contrasts with participant perceptions on change in their own travel time, which as seen in Section 5.7.4, it was positive (1.5 to 2.2 minutes, depending on the type of vehicle).

As expected, participants think that ownership of self-driving vehicles will increase (mean score of 0.20), and ownership of conventional private vehicles will decrease (mean score of -0.25). 17% think that ownership of conventional vehicles will increase and 44% think it will not change. This suggests that people believe that self-driving vehicles will coexist with conventional vehicles, not replacing them completely. More surprising is the fact that 19% think that ownership of self-driving vehicles will decrease. This suggests a disbelief that these vehicles will be implemented.

On average, participants think use of self-driving shared vehicles will increase (mean score 0.20), with 37% thinking will increase and 16% thinking it will decrease.

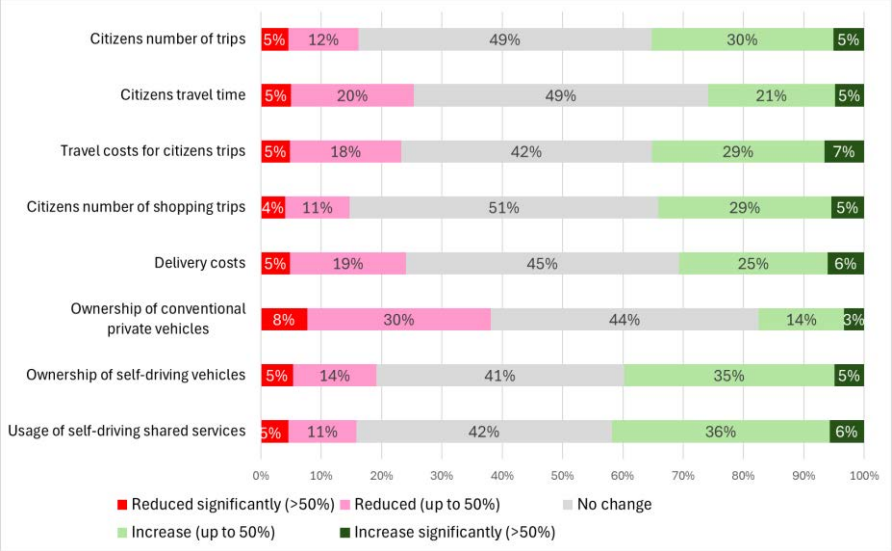

Figure 175. Impact on mobility indicators

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Table 109. Average impacts on mobility

	Citizens number of trips	Citizens travel time	Citizens number of shopping trips	Travel costs for citizens trips	Delivery costs	Ownership of conventional private vehicles	Ownership of self-driving vehicles	Usage of self-driving shared services
ALL	0.20	0.00	0.21	0.14	0.08	-0.25	0.20	0.27
UK	0.26	0.05	0.19	0.27	0.15	-0.18	0.32	0.32
Germany	0.23	0.09	0.17	0.20	0.08	-0.19	0.16	0.22
France	0.15	0.08	0.21	0.20	0.11	-0.18	0.08	0.23
Netherlands	0.22	-0.05	0.17	0.23	0.08	-0.28	0.18	0.25
Spain	0.31	0.18	0.33	0.20	0.09	-0.16	0.29	0.42
Poland	0.35	0.19	0.35	0.22	0.21	-0.13	0.30	0.29
Greece	0.03	-0.32	0.13	-0.09	-0.03	-0.46	0.18	0.26
Cyprus	-0.17	-0.49	-0.02	-0.45	-0.27	-0.66	0.04	0.10
Women	0.20	-0.02	0.25	0.13	0.22	-0.25	0.20	0.25
Men	0.19	0.03	0.29	0.15	0.20	-0.25	0.20	0.29
18-34	0.32	0.06	0.34	0.19	0.30	-0.11	0.31	0.34
35-64	0.20	0.00	0.29	0.10	0.21	-0.29	0.21	0.29
65+	0.03	-0.05	0.12	0.16	0.08	-0.36	0.04	0.12

Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

Table 109 and the seven figures below disaggregate the results for all indicators by country, gender, and age. Greece and Cyprus show lower mean values and Poland and Spain show higher values, for all indicators. More than half of participants in Cyprus think that travel time and travel costs will decrease (Figure 177 and Figure 178) and that ownership of conventional vehicles will decrease (Figure 181). The values for the other four countries tend to be around the overall average. Views in France tend to be more pessimistic than average. Compared with average, French participants indicated that the number of trips will increase less (except shopping trips), travel time and cost will increase more, delivery costs will increase more, ownership of self-driving vehicles will increase less, and that of conventional vehicles will decrease less. As an example, only 31% of French participants think ownership of self-driving vehicles will increase (Figure 182).

