang på delingsmobilitet endre reisevanen din til jobb?

Med delingsmobilitet mener vi at et kjøretøy deles mellom trafikanter. Eksempler er bysykkel, elsparkesykler i gatene og samkjøring.

I de følgende spørsmålene skal du sammenligne og foreta et valg mellom hvordan du reiser i dag og et framtidig scenario med tre ulike former for delingsmobilitet kombinert med buss.

De ulike kjøretøyene står ved bussholdeplassene på Sluppen og kan frakte deg den siste strekningen til kontoret. Spørsmålene gjelder kun reiser til jobb.

Når du besvarer spørsmålene, ta utgangspunkt i den samme turen til jobb som tidligere.

Hvis du ikke vet hvordan busstilbudet er hjemmefra, kan du anta dette:
1. Selve bussreisen vil ta fem minutter mer enn det du bruker i dag når du kjører bil.
2. Et månedskort koster 835 kroner, det vil si ca. 30 kroner per dag.
3. Bussen kjører hvert 10. minutt.

1. Elsparkesykkel

Bus users

Vil tilgang på delingsmobilitet endre reisevanen din til jobb?

Med delingsmobilitet mener vi at et kjøretøy deles mellom trafikanter. Eksempler er bysykkel, elsparkesykler i gatene og samkjøring.

I de følgende spørsmålene skal du sammenligne og foreta et valg mellom hvordan du reiser i dag og et framtidig scenario med tre ulike former for delingsmobilitet kombinert med buss.

De ulike kjøretøyene står ved bussholdeplassene på Sluppen og kan frakte deg den siste strekningen til kontoret. Spørsmålene gjelder kun reiser til jobb.

Når du besvarer spørsmålene, ta utgangspunkt i den samme turen til jobb som tidligere.

Others

Vil tilgang på delingsmobilitet endre reisevanen din til jobb?

Med delingsmobilitet mener vi at et kjøretøy deles mellom trafikanter. Eksempler er bysykkel, elsparkesykler i gatene og samkjøring.

I de følgende spørsmålene skal du sammenligne og foreta et valg mellom hvordan du reiser i dag og et framtidig scenario med tre ulike former for delingsmobilitet kombinert med buss.

De ulike kjøretøyene står ved bussholdeplassene på Sluppen og kan frakte deg den siste strekningen til kontoret. Spørsmålene gjelder kun reiser til jobb.

Når du besvarer spørsmålene, ta utgangspunkt i den samme turen til jobb som tidligere.

Hvis du ikke vet hvordan busstilbudet er hjemmefra, kan du anta dette:
1. Selve reisen dør til dør tar tar like lang tid som du bruker til jobb i dag.
2. Et månedskort koster 835 kroner, det vil si ca. 30 kroner per dag.
3. Bussen kjører hvert 10. minutt.

All

15. Se for deg at det **alltid** er en **elektrisk sparkesykkel** tilgjengelig når du går av bussen på Sluppen. Det **koster 20 kroner ekstra** å ta elsparkesykkelen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + elsparkesykkel
- Slik jeg reiser i dag, med bil

16. Se for deg at det **noen ganger** er en **elektrisk sparkesykkel** tilgjengelig når du går av bussen på Sluppen. Det **koster ikke noe ekstra** å ta elsparkesykkelen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + elsparkesykkel
- Slik jeg reiser i dag, med bil

17. Se for deg at det **noen ganger** er en **elektrisk sparkesykkel** tilgjengelig når du går av bussen på Sluppen. Det **koster 20 kroner ekstra** å ta elsparkesykkelen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + elsparkesykkel
- Slik jeg reiser i dag, med bil

18. Se for deg at det **alltid** er en **elektrisk sparkesykkel** tilgjengelig når du går av bussen på Sluppen. Det **koster ikke noe ekstra** å ta elsparkesykkelen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + elsparkesykkel
- Slik jeg reiser i dag, med bil

2. Elsykkel

19. Se for deg at det **alltid** er en **elektrisk sykkel** tilgjengelig når du går av bussen på Sluppen. Det **koster 20 kroner ekstra** å ta elsykkelen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + elsykkel
- Slik jeg reiser i dag, med bil

20. Se for deg at det **alltid** er en **elektrisk sykkel** tilgjengelig når du går av bussen på Sluppen. Det **koster ikke noe ekstra** å ta elsykkelen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + elsykkel
- Slik jeg reiser i dag, med bil

21. Se for deg at det **noen ganger** er en **elektrisk sykkel** tilgjengelig når du går av bussen på Sluppen. Det **koster 20 kroner ekstra** å ta elsykkelen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + elsykkel
- Slik jeg reiser i dag, med bil

22. Se for deg at det **noen ganger** er en **elektrisk sykkel** tilgjengelig når du går av bussen på Sluppen. Det **koster ikke noe ekstra** å ta elsykkelen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + elsykkel
- Slik jeg reiser i dag, med bil

3. Shuttlebuss

23. Se for deg at det er en **shuttlebuss** tilgjengelig når du går av bussen på Sluppen. Det er **ingen ventetid** og det **koster 20 kroner ekstra** å ta shuttlebussen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + shuttlebuss
- Slik jeg reiser i dag, med bil

24. Se for deg at det er en **shuttlebuss** tilgjengelig når du går av bussen på Sluppen. Du risikerer å **vente opp til fem minutter** før den ankommer. Det **koster 20 kroner ekstra** å ta shuttlebussen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + shuttlebuss
- Slik jeg reiser i dag, med bil

25. Se for deg at det er en **shuttlebuss** tilgjengelig når du går av bussen på Sluppen. Du risikerer å **vente opp til fem minutter** før den ankommer. Det **koster ikke noe ekstra** å ta shuttlebussen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + shuttlebuss
- Slik jeg reiser i dag, med bil

26. Se for deg at det er en **shuttlebuss** tilgjengelig når du går av bussen på Sluppen. Det er **ingen ventetid** og det **koster ikke noe ekstra** å ta shuttlebussen til kontoret. Hvordan velger du å reise til jobb?

- Med buss + shuttlebuss
- Slik jeg reiser i dag, med bil

Hadde du valgt annerledes hvis gateutformingen fra bussholdeplassen til kontoret var annerledes?

26. I hvilken grad vil følgende tiltak gjøre deg mer villig til å ta buss kombinert med delingsmobilitet?

	Påvirker meg ikke	Liten grad	Stor grad
Dedikert trasé for sykkel og sparkesykkel (kontinuerlig, uten barrierer eller hindringer)	○	○	○
Signalanlegg ved fotgjengerfelt med prioritet for gående/syklende	○	○	○
Bredere fortau	○	○	○
Ny, jevnere asfalt	○	○	○
Opplyst gang- og sykkelvei	○	○	○

Til slutt lurer vi på godt kjent du er med ulike reisemidler utover reisene til og fra jobb.

Se bort i fra reisene som tar deg til og fra jobben når du besvarer spørsmålene nedenfor.

27. Hvor ofte tar du buss?

- ○ Tar buss ukentlig
- ○ Tar buss et par ganger i måneden
- ○ Tar buss et par ganger i løpet av et halvår
- ○ Tar svært sjeldent eller aldri buss

28. Hvor ofte sykler du utenom vinterstid (april til oktober)?

- ○ Sykler ukentlig
- ○ Sykler et par ganger i måneden
- ○ Sykler et par ganger i løpet av et halvår
- ○ Sykler svært sjeldent eller aldri

29. Har du brukt elektrisk sparkesykkel før?

- Har egen
- Leid/lånt flere ganger
- Leid/lånt 1-3 ganger
- Nei, aldri prøvd

30. Hva er din helhetsoppfatning av dagens busstilbud?

Dårlig ★ ★ OK ★ ★ Bra ★

Tusen takk for at du tok deg tid til å svare på spørsmålene!

31. Hvis du vil være med i trekningen av gavekort til Midtbyen på 1000 kroner, vennligst oppgi en e-postadresse som vi kan kontakte deg på:

32. Hvis du har noen kommentarer til delingsmobilitet, kollektiv transport eller selve undersøkelsen, kan du legge dem igjen her:

Appendix F - Comments

Hvem betaler parkeringsavgiften?

- Arbeidsgiver betaler plasser og fakturerer ansatte for 50 kr pr dag de benytter plassen
- Begrenset antall gratis plasser
- Ikke fast plass til bil. Mulighet til gratis parkering. Mc er gratis

Hovedgrunner for å velge bil som transportmiddel (her kan du velge flere alternativer):

- Ugunstig buss forbindelse.
- Usikkert om det er plass på bussen hjem igjen etter jobb.
- Dårlig kollektivtilbud
- Liker å kjøre
- Må skifte buss
- Sparer tid
- Kollektivtilbudet er for dårlig
- Kjører flere i samme bil
- Samkjøring med mannen min
- Ekstremt upraktisk med buss og pendling fra Fosen/Stadsbygd
- Tar alt for lang tid å ta buss
- Kjører bil om jeg trenger bil i løpet av dagen (møter), går ellers.
- Samkjøring med husbond
- Kollektivtilbud tar for lang tid

Hvis du har noen kommentarer til delingsmobilitet, kollektiv transport eller selve undersøkelsen, kan du legge dem igjen her:

- Det er ikke forholdene rundt Sluppen som avgjør hvilket fremkomstmiddel jeg benytter, men at jeg har 40 min å gå til bussen hjemmefra. Da har jeg allerede kjørt bil i 5 km og kjører da like godt resten av veien ettersom jeg må kjøre uansett
- Tok buss til jobb i 9 år, men ble for ustabilt i forhold til å komme meg hjem. Ble ofte forbikjørt. Endte med å kjøpe el-bil som transport til jobb.
- Det hadde vært ønskelig med bussrute fra Byåsen med stopp på Slippen, uten å måtte bytte buss. Det gjør buss uaktuelt. El-sykkel er et godt alternativ.

- Om logistikk med kjøring og henting i barnehage og skole skal fungere vil det nok aldri bli et reelt alternativ med kollektivt i trondheim. Der er tilbudet milevis unna å være godt nok. Da må det gå hyppigere avganger i langt større hastighet. En utbygging som ikke er realistisk med mindre man ser mer enn 10-30 år frem i tid.
- Det er mange som trenger å bruke bil i løpet av arbeidsdagen, de sitter ikke på kontoret hele tiden og har f. eks utstyr å ta med ut på oppdrag som ikke går an å dra med på en sykkel, eller bruke timesvis på en buss i løpet av arbeidsdagen for å komme seg mellom bydelene eller til en annen kommune. Ofte virker det som at det bare er "vondt vilje" når folk ikke endrer reisevaner til og fra jobb, men jeg skulle gjerne syklet mer hvis jeg bare hadde sittet på kontoret hele dagen. Her på Sluppen er det ikke til og fra bussholdeplassen som er problemet, de fleste vil vel klare å gå fra nærmeste bussholdeplass til kontoret sitt her, men det er generelt et dårlig busstilbud mellom bydelene som gjør at hvis man f. eks bor på Nardo eller Moholt så må man innom sentrum for å komme til Sluppen. Da er det faktisk raskere å gå i 25 min hjemmefra.
- For meg å bytte bort bil må det bli betydelig mer kostbart å ha parkeringsplass på Sluppen. Generelt tar det for lang tid å nå til /fra arbeidsplassen med buss; ca 30-40 min hver vei. Sykkel tar 23 minutter + skifte. Mitt alternativ vil da være el-bil fremfor Mercedes S.
- Bussrutene fra Risvollan til Sluppen er såpass tungvindte at det ikke er et reellt alternativ
- Problemet er at det mangler et kollektivt knutepunkt på sluppen, og når da bil tar 12 min og buss 54 min, så blir dessverre valget enkelt.
- Må bytte buss. Dermed uaktuelt.
- Ang. spørsmålene med kostnad for å leie/låne elsparkesykkel eller lignende - det framgår ikke av spørsmålene om kostnaden er knyttet til hver gang disse leies eller om kostnadene er leie pr. mnd.

I tillegg spiller årstid inn på når jeg evt. vil benytte meg av et slikt tilbud (spesielt mtp sykkkel og sparkesykkel). Sparkesykkel og elsykkel i slush og/eller snøføyka blir ikke valgt av meg.

- Total reisetid er uten til den viktigste faktoren for valg av transportmiddel til og fra jobb.
- Velger ulike reisemåter til jobb. Var ikke mulig å få fram dette
- Direktebussen til Sluppen (linje 15) avslutter for tidlig på ettermiddag. Og går litt for sjelden.
- Det tar 45-50 minutt med buss inkl skifte og ventetid.

- Pga samkjøring med min kone sitter jeg på bil til jobb. Hun er avhengig av bil i jobben. Hadde det ikke vært for det hadde jeg tatt buss.
- Problemet er at jeg må bytte buss på Tiller for å komme meg helt hjem og det sjeldent korresponderer med metro. I tillegg er det litt langt å gå til bussholdeplassen fra jobb til brannstasjonen på tur hjem.
- Hadde strekningen fra bussholdeplassen til Sluppen vært lengre hadde jeg svart annerledes på noen av spørsmålene.
- Tanken på delingsmobilitet er god, og jeg kunne kanskje svart annerledes på den dersom;kollektivtilbudet hjemmefra var annerledes; Bussholdeplassene på sluppen er i ok gangavstand til jobb, derav ikke behov for delingsmobilitet til/fra jobb; Delingsmobilitet kunne vært et godt alternativ til korte reiser fra arbeidssted til møter/ærend i rimelig avstand fra jobb.
- Veldig bra tilrettelagt for sykling og dusj på SV19, men skulle hatt en strek på gulvet i garderoben, med skofri sone slik at man slipper å gå i grus når man kommer ut av dusjen. Ellers alt topp.
- Buss til/fra jobb tar ca 50min en vei, totalt 1t 40min hver dag t/r. Elsykkel tar 25min en vei, totalt 50min hver dag. Det tar 3min å gå til bussholdeplass både hjemmefra og til jobb, og det er direkte rute (Metro 1). Likevel sparer man altså 1t 10min hver dag på å elsykle i stedet for å ta bussen. Så da hjelper det ikke med mer mobilitet til/fra bussholdeplassen. Bra og forståelig undersøkelse, lykke til!
- det mangler bussholdeplass sammen med gangbru i nærheten av Sluppen i retning senter - TIller. Foreløpig er det ubehagelig å vente buss 10 som går Lerkendal - Nidarvol skole, istedet 1,2 kunne benyttes hvert 2 minutt.
- Lite aktuelt for meg som bor langt i fra Sluppen (60+ min reisetid). Om jeg skulle brukt kollektiv ville min reise tid økt med ca 30 min hver vei.
- Jeg har 3,6 km til jobb, synes ikke det å bytte transportmiddel til jobb har noe for seg da. Hadde jeg hatt 10 km eller mer, kunne buss pluss en elsparkesykkel vært fristende, for de dagene det er pent vær. Men trolig ikke, da jeg ville ønsket (men ikke giddet) å ha med egen hjelm, bor jeg ser som nødvendig.
- Bra tema! Jeg tror Sluppen er tjent med en skikkelig terminal. Nå er holdeplassene spredt og det er ingen oppdatert struktur tilpasset den nye tiden. Man må tenke nytt, ikke flikke på gammel/eksisterende infrastruktur.
- Viktig å få på plass overgang/undergang så vi har kort vei til buss i begge retninger. I tillegg viktig å tilrettelegge bedre for gående, f. eks. ved å lage gangvei langs hovedveien ned til NAV-bygget (som forlengelse av veien til bussstoll Sluppen1)
- Bruker turen til og fra jobb som trening. Stort sett sykkel om sommeren, løper om vinteren. Garderobe er viktigste tiltak for mine vaner. Kunne

droppet noen få turer med bil til fordel for buss hvis reiseveien var mer sømløs med f.eks. sparkesykkel, og bussene ikke var stappfulle fra Moholt om morgenen.

