and independence (1.3%), more laziness and obesity (0.8%), and more dependence on technology (0.8%).

Some of the impacts mentioned are further indicators of the dimensions covered in the survey, such as mobility, equity, public health, safety, and security. Other impacts do not fit in those dimensions, but rather on dimensions linked to social ("dependence on technology". "less social interaction", "more spare time"), cultural ("dependence on technology"), legal ("legal issues"), and psychological ("loss of driving pleasure") aspects.

The impacts cover a mix of positive and negative aspects. It should be noted that opinions differ, for a given impact. For example, while the most frequent opinions were "more freedom and independence" and "less social interaction", there were also participants thinking there would be less freedom and independence or more social interaction (not reported in Table 120, as they were less frequent).

The last column of Table 120 shows the countries where the proportion of participants mentioning a given impact was more than double the proportion in the overall sample. All countries except France were overrepresented in at least one impact. For example, compared to participants in other countries, those in the Netherlands had more a double propensity to mention social, equity, and security impacts such as "more laziness and obesity", "less social interaction", "more crime in public transport", "more income inequality", and "more vandalism".

Other impacts, not shown in the table include more ethical problems, more alcohol consumption, less public transport use, less walking, more theft of goods, more use of natural resources, and more visual pollution.

Table 120. Other impacts of self-driving vehicles mentioned by survey participants

Impact	Dimension	Participants		Countries with more double %
		n	%	
More vehicle breakdowns/software failure	Mobility	128	1.6%	
More freedom and independence	Equity	105	1.3%	
More laziness and obesity	Public health	67	0.8%	Netherlands
More dependence on technology	Other	63	0.8%	
More travel convenience	Mobility	53	0.7%	Poland
More travel comfort	Mobility	49	0.6%	Spain, Greece
More legal issues	Other	39	0.5%	Germany
More use of travel time for other activities	Mobility	38	0.5%	Germany
Loss of driving pleasure	Other	32	0.4%	Germany
Less social interaction	Other	26	0.3%	Netherlands, Cyprus
More crime in public transport	Security	26	0.3%	Netherlands
More spare time	Other	20	0.3%	United Kingdom
Less pedestrian safety	Safety	18	0.2%	U. Kingdom, Poland
More wayfinding problems	Mobility	15	0.2%	Poland
More income inequality	Equity	14	0.2%	Netherlands
More spatial inequality (urban vs rural)	Equity	14	0.2%	France
More vandalism	Security	14	0.2%	Netherlands, Spain
More surveillance/data privacy problems	Security	13	0.2%	Germany
More vehicle theft	Security	12	0.2%	Poland

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Table 121 disaggregates the results by gender and age. Women and men had similar propensities to mention almost all the impacts. However, women were 0.5% more likely than men to mention “more freedom and independence”. Results by age group are also broadly similar. However, the 18-34 group were more likely to mention “more laziness and obesity” (1.4%) than other age groups did (0.6-0.7%). Those aged 65+ had a very small propensity to mention “more travel comfort” and “more use of travel time for other activities”, unlike younger age groups.

Table 121. Other impacts of self-driving vehicles, by gender and age

Impact	All	Women	Men	18-34	35-64	65+
More vehicle breakdowns and software failure	1.6%	1.9%	1.4%	1.8%	1.5%	1.7%
More freedom and independence	1.3%	1.8%	0.9%	1.5%	1.2%	1.3%
More laziness and obesity	0.8%	0.9%	0.9%	1.4%	0.7%	0.6%
More dependence on technology	0.8%	0.9%	0.6%	0.9%	0.7%	0.7%
More travel convenience	0.7%	0.7%	0.7%	0.6%	0.7%	0.9%
More travel comfort	0.6%	0.5%	0.8%	0.7%	0.8%	0.2%
More legal issues	0.5%	0.3%	0.7%	0.4%	0.5%	0.8%
More use of travel time for other activities	0.5%	0.4%	0.7%	0.6%	0.6%	0.1%
Loss of driving pleasure	0.4%	0.4%	0.4%	0.3%	0.5%	0.4%
Less social interaction	0.3%	0.4%	0.2%	0.3%	0.3%	0.3%
More crime in public transport	0.3%	0.4%	0.3%	0.2%	0.4%	0.4%
More spare time	0.3%	0.2%	0.3%	0.3%	0.2%	0.3%
Less pedestrian safety	0.2%	0.3%	0.1%	0.3%	0.2%	0.3%
More wayfinding problems	0.2%	0.2%	0.1%	0.2%	0.2%	0.3%
More income inequality	0.2%	0.2%	0.1%	0.1%	0.2%	0.1%
More spatial inequality (urban vs rural)	0.2%	0.2%	0.2%	0.0%	0.2%	0.3%
More vandalism	0.2%	0.2%	0.2%	0.0%	0.2%	0.3%
More surveillance and data privacy problems	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%
More vehicle theft	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%

5.16 Conclusions

This section collects the key conclusions from the Pan-European survey, organised of terms of the six objectives stated in the introduction to the chapter. The survey was implemented in eight countries covering all parts of Europe (North, South, East, West). Samples were representative of region, gender, and age in all countries except Cyprus, were the sample covered only the 18-64 age group and had a disproportionate proportion of women. The Greek and Cyprus samples also had larger proportions of individuals with a university degree, in households with children and with cars, and self-assessing as having a faster degree of adoption of technologies than in other countries.

5.16.1 Citizens’ current travel patterns across Europe

Two main conclusions can be derived from the survey results on current travel patterns: 1) on average, people in Europe have a high degree of mobility and travel frequently, and 2) travel in Europe is still car-based. Table 122 gives more detail on key results leading to these conclusions.

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Table 122. Conclusions of Pan-European survey: current travel behaviour

Travel	• People make an average of 16 trips per week. The average trip is 30 minutes long and less than 10% of the trips are less than 10 minutes long. • The most frequent trip for the majority of people of working age is still going to work. • Almost all individuals who have children escort their children to school or other activities every day • While a few people (~15%) make online delivery orders a few times per week, a larger number (37%) make deliveries only a few times per year or never. Shopping is the most frequent trip purpose for 20% of the sample. • Travel time is the most important factor determining travel mode choice
Car travel	• Close to 90% of the individuals surveyed have a driving licence and live in a household with cars • Half of all trips are made by car, with more than half of these being single-occupant • Citizens spend more than four times as much in car travel than in public transport • This pattern masks some geographic and demographic variations: car travel is particularly predominant in Greece and Cyprus and less predominant in the Netherlands and among people aged 65+. • Public transport (especially rail) and non-motorised modes (especially cycling) represent only a marginal proportion of all trips.

5.16.2 Citizens' intentions, needs, and requirements regarding self-driving vehicles

On striking result of this survey is that one fifth of the individuals interviewed were not aware of self-driving vehicles.

In addition, intentions regarding these vehicles were mixed, as detailed in Table 123. Enthusiasm about self-driving vehicles is mild, with considerable proportions of people thinking they will never be implemented, and weak average intentions of buying or using one, and lower willingness to pay for using one than what individuals currently spend on travel. Some of the intentions signal a possible reinforcement of private car travel.

Table 123. Conclusions of Pan-European survey: intentions

Likelihood of buying or using	• The average individual is roughly between “neutral” and “somewhat unlikely” to buy a self-driving car or to use a delivery robot. The likelihood of using a self-driving car, bus, taxi, or drone is slightly higher • Only a quarter of individuals surveyed are likely to buy a self-driving car, but more are likely to use one, especially to escort children (43%).
Willingness to pay	• On average, Europeans are willing to pay €24,276 to buy for a self-driving car (less than the current price of the average car) and €100 per month to use and maintain it (less than what they currently spend today on car travel (€115) • They are willing to pay €7.6 for a 3-km trip on a self-driving taxi and €5.6 for a one-way bus trip of an unspecified distance. • Mean willingness to pay values are higher in countries with higher income per capita.
Willingness to share	• Only half of people would share a self-driving taxi with strangers
Needs and requirements	• Private car is the most preferred self-driving vehicle • The most preferred activities while travelling in self-driving vehicles are surf the web, talk on the phone, and focus on the road

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Perceived timeline	• 11-14% of participants think all types of self-driving vehicles will be implemented before 2030 • In contrast, 17-22% think none will ever be implemented

5.16.3 Citizens' perceptions about the possible impact of self-driving vehicles

Table 124 shows the conclusions on personal impacts of self-driving passenger and freight vehicles. Citizens expect an increase in mobility, translated into more and longer trips. Opinions on change in delivery orders, parking needs, and residence relocation are split. Again, there are signals of a possible reinforcement of private car use. Self-driving freight vehicles are expected to have a weaker impact than passenger vehicles.

Table 124. Conclusions of Pan-European survey: personal impacts

Travel time	• The availability of passenger self-driving vehicles is expected to increase travel time by 5% to 13%, depending on the vehicle.
Trips	• Self-driving passenger vehicles are expected to increase the number of trips individuals make by 4 to 9%, depending on the vehicle. • Number of trips is expected to increase more in countries with lower income per capita (Spain, Cyprus, Poland, and Greece) compared with those with higher income per capita (Netherlands, Germany, France, United Kingdom). • Self-driving passenger vehicles could substitute almost 40% of trips currently made by car or public transport • Possible reinforcement of car dominance: 17% would substitute most of their current car trips with self-driving bus, but 27% would substitute most of their current bus strips with a self-driving car. • Possible reduction in active modes: self-driving vehicles could substitute 31% of trips currently made by walking and cycling. • Self-driving freight vehicles are not expected to change number of trips
Delivery orders	• On average, self-driving vehicles would result in only a minor increase in delivery orders • Similarly to the case of trips, delivery orders will increase more in countries with lower income per capita. • Self-driving robots or drones could substitute about a third of orders currently delivered with conventional vehicles.
Delivery costs	• Opinions are divided: almost same proportions of people think parking needs will increase and decrease. Overall estimated effect almost neutral.
Parking needs	• Opinions are divided, in the case of passenger vehicles: almost same proportions of people think parking needs will increase and decrease. The overall estimated effect is almost neutral. • Stronger belief in a reduction of parking needs in the case of self-driving taxis and buses, compared with self-driving cars. • Self-driving delivery vehicles is expected to slightly reduce parking needs.
Residence location	• Some movement towards more central areas: 2-3% of people would relocate to the city centre and around 10% to places closer to the centre. • But there is also the possibility of some movement to less central areas: 3-5% would relocate to rural areas and 6% to suburbs.

Table 124 shows the conclusions on wider impacts of self-driving passenger and freight vehicles. Citizens expect some improvements in mobility in their regions without increasing congestion, more comfort and convenience, but also at a higher price. Most other perceived impacts are benefits, rather than costs, e.g. increase in accessibility and economic dynamism and reduction in environmental harms and safety problems. There is also belief that self-driving vehicles will require resources such as electricity and redesigned infrastructure. Opinions about changes in

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land use (such as parking space and residence location), employment opportunities and job losses, and travel stress, are split. Possible detrimental impacts are the increase in cyber attacks, vehicle breakdown, obesity, dependence on technology, and legal issues.

Table 125. Conclusions of Pan-European survey: wider impacts

Mobility	• On average, people think self-driving vehicles will increase number of trips in their region (general and for shopping), and use of self-driving shared services. • About 60% of participants think that ownership of conventional vehicles will increase. • On average, people believe travel costs in their region will increase but travel time and delivery costs are not expected to change much (this contrasts with the positive effect on personal travel time as shown in Table 124).
Transport network	• On average, people think that the number of vehicles on the network will increase but without creating more congestion.
Land use	• Split opinions: some think parking needs in the city centre will increase, others think they will decrease, some think there will be a move to more central areas, others think the move will be to less central areas. • Belief that the demand for redesigned infrastructure will increase.
Environment	• Belief that emissions and noise will decrease. • Even stronger belief that demand for electricity will increase.
Economy	• Belief that economic growth, investments, and new skills requirements will increase. • Split opinions: some think job losses will increase, others think they will decrease. On average, the perception is almost neutral.
Equity	• Belief that accessibility will increase, especially for specific groups (people with mobility needs, older people, families with children). • Split opinions about employment opportunities, on average the perception is that they will change little.
Public health	• Almost neutral view on change in travel stress. • Belief that access to healthcare and emergency response will increase.
Safety	• Belief that traffic fatalities, violations and tickets, and harassment will decrease and, to a lesser extent, that the number of accidents will also decrease.
Security	• Belief that number of cyber attacks will increase.
Other impacts	• Positive impacts mentioned by survey participants in an open-ended question include more freedom and independence and more travel convenience and comfort. • Negative impacts include more vehicle breakdowns, laziness and obesity, dependence on technology, and legal issues.

5.16.4 Comparison of perceptions across countries, regions, age groups, and genders

Table 126 lists the main differences across the eight countries surveyed. The table lists only the aspects where the country differs strikingly from the overall sample average. In the table, comparative adjectives (e.g. “more”, “less”, “stronger”) mean that that the country is considerably above or below the average of the eight countries. Superlative adjectives (e.g. “most”, “least”, “strongest”) mean that the country has the maximum or minimum values for the variable in question, while also being considerably above or below the average. Some of the impacts were assessed at the personal and regional (wider) level. In the table below, we identify the latter with the word “regional”. Impacts without that qualifier are personal impacts.

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Cyprus, and to a lesser extent also Greece, are the countries that differ the most from the average: in these countries, there is more enthusiasm for self-driving vehicles and more optimism that they will increase mobility without increasing costs, while also bringing social and environmental benefits (but not economic ones). In Cyprus, these differences from the sample average are partly explained by the fact that the sample only includes individuals aged 35-64, and two thirds of them are women. But the fact that both countries share many of the patterns differing from the other six countries signals that some geographic, economic, social, and cultural issues may also have an influence.

Spain and Poland also tend to anticipate increases in mobility, accompanied by relocation to more central areas. However, in Poland there are also doubts that some environmental and social problems will be solved. In the other countries, there is a mix of opinions, with average perceived impacts close to neutral. There are also regional differences inside those countries.

Table 126. Conclusions of Pan-European survey: country differences

UK	• High levels of awareness of self-driving vehicles • Strongest belief that road congestion will increase • Strongest belief that the demand for electricity will increase
Germany	• Regional variations: the former East Germany has low levels of awareness and likelihood of using passenger self-driving vehicles • Stronger belief that employment opportunities will increase
France	• Stronger belief that mobility will increase less and at a higher cost
Netherlands	• Lowest expected increase in number of trips • Lowest proportion of delivery orders substituted by delivery robots or drones • Strongest belief that investment will grow but also that job losses will grow
Spain	• Higher expected increase in number of trips • Higher proportion of trips substituted with self-driving vehicles • Belief that delivery costs will increase • Strongest belief that self-driving vehicles are useful for work • More likely to relocate to more central areas and to think others in their region will also do so • Most optimistic regarding timeline of implementation of self-driving vehicles
Poland	• Low levels of awareness of self-driving vehicles • Highest expected increase in number of trips • Higher proportion of trips and deliveries substituted with self-driving vehicles • Belief that delivery costs will increase • More likely to relocate to more central areas and to think others will also do so • No expectation that emissions will decrease, unlike all other countries • Only country where travel stress in expected to increase
Greece	• More likely to buy or use a self-driving passenger or freight vehicle • High expected increase in (personal and regional) number of trips • More likely to believe that regional travel costs will decrease and (personal and regional) delivery costs will decrease • More likely to believe that travel time and congestion will decrease • More likely to believe that (personal and regional) parking needs will decrease • More likely to relocate to less central areas • Stronger preference to use self-driving travel time to work or study • Stronger belief that emissions, noise, travel stress, and traffic incidents will decrease and weaker belief that demand for electricity and redesigned infrastructure will increase • Weaker belief that economic growth will increase and weakest belief that employment opportunities will increase

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Cyprus	• Low levels of awareness of self-driving vehicles • More likely to buy or use a self-driving passenger or freight vehicle • Only country where, on average, citizens expect travel time to decrease • Strongest believe that congestion will decrease • High expected increase in (personal and regional) number of trips • Lowest proportion of trips substituted with self-driving cars, but highest proportion of delivery orders substituted with delivery drones • Most likely to believe that regional travel costs will decrease and (personal and regional) delivery costs will decrease • Strongest belief that (personal and regional) parking needs will decrease • More likely to relocate to less central areas and to think others will also do so. • Strongest preference to use self-driving travel time to work or study • Strongest belief that emissions, noise, travel stress, and traffic incidents will decrease and weaker belief that demand for electricity and for redesigned infrastructure will increase • Weakest belief that economic growth will increase and weaker belief that employment opportunities will increase

Gender is related to only some of the variables studied. In contrast, many of the variables have a distinct age pattern, with their values correlated with age (Table 127).

Table 127. Conclusions of Pan-European survey: gender and age differences

Gender	In comparison to women, men: • Have higher levels of awareness of self-driving vehicles • Have higher willingness to pay to buy or use a self-driving car, but lower willingness to pay to use a self-driving taxi. • Are more likely to share a self-driving taxi with strangers • Are more likely to think that travel time will increase • Are less likely to use travel time in self-driving vehicles to focus on the road • Are less likely to think delivery costs will decrease • Are more likely to think employment opportunities will increase and that emissions and noise will decrease • Are more likely to think cyber attacks will increase

Age	• The 35-64 group would pay more to buy a self-driving car, but the 18-34 would pay more to use a self-driving car, taxi, or bus.
	• The following variables decrease with age:
	  ○ Level of awareness of self-driving vehicles
	  ○ Likelihood of buying or using self-driving passenger or freight vehicles
	  ○ Perceived utility of self-driving freight vehicles for work
	  ○ Expected change in personal and regional travel time and number of trips and in regional travel costs
	  ○ Degree of substitution of current trips and delivery orders with self-driving vehicles
	  ○ Expected change in personal and regional delivery orders and delivery costs
	  ○ Expected change in (personal and regional) parking needs
	  ○ Intention to relocate to more central areas and belief that other people will relocate either to more or less central areas
	  ○ Use of travel time in self-driving vehicles to do smartphone-related activities
	  ○ Belief that self-driving vehicles will be implemented at some point in the future (rather than never be implemented)
	  ○ Belief that number of vehicles on the network, congestion, emissions, noise, and job losses will increase

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	○ Belief that accessibility and employment opportunities will increase and that access to healthcare and emergency response will improve ○ Belief that traffic accidents, fatalities, violations and tickets and harassment events will increase

5.16.5 Relationships between intentions and impacts

Some of the perceived intentions and impacts are correlated (Table 128)

Table 128. Conclusions of Pan-European survey: inter-relationships

Intentions and impacts for passenger vehicles	• The likelihoods of buying a self-driving car and using a self-driving car, taxi, or bus, are strongly correlated • The likelihoods of buying or using a self-driving vehicle for commuting, non-commuting, and escort children, are strongly correlated • Willingness to pay to use different types of vehicles are not strongly correlated among themselves or with the likelihood of using those vehicles. • The perceived impacts on various aspects (travel time, number of trips, parking needs, and residence location) are not strongly correlated • The perceived impacts of self-driving-cars, taxis, and buses, are also not strongly correlated • Likelihood of using a passenger self-driving vehicle is related to the impact that citizens perceive that would have in their travel time, number of trips, and parking needs. • Likelihood of using a freight self-driving vehicle is related to the impact people perceive it would have in the number of their delivery orders.
Intentions and impacts for freight vehicles	• The impact on number of delivery orders is strongly and positively correlated with the impact on number of trips – which suggests that delivery orders are not substitutes of shopping (or other) trips.
Passenger vs freight	• The likelihood of using a self-driving passenger vehicle is only moderately related to the likelihood of using self-driving freight vehicle. • The impacts of self-driving passenger and freight vehicles are only weakly or moderately correlated
Wider impacts	• There are three main types of correlation in people's perceptions of the wider impacts of self-driving vehicles: ○ More mobility is related with more resource use, including financial ones (i.e. travel and delivery costs), parking space, redesigned infrastructure, and electricity. ○ More mobility is related with more accessibility and economic dynamism ○ Negative environmental impacts (emissions and noise) and related to social ones (accidents, fatalities, traffic violations, and harassment)
Wider vs personal impacts	• Expected wider (regional) impacts tend to be related with expected personal impacts.