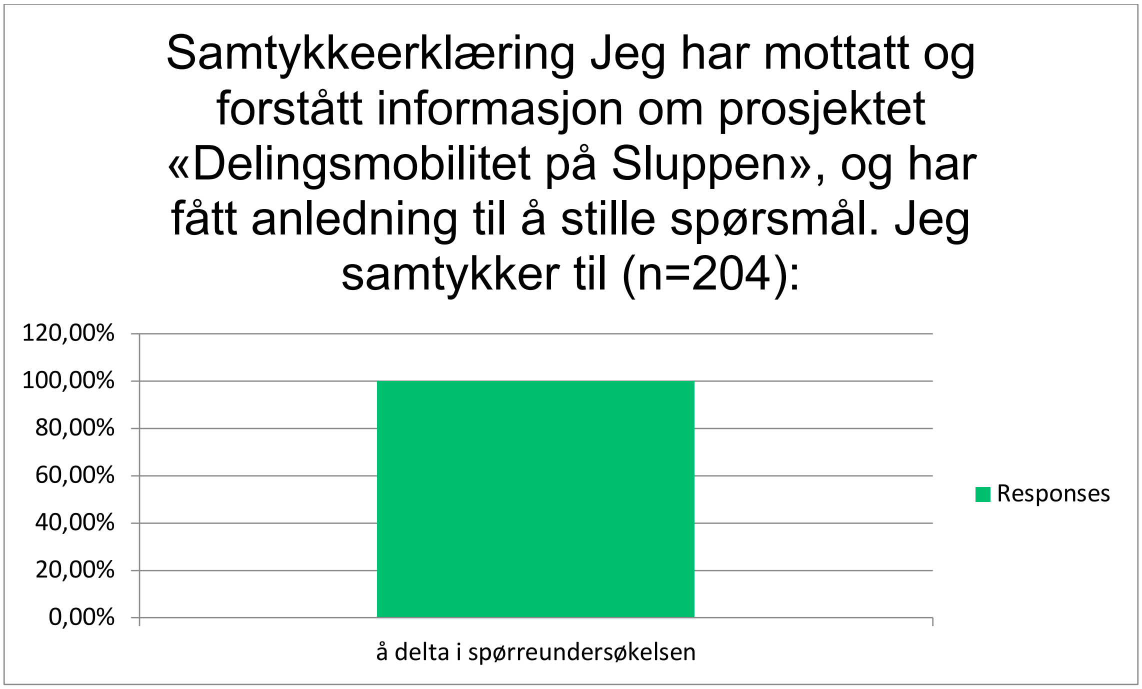
- De dagene jeg tar buss ville jeg satt pris på en el(sparke)sykke. Men jeg tar buss bare når det er mye snø eller jeg må ha med meg mye bagasje. Ellers bruker jeg egen sykkel dør til dør.
- Dersom elsykkel hadde vært mulig hele veien fra Trh. sentrum til Sluppen så hadde det vært akuelt.
- Etter at busstoppet Sluppen 1 åpnet så er det så kort vei å gå til kontoret at det gjør liten forskjell på turen _til_ jobb om man kan trille i stedet for å gå. Gåturen til et av de sørgående busstoppene (Kroppanbrua eller Sluppen) er et større hinder for å ta buss i så måte. Men uansett så er selve bussturen såpass langdryg at elsykkel hele veien blir å foretrekke, det tar ca. halve tiden fra dør til dør.
- Ettersom Trondheim er en ganske kompakt by, så er sykkel det viktigste for meg. For å gjøre det enklere å sykle trenger vi flere sammenhengende sykkelveier!
- Viktigste for meg at det skjer en reorganisering av bussruter i byen som kan gjøres mer effektiv å mobilisere i byen
- Hadde nok stilt meg mer positiv til delingsmobilitet etter bussturen dersom jeg hadde hatt direkterute med buss Jakobsli-Sluppen. Det er disse bussturene som tar tid, ikke de minuttene det tar hjemmefra til holdeplass og fra holdeplass til jobb.
- Hovedproblemene er 1) Det er få buss som kjører innom Sluppen. Alle med unntak av en buss, som kjører svært sjeldent, stopper på Nidarvoll Skole, som er noen minutter fra kontoret. Det hjelper ikke for de som pendler med buss at "Sluppen 4" er nå åpent på E6 når det er kun fra en retning. 2) Jeg har flere kolleger som bor på Angelltrøa, Jakobsli, Brunndalen, osv som tok buss i en stund, men forbindelser var så dårlig at de fleste har begynt å kjøre egen bil. Vi som bor på dette området ønsker at buss 14 kjørte 2 stopp til til Nidarvoll Skole i stedet for å stoppe ruten på Valøyvegen feks. Da må man vente for buss nr. 10, som er vanskelig å time. Selv går jeg i ca. 12 min. til Granåsvegen for å ta buss nr. 15 ned E6 til Nidarvoll Skole. Problemet er at bussen kjører kun hver 20. min., og den kjører kun i et veldig begrenset tidsrom. 3) Folk kjører helt vilt på Sluppen. Selv har jeg nesten blitt påkjørt mens jeg krysser veien. Jeg har sett bil kjører på gangfeltet for å komme forbi andre bil som står i bilkø. Flere har sagt at de har sett nesten-ulykker på Sluppen. 4) Hvorfor er det ikke et gangfelt som krysser parkeringsplassen til Multiconsult? Eller en bedre snarvei / et markert felt for å komme fra Nidarvoll Skole- retning til Stålgården, Lysgården, osv. 5) Generelt oppleves det som vanskelig å komme meg til/fra jobb. Det er ikke bra når jeg kunne kjøre til Sluppen i 7

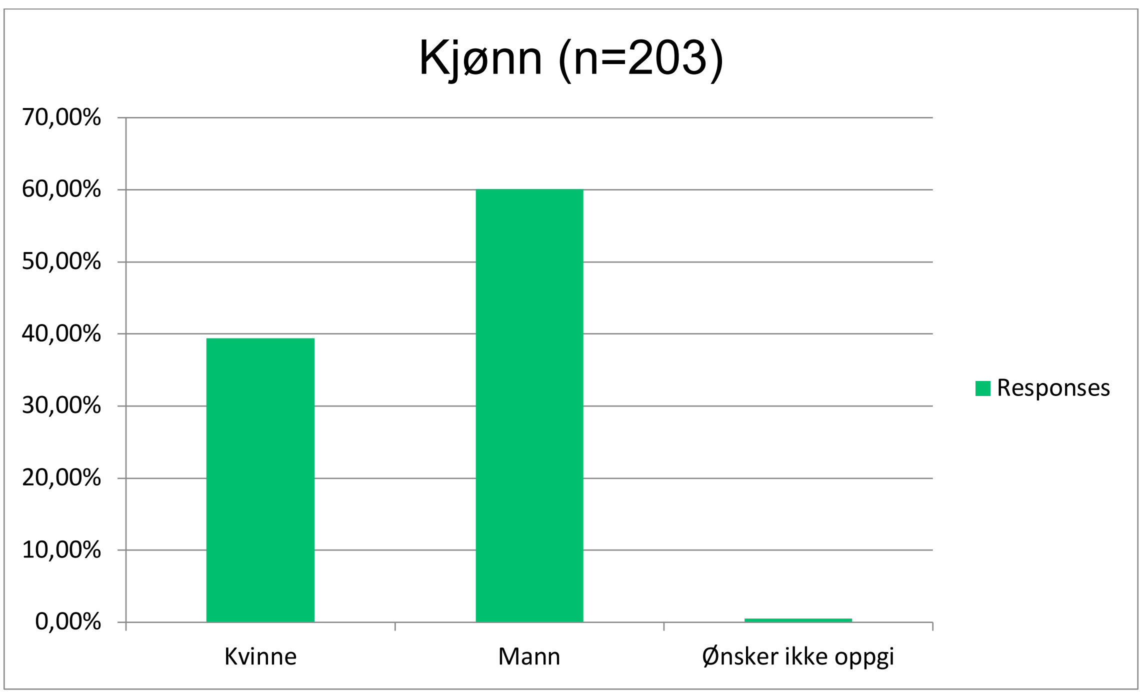
min., men det tar nærmere 40 min. å ta buss. Jeg sykler om sommeren / høsten, men stien er svært dårlig ned fra Dragvoll området og gjennom Nardo. Det finnes ikke en ordentlig sykkelvei på noen strekninger.

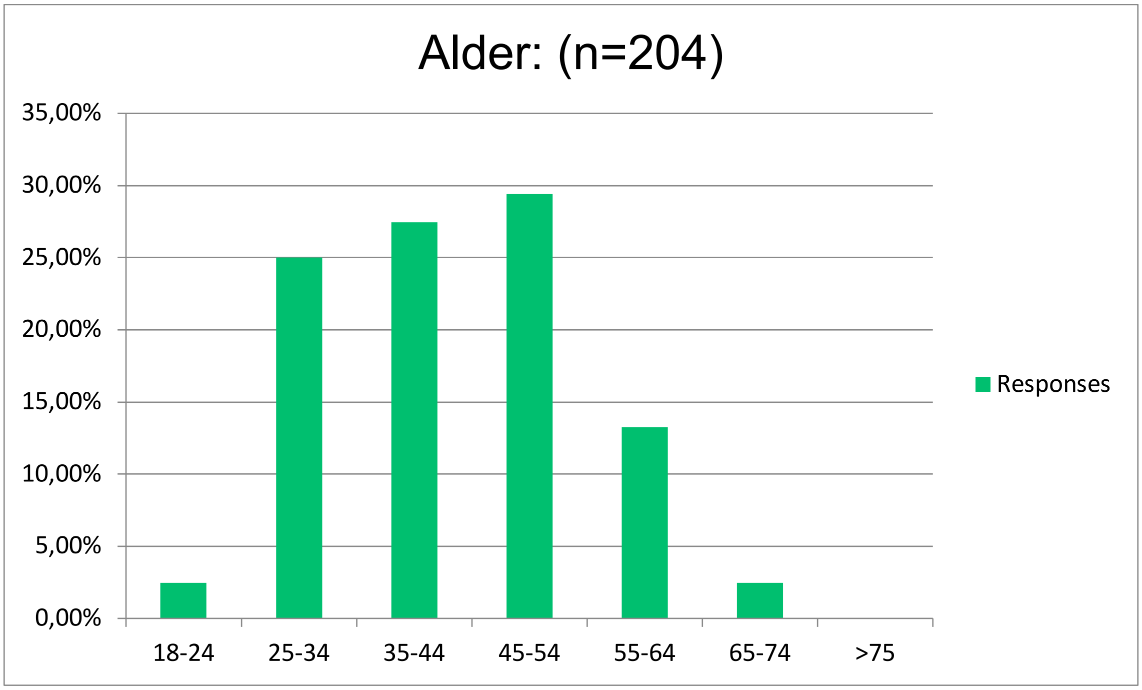
- Det tar i dag 6-8 minutter å gå fra bussholdeplassen til kontoret med holdeplas enten Kroppanbrua eller Brattsbergveien. Det er litt langt å gå, men ikke langt nok til at jeg tenker at jeg trenger et alternativ til å gå. Så undersøkelsen er litt søkt.
- Foretrekker egen sykkel til jobben pga fleksibilitet, kostnad og mosjon. Kjører bil de få gangene det er nødvendig. Hvis jeg skulle valgt buss til jobb er det viktigste at det opprettes direkterute, deretter pris og antall avganger
- Bra tilbud, men jeg har så dårlig tilbud på hjemsted at bil blir det beste valget. Å kjøre til buss stopp medfører problemer med P-plass der. Nærmeste park&ride er halvveis til jobben så da har deg liten effekt
- Det ble bare spurt om buss. Buss til sluppen fra Byåsen er ikke et alternativ. det tar 45 min, sammenlignet med (el)sykling blir det altformye tid i bussen.
- For meg som bor på Stjørdal hadde det vært praktisk med en buss som kjører omkjøringsveien og ikke via byen. Bruker ca 30 min lengre på å reise gjennom byen. Den ene bussen jeg kan ta fra Sirkus shopping koordinerer ikke med buss 310 som går fra Stjørdal
- Undersøkelsen ok. Delingsmobilitet ok. Kollektiv transport katastrofe. AtB burde slutte å hente folk der de ikke er og kjøre de dit de ikke skal.
- Bare som en opplysning: Jeg sykler som regel fra Ranheim til Grilstad med egen el-sykkel vinteren gjennom. Om sommeren bruker jeg helst motorsykkel.
- Isteden for el sparkesykler og el sykler ønskes det heller bysykler utplassert flere steder i Sluppenområdet.
- Jeg synes sparkesykler er et supert fremkomstmiddel, og ønsker dette velkommen i Trondheim på alle måter.
- Den største utfordringen er at buss til sluppen går trekt, og at jeg kontra å bruke 12 min totalt med bil, bruker 40 med gåing til/fra bussholdplass pluss buss
- For min del er det raskere å gå til jobb (45 min) enn å benytte kollektivt. Derfor lite aktuelt med kollektiv transport.
- Dårlig forbindelse mellom Byåsen og Sluppen. Savner direkteforbindelse.
- bruker bil buss og sykkel. Ikke mulig å svare samlet på dette spørsmålet
- Jeg ville vært veldig villig til å bruke sykkel fra holdeplassen til jobb dersom det var lagt til rette for sykkel, men slik det er i dag, foretrekker jeg å gå. Busstilbudet generelt syns jeg er bra, men på Sluppen er det for dårlig tilrettelagt. Det burde vært to Sluppen-holdeplaser (i begge retninger), men spesielt burde det være godt tilrettelagt for gang og sykkel.