5.16.6 Relationships with participant and travel characteristics

As shown in Table 129, the key variables explaining intentions and impacts of self-driving vehicles are age, having children, residence location (city centre or not), regional income, how mobility people are (e.g. number and duration of trips), level of technology adoption, and awareness of self-driving vehicles. Gender explains only some of the differences among the sample.

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Table 129. Conclusions of Pan-European survey: relationships between intentions and impacts with participant and travel characteristics

Likelihood of using vehicle	• Likelihood of using self-driving passenger vehicle is higher for people who live in the city centre, are younger, have children, concern about travel cost and parking availability and currently make more and longer trips • Likelihood of using self-driving freight vehicle higher for almost the same groups: people who live in the city centre, are younger, have children, currently make more trips, and whose main trip purpose is shopping. • Both increases with level of technology adoption and awareness of self-driving vehicles
Willingness to pay	• Higher in richer regions and among people who have children and currently make more and longer trips • The gender and age effects depend on the type of vehicle (see Table 127) • Increases with level of technology adoption and awareness of self-driving vehicles
Impact on travel time	• Younger people, those with children or with no health issue, who live in cities and in richer regions, and those who currently make and longer trips expect more increases in travel time • Increases with level of technology adoption and awareness of self-driving vehicles
Impact on number of trips	• Women, younger people, those with children, who live in cities, and those who currently make and longer trips expect more increases in number of trips • Living in richer regions is linked with lower increases in number of trips • Increases with level of technology adoption and awareness of self-driving vehicles
Impact on delivery orders	• Higher for men, younger people, and those with children, who live in the city centre, and in richer regions. • Increases with level of technology adoption and awareness of self-driving vehicles
Impact on delivery costs	• Higher for women, younger people, and those with children, who live in the city centre, and in poorer regions. • Increases with level of technology adoption and awareness of self-driving vehicles
Impact on parking needs	• Younger people and those with children and who currently make more trips are more likely to report an increase in parking needs • Increases with level of technology adoption and awareness of self-driving vehicles
Impact on residence location	• Younger people and those with children, with no health issue, and who currently make more and longer trips are more likely to report relocation to more central areas • Increases with level of technology adoption and awareness of self-driving vehicles
Wider impacts	• The view that mobility requires resource use is higher among women and those more aware of self-driving vehicles • The view that self-driving vehicles will have negative social and environmental impacts is higher among women, the youngest age group, people in richer areas, and those with lower levels of adoption of technology • The view that mobility is associated with accessibility and economic benefits is higher among the 35-64 age group, and individuals who

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	currently do not own a car and those who are keener to accept technology and more aware of self-driving vehicles.

5.16.7 Final remarks

Overall, this chapter showed that the impacts of self-driving vehicles tend to be perceived slightly beneficial. Mobility and accessibility will increase and may or may not have associated increases in costs but will probably require the use of more resources such as electricity and, according to some citizens, also parking space. Self-driving vehicles are also expected to deliver some economic, social, and environmental benefits, especially in the four countries with lower income per capita (Spain, Cyprus, Poland, and Greece) but also in the other four countries analysed with higher income per capita (Netherlands, Germany, France, and United Kingdom).

However, there are two risks in delivering these benefits:

- The risk that the mobility system will become even more based on private car use than already is
- The risk that benefits will accrue mostly to younger people or to city residents.

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6. Survey on impact of self-driving freight vehicles

6.1 Overview

An online survey was implemented in the UK about the impact of self-driving freight vehicles on customers and road users, involving 700 participants. The survey had three objectives:

- To assess customers' attitudes, preferences, and willingness to pay to use self-driving freight vehicles, from the point of view of customers ordering deliveries
- To assess road users' attitudes towards those vehicles
- To capture perceptions about the impact of these vehicles on several dimensions of people's lives

This survey provides an opportunity for understanding the adoption of delivery solutions based on self-driving freight vehicles. It can also provide information from the point of view of different stakeholders, including not only customers ordering deliveries but also road users who would share roads with those vehicles.

The rest of this chapter is organised as follows.

- Sections 6.2 and 6.3 describe the **methods** used in this survey and the **characteristics** of participants
- Section 6.4 analyses **customer attitudes** towards self-driving freight vehicles
- Section 6.5 analyses customer **preferences** and **willingness to pay** to use those vehicles
- Section 6.6 analyses **road user attitudes** towards self-driving freight vehicles
- Section 6.7 analyse perceived **impacts** of those vehicles
- Section 6.8 summarises the **key results** of the survey

6.2 Methods

6.2.1 Questionnaire

Appendix 8 contains the questionnaire used. The anticipated duration was 15 minutes. The questionnaire was structured into five parts:

Part 1 captured the **characteristics** of participants and their online shopping behaviour, including:

- Region
- Age (in years)
- Gender
- Educational level
- Employment situation
- Self-identified profile in terms of technology adoption, on a 5-point scale from "like to try new technologies" to "cautious about adopting new technologies".
- Self-identified awareness about self-driving delivery vehicles such as delivery robots, self-driving vans, and delivery drones, on a 4-point scale from "not aware" to "well aware"
- Frequency of making orders for deliveries
- Ranking of factors affecting the choice of delivery options

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- Frequency of experiencing delivery problems (delays, stolen goods, and damages)

Part 2 of the questionnaire captured **customers' preferences and attitudes** towards self-driving freight vehicles. Participants were first introduced to four types of delivery vehicles: self-driving vans, delivery robots, and delivery drones. They then completed a choice experiment, composed of six questions asking which vehicle they would choose for deliveries, given specific characteristics of the delivery service. This experiment will be described later in Section 6.5.1. Participants were then shown the same vehicles and were asked if they agreed or disagreed with a series of statements, on a 5-point scale. The statements include:

- Chance of deliveries by self-driving freight vehicles having problems, including being stolen, delayed, damaged by someone, damaged by the vehicle, injuring someone, delivering to the wrong address, and failing to deliver in bad weather.
- Opinion about the convenience, speed, and punctuality of the vehicle, compared with conventional vehicles
- Intention to use the vehicle to order and return goods

Part 3 of the questionnaire captured **road users' attitudes** towards self-driving freight vehicles. Participants were asked to imagine a scenario in the future when half of the vehicles on the road are self-driving. Then they are presented with specific situations and asked questions about how comfortable on a 5-point scale. The situations are:

- Being a passenger on a self-driving bus and a delivery robot getting on the bus
- Being a pedestrian or cyclist and a delivery robot or self-driving van driving past
- Being a driver in a conventional car and a delivery robot or self-driving van driving past
- Being a passenger in a self-driving vehicle and a self-driving van driving past
- A drone flying above them with a small parcel

They were then asked about their concern about possible situations, on a 5-point scale, including:

- Self-driving freight vehicles causing traffic jams and travel delays
- Delivery robot and/or its content on the bus causing harm to passengers
- Self-driving freight vehicles crashing with other vehicles or people
- Cameras or sensors on these vehicles capturing information about people on the street

Part 5 of the questionnaire captured **impacts** of self-driving freight vehicles on people's lives on a 5-point scale, including:

- Likelihood of working from home
- Meeting more people in person
- Stress
- Frequency of shopping in-person
- Frequency of taking public transport

6.2.2 Participant recruitment

The target sample size was 700 participants, which was deemed to be essential to obtain precise results and to ensure that the sample accurately represents the country's gender, age, and regional demographics. Participants were recruited through a market research company. Only individuals aged 18 or above were recruited. Quotas were imposed on sex, age groups (18-34, 35-64, 65+), and regions according to the NUTS1 classification for the UK. Participants who stated that they did not live in the UK did not proceed with the questionnaire.

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6.2.3 Ethics

The study received ethical approval from the Bartlett School of Environment, Energy and Resources at the University College of London (ID: 20231120_EI_ST_ETH_ Move2CCAM). Participants were provided with an information sheet before they were asked to agree to take part in the survey. This sheet was similar to the one used in the pan-European survey described in the previous chapter. Participants gave their consent by confirming (ticking a box) that they understand what the research involves and what is expected of them.

6.3 Participant characteristics

Table 1 shows that the gender, age, and regional distributions of the sample closely match that of the population of the UK.

Table 130. Gender, age, and region: sample vs. population (%)

	Sample	Population
Gender		
Male	48	49
Female	51	51
Age		
18-34	29	28
35-64	49	49
65+	22	23
Region		
North East	5	4
North West	11	11
Yorkshire and Humber	8	8
East Midlands	7	7
West Midlands	9	9
East of England	9	9
London	14	13
South East	14	14
South West	8	8
Wales	5	5
Scotland	8	8
Northern Ireland	1	3

Note: Excludes participants not providing gender information (2 individuals, i.e. 0.29% of the sample).

Table 2 shows other demographic characteristics of participants. Half of participants have completed secondary school or vocational education, 29% have a university degree, and 16% have a university degree. About half of participants are currently working.

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Table 131. Other sample characteristics (%)

Educational level	
No formal education	1
Primary school	1
Secondary school or vocational education	51
University degree or equivalent professional qualification	29
Higher university degree (e.g. Master's, MBA, doctorate)	16
Still in full-time education	1
Employment status	
Currently not working	11
Working part-time	19
Working full-time	39
Student	3
Retired	19
Homemaker	8

19% of participants like to try new technologies as soon as they are available, and another 19% embrace them relatively early (Table 132). The majority of respondents had some level of awareness of self-driving delivery vehicles, Only 17% of respondents were not aware of self-driving delivery vehicles at all.

Table 132. Technology adoption and awareness of self-driving vehicles (%)

Technology adoption	
Likes to try new technologies and innovations as soon as they are available.	22
Embraces new technologies and innovations relatively early in their lifecycle.	21
Prefers to adopt technologies and innovations once they have become well-established.	32
Adopts technologies and innovations only after they have become widely accepted	14
Cautious about adopting new technologies and innovations	11
Awareness of self-driving vehicles	
Not aware of self-driving delivery vehicles	7
Have only listened about self-driving delivery vehicles, but I do not know much	44
Aware of self-driving delivery vehicles	29
Well aware of self-driving delivery vehicles	20

Participants make an average of 6.1 deliveries per month for households and personal items, 4.4 for clothes, 4.1 for supermarket orders, and 3.3 for other items. Table 4 shows the factor identified by participants as the most determinant to choose the method to deliver their orders. Cost and time are the two key determinants, mentioned by 89% of participants.

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Table 133. Factors affecting delivery options

Factors	% of times each factor was ranked #1
Cost	48
Time from order to delivery	41
Delivery location	3
Chance of delivery problems	2
Flexible delivery slots	2
Delivery time window	2
Human interaction	1
Flexible delivery address	0

Figure 2 shows the frequency of experiencing delivery problems within the last six months. 60% have experiencing delivery delays at least once. 44% have received damaged goods, and 28% have had deliveries stolen.

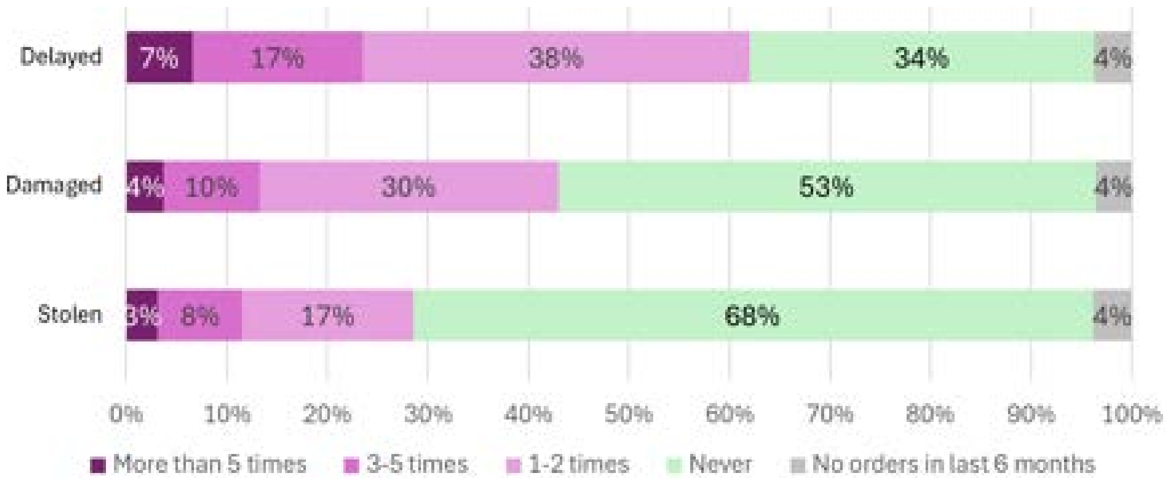

Figure 220: Frequency of delivery problems

6.4 Customer attitudes towards self-driving delivery vehicles

This section shows the results on customer attitudes towards self-driving delivery vehicles. Between 41% and 56% agreed that self-driving vans could cause problems, including failing to delivery in bad weather, delivering to a wrong address, injuring someone, damaging the package, taking too long, being damaged by someone, or be stolen (Figure 221). The main concerns were the van injuring someone (56%) and the van and its contents being damaged by someone (55%). However, 33-45% of participants also had positive views about self-driving vans: deliveries will be more punctual, faster, and more convenient. 32-33% of participants agreed they would use a self-driving van to order or return deliveries. Slightly higher proportions (35-36%) disagreed.

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Figure 221: Customer attitudes towards self-driving vans

There were more concerns for the delivery robot than for the self-driving van (Figure 222). The proportions agreeing that the robot will cause problems vary between 41% and 61%. The main concerns were failing in bad weather (60%), the contents being stolen (61%), or the robot or the contents being damaged by someone (60%). Positive views were similar to the ones expressed for the self-driving van. 31% agree that they will be using a delivery robot to order goods and 28% to return goods, values slightly lower than for self-driving vans. However, the proportions disagreeing with those statements are higher than in the case of self-driving vans, at 41-42%.

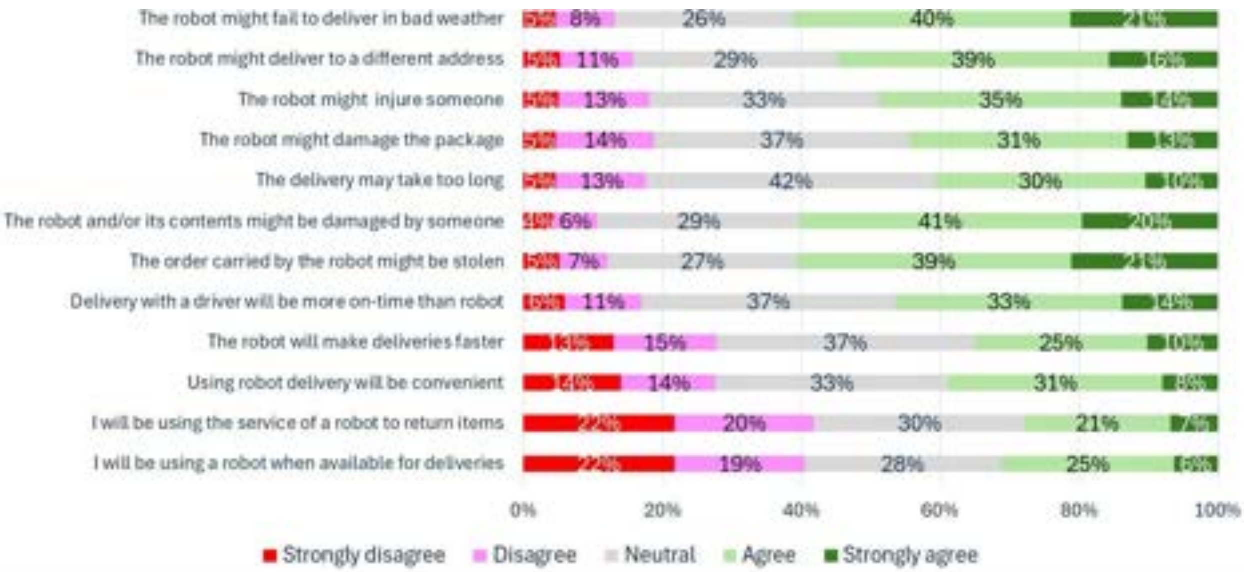

Figure 222: Customer attitudes towards delivery robots

The proportions agreeing that the delivery drone will cause problems vary from 38% to 66% (Figure 223). The main concerns were failing in bad weather (66%), delivering to a wrong address (58%), and the robot or the contents being damaged by someone (57%). Positive views were similar to the ones for the other vehicles. 34% agree that they will be using a delivery robot

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to order goods and 29% to return goods. The proportions disagreeing with those statements were higher than in the case of self-driving vans but lower than the case of drones, at 37-41%.