- Det viktigste vil være å få ned reisetiden og få en direkterute på kollektivt med direktebuss fra Charlottenlundeområdet til Sluppen
- Hovedproblemet pr i dag er at det ikke er direkte bussrute fra Byåsen til Sluppen. Det tar for lang tid å komme seg til/fra jobb slik det er i dag.
- Buss tar ca. 45-50 minutter fra hjem til jobb, mens jeg til sammenlingning bruker kun 12-14 min i egen bil. Buss er mao. ikke et aktuelt alternativ.
- Veldig for delingsmobilitet, men ikke veldig aktuelt for meg som har såpass kort vei til jobb og det er hovedsaklig gjennom borettslag så er jeg på busstoppet som er nærmest kontoret. Busstoppet nærmest meg er i motsatt retning av kontoret.
- Hovedproblemet er at busstilbudet er for dårligt. Må bytte buss 2 ganger og bruke ca 1 time til jobb. Sykkel tar 15 min, gå tar ca 35 min.
- Elsparkesykkel oppleves generelt ikke som et reelt alternativ.
- Hovedårsak til at jeg ikke tar buss er at det ikke er direkteruter som går innom Sluppen, må bytte buss og turen til jobb med buss vil ta 30 min.....
- Ta buss tar for lang tid og koster for mye i forhold til å sykle. Derfor ikke aktuelt, har ingenting med elingsmobilitet å gjøre.
- Mye kommer an på avstand fra bussholdeplass til jobb/hjem. Fra hjemmet har jeg kort avstand til bussholdeplass og behøver ikke tenke på det. til jobb fra bussholdeplass er det 5-15 minutter gange avhengig av ruter som går pga dårlig busstilbud. Hadde det vært sømløs overgang kunne man stolt mer på dette, men et skjer ikke når bussene er forsinket - så da velger man heller å gå et lengre stykke for å slippe å vente i usikkerhet.
- For min del tar det like lang tid å ta bussen til jobb som det tar å løpe. Det er ikke fordi kollektivtilbudet er så elendig, men jeg må bytte rute en til to ganger avhengig om jeg må innom sentrum eller ikke. Det tar tid.
- Billigere kollektivtransport ville gjort at jeg hadde benyttet buss istedet for bil
- Grunnen til at jeg har svart som jeg gjorde er at jeg tar taxi til jobb pga sykdom. Tok buss før.
- Jeg bor såpass nær arbeidssted (ca 14 minutter å gå) at det ikke er noe poeng med buss. Når jeg kjører er det pga møter/ærend i løpet av dagen. Dersom disse er i midtbyen hender det at jeg tar buss frem og tilbake. Andre steder er det uansett såpass uforutsigbart med kollektivt at bil/MC vinner.
- Flott tiltak men når det ikke er direktebusser så blir dette uaktuelt for min del da det tar for lang tid

Appendix G – Results







Hva er postnummeret der du bor?

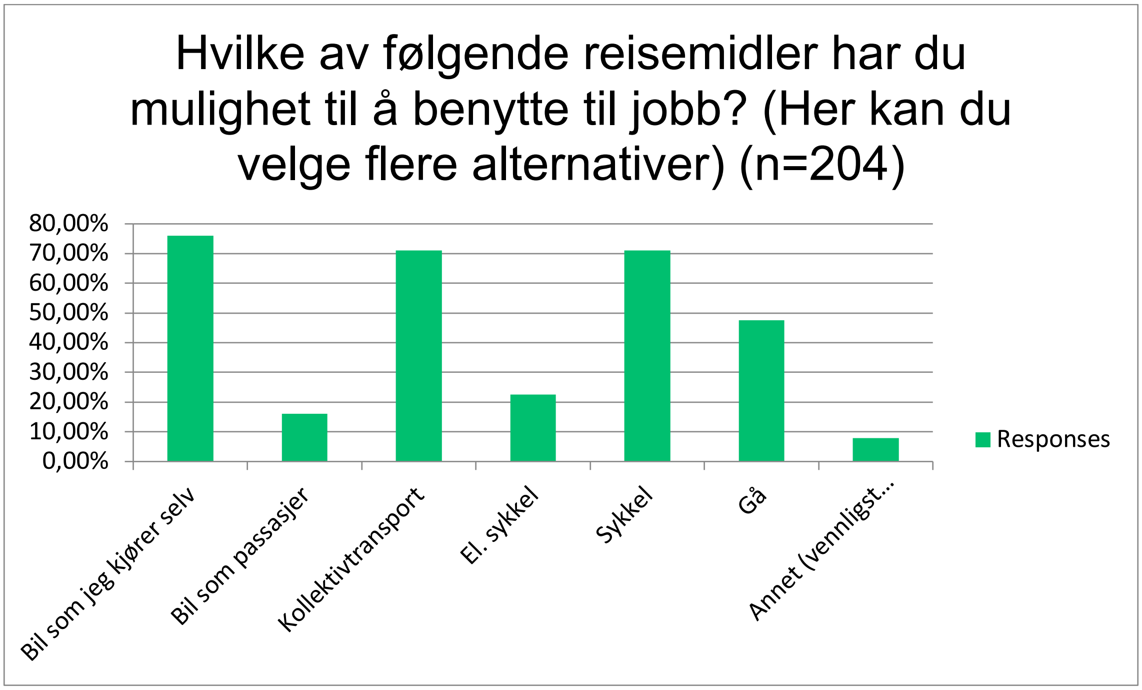
Respondents	Responses		Respondents	Responses
1	7020		103	7025
2	7224		104	7031
3	7071		105	7033
4	7040		106	7020
5	7017		107	7021
6	7040		108	7052
7	7024		109	7052
8	7046		110	7014
9	7091		111	7020
10	7091		112	7050
11	7320		113	7021
12	7024		114	7030
13	7059		115	7020
14	7067		116	7056
15	7022		117	7224
16	7042		118	7070
17	7082		119	7075
18	7032		120	7099
19	7032		121	7052
20	7031		122	7088
21	7052		123	7048

22	7091		124	7037
23	7081		125	7224
24	7089		126	7047
25	7042		127	7059
26	7031		128	7055
27	7027		129	7033
28	7041		130	7033
29	7022		131	7540
30	7036		132	7038
31	7224		133	7035
32	7048		134	7075
33	7088		135	7097
34	7066		136	7020
35	7049		137	7099
36	7014		138	7036
37	7021		139	7048
38	7018		140	7031
39	7089		141	7512
40	7018		142	7035
41	7021		143	7021
42	7026		144	7517
43	7043		145	7091
44	7020		146	7024
45	7049		147	7036
46	7024		148	7504
47	7021		149	7037
48	7074		150	7053
49	7075		151	7045
50	7050		152	7015
51	7056		153	7048
52	7036		154	7041
53	7026		155	7049
54	7043		156	7091
55	7040		157	7052
56	7040		158	7023
57	7020		159	7058
58	7030		160	7020
59	7050		161	7045
60	7092		162	7079
61	7052		163	7052
62	7048		164	7022

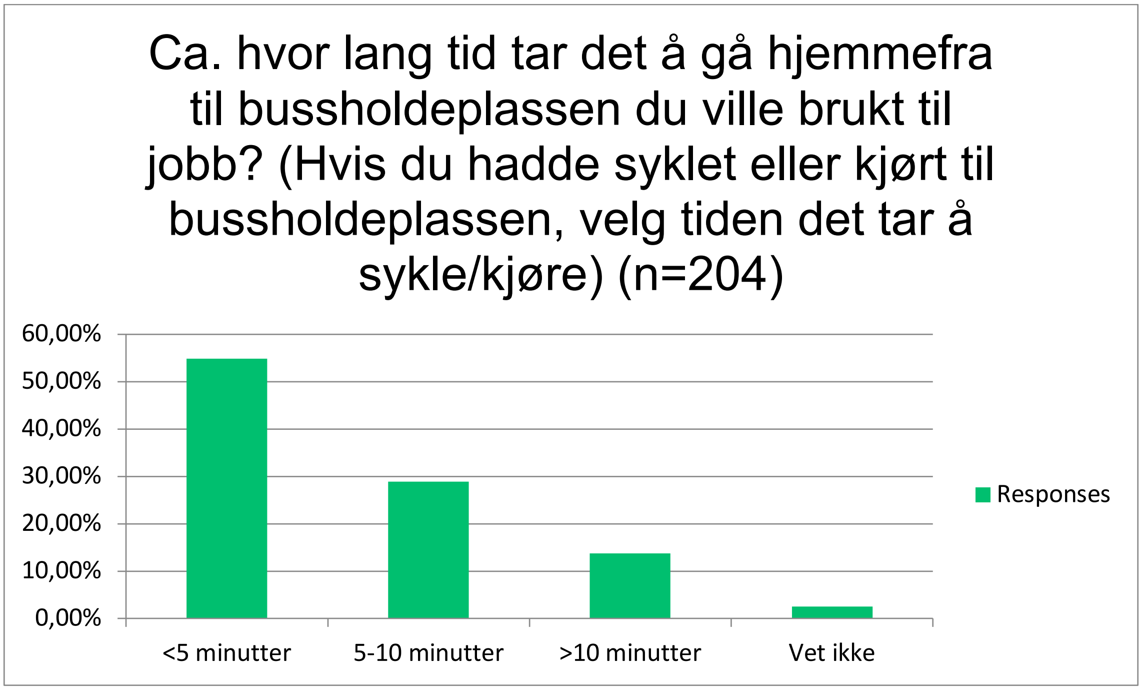
63	7054		165	7540
64	7012		166	7018
65	7015		167	6868
66	7049		168	7092
67	7030		169	7058
68	7088		170	7057
69	7036		171	7026
70	7224		172	7040
71	7021		173	7105
72	7047		174	7046
73	7046		175	7027
74	7091		176	7560
75	7350		177	7340
76	7098		178	7035
77	7091		179	7033
78	7021		180	7036
79	7020		181	7068
80	7026		182	7030
81	7023		183	7020
82	7074		184	7081
83	7033		185	7033
84	7021		186	7058
85	7350		187	7037
86	7056		188	7029
87	7046		189	7030
88	7021		190	7021
89	7580		191	7052
90	7071		192	7054
91	7030		193	7036
92	7030		194	7027
93	7052		195	7046
94	7089		196	7032
95	7021		197	7025
96	7024		198	7051
97	7026		199	7091
98	7042		200	7562
99	7026		201	7042
100	7018		202	7035
101	7026		203	7027
102	7045		204	7079

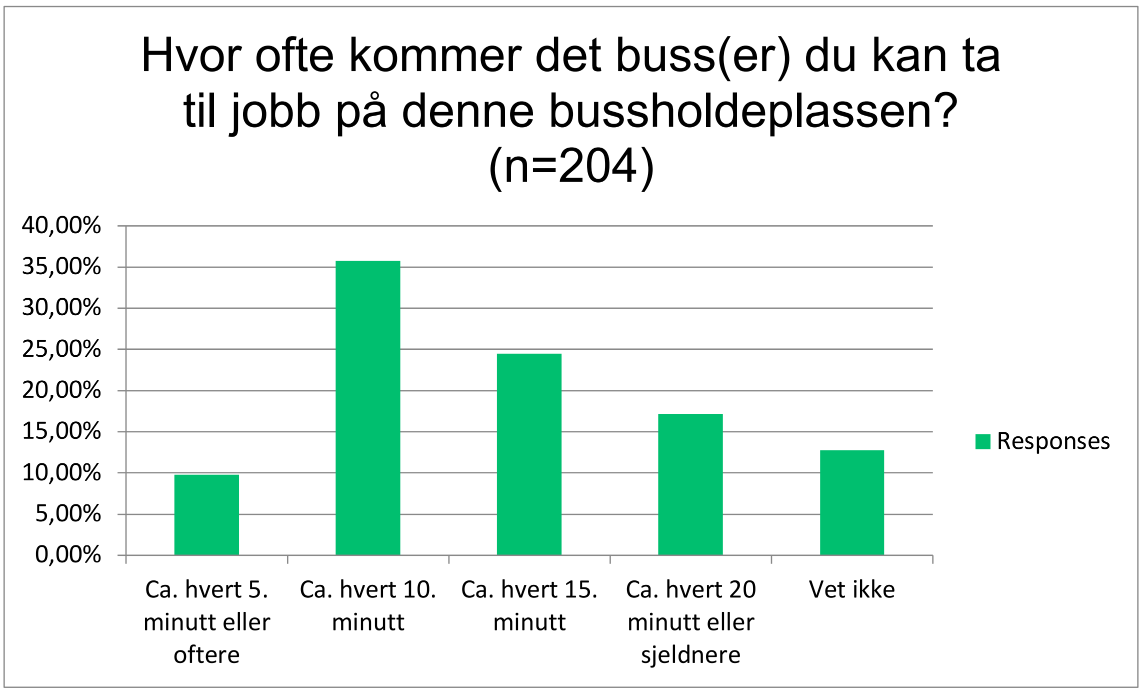
Hva heter gaten der du bor? (Valgfritt)			
Respondents	Responses	Respondents	Responses
1	Varmbuvegen	71	Karolinerveien
2	Fagerheim Alle	72	Øvre Bergsvingen
3	Steinberget	73	Gamle Oslovei
4	Granliveien	74	maristuveien
5	Torvmyra	75	olastubakken
6	Tonstadgrenda	76	Okstadbrinken
7	Aunemoveien	77	Flatåsenget
8	Ivar Mortensons veg	78	Jonsvannsveien
9	Heggvegen	79	Sørbruvegen
10	Ulstadløkkveien	80	Bratsbergvegen
11	Sunnlandsvegen	81	aunegrenda
12	Holtermannsveg	82	Gammelbakken
13	Moltmyra	83	Per Kvists veg
14	Skjetnemarkvegen	84	Ranheimsvegen
15	Nordlundvegen	85	Othilienborgvegen
16	Dyre Halses gate	86	Einar Øfstis veg
17	Klæbuvegen	87	Litjmyrveien 7
18	Waldemar Aunes vei	88	Tors Veg
19	Marsvegen	89	Husebyvegen
20	Teglverkstunet	90	Gamle Åsveg
21	Tiurvegen	91	Anton Bergsvei
22	Ladeveien 12	92	Njords veg
23	Ole Nordgaards veg	93	Eli Sjursdotters vei
24	Nedre Bakklandet	94	Tonstadgrenda
25	Mellomila	95	Sortasvegen
26	Karolinerveien	96	Kystadvegen
27	Mellomila	97	Flygata
28	Harevegen	98	Anders Tvereggens veg
29	Kolsåslia	99	Marie Wexelsens veg
30	Stadsing Dahls gate	100	Grillstad Marina
31	Bjørkhaugvegen	101	Stadsing. Dahlsgt
32	Jens Tvedts veg 6c	102	Sildråpeveien
33	Kroppanvegen	103	Julianus Holms veg
34	Lillian byes veg	104	Brauta
35	Laura Hangerås' veg	105	asbjørnsens
36	Ludvig Daaes gt	106	Erlendsveg
37	Odenseveien	107	Oscar Wistings vei
38	Maristuveien	108	Hanna Winsnes vei