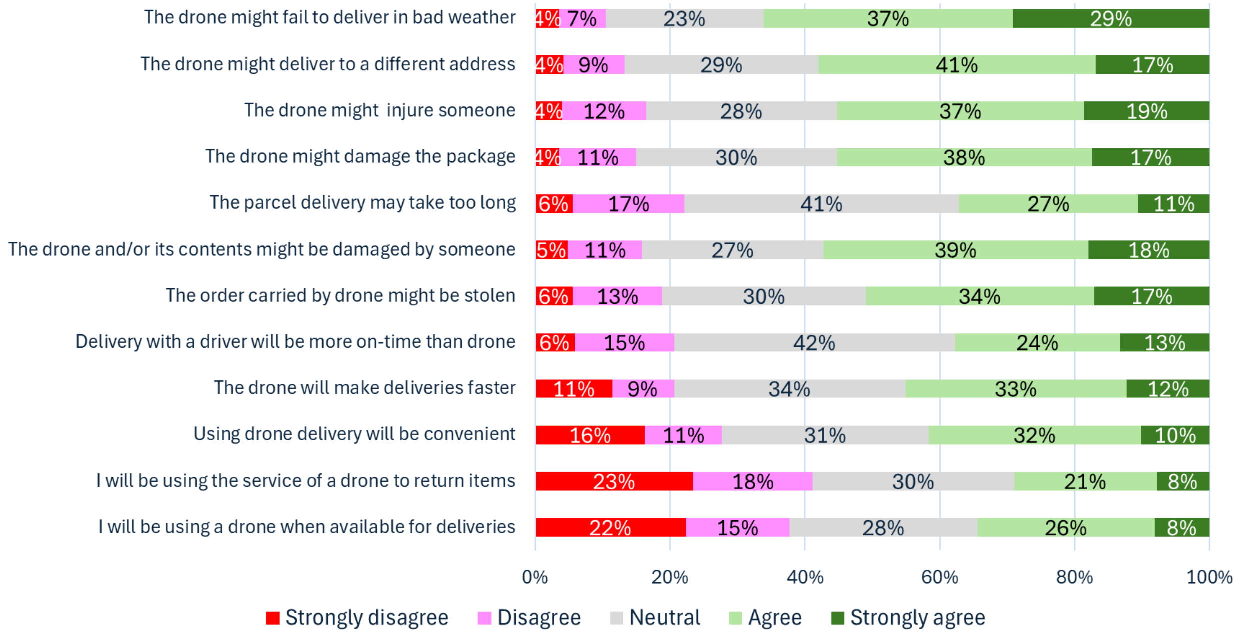

Figure 223: Customer attitudes towards delivery drones

Figure 224 shows the participants' general concerns about self-driving freight vehicles. 42% is concerned a bit or very much that the vehicle will record them on audio and video, 53% that someone will track their location, 52% that hacking might cause accidents, and 51% that the vehicle technology may fail. The proportions who are only slightly or not at all concerned are much smaller.

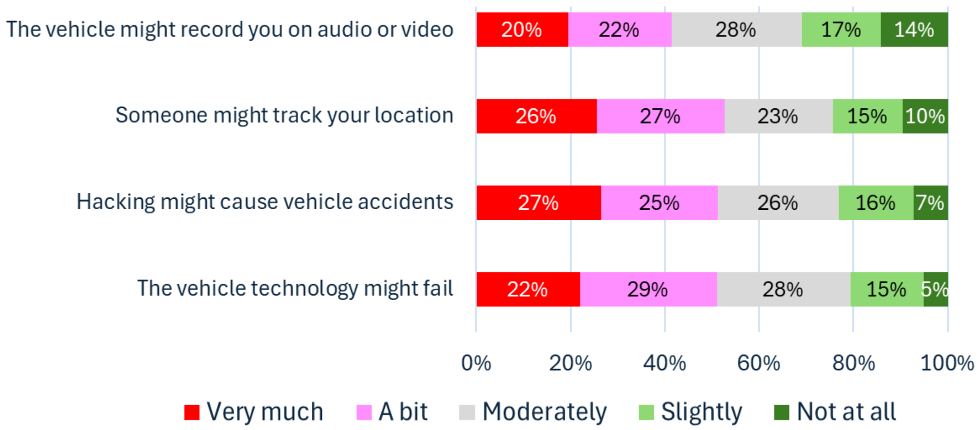

Figure 224: Customer concerns about self-driving delivery vehicles

6.5 Customer preferences and willingness to pay

6.5.1 Methods

The questionnaire included a choice experiment, i.e., a group of six questions where participants were asked to choose among four options for a hypothetical delivery of household goods that are

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needed as soon as possible. The options were deliveries by conventional van, self-driving van, delivery robot, and delivery drone. Each option was characterized by six attributes, which assumed different levels from question to question. Table 134 shows the attributes and levels and Figure 225 shows an example of the questions that participants answered

Table 134. Choice experiment: attributes and levels

	Conventional van	Self-driving van	Delivery robot	Delivery drone
Delivery location	• Front door • Walk to vehicle (up to 3 minutes)			• Front door • Walk to vehicle (up to 3 minutes) • Garden or terrace
Human interaction	Driver	• No interaction • Contact company by phone		
Time from order to delivery	1, 2, 3 days			
Chance of delivery problems	5%, 10%, 15%			
Delivery time window	0.5, 1, 2 hours			
Cost	£2, £4, £6			

	Conventional van	Self-driving van	Delivery robot	Delivery drone
Delivery location	Front door	Walk to vehicle (up to 3 minutes)	Front door	Front door
Human interaction	Driver	Delivery company via telephone	No	No
Time from order to delivery (days)	3 days	1 day	1 day	2 days
Delivery time window (hours)	2 hours	2 hours	1 hour	2 hours
Delivery problems (%)	10%	5%	10%	5%
Cost (£)	4	2	2	4

Which option would you choose?

Figure 225: Example of question in choice experiment

6.5.2 Model results

Table 135 shows the frequency of choices for each type of vehicle. More than half of all choices were for the conventional van. This proportion is not much different across genders, but it increases with age. Two thirds of all choices by participants aged 65+ were for the conventional van.

Table 135. Frequency of choices (%)

	Conventional van	Self-driving van	Delivery robot	Delivery drone
All	53%	17%	14%	16%
Male	55%	14%	14%	16%
Female	51%	19%	14%	16%
18-34	36%	25%	18%	21%
35-64	57%	14%	13%	16%
65+	66%	12%	12%	10%

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We then modelled all the choices using a mixed logit model. This model estimates how the odds of choosing a given option (i.e., a vehicle) are associated with each attribute value. The model accounts for the fact that each person have different preferences. Hence, the model estimates coefficients for each participant.

The variables of the model are:

- Cost, time, delivery time window, and delivery problems, all entered as quantitative variables
- Dummy variables representing two of the possible values of delivery location (walk to vehicle and garden/terrace). The omitted value is "front door", i.e., results for the two dummy variables are in relation to delivery to customers' front door
- Dummy variables representing one possible value (telephone) for human interaction in deliveries made by self-driving vehicle. The omitted value is "no interaction"
- Dummy variables representing options for each of the three self-driving vehicles. The omitted value is conventional van

Table 136 shows the mean of the coefficients for each participant and respective significant levels (p value). The table also reports the significance of the standard deviations of the coefficients. This is an indicator of whether preferences for each attribute level do differ across the sample.

The estimated model shows that:

- The cost, time, and delivery problems coefficients are negative and significant, i.e., participants prefer cheaper, faster, and less problematic deliveries, as expected
- The coefficient for time window is insignificant, i.e. participants are indifferent between longer and shorter time windows
- The "walk to vehicle" coefficient is negative and significant, i.e., participants prefer the omitted value (delivery at front door) than walking to vehicle, as expected
- The garden/terrace coefficient (which applies only to drone deliveries) is insignificant. This shows that participants are indifferent between drone deliveries in their garden/terrace or at their front door
- The three dummies representing self-driving vehicles are all negative. This means people prefer conventional vans than self-driving vehicles, after accounting for all attributes (i.e., cost, time, delivery time window, delivery problems, and delivery location)

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Table 136. Model of choices for delivery vehicle

	Mean of coefficients		Standard deviation of coefficients
	Estimate	p-value	p-value
Cost	-0.20	<0.01	<0.01
Time from order to delivery	-0.05	<0.01	0.10
Delivery time window	0.00	0.95	0.03
Delivery problems	-0.04	<0.01	<0.01
Delivery location: walk to vehicle	-0.21	<0.01	<0.01
Delivery location: garden/terrace	0.09	0.44	0.21
Human interaction: telephone	-0.02	0.78	<0.01
Self-driving van	-1.72	<0.01	<0.01
Delivery robot	-1.94	<0.01	<0.01
Delivery drone	-2.10	<0.01	<0.01

Participants were also asked to provide the reasons for their choice, after the first choice situation. The question was open ended. We coded all the answers. Table 137 shows the results. The stars identify the reasons that correspond to attributes of the choice experiment. The main reason to choose the conventional van was human interaction (20%), followed by safety, trust, and familiarity. The main reason to choose the self-driving van was convenience (15%), followed by time from order to delivery, safety, and cost. For the delivery robot, the main reasons were cost (31%), time from order to delivery, and technology adoption. For drones, the main reasons were time from order to delivery (29%), cost, delivery problems, technology adoption, and delivery adoption.

Overall, attributes of the experiment such as cost, delivery problems, time from order to delivery, and delivery location, were more important in the choice of the self-driving options. Human interaction was more important in the choice of the conventional van. The other attribute (delivery time window) was seldom given as a reason, which is consistent with the results of the model, as this attribute was insignificant.

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Table 137. Reasons for choices (%)

	Conventional van	Self-driving van	Delivery robot	Delivery drone
Human interaction*	20%	5%	0%	0%
Safety	12%	12%	2%	5%
Trust	12%	7%	0%	0%
Familiarity	11%	1%	0%	0%
Cost*	7%	11%	31%	21%
Support employment	7%	0%	0%	0%
Reliability	6%	3%	0%	3%
Delivery problems*	5%	5%	1%	15%
Convenience	5%	15%	9%	7%
Time from order to delivery*	4%	14%	24%	29%
Delivery location*	1%	7%	2%	10%
Delivery time window*	1%	0%	3%	1%
Efficiency	1%	4%	1%	4%
Interest in technology	0%	4%	15%	12%
Other	21%	26%	25%	15%
Number of answers	**354**	**74**	**88**	**73**

Note: Some respondents provided two or three reasons in their answers, so the proportions can add to more than 100%. *: attributes of the choice experiment.

6.5.3 Willingness to pay

Table 10 shows willingness to pay for various delivery service attributes. The table does not show willingness to pay for changes in attributes that were insignificant in the model. Willingness to pay values were estimated for each participant as the ratio between the coefficients of each attribute and the coefficient of cost. We then took the median of the participants' willingness to pay values.

The table shows that median consumer is willing to pay £0.22 for reducing delivery time by one day, £0.17 to reduce the chance of delivery problems by 1%, and £0.94 to have deliveries made directly to their front door, instead of walking up to 3 minutes.

The willingness to pay for deliveries made with self-driving vehicles is negative. This means that consumers will only use delivery methods if they are cheaper than deliveries with a conventional van. In other words, the values are willingness to accept deliveries by self-driving vehicle, not willingness to pay. The median consumer is willing to accept deliveries by self-driving vans, delivery robots, and delivery drones if they are £8.16, £8.65, and £9.96 cheaper than deliveries by conventional van.

Table 138. Willingness to pay (£)

Delivery time: 1 day less	0.22
Chance of delivery problem: 1% less	0.17
Delivery location: Front door (vs walk to vehicle up to 3 mins)	0.94
Vehicle: Conventional van (vs. self-driving van)	8.16
Vehicle: Conventional van (vs. Delivery robot)	8.65
Vehicle: Conventional van (vs. Delivery drone)	9.96

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6.6 Road user attitudes towards self-driving delivery vehicles

This section analyses road users' attitudes towards self-driving delivery vehicles. Figure 226 shows the results for self-driving vans. The degree of comfort is similar for situations involving cars and pedestrians, with 31% feeling comfortable or somewhat comfortable and 37% feeling uncomfortable. Surprisingly, there is slightly less discomfort when the situation involves cyclists.

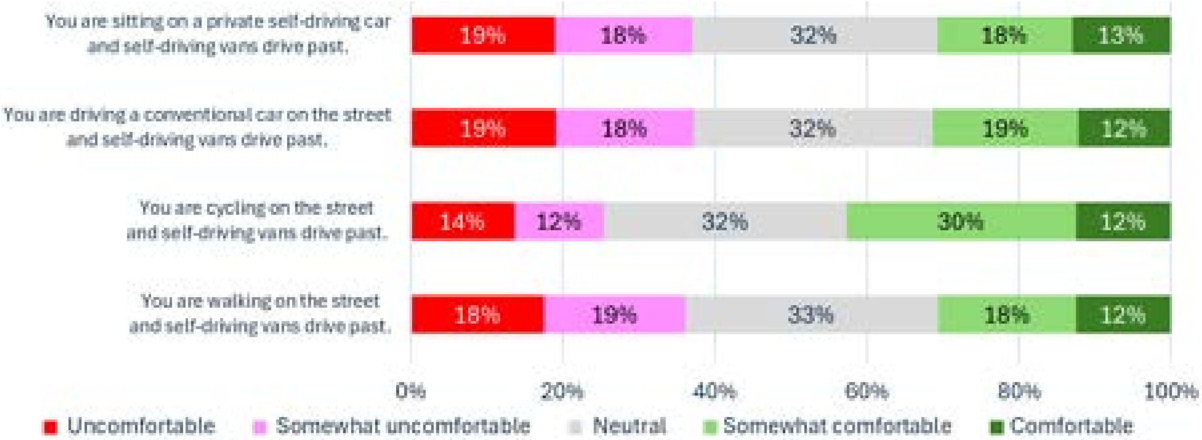

Figure 226: Road user attitudes towards self-driving vans

Figure 227 shows the results for delivery robots, which mirror closely the ones obtained for self-driving vans. The situations generate the same distribution of opinions as the ones in the case of self-driving vans. In addition, situations involving cycling again generate less discomfort.

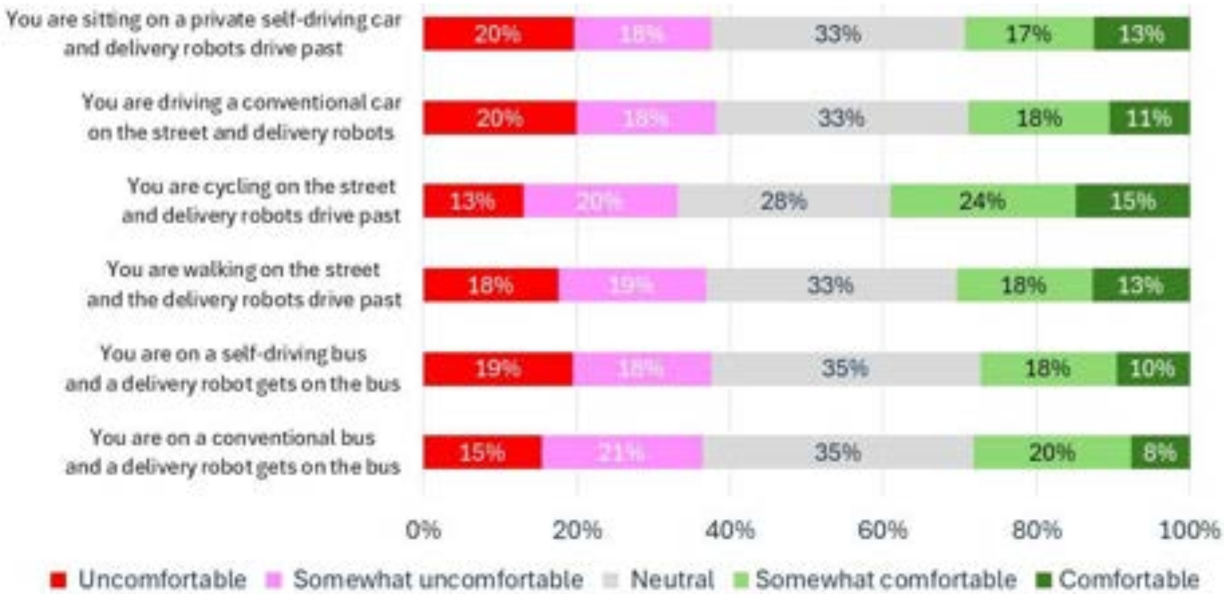

Figure 227: Road user attitudes towards delivery robots

Figure 9 shows the results for drones. The situation shown generates the same distribution of opinions as the other vehicles.

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Figure 228: Road user attitudes towards drones

Figure 10 shows participants' general concerns about self-driving delivery vehicles, from the point of view of road users. The four situations have similar distributions, in terms of concerns. The sample is fairly equally distributed, with the proportions of participants concerned with the situations being almost the same as the proportions of those not concerned.

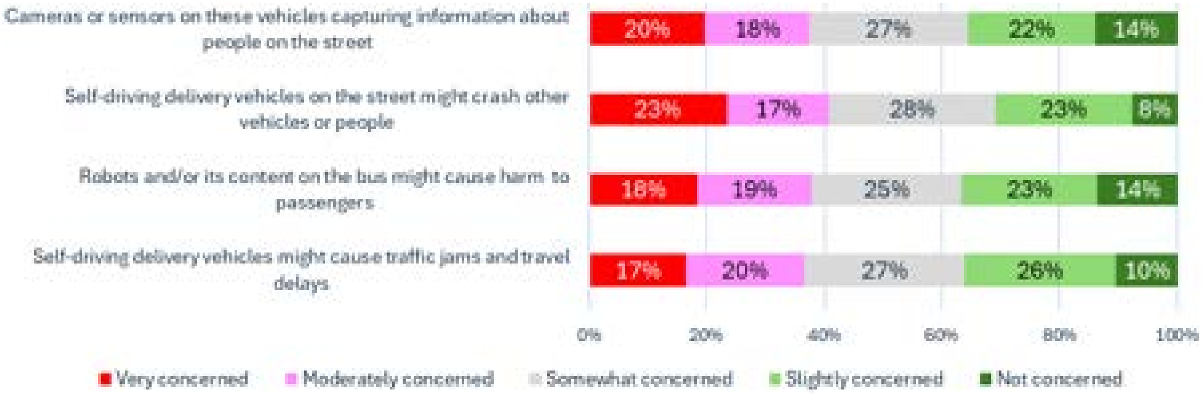

Figure 229: Road user general concerns about self-driving delivery vehicles

6.7 Impact of self-driving delivery vehicles

Figure 230 shows the results regarding the potential impact of self-driving vehicles on people's lives. 35-43% of participants reported neutral impacts. The impacts more likely to happen are working more from home (33% of participants somewhat or strongly agreed with this) and having more spare time (32%), followed by more stress (30%). The impacts less likely to happen are those involving social interaction: meeting more people in person (24%), taking more public transport (26%), and going out for shopping more often (24%).

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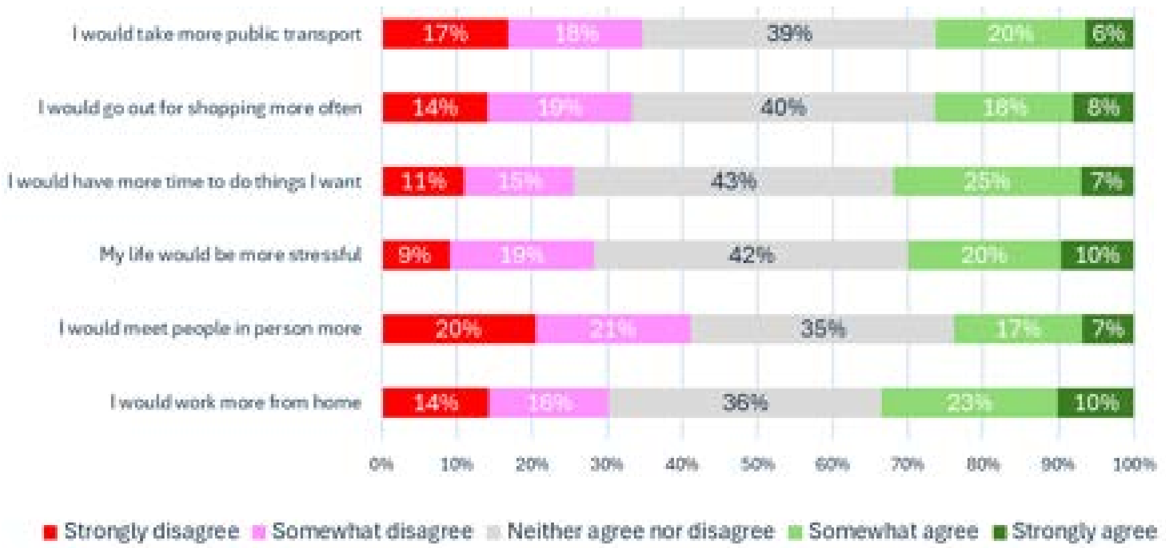

Figure 230: Impacts of self-driving delivery vehicles on people's lives

6.8 Conclusions

This survey analysed attitudes, preferences, and willingness to pay of citizens in the UK towards self-driving delivery vehicles, focusing on self-driving vans, delivery robots, and delivery drones. It also looked at the potential impact of these vehicles on people's lives. The main conclusions are as follows:

- Citizens in the UK prefer conventional vans to self-driving freight vehicles, after accounting for differences in cost, time, and other delivery characteristics. This preference increases with age
- They would only use self-driving freight vehicles if they were cheaper or faster
- Some people are concerned with the reliability of these vehicles in face of unexpected situations or security issues
- Others think deliveries with self-driving vehicles can be faster, reliable (in terms of punctuality), and convenient
- Road users have a variety of concerns about sharing roads with self-driving vehicles

Overall, the results of the survey show that while there is interest towards deliveries made with self-driving vehicles, conventional vans remain the preferred choice, as citizens are familiar with them and value human interaction. The adoption of self-driving vehicles will depend on finding an alternative for the loss of human interaction as well as addressing consumer concerns related to reliability and trust. Measures to protect other road users are also needed.

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7. Conclusions of Part 1 – Impact on citizens

Part 1 of the deliverable analysed the impact of self-driving passenger and freight vehicles on citizens. A variety of data types was collected, in activities involving citizens in eight countries in Europe. This included qualitative assessments using focus groups (Chapter 2), a demonstration of self-driving vehicles (Chapter 3), virtual reality experiments (Chapter 4), a pan-European survey (Chapter 5), and a survey in the United Kingdom on self-driving freight vehicles (Chapter 6). This final chapter of Part 1 compares the main conclusions from these activities, using the same eight-impact structure assessed in each of the chapters.

Table 35 shows the results. A common conclusion is that self-driving vehicles can enhance citizens' **mobility**. Some activities concluded that travel will be cheaper, others that travel will be more expensive. Travel will be more comfortable and allow for productive or leisure uses of time. It is likely that the number of trips may increase, especially by private modes. Shopping trips may decrease.

The increase in mobility is likely to increase road traffic levels, although this will not necessarily increase congestion in the **transport network** if vehicles are more reliable in dealing with unexpected events and bottlenecks.

Regarding **land use**, the effect on parking is uncertain. It is possible that authorities invest more in improving public realm, as the view from vehicles will be a possible use of travel time when driving is no longer necessary.

It is likely that the **environment** will improve, as emissions and noise decrease. However, citizens expressed concern in some activities about the implications of relying on electric vehicles, as demand for electricity will increase, and battery disposal may become a problem.

Regarding perceived impacts on the **economy**, citizens were consistent across activities that there will be both job creation and job destruction. There is a high degree of uncertainty on whether the net effect is positive or negative. Some activities also concluded that productivity could increase because travel time will be more reliable (so employees can arrive on time to work or business appointments), while also allowing for working while travelling. There is also a concern about customer resistance to new solutions, especially the ones relying on self-driving freight delivery vehicles. These freight solutions may also be vulnerable to new problems such as theft and vulnerability to some weather conditions.

The perceived impacts on **equity** were consistent across all activities that focused on this impact: there was a strong concern about whether self-driving vehicles can meet the needs of people with disabilities. There was also concern about price-related exclusion, although accessibility can increase in areas currently not served by public transport, such as rural or outer suburban areas.

The impacts on **public health** were also consistent: there will be better air quality, but the impact on traveller stress is uncertain: it can increase or decrease.

Again, the perceived impacts on **safety** were consistent: travel will be safer, with fewer collisions, but there was a strong concern about emergencies that the vehicles may not be able to handle.

The strongest concern, however, was **personal security**. This was a conclusion about all the activities: travelling in public transport without a human driver or assistant may create fear of crime and harassment. Freight deliveries by self-driving vehicle are also vulnerable to theft. On

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top of these concerns, vehicles can be hacked, and citizen data can be abused by transport companies or governments, or stolen with malicious intent.

Table 139. Comparison of impacts on self-driving vehicles on citizens

	Qualitative assessment	Demonstration	Virtual reality	Pan-European survey	Freight survey
Mobility	• Can enhance mobility	• Can enhance mobility • Cheaper • Smooth and comfortable • Narrow	• Cheaper • Comfortable • Satisfaction depends on speed, and security • Productive and leisure uses of travel time	• Increase in number of trips • Increase in travel costs	• Fewer shopping trips • Reduced use of public transport
Transport network	• Reduces congestion only if traffic decreases		• Traffic levels can increase.	• Increase in traffic levels	• More traffic conflicts
Land use			• Parking needs may decrease in residential areas • View is important, so possible road aesthetic improvement	• Split opinions on effect on parking	
Environment	• Better air quality only if traffic decreases • Problem of disposal of batteries	• Quiet and environmentally-friendly		• Reduced emissions and noise • Increased demand for electricity	
Economy	• Fear of job losses • More jobs and industries can be created		• Use of travel time to work can increase productivity • Congestion and delays may decrease	• Economic growth, investment, and new skills requirements • Split opinions on net effect on jobs	• Customer resistance to deliveries with self-driving vehicles • Split opinions about reliability of freight delivery
Equity	• Can improve mobility of those with low (spatial) accessibility • Concerns about people with disabilities • Price-related exclusion	• Concerns about people with disabilities	• Concerns about people with disabilities	• Increases accessibility for people with special mobility needs, older people, families with children	

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Public health	• Better air quality only if traffic decreases	• Reduces stress	• May increase stress due to security concerns or congestion	• Split opinions on effect on travel stress • Improved accessibility to healthcare and emergency response	• Split opinions about effect of self-driving vehicles on stress • Fewer social interactions
Safety	• Fewer collisions • Concerns about emergencies • Concerns about weather conditions • Liability issues	• Safe in all situations and for all road users • Concern about emergencies	• Safer	• Traffic fatalities will decrease	• Concern about collisions with other road users
Security	• Concern with passenger and freight security (crime) • Concern about hacking	• Concern with passenger and freight security (crime)	• Concern with passenger security (crime)	• Concern about cyber attacks	• Concern with freight security (damage, theft) • Concern about cyber attacks and data privacy

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PART 2

IMPACT OF SELF-DRIVING VEHICLES ON ORGANISATIONS

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Part 2 - IMPACT OF SELF-DRIVING VEHICLES ON ORGANISATIONS

Part 2 reports the results of analyses of European-based organisations' perceived impacts of passenger and freight transport self-driving vehicles on the organisation and on their regions where they live.

Chapter 8: Qualitative assessment of impact, through discussions and other group activities involving organisations

Chapter 9: Citizens' feedback on a demonstration of a passenger self-driving vehicle in Katowice, Poland

Chapter 10: Detailed case studies, based on in-depth interviews, of the impact of self-driving vehicles on organisations

Chapter 11: Conclusions of the analyses above

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8. Qualitative assessment of impacts - organisations

8.1 Overview

The qualitative impact assessment focused on exploring organisations' perceptions of the potential impacts of self-driving vehicle use cases co-created with citizens and organisations in earlier activities.

In seven regions (all excluding France), participants took part in an online or in-person workshop. In-person workshops were held in the prototypical regions (Helmond, North Aegean Region, Metropolis GZM).

In each region, four use cases were examined in detail, aiming to understand perceptions of impact across the eight MOVE2CCAM domains: mobility; safety; public health; environment; transport network; economy; land use; and equity. Use cases in each region were selected according to relevance, based on the results of earlier activities with these participants.

The specific objectives of the online platform and workshop discussions were to understand:

- How organisations view the potential role of the selected use cases in their everyday lives and under what circumstances they might benefit from these use cases (or not)
- What positive and negative impacts organisations imagine might arise from the proposed use cases and which impacts are most important to them
- How certain they are about the range of impacts discussed, when they think use cases might be rolled out, and where they agree and disagree with one another.

A main output from these sessions has been a set of causal effect diagrams, co-created with organisations and citizens (in separate workshops) for each use case. These diagrams have formed the basis of the causal-loop diagrams used to develop the CCAM impact assessment tool.

This chapter is organised as follows:

- Section 8.2 describes the methods used to assess perceived impacts of use cases across domains
- Section 8.3 describes the sample make-up and characteristics
- Section 8.4 reports the results of the engagement activities
- Section 8.5 draws conclusions

8.2 Methods

8.2.1 Organisations' face-to-face activities

Organisations in the Netherlands, Poland and Greece took part in 2-hour face to face workshops following the format of the citizens' workshops (see section 2.2). While organisations did not complete the online engagement platform citizens took part in (this was determined to be unnecessary due to their existing expertise and lack of time), they received the use cases via email in order to familiarise themselves with them and start forming views on their potential impacts ahead of the workshops.

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8.2.2 Organisations' online activities

Organisations in the UK, Spain, Germany, and Cyprus also took part in 2-hour online workshops following the same structure as face-to-face workshops.

8.2.3 Sample overview

Table 140 shows the sample sizes obtained in the workshops at country level. Table 141 shows sample sizes by type of organisation. A good spread of different types of organisations was achieved across workshops. However, the overall sample size was smaller than initially proposed

Table 140: Qualitative assessment (organisations) – sample sizes by country

All	**87**
United Kingdom	9
Germany	16
Netherlands	15
Spain	16
Poland	10
Greece	8
Cyprus	11

Table 141: Qualitative assessment (organisations) – sample sizes by type oof organisation

Authorities and regulatory bodies	16
Research/Higher Education	15
CCAM partners and NGOs	10
Vehicle developers and manufacturers	7
Deployers/passenger transport operators	6
Transport infrastructure operators	5
Transport/urban planning consultancy	3
AV demonstration sites	2
Food and drink/hospitality	2
Health	1
Telecommunications and cyber	1
TV and radio	1

8.3 Results by use case: passenger-carrying services

8.3.1 Self-driving e-hailing

Table 142: Self-driving e-hailing use case (organisations)

Description	The self-driving e-hailing service is a platform that uses self-driving vehicles to provide on-demand rides to passengers. It allows passengers to go to any location within a 10km radius in the city/area, similar to e-hailing services now but without a driver.
Countries tested	Cyprus, Germany, Greece, Netherlands, Poland, Spain, United Kingdom

The issues of mobility and parking stood out most to organisations in this use case. On the former, participants felt that this technology could improve the mobility and independence of certain groups, such as older and younger people. On parking, some in the UK raised the issue

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of where these vehicles would be stored when not in use, as the added storage (particularly in cities) may negate benefits from reducing congestion, for example.

Safety also stood out as a key issue. Many agreed that this use case would lead to fewer traffic-related accidents, but they were broadly sceptical of how safe this service would be in practice for passengers. Data security was also a concern, and there was debate around whether this use case would lead to increased or decreased congestion on roads (depending on whether self-driving vehicles would replace, or merely add to, private vehicles).

Organisations in Cyprus were keen to point out that those who are digitally excluded may struggle to use this service, and organisations in Spain thought the service could be too expensive for some to use regularly.

Table 143: Self-driving e-hailing use case: results of qualitative assessment (organisations)

Mobility	• Widespread attention was given to the potential benefits in this domain; Greece, Germany, and the Netherlands in particular indicated how this technology could improve the mobility and independence of certain groups, such as older and younger people, particularly in the context of an ageing population. • They felt there was potential for this factor to significantly increase the adoption rate of the use case.
Public health	• Organisations did not explore this theme in depth; most health concerns related to this use case were seen as more closely aligned with the Safety domain. • However, organisations in Spain expressed concerns about the technology potentially reducing active mobility (e.g., walking) among the population, which could have a negative effect on public health in the long term.
Land use	• Parking was a salient topic for organisations across most countries. They discussed the need for new parking strategies to accommodate this technology, as this may lead to fewer private vehicles on the road and less space given over to parking. • Organisations in the UK raised the issue of where these vehicles would be stored when not in use, as the added storage (particularly in cities) may negate any tangible benefit to having them and this would not lead to increased uptake. • German organisations felt the vehicles might encourage more electric charging infrastructure, which may in turn promote uptake of self-driving technology.
Safety	• As among citizens, safety was discussed in detail by organisations in all countries. Many agreed that this use case would lead to fewer traffic-related accidents. • However, they were broadly sceptical of how safe this service would be in practice for its passengers; organisations in the Netherlands, Poland, and UK all discussed the implications of not having a driver present as a buffer between passengers, with Poland suggesting that initiatives such as female-only vehicles may emerge. • Additionally, German organisations raised doubts about the ability of a self-driving vehicle to safely navigate complex traffic situations. Data security was also a large concern, raised especially in Spain and Greece, with the latter advocating for a government department dedicated to self-driving vehicle/citizen safety issues and regulatory laws to prevent the theft or misuse of personal data.
Transport	• Overall, the countries were unsure of the net benefits in this domain • In the UK, Germany, Cyprus and the Netherlands, there were doubts that this

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network	service would improve congestion; some felt it would likely increase if the service does not replace private car use, with harmful effects on the environment. • Organisations in the Netherlands believed that outcomes would likely depend on how often these vehicles were shared or used by individuals. • Meanwhile, Spain was more optimistic that this technology could reduce traffic congestion, though still conceding that this may not apply during peak travel times.
Environment	• Although Environment was not a salient point for organisations overall, they felt that reduced levels of private vehicle ownership could lead to less air pollution – if indeed the service would have this effect on private ownership.
Economy	• There was general agreement that self-driving e-hailing services could generate new jobs, businesses, and stimulate competition with pre-existing ridesharing services. • However, organisations in Greece and Germany expressed concerns that this technology could lead to job losses for those already employed by providing similar services. Spain had similar sentiments but felt that the number of jobs created would offset this figure.
Equity	• Organisations in the UK suggested this service had the potential to be beneficial to low-income families; similarly, some in the Netherlands believed this may supplant the need for a second car. • On the other hand, Greek organisations felt that this service may be expensive from the outset, hindering uptake. Similarly, some groups in the UK and Spain were concerned about the service only being available to affluent people. Cyprus suggested that digitally excluded groups may struggle to benefit from this service.
Timeline	• Organisations across most countries were fairly cautious, expecting rollout to be at around 50% by 2050 (organisations in the Netherlands were particularly so, estimating 35%). For Germany, this was due to concerns around the pace of regulation and social acceptance. • Spain and Poland were more optimistic, with Spain in particular envisioning 90% deployment by 2050, if public trust is present.

8.3.2 Self-driving car

Table 144: Self-driving car use case (organisations)

Description	This car is completely self-driving. The owners can use it to go anywhere at any time, just like a private car today but without the need for a driver.
Countries tested	Greece, Cyprus

Similar to the self-driving e-hailing use case, organisations felt that this use case had benefits for the mobility, public health, and equity. These included increased access for people with disabilities and mobility issues (plus those in rural areas) and lower levels of pollution and stress for drivers.

However, there were questions over whether self-driving cars would lead to increased or decreased congestion, and whether they would be unaffordable to the majority. Cyprus and Greece were divided in their assessments of the economic impacts of this use case, as well as on their predicted timelines for this technology to be rolled out.

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Table 145: Self-driving car: results of qualitative assessment (organisations)

Mobility	• Organisations in both countries felt that this use case would significantly help those with mobility issues and health problems. However, despite this positive, those in Cyprus felt it would also lead to an increase in traffic congestion.
Public health	• There was agreement across both countries that public health could benefit from a reduction in both road accidents and air pollution, assuming that the self-driving vehicles are electric, and that self-driving technology will reduce human error. • Organisations in Cyprus in particular felt that self-driving vehicles could lower the number of traffic-related accidents, while those in Greece were more sceptical, but ultimately did not think this would prevent uptake of self-driving vehicles. • Organisations in both countries mentioned that not having to drive would lead to a reduction in stress, and therefore better quality of life, for many people. They also thought that lower levels of noise pollution would have positive impacts on quality of life.
Land use	• Although not a prominent area of discussion, there was consensus that self-driving technology could lead to fewer available parking spaces. However, this was connected to the potentially positive impact of increased green space. • On a separate note, Greece felt that the upgrade in infrastructure needed to roll out self-driving vehicles presented an opportunity to improve infrastructure for bicycles at the same time.
Safety	• Safety was a salient issue for organisations in both countries, specifically the reduction in traffic-related accidents, directly connected to the lack of human control (though for Greece, this was predicated upon speed limiters and well-connected GPS). Both countries expressed concern for the handling of personal data due to worries about unauthorised use.
Transport network	• Transport network efficiency was not discussed in detail by organisations. However, those in Cyprus raised the possibility of lowered demand for public transport, seeing this as a negative, while organisations in Greece felt that self-driving vehicles would have no effect on public transport in this way.
Environment	• Organisations highlighted the potential for reduced noise pollution in this use case, which they directly connected to a better quality of life for citizens (see Public health). • Both Greece and Cyprus claimed this would lead to positive perceptions of self-driving vehicles, encouraging their uptake.
Economy	• Organisations in Cyprus were more optimistic towards the economic impacts of this use case, citing increased productivity, likely stemming from the infrastructure and jobs created to support the technology. • Organisations in Greece, meanwhile, were less convinced of the economic benefits; while agreeing that the use case would create new industry needs and therefore more jobs, they also felt that the economy would experience 'growing pains' associated with self-driving vehicle uptake and the required infrastructure upgrades.
Equity	• Organisations from both countries were concerned that not everyone would be able to afford these vehicles. Greece felt they could fill gaps in transport provision for those with disabilities, provided funding was made available to support vulnerable groups to use them. In Cyprus, organisations felt they would lead to greater levels of connectivity for citizens n rural areas.
Timeline	• Greek organisations felt that by 2050 penetration would be at around 30-35%. Organisations in Cyprus provided a lower rate, estimating 10-35%, on the basis that Cypriots are culturally less inclined to stop driving.