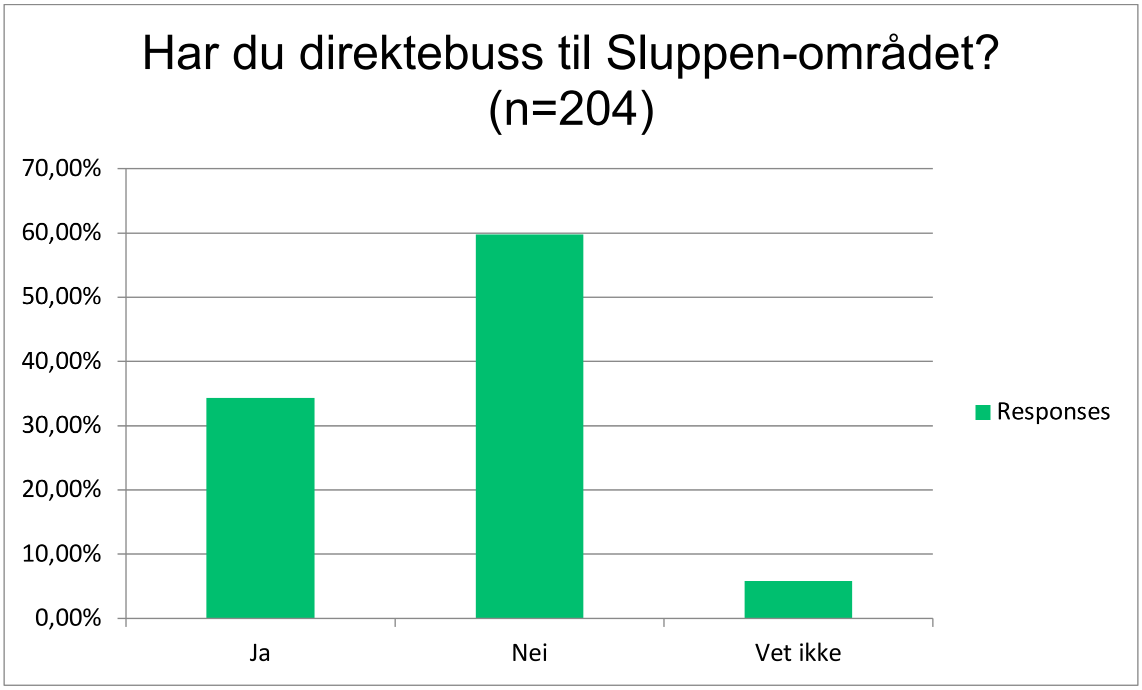
39	Blåklokkeveien	109	Øvre Flatåsveg
40	Svartholtet	110	Paul Fjermstads veg
41	Kong Inges gate	111	Treskovegen
42	Angelltrøveien	112	Bynesvegen
43	Markaplassen	113	Øyane 14
44	Kongens gate	114	Eyvind Løkkens vei
45	ibsen	115	Roosevelts veg 10A
46	Åsvangvegen	116	Fortunalia
47	Parkveien	117	Nedre Stavsetvegen
48	Utleirtunet	118	Ingemann Torps vei
49	Bergvegen	119	Ytre Haltvei
50	Rognersvingen	120	Tingvegen
51	anne hogstadvei 6	121	Kvitsteinveien
52	Hammerstranda	122	Naustmarka
53	Havsteinekra	123	Skogaromvegen
54	Nordre Hallsetveg	124	Tors Veg
55	Spongdalsvegen	125	Abels gate
56	Edgar B Schieldrops veg	126	Odenseveien
57	Hsvsteinflata	127	Sjetnhaugan
58	Gjerdesgarden	128	Granvegen
59	Anders Søyseths vei	129	Romolslia
60	Magnus den Godes gate	130	Eidsvolls gate
61	Tidemandsgate	131	Asbjørnsensgate
62	Johan Arnt Høiseths veg	132	heimtrøa
63	Byåsenveien	133	Saturnvegen
64	Lysverkvegn	134	Øysten Langsets veg
65	Dyre Halses gate	135	Nardovegen
66	Overlege Bratts veg 64	136	Buckhaugen
67	Pinebergsvingen	137	Hårstadhaugen
68	Vinkelstien	138	saxe viks vei
69	Klæbuveien	139	Njords veg
70	Gamle Oslovei	140	Dokkgata

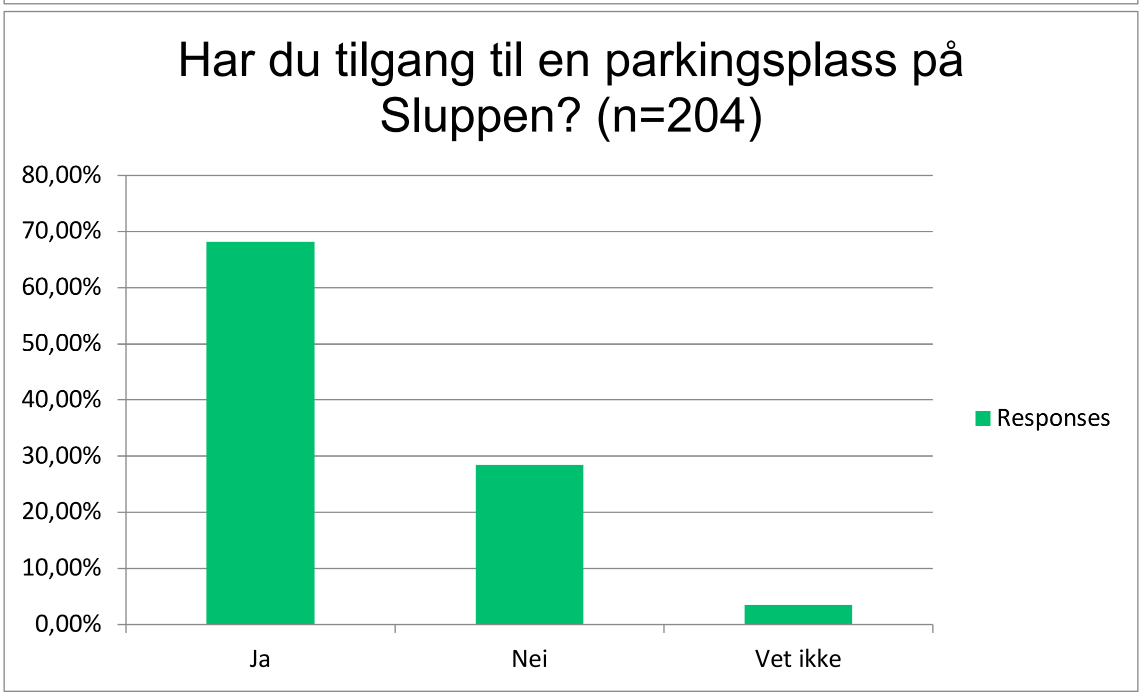

Hvilke av følgende reisemidler har du mulighet til å benytte til jobb? (Her kan du velge flere alternativer) (n=204)
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
Bil som jeg kjører selv
Bil som passasjer
Kollektivtransport
El. sykkel
Sykkel
Gå
Annet (vennligst…
Responses

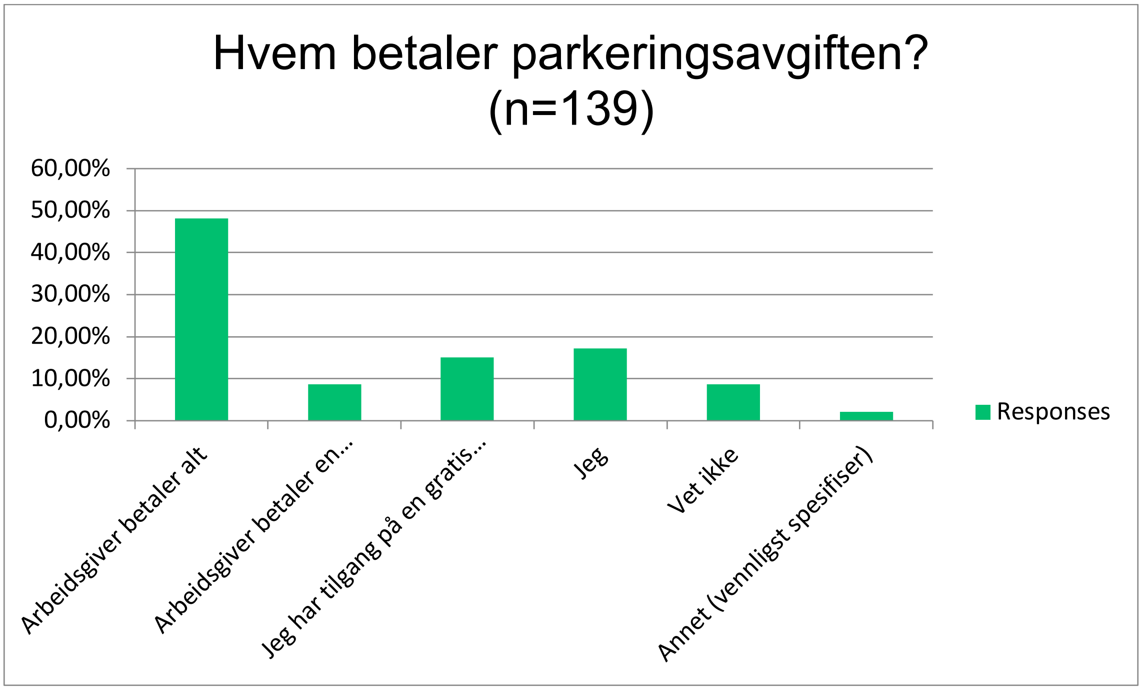

Hvilke av følgende reisemidler har du mulighet til å benytte til jobb? (Her kan du velge flere alternativer) (n=204)
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
Bil som jeg kjører selv
Bil som passasjer
Kollektivtransport
El. sykkel
Sykkel
Gå
Annet (vennligst…
Responses


Ca. hvor lang tid tar det å gå hjemmefra til bussholdeplassen du ville brukt til jobb? (Hvis du hadde syklet eller kjørt til bussholdeplassen, velg tiden det tar å sykle/kjøre) (n=204)
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
<5 minutter
5-10 minutter
>10 minutter
Vet ikke
Responses


Hvor ofte kommer det buss(er) du kan ta til jobb på denne bussholdeplassen? (n=204)
40,00%
35,00%
30,00%
25,00%
20,00%
15,00%
10,00%
5,00%
0,00%
Ca. hvert 5. minutt eller oftere
Ca. hvert 10. minutt
Ca. hvert 15. minutt
Ca. hvert 20 minutt eller sjeldnere
Vet ikke
Responses


Har du direktebuss til Sluppen-området? (n=204)
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
Ja
Nei
Vet ikke
Responses

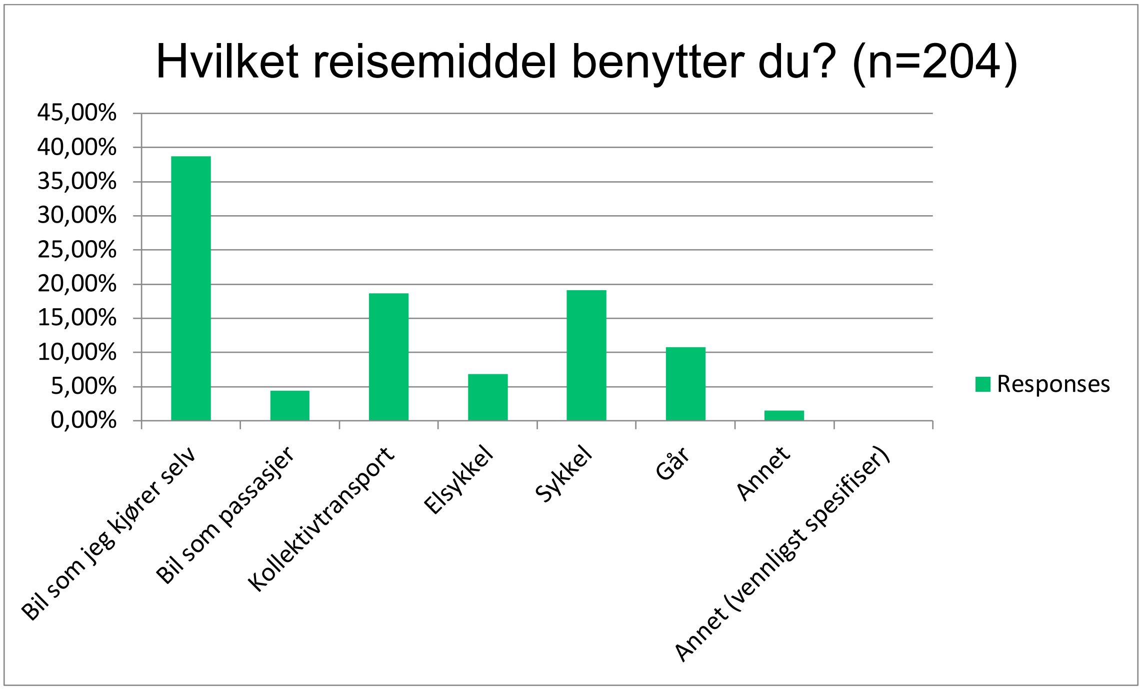

Har du tilgang til en parkingsplass på Sluppen? (n=204)
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
Ja
Nei
Vet ikke
Responses