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8.3.3 Emergency shuttle pod

Table 146: Emergency shuttle pod use case (organisations)

Description	The Emergency shuttle pod is a dedicated service that is able to pick people up in medical emergencies and take them to the nearest hospital. It is a bit like an ambulance but with no driver or medical professional on board.
Countries tested	Germany, Poland

Polish organisations felt that faster emergency response times and support for existing ambulance services would be the key benefits of this use case. However, there were concerns about Equity; organisations felt that without a driver, some vulnerable passengers would not be able to use the service, and all users would be helpless in the case of vehicle breakdown. Organisations also felt that if this were a private service, it would increase inequality of accessing medical care at a hospital.

Table 147: Emergency shuttle pod: results of qualitative assessment (organisations)

Mobility	• Organisations saw this service as sitting alongside the existing ambulance service, as it would not be suitable for all people and situations. There was some concern about who would have priority use of the emergency shuttle pods, potentially from the assumption among Polish organisations that this would be a private service rather than a public one. (See also Equity)
Public health	• Polish organisations saw clear positive impacts to public health from this use case, such as the ability to treat injuries and provide non-emergency medical transport. • They felt that medical professionals should still be present to provide on-site care for severe injuries such as heart attacks and strokes; they also pointed out that uptake will rely upon this technology performing at the highest possible level to build the required trust. • In Germany, there was an expectation that this use case was more suited to minor injuries and non-emergencies, but could make a difference, provided public trust was present.
Land use	• Organisations felt that the pods could improve land use by reducing the need for parking spaces overall and increasing parking access at the hospital as there would be a reduced need for private vehicles. • However, they also suggested there would need to be an update to infrastructure in order to avoid congestion around hospitals. (See also Transport network).
Safety	• Organisations in Poland raised doubts about the ability to repair faults that occur in the course of attending/providing care. • As among citizens, there were concerns about privacy if the location of the pods were to be shared, as well as the possibility of losing control of personal data. In Germany, organisations added privacy concerns related to the shared use of pods. • There was also concern for passenger safety if the pod were to lose data connection.
Transport network	• Organisations cited faster emergency responses as a positive impact of this use case and suggested that the pod could also work as a highway support vehicle to take people away from dangerous roadside environments. • However, they were concerned that if self-driving vehicles were privatised then they could add to congestion around hospitals (see also Equity).
Environment	• Organisations in Poland felt that there was potential for this use case to reduce

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	air and noise pollution.
Economy	• Organisations in Poland agreed that this use case could lead to the emergence of new professions, such as service technicians and programmers, however they felt that this would be difficult to predict.
Equity	• Polish organisations raised concerns that without a driver or other onboard assistance, some vulnerable passengers would not be able to use the service, as they might need physical assistance. They also felt that if this was a private service, it would increase inequality of accessing medical care at a hospital.
Timeline	• Polish organisations were not specific on their penetration estimates, though there was optimism that this technology would be taken up quickly. • In Germany, deployment expectations varied, with some participants optimistic about near-term use in specific scenarios (minor injuries, patient transport) and others cautious due to safety, regulatory, and technological challenges.

8.3.4 Mobility bus on demand

Table 148: Mobility bus on demand use case (organisations)

Description	This vehicle will transport passengers to their destination with onboarding and security features that will ensure a controlled ride for everyone.
Countries tested	Netherlands

Organisations felt that a mobility bus on demand would only lead to significant improvements in domains including mobility and public health if the service was truly integrated with other services and accessible to anyone. Many questions remained as to how this would be better than existing services.

Table 149: Mobility bus on demand: results of qualitative assessment (organisations)

Mobility	• Organisations did not highlight any added mobility benefits beyond existing services.
Public health	• Organisations in the Netherlands focussed on the issue particulate matter from tyres, which they felt would still be a problem (especially when brakes will be used more often due to the strict safety measures taken for autonomous vehicles to prevent accidents). • Vehicles will also be heavier, which will further increase the wear of the tyres, resulting in further pollution.
Land use	• There were questions over how this service would interact with emergency services and whether it would be able to clear the road for them, especially during boarding and alighting from the vehicle. • If the trend towards mobility services on demand continues, it may mean less road space is needed overall, leading to a better and safer environment for people with a disability.
Safety	• There was an expectation that more accidents may happen as a result of this service and that attention was needed to safety on the pavements and bicycle lanes.
Transport network	• Organisations felt that efficiency can only be reached by if the process is optimised, which will depend on the time needed to board and alight the vehicle, which is further dependent on the user. • They argued that there must be a focus on consolidation with other users: mobility should be available to anyone, specifying a use case for one user group only would not use the potential of the vehicle as much as possible. They suggested having several variants of size and usage of these kind of vehicles.
Environment	• Environmental benefits may be undermined by particulate matter from tyres.

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Economy	• Organisations considered that self-driving technology might decrease the number of motor vehicle accidents and the severity of these accidents. If this happens, they will also expect a reduction in the associated costs of healthcare and emergency services.
Equity	• Beneficial equity outcomes will depend on whether the service is accessible to all and whether all have trust in it.
Timeline	• Most can see a 50% penetration rate by 2050.

8.3.5 Self-driving bus service

Table 150: Self-driving bus service use case (organisations)

Description	This self-driving bus service provides passengers with connection between local towns and villages at specific times from designated spots, much like a regular bus service but without a driver.
Countries tested	Netherlands, Spain, United Kingdom

The necessary updates to infrastructure were a key topic of discussion in relation to economy across all countries, with organisations feeling that that this use case would require significant investment in this area.

Organisations were more divided in their assessment of this use case's environmental impact. Some in Spain thought it would lead to lowered emissions and greater fuel efficiency, while particulate matter from tyre wear was a concern for others in the Netherlands. Meanwhile, organisations in the UK felt that a large fleet would be required to service peak times, increasing both congestion and pollution which would limit uptake of these self-driving vehicles.

The organisations of each country were also split on their expected timelines for this use case, with those in the UK anticipating a much quicker rollout than those in the Netherlands.

Table 151: Self-driving bus service: results of qualitative assessment (organisations)

Mobility	• This domain was not discussed in detail by the organisation's groups. This suggests that, from an organisational perspective, there may not be any perceived benefits to mobility that do not already exist with current bus services, for example such as increased mobility for those who do not or cannot drive.
Public health	• Organisations in the UK identified the potential for better air quality in this use case, as a result of reduced fossil fuel use. They also felt that if the service was popular, it could provide an opportunity for increased mental health, through increased interactions for lonely or vulnerable people using the service. Meanwhile, organisations in the Netherlands had concerns that the service might replace journeys made by active transport (i.e. walking and cycling), and that this could in turn negatively impact public health.
Land use	• Some organisations felt that this use case had the potential to reduce private vehicle use, leading to secondary benefits to land use, such as more green space and less congestion. However, UK groups were more sceptical that public self-driving vehicles would have much of an impact on land use.
Safety	• Many organisations felt that this service would reduce the number of traffic-related accidents through reduced human error, though some in the Netherlands were more sceptical of this. Organisations in the UK felt that if a negative incident became highly publicised, this could be disruptive for rollout.
Transport network	• Organisations in the UK and the Netherlands felt that this service needs to work within and alongside current transport infrastructure. For the UK, this was seen as a way of reducing wastage of the current fleet.

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Environment	• Organisations were more diverse in their opinions of the environmental impacts of this service. Those in Spain were more optimistic that this service would lead to lowered emissions and greater fuel efficiency, which would positively impact the environment. However, the Netherlands felt that particulate matter from tyre wear would be a concern. Organisations in the UK, on the other hand, felt that a large fleet would be required to service peak times, increasing both congestion and pollution which would limit uptake of these self-driving vehicles. There was also concern that the fleet would need regular updates, in which case disposal would need to be considered carefully.
Economy	• Similar to concerns around transport network efficiency, organisations across countries felt that this use case would require significant investments to infrastructure. However, organisations in the UK saw this as a way for Government to demonstrate commitment to the technology, building trust and encouraging uptake. The groups felt that the creation and loss of jobs would ultimately balance out, as people move from one type of career to another. Organisations in Spain were less concerned about the loss of driving jobs as culturally, there is little interest in those roles, particularly among young people. Additionally, organisations present this as an opportunity to get people into less dangerous and healthier jobs.
Equity	• Organisations across countries saw potential for this service to support accessibility of vulnerable groups such as the elderly, if the necessary provisions were made (see also Mobility). However, organisations in every country were unsure to what extent this service could include those who are digitally excluded or at risk (such as women travelling alone at night) due to the lack of safety and support from a driver.
Timeline	• Organisations across countries were split in their estimates. The Netherlands felt that diffusion will stand anywhere between 25% and 80% by 2050; meanwhile, the UK believed that by 2035, every town will have a flagship autonomous fleet. • Spanish organisations were mixed in their estimates but believed that there would need to be a transitionary period (where both self-driving and traditional buses are in operation), as well as new regulations implemented, before full take-up of this use case.

8.4 Results by use case: freight services

8.4.1 Consolidated delivery bot

Table 152: Consolidated delivery bot use case (organisations)

Description	A consolidated delivery bot transports packages like products or food items from several companies to people in their homes, much like a private courier service, e.g., DPD Courier.
Countries tested	Cyprus, Germany, Greece, Netherlands, Poland, Spain, United Kingdom

Organisations across countries expressed doubts that this technology would work with their current infrastructure; most believed that significant investments would be needed for only marginal improvements to transport network efficiency under this use case. As such, organisations felt that, in the short term at least, penetration of this technology would remain low.

In terms of safety, data privacy was an area of debate among organisations in Greece, who expressed concern about the potential misuse of personal data. Other concerns from organisations in general related to pedestrians having to share pavements with bots (leading to

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accidents), loss of jobs for couriers, and the reduction in face-to-face social interaction that citizens would have if couriers were replaced by bots.

Organisations in Spain were particularly positive about this use case's potential to reduce the number of delivery vans in cities, which they feel are currently causing traffic jams. They were also more likely to think that the bots would be secure against theft of goods.

Table 153: Consolidated delivery bot: results of qualitative assessment (organisations)

Mobility	• Organisations across countries were sceptical about positive impacts to mobility in this use case. Generally, they felt that consolidated delivery bots would increase congestion on the pavements where pedestrians walk, leading to negative perceptions of them and limiting their uptake.
Public health	• Some mentioned that this use case could benefit those in isolated and rural locations by bringing deliveries such as medical supplies straight to them (see also Equity). Organisations in Poland and Cyprus were concerned about the impact of getting rid of human couriers on social isolation. (Also see Safety for insight about accidents)
Land use	• Organisations across countries expressed doubts that this technology would work with their current infrastructure. Pavements are felt to be too narrow and heavily used by pedestrians to accommodate this use case and, according to organisations in Poland in particular, significant investments would be needed to sufficiently upgrade current pavements. Meanwhile organisations in Spain and the Netherlands were unsure of how this technology would navigate European cities which have old and narrow streets.
Safety	• Organisations showed variation across countries on the extent to which safety would be impacted. Most were concerned about theft of goods from the bot, however organisations in Spain in particular were more optimistic that bots would be very secure. For organisations in Greece, the most important aspect of safety was to protect personal data from being stolen. Sharing pavements with bots was a concern for organisations in Cyprus and the Netherlands in particular, who felt this could lead to accidents involving pedestrians and children, negatively affecting public acceptance of this technology.
Transport network	• Organisations felt that significant investments would be needed for only marginal improvements to transport network efficiency, because of the limited space and infrastructure in many European cities. However, many also felt that the consolidation of deliveries could work to limit traffic congestion, which Spain in particular felt was a significant problem currently facing their urban areas.
Environment	• Organisations had differing opinions about the potential for noise pollution in this use case. In Spain, for example, organisations felt that this technology would increase noise pollution, as it would need some sort of siren to alert people to its presence, while in Greece they felt it would be quieter than what is currently used.
Economy	• Organisations across all countries thought that this use case might lower transport costs, leading to savings for consumers and profits for businesses. However, all felt this would lead to job losses for couriers and delivery companies which might negatively impact the perception self-driving vehicles. However, organisations in Spain felt new opportunities may be created in the process.
Equity	• Some organisations were positive about accessibility, believing the bot could improve access for people in rural, isolated locations, but only if they are able to navigate terrain better than traditional delivery vans. However, organisations in the Netherlands in particular were more sceptical about improved accessibility, given that the deliveries are not brought directly to the recipient's door as opposed to deliveries by hand – thereby making this use case even less equitable for those with mobility impairments.

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Timeline	• Organisations felt that, in the short term, penetration of this technology would remain low. Poland in particular did not expect this use case to be adopted at all due to infrastructure restrictions. However, in the long term, most organisations felt similar to citizens with penetration predicted to be over 50% by 2050. Spain and Cyprus predicted 80-100% penetration by 2050.

8.4.2 Single supplier delivery bot

Table 154: Single-supplier delivery bot use case (organisations)

Description	The single supplier delivery service replaces a retailer's previous fleet of delivery vans and drivers. Depending on the retailer, the delivery service can operate nationwide.
Countries tested	Greece

Organisations did see the potential for several benefits from this use case (in theory), such as reduced congestion on roads, lower frequency of road accidents, shorter delivery times, and reduced air pollution.

However, as with the consolidated delivery bot (See 2.4.1), they felt that current infrastructure is not suitable for this technology to be rolled out in the short term, and that considerable investment to local infrastructure would need to be made for this use case to be successful. Here, organisations also pointed out that the high upfront cost associated with getting the infrastructure ready would likely increase the cost of the service to customers, possibly inhibiting uptake.

Table 155: Single-supplier delivery bot: results of qualitative assessment (organisations)

Mobility	• Organisations felt this use case could reduce **road** congestion and therefore support better mobility, increasing positive perceptions of self-driving vehicles. However, they foresaw needing control centres to support facilitation of this. They also felt that the use case could reduce delivery times for packages.
Public health	• Organisations agreed that autonomous vehicles being electric could have a positive effect on public health from reduced air pollution, and that advanced traffic management from self-driving technology could also support this goal through more efficient driving. They also felt that there would be a reduction in road accidents caused by human error. However, they felt there could be an increased likelihood of accidents for pedestrians with the increased pavement congestion (see also Safety).
Land use	• Organisations were concerned that current infrastructure is unsuitable, with congested roads and narrow pavements leading to accidents and low trust in the bots. In order to make this technology feasible, participants felt that considerable investment to local infrastructure would need to be made.
Safety	• Organisations expressed concern about the handling of personal data and its potential misuse. They also felt that the bots would need a camera to help prevent accidents and citizens would need training in how to handle the bots.
Transport network	• Organisations felt this use case would increase the amount of traffic on pavements, leaving less room for pedestrians, and felt that new regulations and laws would be needed to govern where they can go.
Environment	• Some organisations felt there was potential for the bots to reduce the number of traditional delivery vehicles on the road. This would reduce fuel used – and therefore emissions created – by traditional delivery vehicles, resulting in positive perceptions of self-driving vehicles. Some thoughts bots would also lead to a reduction in noise and air pollution.
Economy	• Organisations pointed out that the high cost associated with getting the infrastructure ready would increase the cost of the service to customers,

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	possibly inhibiting uptake.
Equity	• Like citizens, organisations were unsure about whether this use case would increase access for people who have limited digital capabilities. They also wondered whether bots might struggle to navigate rural areas, due to lack of connectivity and uneven terrain.
Timeline	• All organisations felt there would be very limited uptake in the near future but were more varied in their estimates for 2050. Most settled on 30%, while others were more optimistic with figures between 65% and 70%.

8.4.3 Medical delivery drone

Table 156: Medical delivery drone use case (organisations)

Description	Self-driving delivery drones designed to transport medicines and healthcare products to people with reduced mobility.
Countries tested	Poland, Spain

Polish and Spanish organisations could see positive impacts in public health with the potential for increased medical access, particularly in rural areas and for people with limited mobility.

However, both countries had concerns regarding economy, as they foresaw a need for substantial training in the operation of drones, and did not envision a large positive impact on jobs due to the assumption that the manufacture would be overseas. They were also worried about the impact of any incidents on the uptake of the use case, potentially negatively impacting businesses.

When discussing the transport network, there was uncertainty as to whether this use case would lower traffic congestion. Spanish organisations were sceptical, whereas Polish organisations felt that the use case would need considerable infrastructure development such as distribution centres for the use case to meet coverage demands.

Table 157: Medical delivery drone use case: results of qualitative assessment (organisations)

Mobility	• Organisations in Poland saw the potential for night-time deliveries as a positive but were unsure of how the use case would work in bad weather. They also felt that the service could be quite inefficient if each drone was limited to one delivery at a time. Meanwhile, organisations in Spain felt that the use case could improve accessibility to medicines in rural areas but did not believe it would reduce congestion overall (see also Transport Network).
Public health	• Organisations in both Spain and Poland agreed that access to medicine and treatment would be improved as a result of this service, particularly for groups with limited mobility or who live in remote areas. Polish participants suggested that the delivery of medicine would be faster and will show people first-hand the benefits of self-driving vehicles, increasing their acceptability and therefore their uptake (see also Equity).
Land use	• In Spain, organisations thought that this use case could make use of existing infrastructure and that they would lead to less road use. Polish organisations agreed but foresaw a need for new infrastructure, such as vertiports, and were concerned about where these might be located.
Safety	• Organisations in both countries raised concerns about the potential theft of medication from the drones, and organisations in Poland shared citizen concerns about accidents and data security.
Transport network	• Polish organisations agreed that this use case had the potential to reduce road congestion, assuming a distribution network that could meet demand and reach

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	remote areas. Organisations in Spain, on the other hand, did not feel the use case would have much of an effect on road congestion but did think it could make for a more reliable service than what is currently available.
Environment	• Organisations in Poland were concerned about a potential harmful impact on birds but saw the potential of less air pollution as a positive. Spanish organisations were concerned about greater levels of noise and visual pollution.
Economy	• Organisations in both countries were less optimistic about economic impacts. • Spanish organisations assumed the drones would be manufactured overseas, thereby limiting the domestic impact, and agreed that any new jobs would need to be accompanied by the necessary training opportunities. • Organisations in Spain also felt that this service would be unnecessary if replacing delivery vans in rural areas altogether, since people in rural areas have alternatives that work, including going to the pharmacy by car, asking for support from family, or using pharmacies which use vans to distribute medicines. They thought that most economic benefits of this use case would come from a collaborative approach where both vans and drones are used • Polish organisations were concerned that any incidents involving the drones would result in economic losses for businesses through public distrust – however they were optimistic about the potential for new services, investment, and jobs.
Equity	• While organisations in both countries acknowledged increased access for some, such as those in rural areas, they felt that others, particularly users with limited digital capability, would struggle to benefit from this service.
Timeline	• Organisations in both countries were unsure of exact timelines but did not appear convinced that this technology would have any meaningful diffusion before 2040 or 2050, because of legal restrictions and a perceived lack of economic incentive.

8.4.4 Long-distance truck

Table 158: Long-distance truck use case (organisations)

Description	This long-distance truck transports goods efficiently and safely, eliminating the need for drivers. The truck navigates routes, delivers cargo, and optimises supply chains, ensuring timely and reliable freight transportation.
Countries tested	Germany, United Kingdom

Organisations had a broadly positive outlook about this use case. Those in the UK, in particular, were optimistic that any safety issues would be rectified before the technology was rolled out and that they would therefore be safer than traditional driven trucks. Under Land use, both countries' organisations shared optimism that space could be reclaimed from current rest stops and parking spaces. They also felt that transport network efficiency stands to improve with fully automated vehicles, as traffic flow could be controlled remotely to maximise efficiency.

There were however some concerns, for example around unsupervised dangerous cargo, cybersecurity, noise pollution and particulate pollution from tyres. Organisations also felt that improvements to infrastructure, such as dedicated motorway lanes, would need to be made to support the rollout of this use case, with high associated costs. Therefore, their estimations for the timelines were cautious overall – a maximum of 50% rollout by 2050.

Table 159: Long-distance truck: results of qualitative assessment (organisations)

Mobility	• For UK organisations, the possibility of introducing truck-only driving corridors felt like an opportunity for controlled traffic; they thought this would improve perceptions of autonomous vehicles amongst other road users if lorries safely occupied their own lanes.

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	• German organisations also saw opportunities for increased traffic control if lorries could be contained in one lane but were concerned that this use case would lead to more lorries overall.
Public health	• UK organisations felt confident that this technology would not be deployed unless its safety was certain, so this was not a concerning domain for them. German organisations however did have reservations about the management of dangerous cargo but, much like citizens, they recognised the opportunities for better air quality leading to better public health.
Land use	• Both German and UK organisations shared optimism that space could be reclaimed from rest stops and parking seeing the impact of this being new development or a return to nature, positively impacting the environment (see also Environment). UK organisations also felt there would be a need for central hubs or distribution centres to manage capacity (see also Transport network).
Safety	• UK organisations were more optimistic about safety as they did not believe that this technology would be introduced if safety was not guaranteed. However, they acknowledged that public perceptions might be different and could negatively impact uptake. They also had some concerns about unsupervised dangerous cargo, as well as cybersecurity, but again they felt confident that there would be systems in place to address this. German organisations also shared concerns about unsupervised cargo as well as risks of theft and connection issues, but they were less optimistic about these issues being resolved before the technology is used, leading to low trust in the use case.
Transport network	• Both UK and German organisations felt that transport network efficiency stands to improve with fully automated vehicles, as traffic flow could be controlled remotely to maximise efficiency. Additionally, lorries could travel across the country in dedicated lanes without needing to stop, with reduced human error, vastly improving delivery times and allowing for more accurate estimates. However, they acknowledged the upshot of a network operating at peak capacity all the time could cause stress to people and infrastructure. Although there was some debate in Germany about the potential for increased traffic, the perception would be a decrease due to deliveries being done 24/7 so journeys can be distributed across the day.
Environment	• UK organisations raised concerns about environmental impacts, mentioning noise pollution and particulate pollution from tyres. They felt this could be offset with distribution centres and hubs, limiting heavy goods vehicles and the impact of pollution in urban areas. They agreed that the driverless vehicles in this use case should be more efficient, since they are powered from hydrogen, using less energy for the same level of productivity. • German organisations largely agreed that self-driving trucks could lead to reduced traffic congestion, as well as lower emissions, and better fuel efficiency due to being hydrogen powered. Some also mentioned reduced littering from truck drivers. All of these benefits were felt to contribute positively to environmental sustainability.
Economy	• Organisations in the UK were less concerned about job losses as a result of this technology being introduced, as the UK is currently experiencing a driver shortage. Furthermore, they saw new job creation in the facilitation of this technology such as distribution centres. German organisations agreed there could be potential job losses for drivers, which could have significant economic implications. However, they saw potential for optimising supply chains through automation, for example no rest periods for drivers would be necessary. There were however concerns about the initial high costs of implementing self-driving technology, such as creating dedicated lanes on motorways.
Equity	• German organisations agreed with German citizens, who were worried about impacts to smaller businesses that may be priced out of using this technology. UK organisations felt that this technology could make the delivery process

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	easier and cheaper, therefore making some goods more accessible for consumers. Additionally, the possibility of remote driving may open up job opportunities for disabled employees or those with limited mobility.
Timeline	• UK organisations were more conservative on their estimations, predicting up to 40% diffusion of this technology by 2050. German organisations were also conservative, predicting 0 to 10% deployment by 2025, 20 to 35% by 2035 and 50% by 2050. This was mostly due to a perceived lack of infrastructure available to support the rollout of these vehicles.

8.4.5 Delivery drone

Table 160: Delivery drone use case (organisations)

Description	The drone will pick up your package and navigate on its own, delivering it to a specified location within its area of coverage. It operates on-demand, and will transport products, goods, or food items.
Countries tested	Cyprus

Cypriot organisations could see the potential for this use case to decrease the number of large delivery vehicles on the road, and provide benefits associated with that (e.g., reduced congestion and accidents on roads, reduced air pollution, increased space in urban areas). However, they also felt that these benefits might be offset by accidents caused by drone malfunctions in the sky, as well as more noise and visual pollution from an increase in low air traffic.

Further concerns raised were consistent with other use cases tested, namely: environmental harm from EV battery manufacturing; risks to businesses if the technology were to malfunction and/or lose public trust; lack of human support compared to traditional delivery services, potentially excluding vulnerable groups.

Table 161: Delivery drone: results of qualitative assessment (organisations)

Mobility	• Organisations felt that this use case would decrease the number of large delivery vehicles on the road, and their associated trips, thereby reducing congestion and increasing positive perceptions of self-driving vehicles.
Public health	• Organisations felt that delivery drones could reduce the number of traffic-related accidents as a result of fewer large vehicles on the road (see also Safety). They felt the drones had the potential to increase access to goods such as medical supplies, particularly in harder-to-reach areas, leading to positive perceptions of self-driving technology. However, others felt that delivery drones could generate a higher level of noise pollution – as well as causing accidents by colliding with objects and people on the ground – leading to a negative effect on public health and perceptions of self-driving vehicles.
Land use	• Consistent with citizens, organisations felt that decreased road congestion could have a positive effect on the amount of land given over to green space, particularly in urban areas.
Safety	• Organisations shared the perception that the reduced congestion brought about by this use case could lead to fewer accidents on roads. Malfunctioning technology was a central concern due to perceived high levels of distrust from citizens toward self-driving vehicles in Cyprus.
Transport network	• For organisations, reduced road congestion and the efficiency with which goods could be transported would improve public perception of this technology and lead to more significant uptake.
Environment	• This theme was important to organisations. They felt that the reduction of congestion would lead to less air pollution and better air quality. However, the

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	manufacture of batteries to power this technology as well as increased noise pollution were significant concerns that participants felt could offset improvements to air quality.
Economy	• Organisations felt that this technology would lead to job losses for delivery drivers and couriers, though this negative impact would be offset by the new jobs and employment opportunities that would emerge with the new technology. Participants also identified risks to businesses if the technology were to malfunction and lose public trust.
Equity	• Organisations identified the potential for greater delivery coverage for isolated and rural areas, which could have a positive impact on public health, for example if the drones delivered food or medicine. However, they were concerned about the comparative lack of human support compared to traditional delivery services with a driver, potentially excluding people who are less mobile or digitally engaged from using the service.
Timeline	• Organisations felt that penetration rates for this use case would remain low in the short term at around 0-15% by 2026, but would be between 70-100% by 2050, indicating the belief that most small packages will eventually be delivered by drone.

8.5 Conclusions

The potential role and benefits of self-driving vehicles

Overall, organisations had a positive outlook on the use cases and could identify a number of benefits to self-driving vehicles' rollout. They were more likely than citizens to be able to envisage a world in which most transport is self-driving, with benefits to safety and transport network efficiency. They saw a role for self-driving technology across a range of functions and services.

Positive and negative impacts

Organisations were positive about the possibility of self-driving traffic flow being controlled remotely, in order to maximise reliability and transport network efficiency. Facilitating more night-time journeys and deliveries was an example of this. Similarly, in most use cases, organisations felt positive about self-driving vehicles increasing access to transport or goods for people with mobility issues or living in isolated areas. As with citizens, improving access for users with limited digital capability remains a concern.

While more pragmatic and optimistic than citizens, safety is a core concern for organisations. For example, as with citizens' groups, there were concerns around the potential theft of goods from driverless vehicles, dangerous or hazardous cargo being unsupervised, and issues around cybersecurity. However, organisations did not believe that this technology would be introduced if safety was not guaranteed, and they imagined there would be multiple safeguards and regulations in place by point of rollout.

Other concerns raised by organisations were consistent with those raised by citizens, for example:

- Environmental impacts of battery manufacture, and in some cases particulate pollution from tyres and breaks
- Overall congestion not reducing, but instead moving from roads to the pavement or air
- Ability of self-driving vehicles to drive in bad weather, uneven terrains, and areas of poor connectivity
- Affordability of using the technology (and possible inequity here)

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- Levels of noise pollution and visual pollution (in the case of drones) increasing

Certainty about impacts

Infrastructure is a key barrier to implementation for organisations, who believe that it is currently not suitable to support rolling out self-driving technology. They believe that significant improvements to infrastructure need to be made to support the rollout of the use cases, and that this would have high associated costs that could ultimately be passed onto users. Should improvements to infrastructure be made, organisations can see the potential for self-driving vehicles to improve reliability of service and increased access.

Organisations are undecided about whether jobs, overall, would be positively or negatively impacted by self-driving vehicles. Consistent with findings from the citizens research, potential job losses for delivery and public transport drivers are frequently raised as a concern. However, this is often mentioned in the same breath as an expectation that more jobs, industries and investment will be created in the rollout of self-driving vehicles. As a whole, organisations did not strongly lean one way or the other here. The need for to give people skills and training was mentioned, but only by a small number of organisations across the countries.

While positive about the use cases overall, organisations from the seven European countries involved feel that there is still a lot of uncertainty which makes it difficult to estimate impact. They felt that the interdependence between the different domains leads to many unknowns. It is not clear to organisations that the benefits will happen necessarily, and it is difficult for participants to know confidently either way. As with citizens, one of the main questions raised by these use cases is: will this technology lead to fewer vehicles on the road? If yes, then there are many perceived benefits which follow, most notably: reduced road congestion; fewer road accidents; reduced air pollution; increased space in urban areas. But these benefits are not considered a given.

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9. Demonstration of self-driving vehicles - organisations

9.1 Overview

A demonstration of a self-driving mini-bus was organised in Katowice, Poland, involving 20 representatives of organisations related to transport planning and provision. The demonstration had four objectives:

- To capture participants' feelings and opinions about self-driving vehicles after using one
- To assess whether using a self-driving mini-bus changes opinions, compared with those expressed before the event
- To assess how participants compare self-driving and human-driven buses
- To assess whether results differ from the ones obtained in a demonstration with citizens (described in Chapter 3 of this report).

The demonstration in Poland provides a good opportunity to gather additional data, by proving participants with the same questionnaire used in the Move2CCAM demonstration involving citizens (in the Netherlands). This can provide insights on how organisations perceive the possible impact of those vehicles on their activities and on the lives of citizens in their regions.

The demonstration had a small group of participants. As such, the analysis of this chapter is descriptive. Unlike in the case of the demonstration in the Netherlands, we do not analyse how intentions are related to opinions about the vehicles or how both relate to the participant characteristics.

Where possible, we compare the results of the demonstration with organisations in Poland, which featured a self-driving mini-bus, with those of the demonstration of the mini-shuttle in the Netherlands (the vehicle most similar to the one used in Poland). The comparisons have the caveat of being based on small samples (especially the one in Poland) and that the demonstrations took place in different countries and in different times of year (winter in Netherlands, summer in Poland).

The rest of this chapter is organised as follows

- Section 9.2 describes the **methods** used to organise the demonstration and in data collection and analysis, including ethics considerations.
- Section 9.3 describe the **characteristics** of the organisations and their opinions **before the demonstration**
- Section 9.4 describe the organisations opinions and intentions **after the demonstration**
- Section 9.5 synthesises the key **conclusions** of the demonstration

9.2 Methods

9.2.1 Design of the demonstration and participant recruitment

The event was organised by Metropolis GZM on 6 June 2024. Participants were recruited from GZM's contacts among organisations related to the transport sector. 20 participants joined the event. The event had other participants (joining as citizens, rather than organisation representatives). This chapter reports only the results for participants representing organisations.

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The demonstration featured a self-driving mini-bus sourced from BLEES, a Polish-based vehicle developer (Table 162). The journey was on public roads, used by other vehicles. Safety measures were in place. A safety driver was in the bus, ready to take over the vehicle in case of an emergency. The route was about 3.5 km long. The average speed of the bus was 24km/hour. A dummy representing a pedestrian was placed on the vehicle path to show participants how the vehicle handled this situation. Figure 231 shows various aspects of the demonstration.

Table 162. Vehicle used in the demonstration in Poland - specifications

	Bus
	
Name	Blees mini-bus
Type	Electric mini-bus
Size	Small (unknown specifications)
Seats	15 seats
Web	https://blees.co/en/vehicle

Figure 231. Aspects of the demonstration in Poland

9.2.2 Pre-event questionnaire

Participants answered a questionnaire before the event. This was done online, through the Qualtrics platform. The questionnaire was in Polish. Appendix 9 contains the English version of this questionnaire. It includes questions about organisation type (from a list of 12 types of organisations), geographical coverage, and opinions regarding self-driving vehicles, including:

- Awareness of these vehicles
- General view about them (positive, negative, or uncertain)
- Three main concerns
- Perceived likelihood that specific groups would benefit from these vehicles: individuals who cannot drive because of age or disability, those who do not want to drive or do not have a driving licence, high and low income groups, tourists, companies delivering goods, and consumers receiving those goods.

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- The three most influential actors in the deployment of self-driving vehicles, from the same list of 12 types of organisations shown before.

9.2.3 Post-event questionnaire

Participants answered a questionnaire where they expressed their views after the demonstration. The questionnaire was filled in Polish in a paper format.

This questionnaire was identical to the self-driving bus section of the one used in the demonstration with citizens in the Netherlands, probing about participants' feelings, what they liked and disliked about the vehicle, how safe they felt, how self-driving mini-buses will compare human driven ones, concerns, and intention to use them. At the end there was also a question on whether participants would buy a vehicle not featured in the demonstration: a self-driving car. See Section 3.2.4 and Appendix 4 for more details on this questionnaire.

9.2.4 Ethics

Safety measures were in place. Participants were provided with an information sheet with details about the event, use of personal data, capture of photos and video recordings of the event, reporting, and other ethics-related information. They then filled a consent form, prior to joining the event. The information sheet and consent form were included as appendices in a previous report of this project (Deliverable 3.3., Appendix 19).

The pre- and post-event questionnaires did not capture any information that could identify individuals. Participants were identified through an ID number. The data was analysed by University College London, which did not have access to the file matching ID numbers with participant contact details. Only the event organiser (GZM) had access to this file.

9.3 Organisation characteristics and prior opinions

Figure 232 shows the characteristics of the organisations. There was a mix of authorities and public transport operators, with a regional or city reach.

Figure 232. Demonstration of self-driving vehicles – organisation characteristics

Participants stated their levels of awareness of self-driving vehicles in pre-event questionnaire. Almost all participants said they were aware of these vehicles and have been following developments (Figure 233). In the post-event questionnaire, participants stated whether they had previous experience involving fully self-driving vehicles. Half of them had experienced some type

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of self-driving vehicles. Most participants have a (somewhat or extremely) positive view of these vehicles.

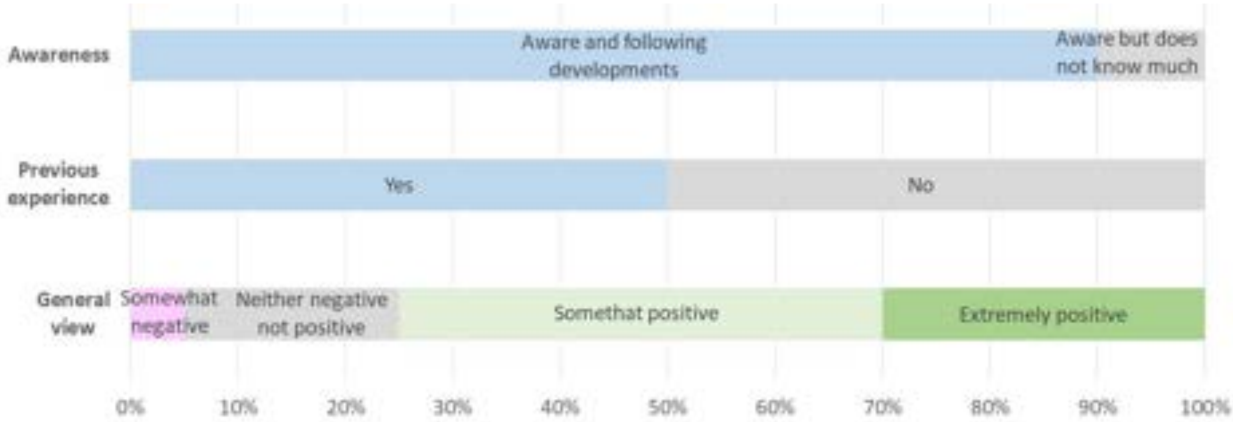
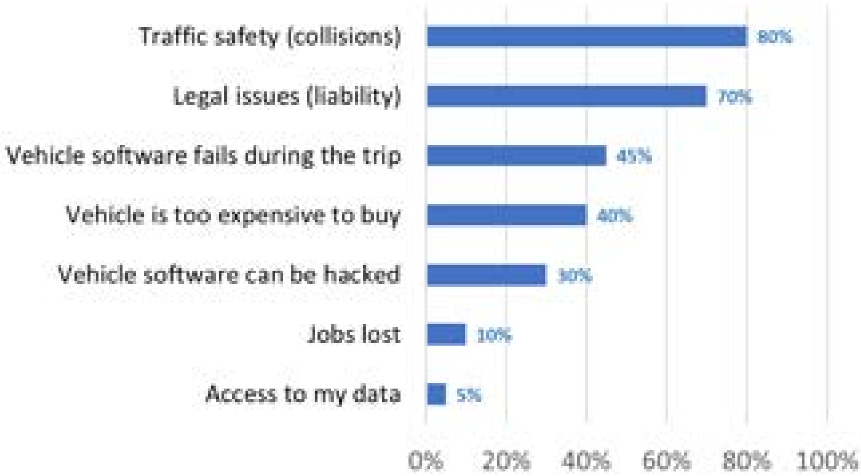


Figure 233. Prior awareness, experience, and views about self-driving vehicles

Organisations in Poland ranked concerns in almost the same order as citizens did in the Netherlands (compare Figure 234 below with Figure 28 in Chapter 3). Traffic safety was the number one concern, followed by legal issues, technology failure, and cost.