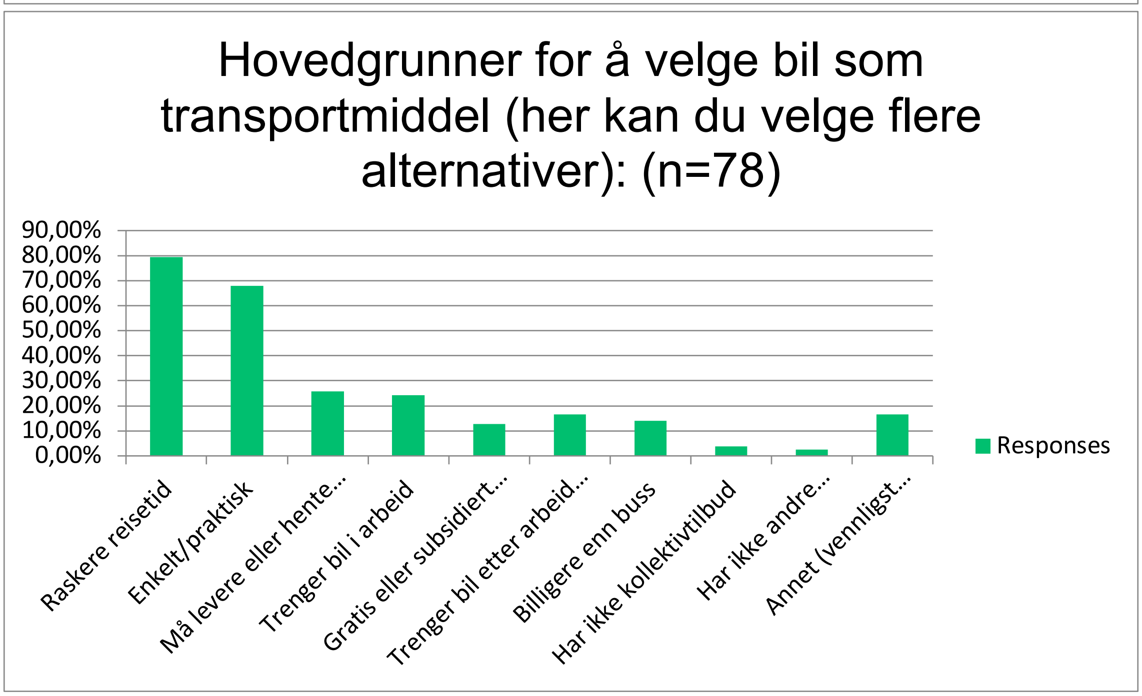


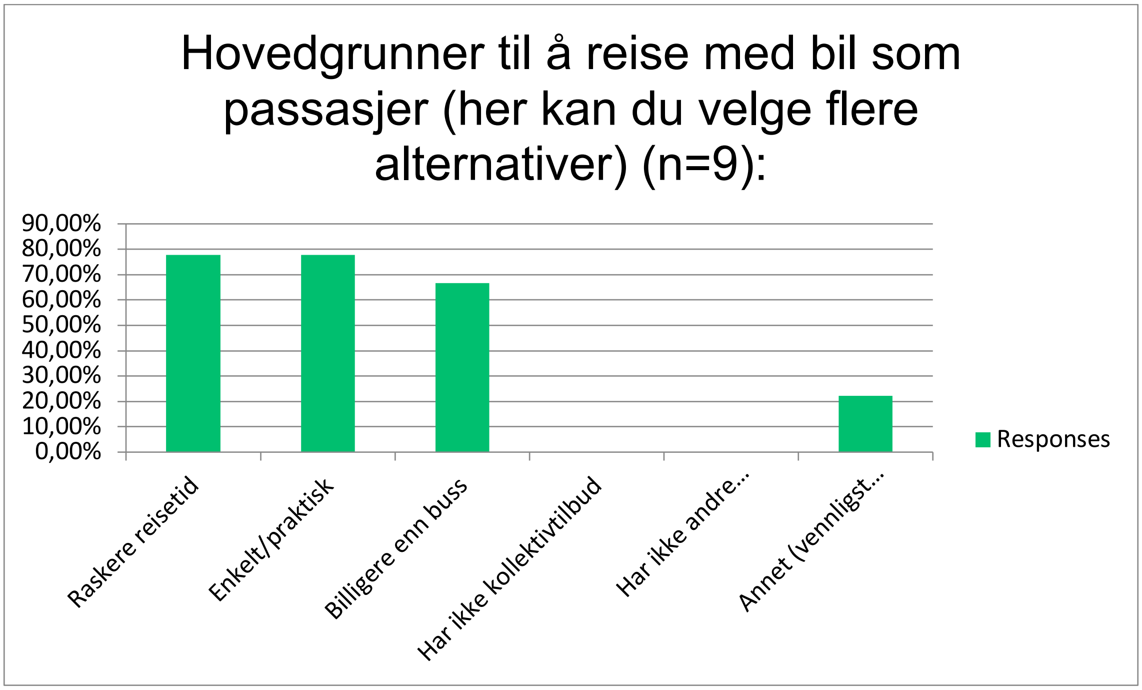
Ca. hvor mange minutter bruker du hjemmefra til jobb?				
Respondent	Responses		Respondent	Responses
1	4		102	20
2	4		103	20
3	5		104	20
4	5		105	20
5	5		106	20
6	7		107	20
7	7		108	20
8	7		109	20
9	7		110	20
10	8		111	20
11	8		112	20
12	8		113	20
13	8		114	20
14	8		115	20
15	9		116	20
16	9		117	20
17	10		118	20
18	10		119	20
19	10		120	20
20	10		121	20
21	10		122	23
22	10		123	25
23	10		124	25

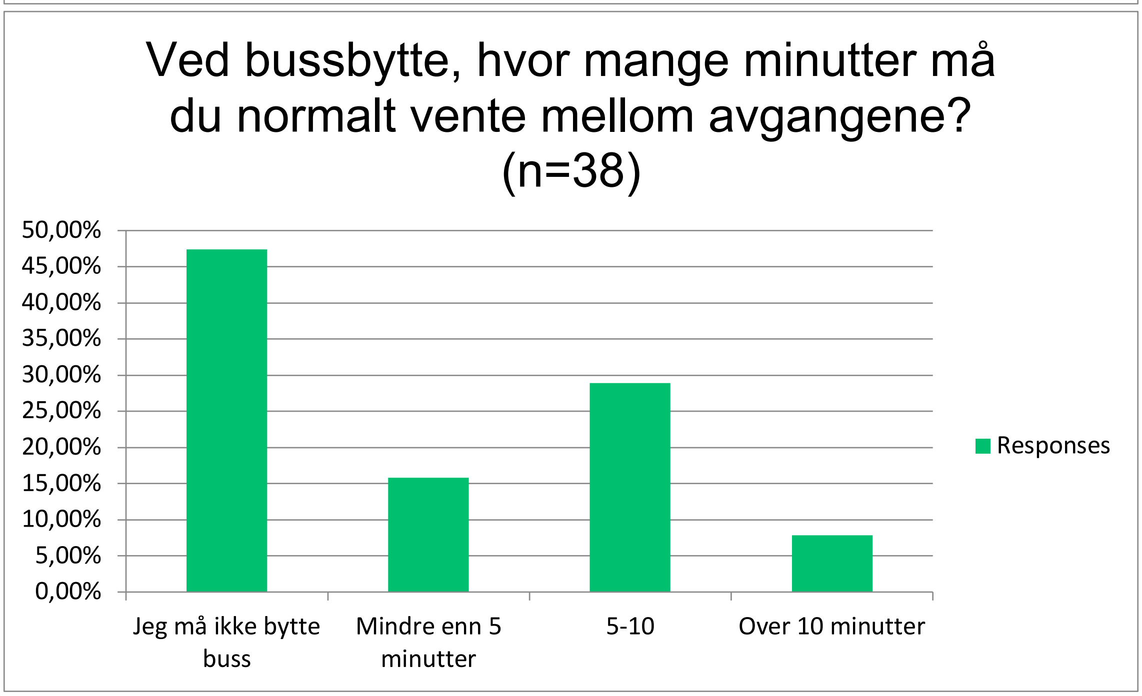
24	10		125	25
25	10		126	25
26	10		127	25
27	10		128	25
28	10		129	25
29	10		130	25
30	10		131	25
31	10		132	25
32	10		133	25
33	10		134	25
34	10		135	25
35	10		136	25
36	10		137	25
37	10		138	25
38	10		139	25
39	10		140	25
40	10		141	28
41	10		142	30
42	10		143	30
43	10		144	30
44	11		145	30
45	12		146	30
46	12		147	30
47	12		148	30
48	12		149	30
49	12		150	30
50	12		151	30
51	12		152	30
52	12		153	30
53	12		154	30
54	12		155	30
55	12		156	32
56	12		157	33
57	13		158	35
58	15		159	35
59	15		160	38
60	15		161	40
61	15		162	40
62	15		163	40
63	15		164	40
64	15		165	40

65	15		166	40
66	15		167	40
67	15		168	40
68	15		169	45
69	15		170	45
70	15		171	45
71	15		172	45
72	15		173	45
73	15		174	45
74	15		175	45
75	15		176	45
76	15		177	45
77	15		178	45
78	15		179	50
79	15		180	60
80	15		181	65
81	15		182	10-15
82	15		183	7-10
83	15		184	13min
84	15		185	15-20
85	15		186	20 - 25 min
86	15		187	20 min
87	15		188	20 minutter
88	15		189	20-25
89	15		190	20-25
90	15		191	20-25 min
91	15		192	20-35 minutter
92	15		193	25 min
93	15		194	30 min
94	15		195	30-40
95	15		196	40 minutter
96	18		197	45min
97	20		198	7-8 min
98	20		199	Ca 10 min
99	20		200	Gå = 45, bil=15
100	30 minutter ved levering i barnehage på vei til jobb. 10 minutter med bil uten levering i barnehage.			
101	1 time dersom jeg tar buss			


Hvilket reisemiddel benytter du? (n=204)
45,00%
40,00%
35,00%
30,00%
25,00%
20,00%
15,00%
10,00%
5,00%
0,00%
Bil som jeg kjører selv
Bil som passasjer
Kollektivtransport
Elsykkel
Sykkel
Går
Annet
Annet (vennligst spesifiser)
Responses


Hovedgrunner for å velge bil som transportmiddel (her kan du velge flere alternativer): (n=78)
90,00%
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
Raskere reisetid
Enkelt/praktisk
Må levere eller hente...
Trenger bil i arbeid
Gratis eller subsidiert...
Trenger bil etter arbeid...
Billigere enn buss
Har ikke kollektivtilbud
Har ikke andre...
Annet (vennligst...
Responses

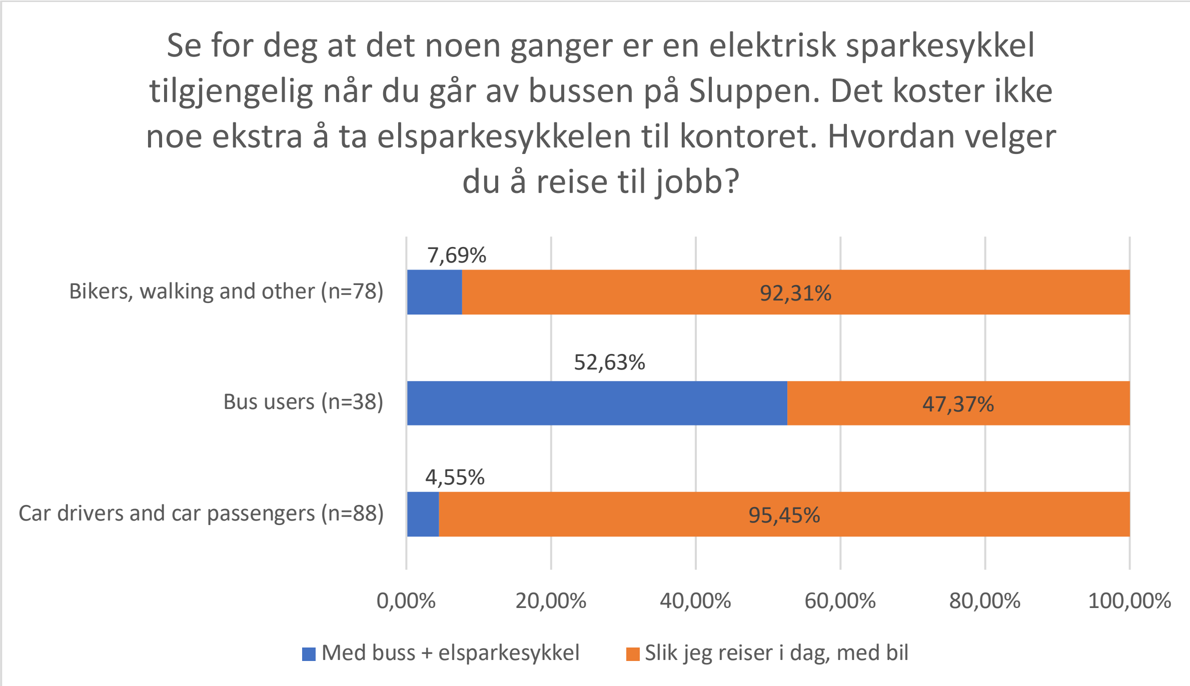




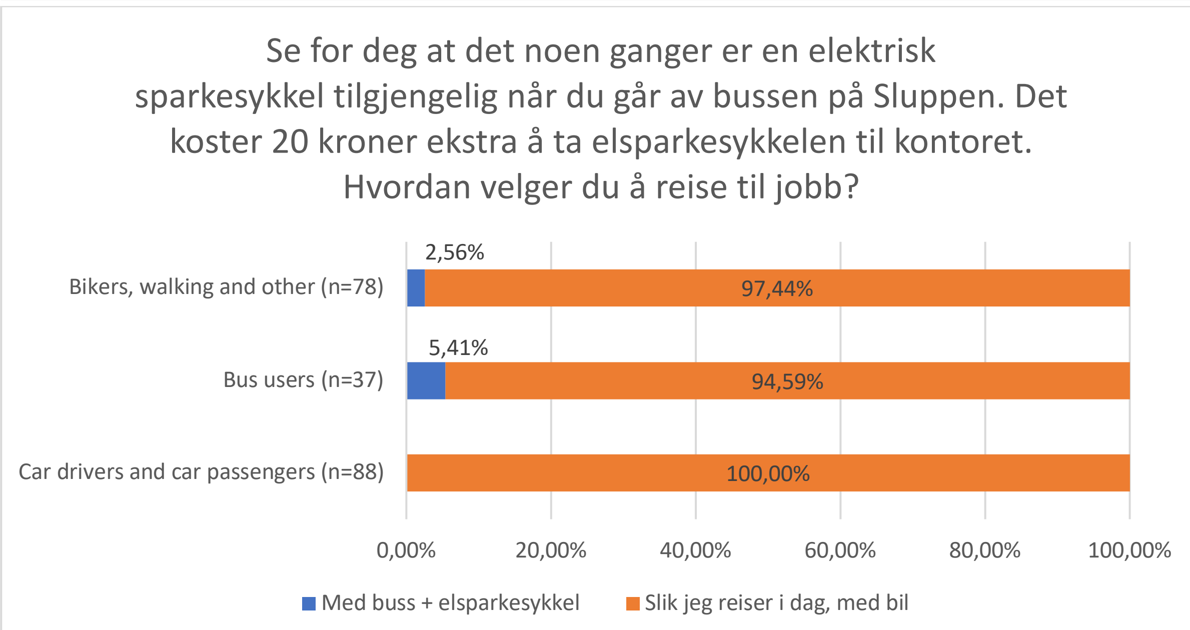
Ca. hvor mange minutter bruker du fra bussholdeplassen til arbeidsplassen (etter at du har gått av bussen)?	
Respondents	Responses
1	2
2	4
3	5
4	5
5	5