Note: participants could indicate up to three concerns

Figure 234. Prior concerns of organisation about self-driving vehicles

Figure 235 shows the organisations' opinions about the likelihood of different groups benefiting from self-driving vehicles. The proportions saying that a group is likely or extremely likely to benefit range from 15% (tourists) to 35% (individuals with low income and customers receiving goods). Participants had roughly similar opinions about the benefits for older or disabled people and for those who do not have a driving licence, and about the benefits for companies sending goods and for customers receiving them. In general, low-income groups were thought to benefit more than high-income ones. Tourists are the groups less likely to benefit (for reference, Katowice is not one of the main tourist spots in Poland).

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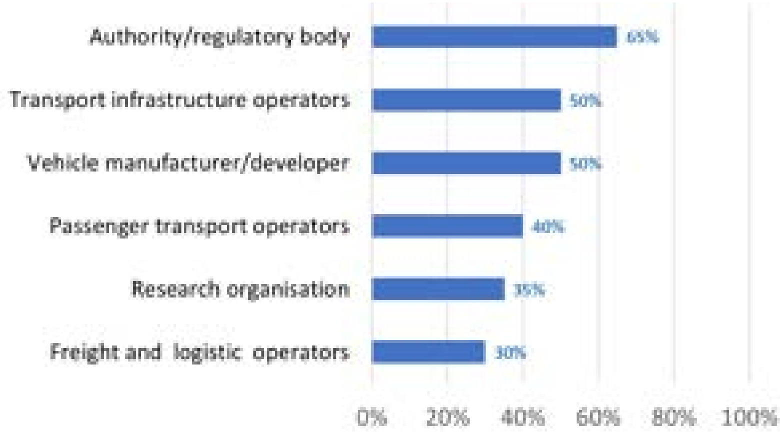
Figure 235. Perceptions about benefits of self-driving vehicles

Figure 236 shows who participants perceive to be the most influential actors in the deployment of self-driving vehicles. The chart shows only organisation types mentioned by at least five (i.e. 25%) of participants. Authorities and regulatory bodies were seen by 65% as the most influential type of organisation. This is a similar proportion as the one that this type of organisations represents in the sample (60%). Other influential actors are transport infrastructure operators (50%), vehicle manufacturers/developers (50%) and passenger operators (40%, which compares with a proportion of 35% that they represent in the sample).



Note: participants could indicate more than one actor

Figure 236. Perceived most influential actors in deployment of self-driving vehicles

9.4 Opinions after the event

This section reports all the results of the post-event questionnaire, including aspects participants liked and disliked (sub-section 9.4.1), feelings (9.4.2), safety perceptions (9.4.3), comparison between self-driving and human-driven vehicles (9.4.4), main concerns (9.4.5), and intentions (9.4.6).

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9.4.1 Aspects participants liked and disliked

Participants were asked open ended questions about the three aspects they liked and disliked about the vehicle. We coded all the answers. Answers stating that participants did not have anything to report (e.g. “nothing”, or “I liked everything” when the question was about “dislikes”) were removed from further analysis. The table below shows the number of valid responses across the sample, after excluding those mentioned above. Participants provided an almost complete set of “likes” and “dislikes” (2.6 and 2.4 per person, out of a maximum of 3). These numbers are higher than in the demonstration with citizens.

Table 163. Aspects participants liked and disliked about self-driving vehicles: responses

Like		Dislike	
Responses	**Responses per participant**	**Responses**	**Responses per participant**
51	2.6	48	2.4

Notes: Each participant could indicate up to three aspects. Table shows valid responses only

Figure 237 shows the aspects mentioned by at least two participants (i.e., by at least 10% of the sample). The main aspect that organisations liked was the innovative character of the vehicle. This was mentioned by 60% of the sample, a number much higher than the one obtained in the demonstration with citizens in the Netherlands (9%) - compare with Figure 17 in Section 3.4.1.

Organisations mentioned a variety of other aspects that they liked (the figure below accounts for only 59% of the comments). Some aspects mentioned were in common with citizens in the Netherlands, such as comfort, quiet, response to events, and safety. However, safety was mentioned only by 15% of organisations, comparing with 34% of citizens.

The major “dislikes” were lack or poor air conditioning (the demonstration was on a warm day) and the low speed of the vehicle. Other dislikes were lack of enough space (this had been the major dislike for citizens in the Netherlands) and lack of handles inside the bus which passengers could grab.

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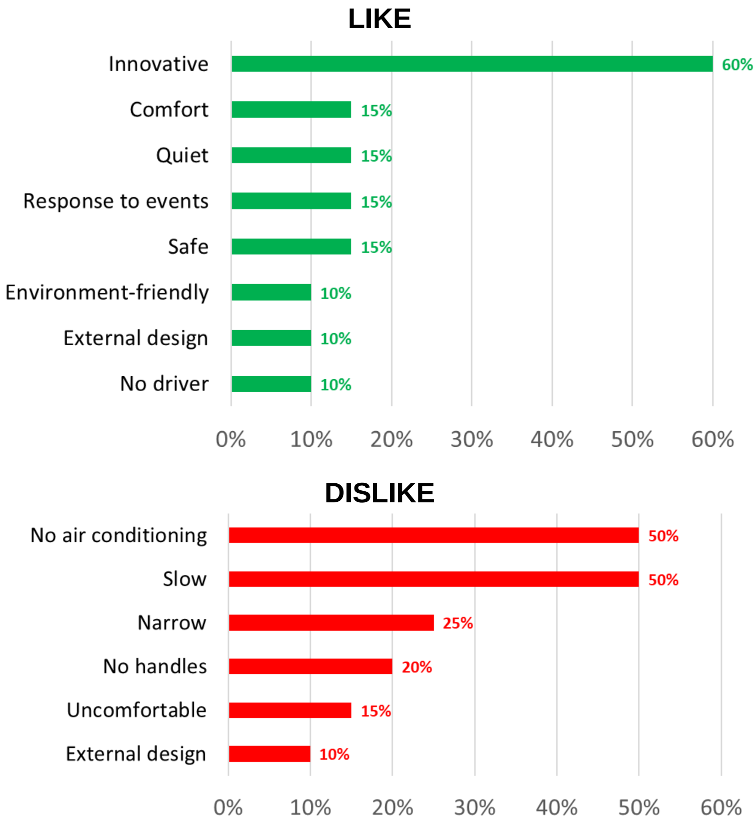

Figure 237. Self-driving mini-bus: main aspects participants liked and disliked

9.4.2 Feelings

Figure 238 shows the feelings that organisations reported regarding their experience while riding the self-driving bus. For comparison, the chart also shows the feelings that citizens reported about the mini-shuttle in the Netherlands. The feelings are sorted in descending order of their frequency among the whole sample in the demonstration with organisations in Poland. The four most common feelings were “alert”, “active”, “safe”, and “content”, mentioned by 30% or more of participants. However, 30% (i.e. 6 participants) also reported feeling bored. Other negative feelings were mentioned by only one or two participants (i.e. 5 or 10% of the sample).

Overall, the results point to a positive experience, although organisations did not show the same enthusiasm as citizens did, with considerably smaller proportions reporting feeling safe, content, in control, and motivated. In contrast, organisations felt more alert and active than citizens, but also more bored.

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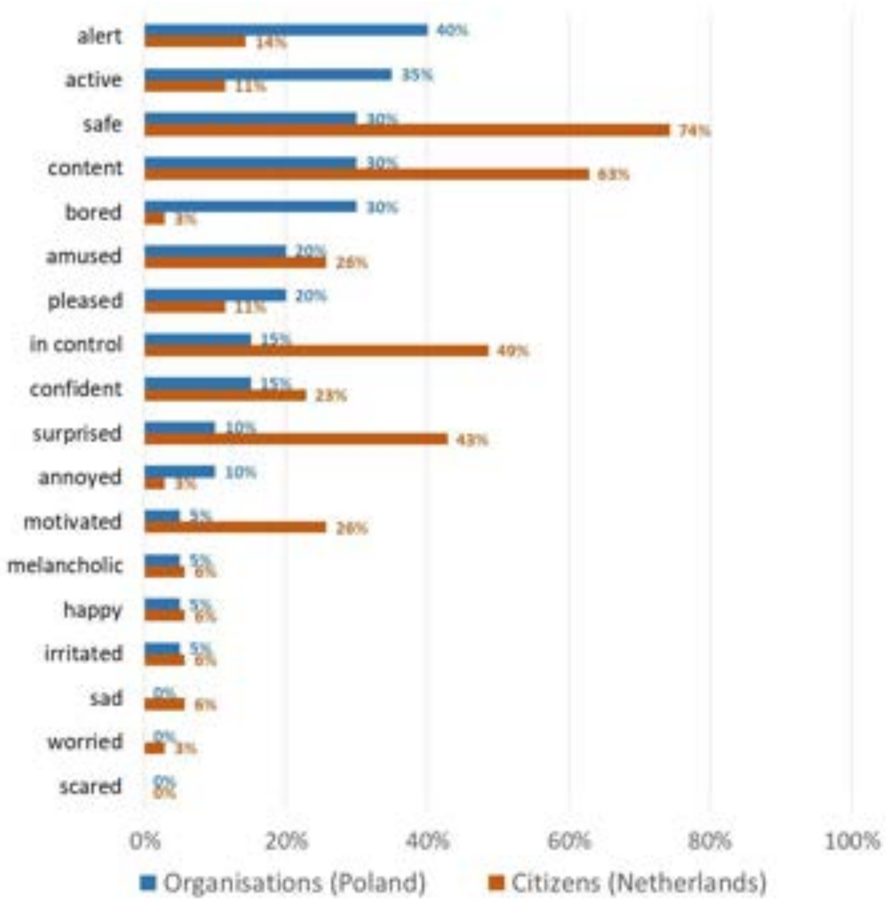

Figure 238. Feelings while riding in the self-driving mini-bus/shuttle

9.4.3 Safety perceptions

The results on safety perceptions are positive, in all situations (Figure 239). The proportions of participants reporting feeling safe or very safe range between 60% and 80%, depending on the situation (Figure 239) – these are numbers below the ones obtained in the demonstration with citizens. Only one participant reported feeling unsafe in some situations and none reported feeling very unsafe.

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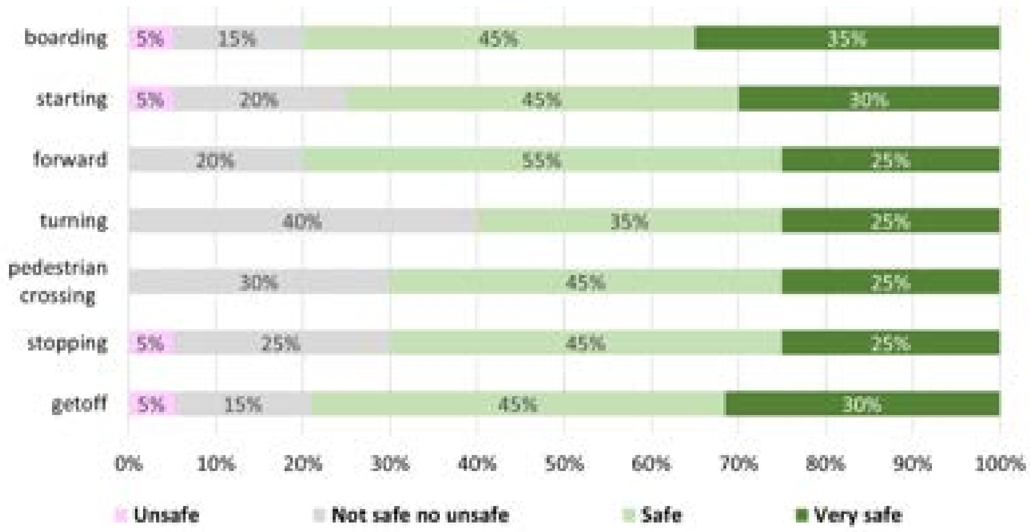

Figure 239. Safety perceptions (mini-bus)

The mini-bus was also generally perceived to be safe from the perspective of pedestrians and cyclists (Figure 240), although safety perceptions were slightly less positive as the ones from the perspective of the mini-bus users, as reported above. The proportions of participants reporting that it will be safe or very safe for pedestrians and cyclists to use streets used by self-driving vehicles were 65% and 45%, respectively. No participants reported any perception of unsafety.

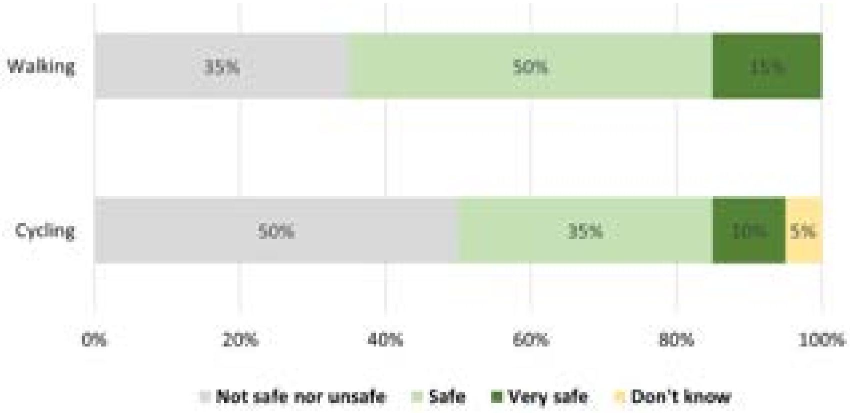

Figure 240. Safety of walking and cycling in streets used by self-driving mini-buses

9.4.4 Assessment of self-driving vs. human-driven mini-buses

Figure 241 shows how participants compared self-driving mini-buses to human-driven ones. On average, self-driven ones are judged to be slower, more stressful, and more insecure (in terms of crime) than human-driven ones. No participants thought self-driving mini-buses will be faster.

The sample was equally or almost equally divided when it comes to which vehicle is more interesting, cheaper, more comfortable, or more dangerous in terms of accidents.

Overall, the assessment is less optimistic than the one that citizens made in the demonstration in the Netherlands, where they thought self-driving mini-shuttles will be more interesting, cheaper, less stressful, and more comfortable.

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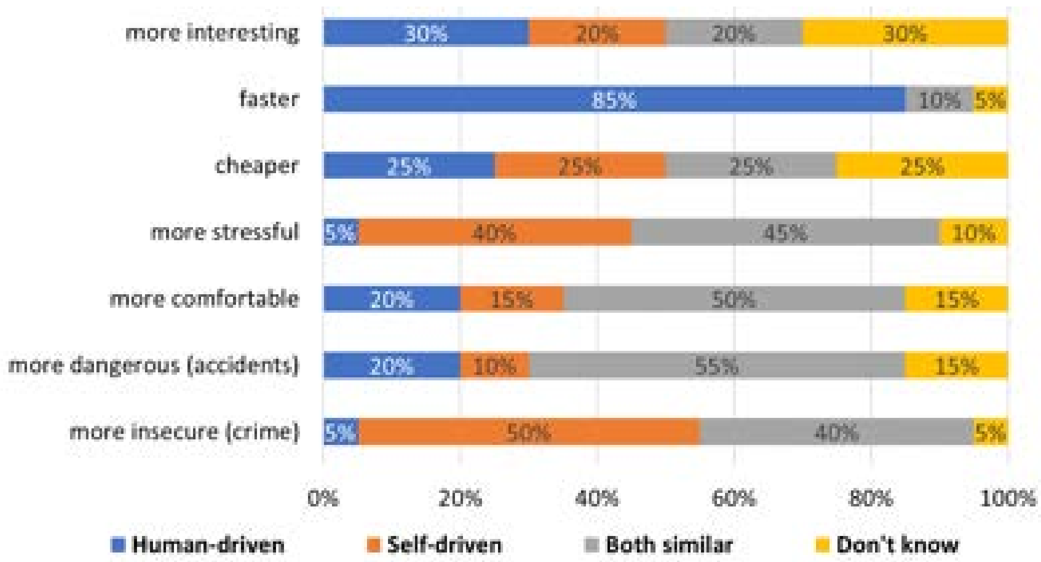

Figure 241. Assessment of self-driving vs. human-driven mini-bus

9.4.5 Main concerns

Participants were asked to state their three main concerns about using the self-driving mini-bus. We then coded all the answers. Answers stating that they did not have anything to report (e.g. "nothing") were removed from further analysis. There were 49 valid responses across the sample (2.5 per person). Figure 242 shows the concerns mentioned by at least two participants (i.e., by at least 10% of the sample). The main concerns are safety, crime and anti-social behaviour from other passengers, and what happens in unexpected emergency situations. These were concerns also mentioned by citizens in the demonstration in the Netherlands. However, safety was mentioned by more organisations (40%) than citizens (14% - see Figure 26 in Section 3.4.5). Cost was mentioned by 25% of organisations in Poland but was not mentioned by any citizen in the Netherlands.

Figure 242. Main concerns about the self-driving mini-bus, after experiencing it

A rough comparison is possible between the results above, which capture the concerns that participants expressed after the demonstration, and the concerns they had previously expressed in the pre-event questionnaire, as shown previously in Figure 234.

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The results after the event are consistent with the ones before the event, as traffic safety had also been ranked as the number one concern. Legal issues were ranked number two before the event but were only mentioned by one participant after the event. This could be because the question in the pre-event questionnaire was about self-driving vehicles in general and participants were thinking in terms of liability for private car owners, and not for mini-bus operators.

Cost and technology failures were in the rank of the main concerns after the event. They had also been mentioned by a considerable proportion of participants (40%) before the event.

The second main concern expressed after the event (i.e. security issues related to crime and anti-social behaviour or stolen goods) had not been mentioned by any participant in the open ended box of the pre-event questionnaire.

9.4.6 Intention to use

Finally, participants were asked if they would use the vehicle they experienced (self-driving mini-bus) and one that they did not experience (self-driving car) (Figure 243). The intentions regarding the mini-bus are overwhelmingly positive: 18 of the 20 participants (90%) intends to use it. The intentions regarding buying a car are mainly negative: half of the sample do not intend to buy one. Only 15% (i.e., three participants) said they intend to buy one.

The intentions regarding using the mini-bus are positive and the ones regarding buying the car are more negative than the ones that citizens expressed in the Netherlands.

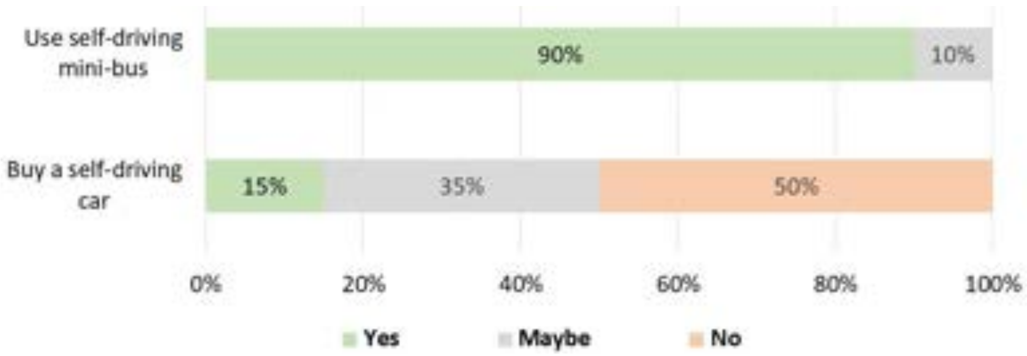

Figure 243. Intention to use or buy self-driving vehicles

9.5 Conclusions

This section collects the key conclusions from the demonstration of the mini-bus in Katowice, an event joined by organisations related to the transport sector (authorities/regulatory bodies and passenger transport operators). Participants had a good level of prior awareness of self-driving vehicles and experience using them. Prior opinions about self-driving vehicles were mainly positive, but there was concern about safety. The conclusions that follow are organised of terms of the four objectives stated in the introduction to the chapter.

9.5.1 Feelings and opinions about self-driving vehicles after using them

Table 164 maps the key results of the demonstration onto the nine Move2CCAM impact dimensions.

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Table 164. Conclusions of demonstration: feelings and opinions

Mobility	• The mini-bus was perceived as an innovative method to enhance mobility. • The vehicle was perceived as slow • Mixed opinions on whether the vehicle is more comfortable or cheaper to use than a human-driven one.
Transport network	• Almost no participant expressed opinions about impacts on congestion or other transport network indicators
Land use	• Almost no participant expressed opinions about impacts on land use
Environment	• Only a few participants mentioned that the vehicle is quiet and environmentally-friendly
Economy	• Almost no participant expressed opinions about economic aspects
Equity	• Almost no participant expressed opinions about equity aspects
Public health	• Tendency to think that self-driving vehicles will increase stress
Safety	• The majority thought that the vehicle was safe, in terms of traffic collisions, in all situations, both for vehicle users and for other road users (pedestrians and cyclists) • Some concern about what can happen in emergency situations
Security	• Concern about crime and anti-social behaviour

9.5.2 Change in concerns

Table 165 shows how participants' concerns compared before and after the event.

Table 165. Conclusions of demonstration: change in concerns

Concerns	• Safety remained the most important concern • Cost and technology failures remain main concerns • Crime and anti-social behaviour emerged as a main concern after the demonstration • Legal issues were a major prior concern but were hardly mentioned after the demonstration

9.5.3 Comparison between self-driving and human-driven vehicles

On average, organisations thought self-driving mini-buses are worse than human-driven ones with regards to speed, stress, and security (in terms of crime), as shown in Table 166. It should be noted that the table does not imply that all participants have the opinions shown, but only that more participants have these opinions than those who have opposite ones. Cases where the majority of the sample has the opinion shown are marked with asterisk.

There were mixed opinions in whether which type of vehicles is more interesting, cheaper, more comfortable and safer (in terms of accidents).

Table 166. Conclusions of demonstration: comparison with human-driven vehicles

	Self-driving vehicles	Human-driven vehicles
Positive	None	• Faster* • Less stressful • More secure (crime)*
Negative	• Slower* • More stressful • More dangerous (crime) *	None

Note: *: opinion held by more than 50% of participants

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9.5.4 Final remarks

This chapter showed that organisations tend to think that self-driving mini-buses are safe both for their users and for other road users, although not necessarily safer than human-driven ones. Safety remains a concern after the demonstration. Organisations also think that self-driving mini-buses are worse than human-driven vehicles in other aspects, especially speed and security in terms of crime. There is also some concern about cost.

Despite these concerns, organisations expressed an overwhelmingly positive intention to use the self-driving mini-bus in the future.

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10. Case studies of organisations

10.1 Overview

Detailed case studies were conducted with 11 organisations, covering various sectors and countries. The aim was to examine the impact that self-driving vehicles may have on the operations and other aspects of the organisations' work. Detailed case studies can produce insights on the motivations and concerns of organisations at a level of detail that cannot be collected in workshops with several participants, such as the ones described in the previous chapter.

The objectives of the case studies were to understand:

- The perceptions and intentions of organisations about self-driving vehicles
- Their needs in relation to using these vehicles
- The potential impacts of the vehicles on the organisation
- The view of the organisation on broader impacts affecting their region

We aimed to select a diversity of organisations, to capture different perspectives, as these are likely to depend on the size, sector, and other characteristics of the organisations.

Project partners in seven countries (United Kingdom, Germany, Netherlands, Poland, Spain, Greece, and Cyprus) interviewed representatives of the organisations, using a semi-structured approach. The interviews were conducted online in March and April 2024 and had a duration of 30 to 60 minutes.

Information from the interviews was complemented with the review of public documents released by the organisations, available from their websites.

The rest of this chapter is organised as follows

- Section 10.2 describes the **methods** used to conduct the interviews and analyse the resulting data
- Section 10.3 is a collection of **information sheets** for each organisation, with standardised information about the characteristics of the organisations and their perceptions, intentions, needs, and perceived impacts related to self-driving vehicles
- Section 10.4 triangulates the results of all interviews to derive insights on the **impacts** of self-driving vehicles on several aspects of the **organisation**'s performance
- Section 10.5 triangulates the results of all interviews to derive insights on the **wider impacts** of self-driving vehicles on **regions**
- Section 10.6 synthesizes the key **conclusions** of this chapter

10.2 Methods

10.2.1 Participant selection

The organisations were selected from the ones that have participated in previous activities of the Move2CCAM project. The target was to study 10 organisations. The selection criteria were:

- At least one organisation from each of the seven countries mentioned above

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- At least one organisation in the following broad groups: passenger transport providers, non-passenger transport providers (including freight), large organisations using transport, and the self-driving vehicle industry (vehicle or software developers).

Each partner in the seven countries suggested two organisations – a total of 14 organisations. Eleven organisations were selected from this list in order to fulfil the criteria mentioned above.

Table 167 lists the organisations, their broad group, and sector. Two organisations could fit into more than one sector. Organisation D is a transport authority but provided information mostly from the point of view of the bus transport operators it oversees. Organisation H is a local government but provided information mostly from the point of view of a large organisation using passenger and freight transport. However, both organisations also provided information about their work as regulators.

The interviewees differed in the amount of information they produced, as seen by the size of the transcripts. Overall, the interviews produced a dataset with 42,754 words.

Table 167: Case study organisations

	Broad group	Sector	Transcript size (words)	Use case discussed
A	Passenger transport provider	Bus services	1819	Bus
B			4729	Bus
C			2317	Bus
D			5049	Bus
E	Non-passenger transport service provider	Freight transport services	1440	Truck
F		Medical product deliveries	6123	Drone
G		Waste collection	6346	Waste collection vehicle
H	Large organisation using transport	Local government	1907	Bus, drone
I		Educational institution	1234	Bus, van
J	Self-driving vehicle industry	Vehicle developer	7713	Bus
K		Software developer	4077	None

10.2.2 Interview topic guides

Interviews were conducted in the local language. A semi-structured interview format was used, following a topic guide (shared with interviewees in advance), but allowing for flexibility. Topic guides were customised for each of the eleven interviews, although the topic guides of the four passenger transport providers were broadly similar. The English versions of all topic guides are included in Appendix 10 of this report.

Where relevant for the organisation's sector, some parts of the interview focused on specific use cases, selected from those co-created by citizens and organisations in previous activities of the Move2CCAM project:

- The interviews with passenger transport providers (organisations A-D) and with the self-driving bus developer (H) focused on self-driving buses.

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- The interview with the freight transport provider (E) asked the interviewee to choose one of three freight transport use cases: self-driving vans or trucks; delivery robots; and delivery drones. The interviewee chose the self-driving truck.
- The company delivering medical products (F) is already an example of a use case od self-driving vehicles, as it uses drones.
- The discussion with the waste collection company (G) focused on the replacement of current vehicles used for waste collection with self-driving vehicles.
- The interviews with the local government and educational institutions (H-I) asked the interviewees to choose one of two passenger transport use cases (self-driving bus or self-driving car) and one of two three freight transport use cases (self-driving van, delivery robot, or delivery drone). They both chose the self-driving bus as the passenger use case. H chose the van, and I chose the drone as freight use case.
- The discussion with the organisation involved in the development of software for self-driving vehicles (K) was not specific to any use case.

Each interviewee was told when citizens and organisations in their region expect that self-driving vehicles will be deployed. This information comes from the results of the workshops described in Chapters 2 and 8 of this report.

While the topic guides differed for all eleven organisations, the topics listed below were covered across all interviews, although with different variants and levels of detail

The interviews started with questions about the organisation and their current situation with regards to transport, including:

- **General characteristics**: sector, type of products/services offered, details about the service, business model
- **Workforce**: number of employees and jobs they perform
- **Current activity**: vehicle ownership and challenges faced in providing or using transport

The main part of the interviews introduced the topic of self-driving vehicles and asked about:

- **Perceptions**: general perceptions, and aspects of the vehicles that are attractive or unattractive to the organisation
- **Intentions**: Possible replacement of vehicle fleet with self-driving vehicles. If no: incentives needed. If yes: timing, intended use of the vehicle, possible shared ownership
- **General impact**: aspects of the organisation’s operations that would be affected, opportunities and difficulties foreseen
- **Business model**: possible changes, offer of new products/services and/or stop offering others, possibility of expanding/narrowing the area covered.
- **Operational aspects**: If the organisation transports paying passengers: possible change in operation days/times. If organisation transports goods: possible change in number of trips and size of vehicles used. Other questions: possible improvement in problems of parking vehicles, picking up/dropping off passengers, loading/unloading goods, and other operational activities.

A series of questions followed about wider impacts, using the Move2CCAM impact dimensions used throughout the project and reported in previous chapters. Some questions were specific to the organisation’s activities, others to the regions where they are based:

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- **Mobility**: if it will be easier or more difficult to transport goods, passengers, and employees; if transport will be faster or slower, more or less reliable, if number of trips and transport users will increase or decrease
- **Transport network**: [asked only to authorities] changes in regulations on traffic management and control, road design, and vehicle parking, monitoring and enforcement of regulations, change in planning strategies
- **Land use**: possible relocation of some of the organisation sites
- **Environment**: would there be more or less pollution in the region
- **Economy (employment impacts)**: job security and possible new roles for drivers and other jobs, training or reskilling needed, new jobs that the organisation could offer
- **Economy (other impacts)**: would revenue increase or decrease; would transport and other costs increase or decrease
- **Equity**: if it will be easier or more difficult to have a gender-balanced workforce or to employ individuals with disabilities; if more entry-level job positions will be offered; if it will be easier or more difficult for younger/older employees to be productive and motivated
- **Public Health**: stress, other health impacts
- **Safety**: if transport will be safer or more dangerous (in terms of accidents)
- **Security**: if transport will be more or less secure (in terms of stolen goods or cyber attacks), other possible security aspects

Participants were then asked to think whether, from a society's point of view, self-driving vehicles will have a general positive or negative impact in their region.

Finally, participants were asked if there was anything about self-driving vehicles that had not been covered yet in the interview and they would like to comment on.

The interviews with organisation F, who is already using self-driving vehicles, and with organisations J and K, who are developing these vehicles had more specific questions related to their activities - see Appendix 10. These include questions about funding, partnerships, market potential, cost, regulatory barriers, risks, intellectual property, operational details, and safety measures applied to their products.

10.2.3 Ethics

The study received ethical approval from the Bartlett School of Environment, Energy and Resources at University College of London (ID: 20231120_EI_ST_ETH_ Move2CCAM).

Interviewees were provided with an information sheet and an informed consent form, which they filled before the interview started. The information sheet contained details about the contents of the interview, collection and use of data, and other ethics-related information. Participants gave they consent by confirming (by ticking a box) that they understood what the research involves and what was expected of them. The information sheet and consent form were included as appendices in a previous report of this project (Deliverable 3.3., Appendix 19).

To preserve anonymity, the individuals interviewed and the organisations they represent are not identified in this report. The country is also not identified, as it would be possible to identify some of the organisations by combining information about their sector and the region where the project partner is based in the country. Organisations are identified in the report only by letters (A-K). Interviewees were informed in the information sheet and before starting the interview that their information would be anonymised in this way.

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A transcript was automatically produced by the online platform used (Microsoft Teams). The names of the interviewees were removed from the transcript by project partners. The institution analysing the data (University College London) had no access to the interviewee's names, only to the organisation they represent, and the job they hold in that organisation. No audio or video recordings were produced. The transcripts will be safely deleted after the project ends.

10.2.4 Analysis methods

The interview transcripts were cleaned by project partners and then translated into English. University College London then analysed the information in these cleaned transcripts, and complemented it with information publicly available, from the organisations' websites.

Three types of analysis were performed

- Classification of the information provided by each organisation into standardized categories: organisation characteristics, current situation with regards to transport, perceptions of self-driving vehicles, intentions, needs, and impacts. This classification is presented in the case study information sheets in Section 10.3
- A SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis for each organisation, also included in the information sheets in Section 10.3
- Classification of impacts of each use case on the organisation, using standardized information for impacts on business models, and financial, operational, employment, regulatory, and safety aspects
- Classification of wider impacts on regions, using standardized information for the nine impact dimensions (mobility, transport network, land use, environment, economy, equity, public health, and security

10.3 Case study information sheets

This section presents all eleven case study information sheets, with standardized information extracted from the interviews. This was complemented with information from the organisation's websites (mostly to add detail on organisation characteristics).

The case studies in this section are presented without comments, as we believe they are self-explanatory. However, the SWOT analyses at the end of each case study synthesize the information. In addition, in the next two sections, we triangulate the information from all case studies and analyse the results, providing an overall assessment of how organisations will be affected by self-driving vehicles.

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10.3.1 Organisation A – Passenger transport

Table 168: Organisation A - information sheet

Organisation characteristics
• Large group consisting of several companies, each serving a different region in a European country • Hierarchical structure: one central division, regional divisions, and sub-divisions • Alignment of strategies across the structure when it comes to innovation (such as self-driving vehicles) • Provider of bus services across a country, mostly in rural areas, but also some intercity services • Two business models: contractor and subcontractor • Apart from bus services, also developed a Mobility as a Service application combining their services with other transport options in the areas served
Current situation with regards to transport
• Difficult to recruit bus drivers • Has participated in research projects on digitalisation and automation of transport provision • Currently has two self-driving shuttle buses and is involved in trails of another 30-40 in the next three years. Safety drivers have been on board
Use case discussed in interview
Self-driving bus
Perceptions
• Self-driving buses have large potential • It is not certain that solutions involving self-driving buses will work • Procuring and operating self-driving buses is costly • The technology does not always operate without failure, and it needs to be developed further • Human assistants (safety drivers) will always be needed (further increasing costs) • Self-driving transport services need to be integrated with other modes; they should not be the only mode available • Passengers will be worried with being recorded while on-board
Intentions
• Engaged in a project to have 15 self-driving mini-buses and shuttles running in one region by 2028. These vehicles will be at Level 4 of automation (human override is still possible) • Some of the bus providers in the group will be early adopters, others will follow • The organisation has run an on-demand service for trips to healthcare facilities • It will take a long time to replace the larger buses with self-driving ones
Needs
• The organisation cannot invest their own funds in the adaptation for self-driving vehicles, it is too risky • Adaptation requires funding and involvement in research projects in order to best test and deploy these vehicles and reduce costs for the users • Also requires collaborations with vehicle developers so that vehicles meet the organisation's needs • Need for inter-modality. Self-driving bus services need to be integrated with train services • Users need to gain awareness and then trust in the technology • Concern about how people with disabilities will get on and off the bus and transport wheelchairs. This has currently been facilitated by a safety driver, but it will be difficult in a fully-automated scenario. Solutions include sensors and cameras to detect wheelchair users and automated audio messages advising passengers using them • Needs cooperation with regulators. Regulatory challenges were faced when providing services with self-driving buses. The provision of barrier-free entrances to the vehicles (e.g. ramps) was restricted by regulations on the minimum distance between bus and pedestrian pavement and

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height of pavement. • Need to reskill and motivate employees to adapt to the transformation. 90% of current employees have not experienced the self-driving vehicles that the organisation already owns
Impacts
• Services will be more efficient if the organisation could use on-demand self-driving mini-shuttles • Running buses will also be more environmentally friendly • Cost reduction or revenue increase will only be possible when the technology is further developed • It will still be difficult to recruit staff, even though the technology will solve some of the current problems recruiting drivers • New jobs will be needed, and training required: on-board safety drivers or human assistants, technical supervisors in control centres • Self-driving vehicles will not contribute to the growth of the organisation and expansion of the markets served, as there is already too much competition • But it is possible to strengthen position in the markets already served, by offering additional services at lower prices • There is a clear societal impact: bus users will have better access to local centres

Table 169: Organisation A - SWOT analysis

Strengths	Weaknesses
• Large company • Already has some self-driving vehicles • Participated in research projects	• Complex structure (divisions and sub-divisions) • Dependent on public funds for innovation • Difficult to recruit drivers
Opportunities	**Threats**
• Provide additional services such as on-demand services • Gain competitive position	• Thinks the bus sector in the country is in general not much receptive to innovation • Self-driving vehicles are costly and unreliable • Users may not be willing to use self-driving services • Problems in the service provided for some market segments, e.g., people with disabilities • Regulatory challenges • Difficult to motivate staff

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