6	5
7	5
8	5
9	5
10	5
11	5
12	5
13	6
14	7
15	7
16	7
17	8
18	8
19	10
20	10
21	10
22	10
23	12
24	15
25	25
26	3-6
27	5-7
28	5-7
29	5-10
30	10 minutt
31	10 minutter
32	6 min
33	ca 10 min
34	ca. 10
35	Ca. 10 min

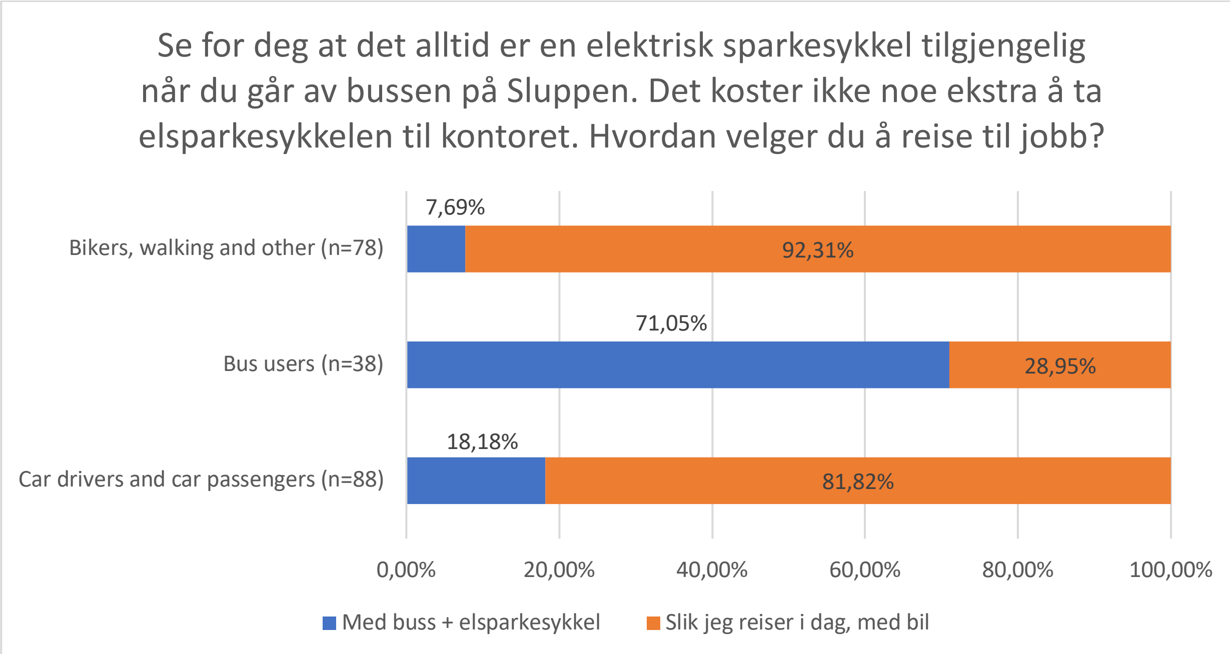
E-scooters

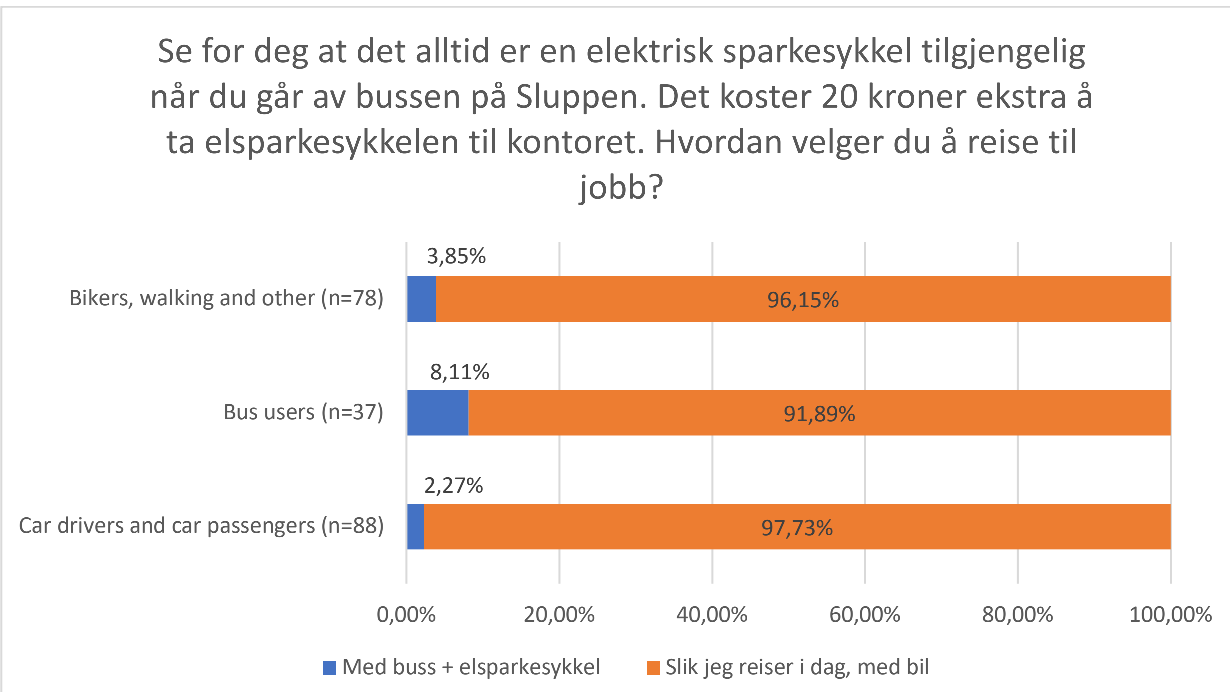


Se for deg at det noen ganger er en elektrisk sparkesykkel tilgjengelig når du går av bussen på Sluppen. Det koster ikke noe ekstra å ta elsparkesykkelen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
7,69%
92,31%
Bus users (n=38)
52,63%
47,37%
Car drivers and car passengers (n=88)
4,55%
95,45%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil

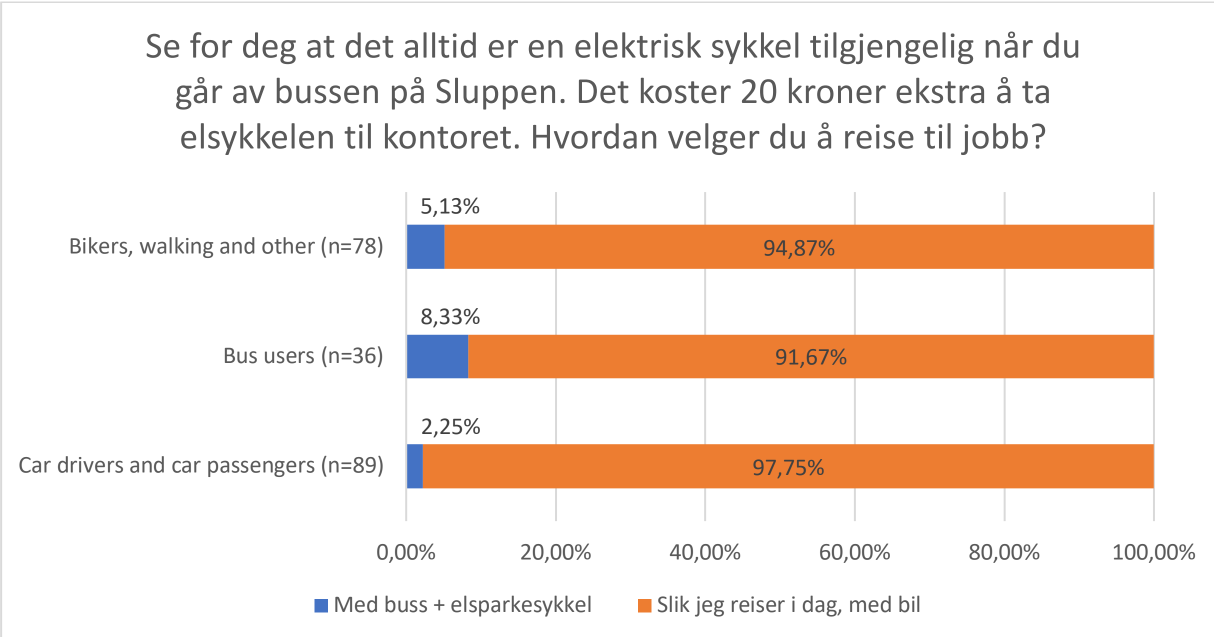


Se for deg at det noen ganger er en elektrisk sparkesykkel tilgjengelig når du går av bussen på Sluppen. Det koster 20 kroner ekstra å ta elsparkesykkelen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
2,56%
97,44%
Bus users (n=37)
5,41%
94,59%
Car drivers and car passengers (n=88)
100,00%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil

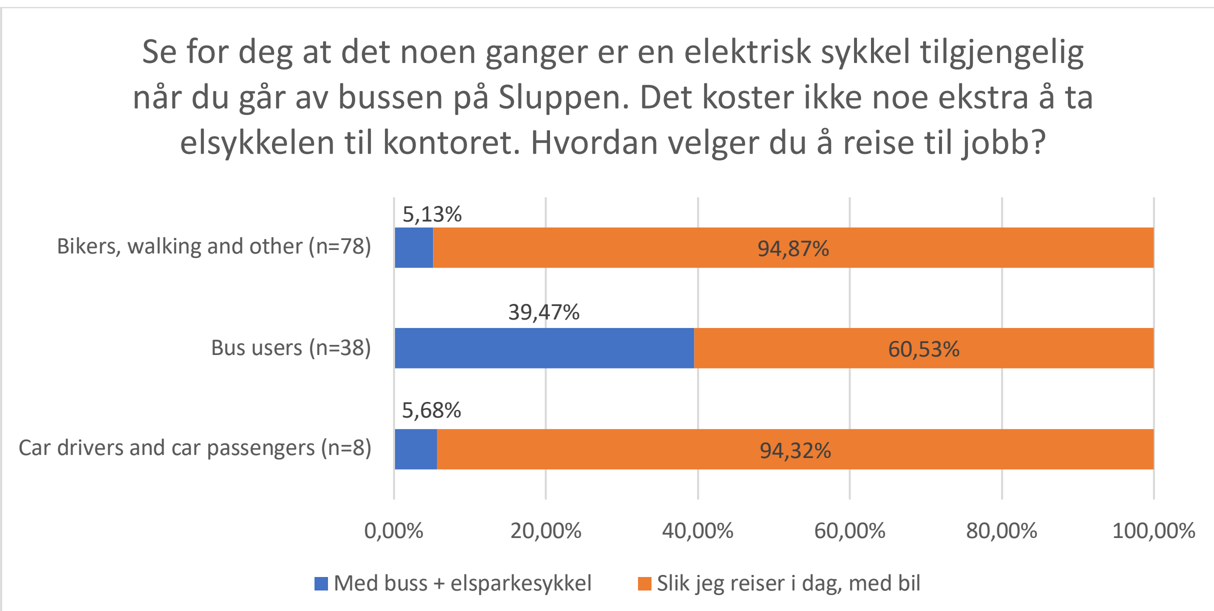

Se for deg at det alltid er en elektrisk sparkesykkel tilgjengelig når du går av bussen på Sluppen. Det koster ikke noe ekstra å ta elsparkesykkelen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
Bus users (n=38)
Car drivers and car passengers (n=88)
7,69%
92,31%
71,05%
28,95%
18,18%
81,82%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil


Se for deg at det alltid er en elektrisk sparkesykkel tilgjengelig når du går av bussen på Sluppen. Det koster 20 kroner ekstra å ta elsparkesykkelen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
Bus users (n=37)
Car drivers and car passengers (n=88)
3,85%
96,15%
8,11%
91,89%
2,27%
97,73%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil

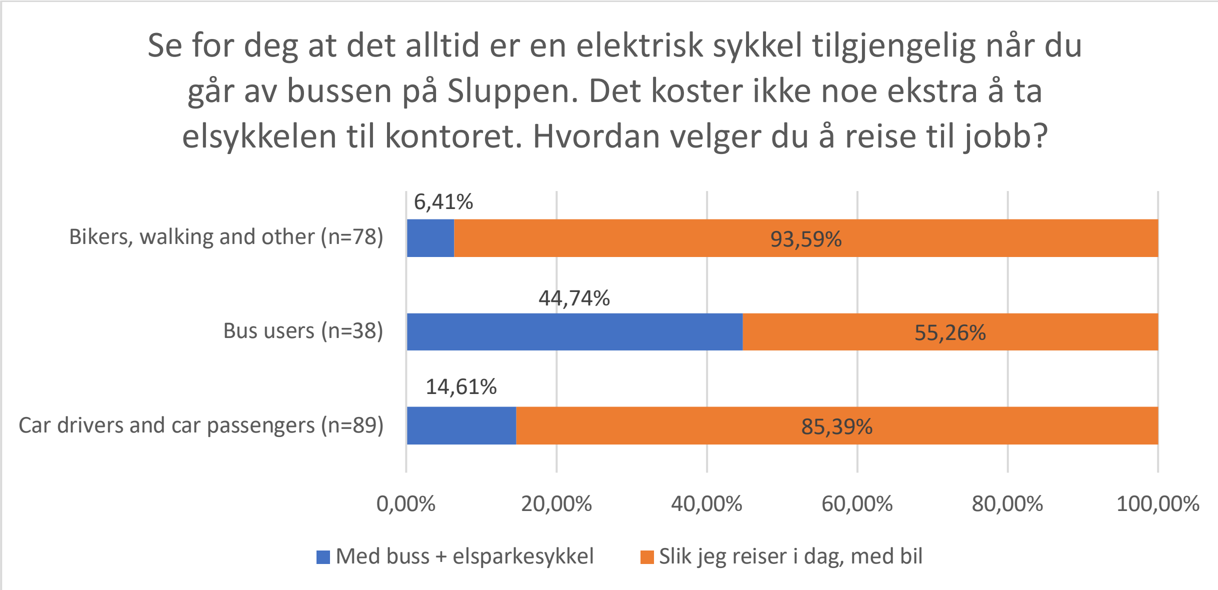
E-bikes

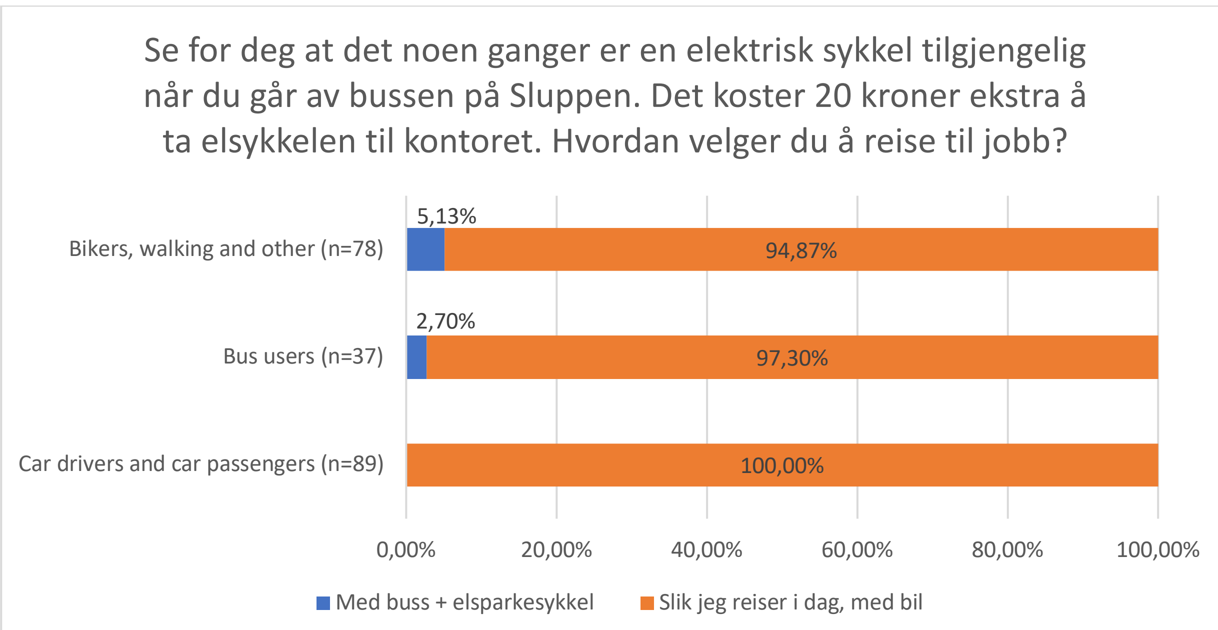


Se for deg at det alltid er en elektrisk sykkel tilgjengelig når du går av bussen på Sluppen. Det koster 20 kroner ekstra å ta elsykkelen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
5,13%
94,87%
Bus users (n=36)
8,33%
91,67%
Car drivers and car passengers (n=89)
2,25%
97,75%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil

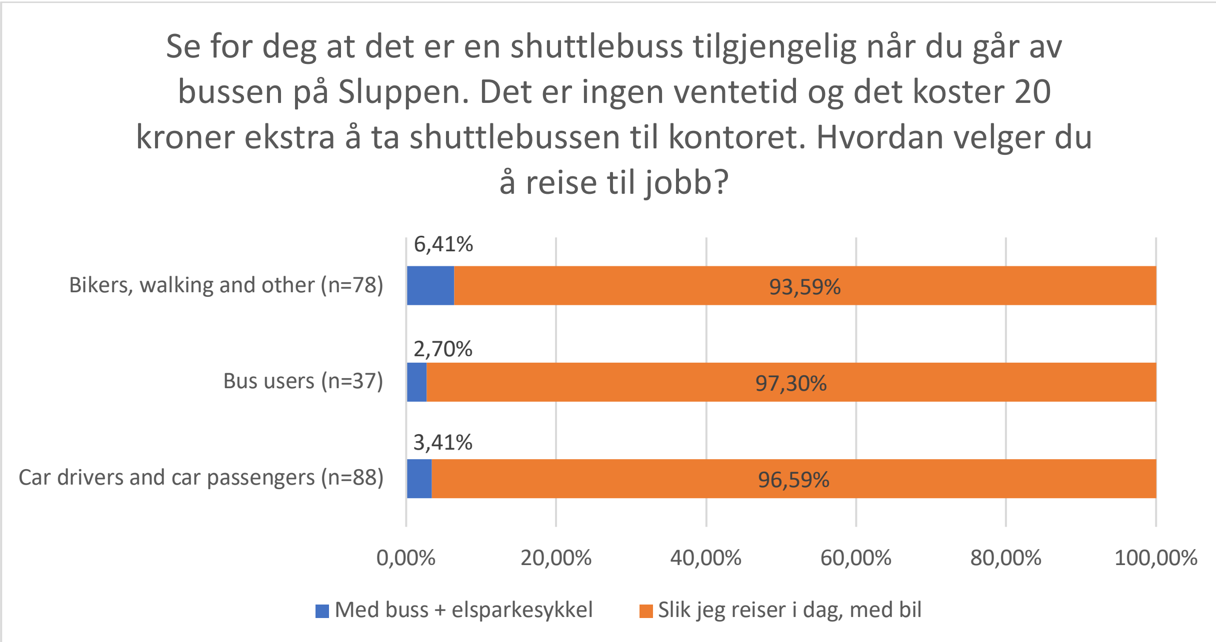


Se for deg at det noen ganger er en elektrisk sykkel tilgjengelig når du går av bussen på Sluppen. Det koster ikke noe ekstra å ta elsykkelen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
5,13%
94,87%
Bus users (n=38)
39,47%
60,53%
Car drivers and car passengers (n=8)
5,68%
94,32%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil

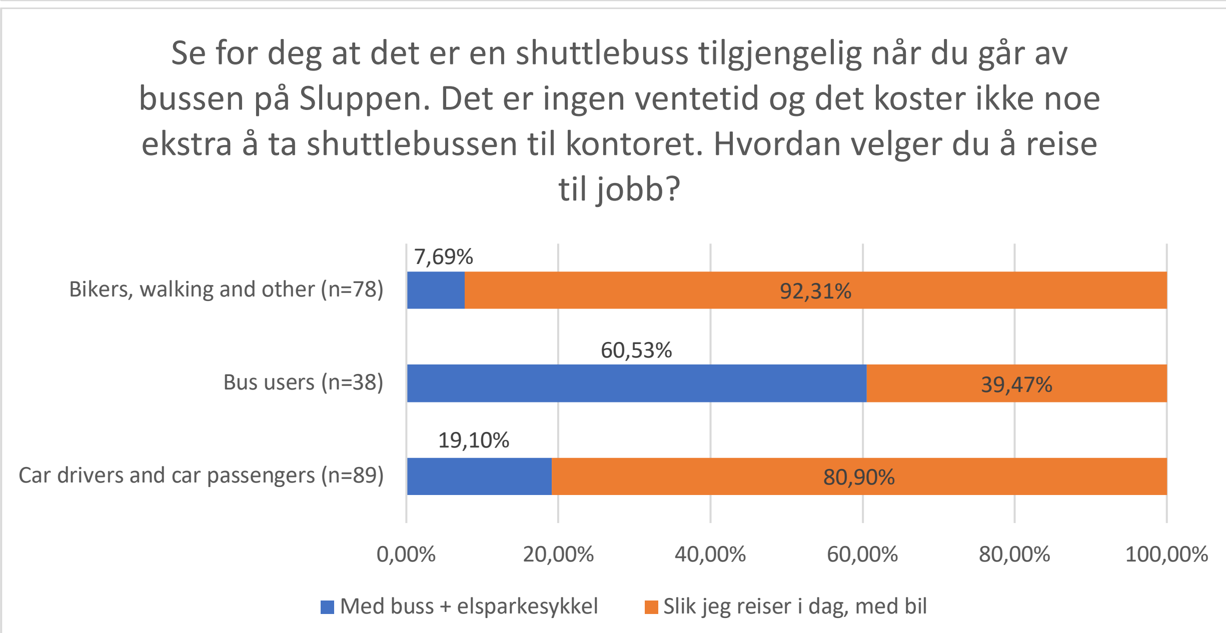

Se for deg at det alltid er en elektrisk sykkel tilgjengelig når du går av bussen på Sluppen. Det koster ikke noe ekstra å ta elsykkelen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
Bus users (n=38)
Car drivers and car passengers (n=89)
6,41%
93,59%
44,74%
55,26%
14,61%
85,39%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil


Se for deg at det noen ganger er en elektrisk sykkel tilgjengelig når du går av bussen på Sluppen. Det koster 20 kroner ekstra å ta elsykkelen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
Bus users (n=37)
Car drivers and car passengers (n=89)
5,13%
94,87%
2,70%
97,30%
100,00%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil

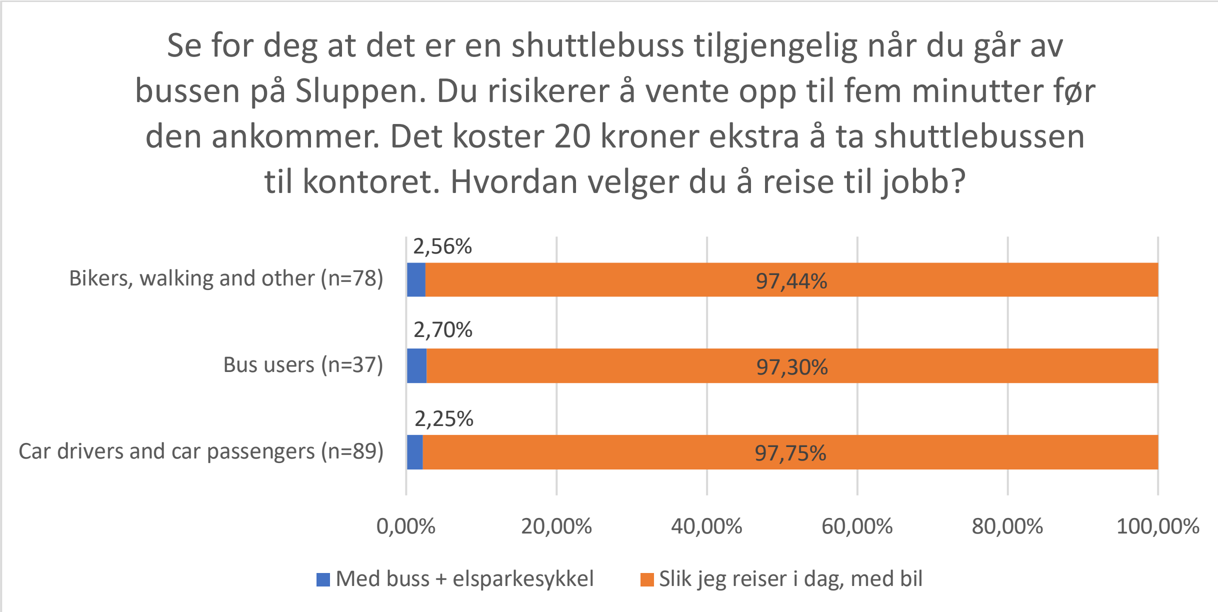
Shuttles

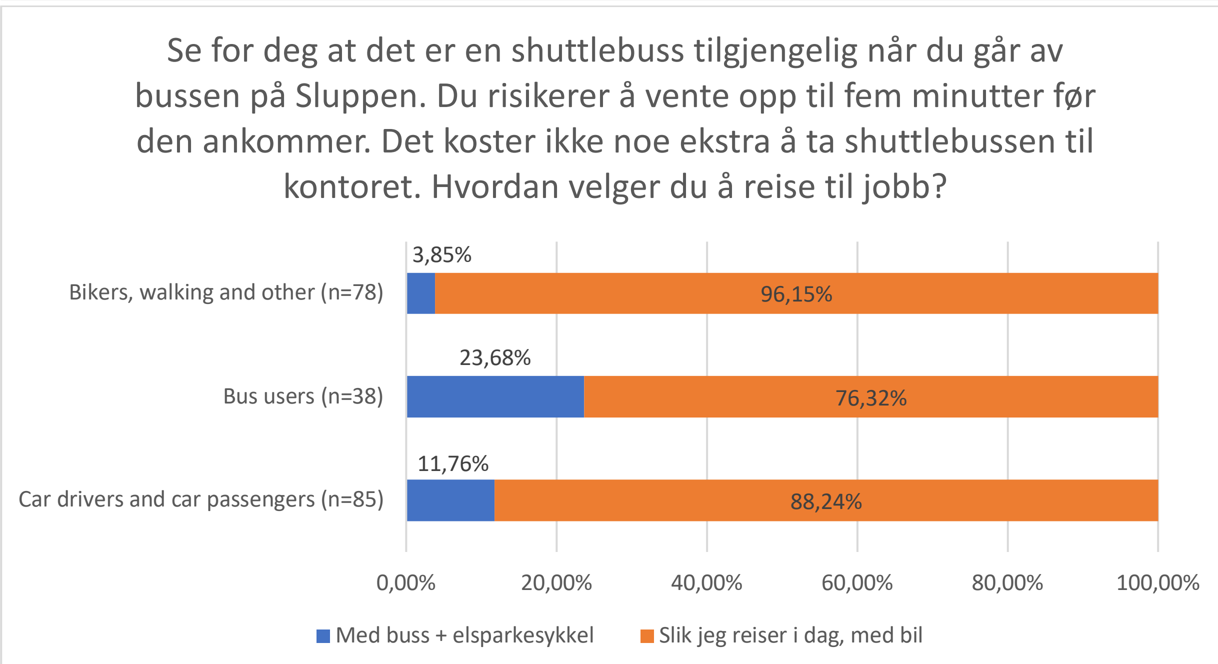


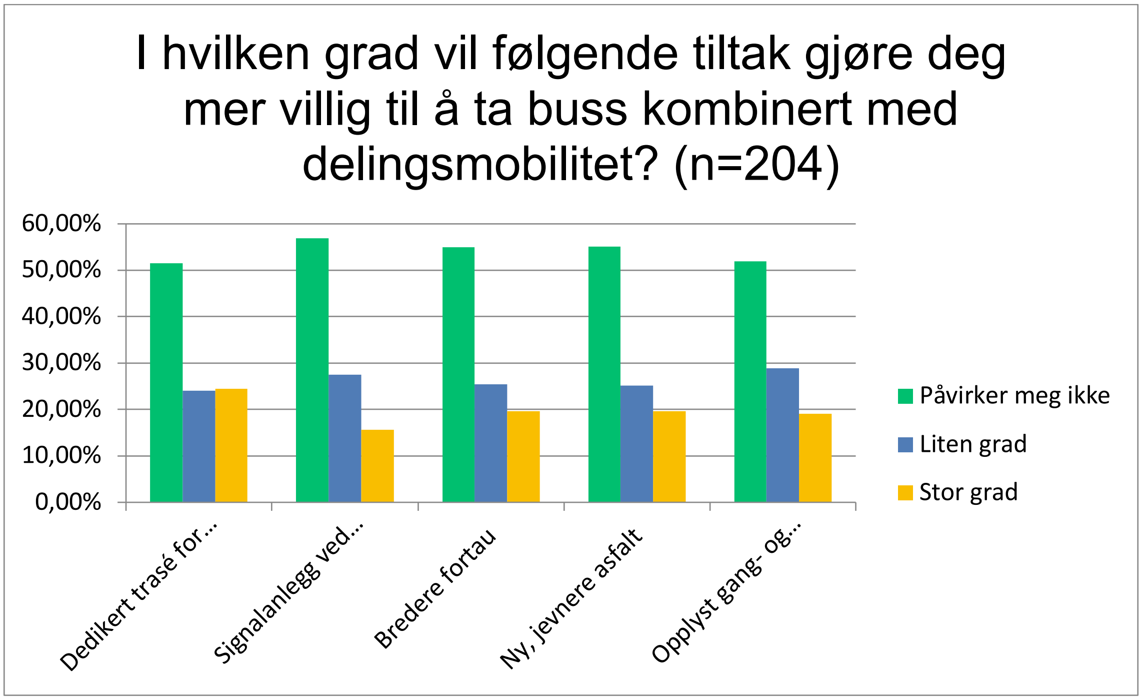
Se for deg at det er en shuttlebuss tilgjengelig når du går av bussen på Sluppen. Det er ingen ventetid og det koster 20 kroner ekstra å ta shuttlebussen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
Bus users (n=37)
Car drivers and car passengers (n=88)
6,41%
93,59%
2,70%
97,30%
3,41%
96,59%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil



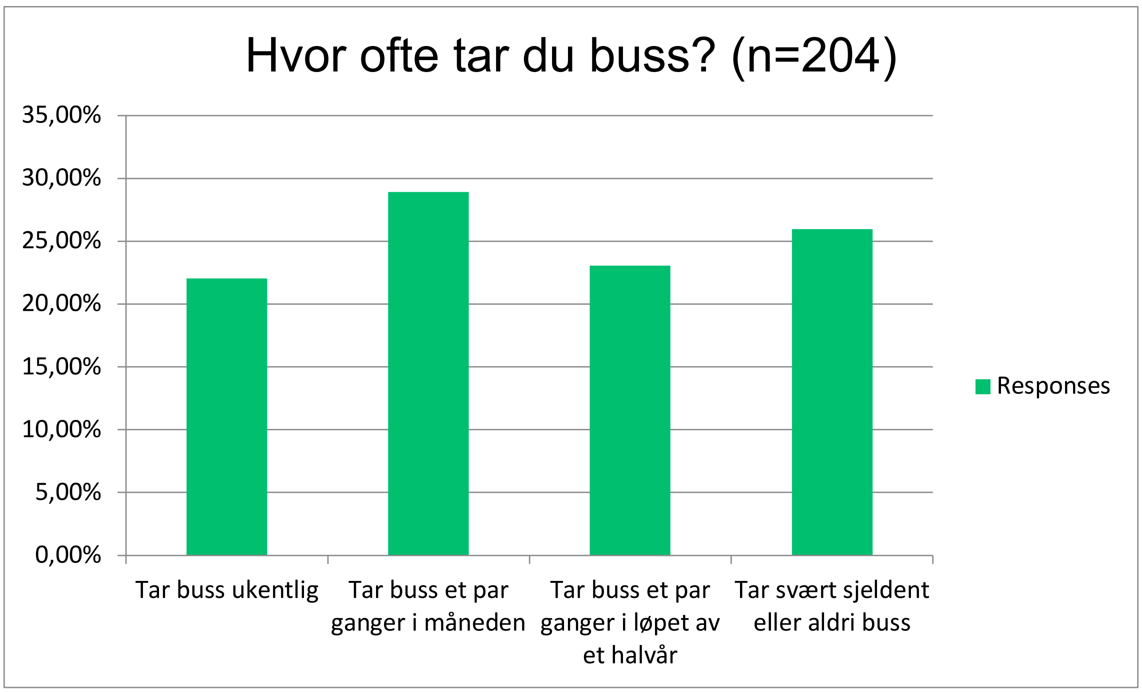
Se for deg at det er en shuttlebuss tilgjengelig når du går av bussen på Sluppen. Det er ingen ventetid og det koster ikke noe ekstra å ta shuttlebussen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
Bus users (n=38)
Car drivers and car passengers (n=89)
7,69%
92,31%
60,53%
39,47%
19,10%
80,90%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil


Se for deg at det er en shuttlebuss tilgjengelig når du går av bussen på Sluppen. Du risikerer å vente opp til fem minutter før den ankommer. Det koster 20 kroner ekstra å ta shuttlebussen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
2,56%
97,44%
Bus users (n=37)
2,70%
97,30%
Car drivers and car passengers (n=89)
2,25%
97,75%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil

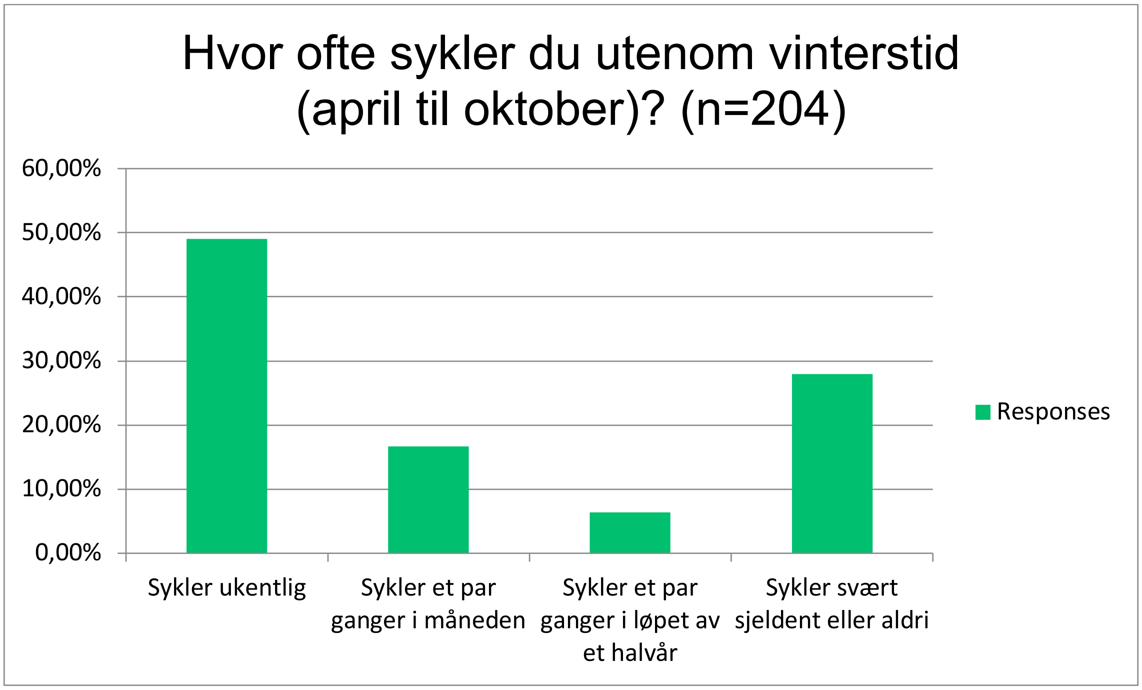

Se for deg at det er en shuttlebuss tilgjengelig når du går av bussen på Sluppen. Du risikerer å vente opp til fem minutter før den ankommer. Det koster ikke noe ekstra å ta shuttlebussen til kontoret. Hvordan velger du å reise til jobb?
Bikers, walking and other (n=78)
3,85%
96,15%
Bus users (n=38)
23,68%
76,32%
Car drivers and car passengers (n=85)
11,76%
88,24%
0,00%
20,00%
40,00%
60,00%
80,00%
100,00%
Med buss + elsparkesykkel
Slik jeg reiser i dag, med bil

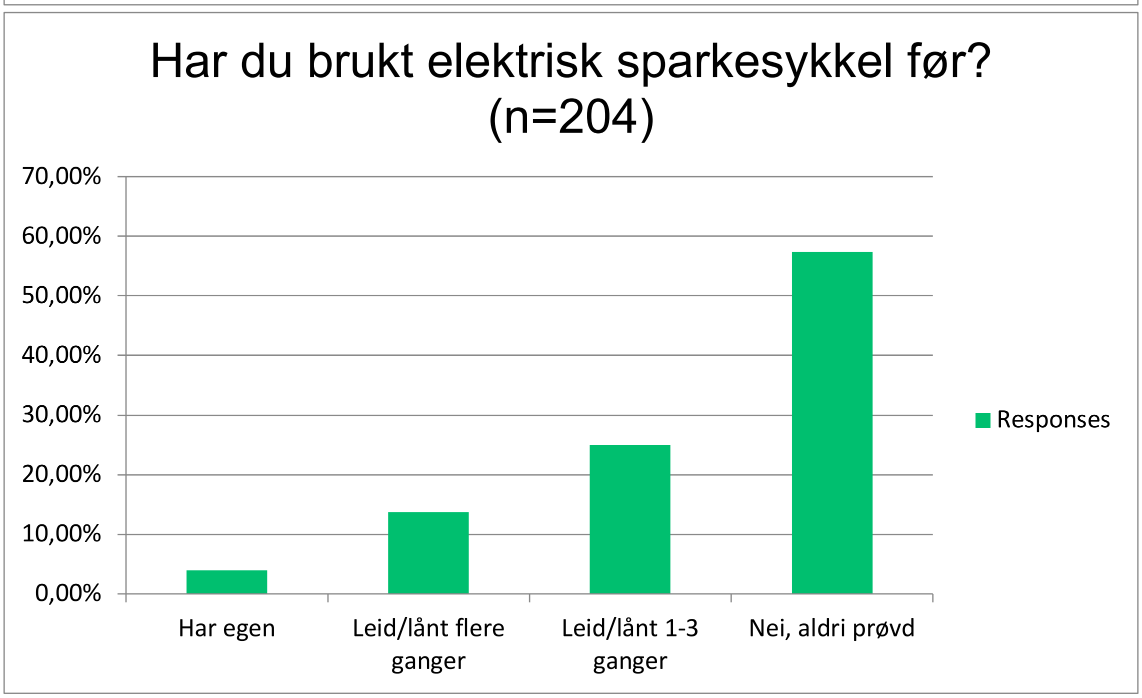


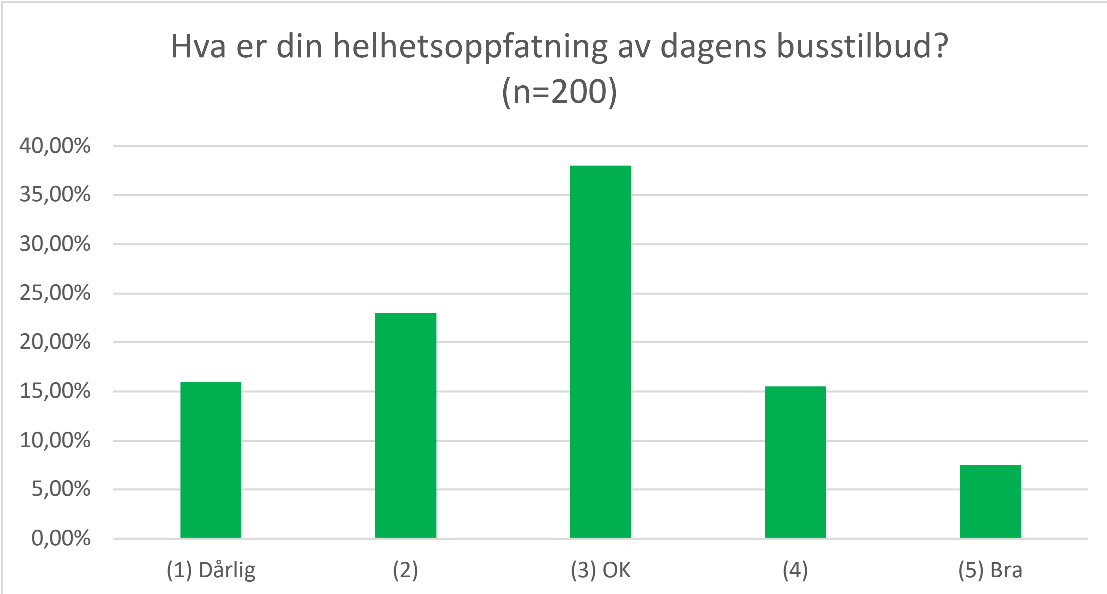
I hvilken grad vil følgende tiltak gjøre deg mer villig til å ta buss kombinert med delingsmobilitet? (n=204)
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
Dedikert trasé for...
Signalanlegg ved...
Bredere fortau
Ny, jevnere asfalt
Opplyst gang- og...
Påvirker meg ikke
Liten grad
Stor grad



Hvor ofte tar du buss? (n=204)
35,00%
30,00%
25,00%
20,00%
15,00%
10,00%
5,00%
0,00%
Tar buss ukentlig
Tar buss et par ganger i måneden
Tar buss et par ganger i løpet av et halvår
Tar svært sjeldent eller aldri buss
Responses


Hvor ofte sykler du utenom vinterstid
(april til oktober)? (n=204)
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
Sykler ukentlig
Sykler et par ganger i måneden
Sykler et par ganger i løpet av et halvår
Sykler svært sjeldent eller aldri
Responses


Har du brukt elektrisk sparkesykkel før?
(n=204)
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
Har egen
Leid/lånt flere ganger
Leid/lånt 1-3 ganger
Nei, aldri prøvd
Responses


Hva er din helhetsoppfatning av dagens busstilbud?
(n=200)
40,00%
35,00%
30,00%
25,00%
20,00%
15,00%
10,00%
5,00%
0,00%
(1) Dårlig
(2)
(3) OK
(4)
(5) Bra

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Science and Technology