The differences between the impacts reported by men and women are minimal, as seen in the table and all the figures below.

All the indicators correlate with age (Table 109). An increase in age is related to lower mean scores for all variables, i.e. perceptions of lower increase in number of trips (overall and for shopping), lower increase in travel time (which becomes a decrease in the case of people aged 65+), lower increases in travel and delivery costs, lower increase in ownership of self-driving vehicles (but also higher decrease in ownership of conventional vehicles), and lower usage of self-driving vehicles. The differences across groups are particularly striking in the case of the first indicator (number of trips). As shown in Figure 176, almost equal proportions of the three age groups think there will be a decrease. However, while 46% of the 18-34 age group thinks there will be an increase, only 23% of the 65+ group thinks so – this is because of a large (59%) proportion thinking there will be no change, among the 65+ age group.

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Figure 176. Impact on citizens' number of trips

Figure 177. Impact on citizens travel time

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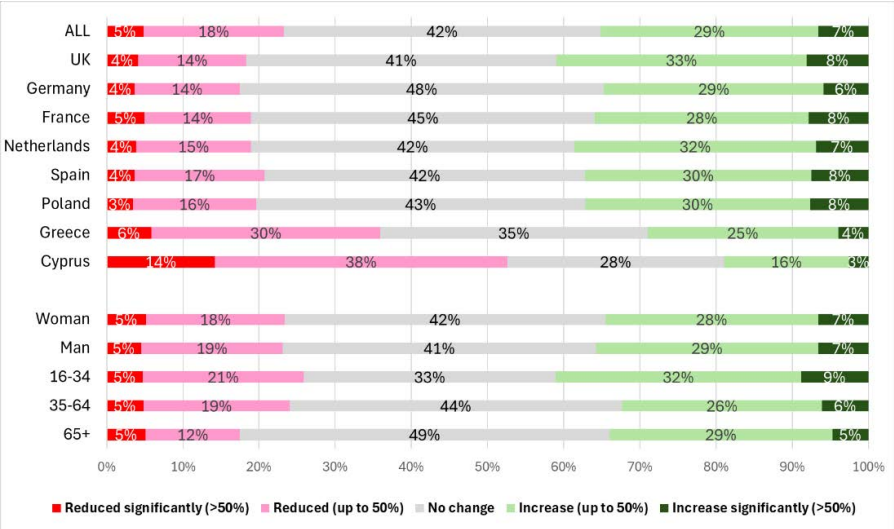

Figure 178. Impact on travel cost for citizens' trips

Figure 179. Impact on citizens' number of trips for shopping

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Figure 180. Impact on delivery costs

Figure 181. Impact on ownership of conventional private vehicles

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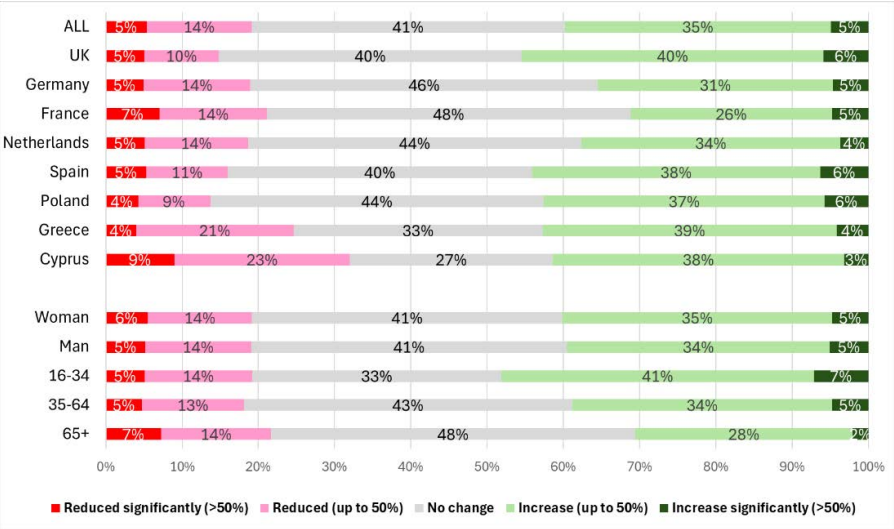

Figure 182. Impact on ownership of self-driving vehicles

Figure 183. Impact on self-driving shared services (public transport, car clubs)

5.14.3 Transport network

Figure 184 shows the results for the two indicators of impacts on the transport network and Table 110 shows the average impacts, on a -2 to +2 scale.

On average, participants believe that the number of vehicles on the network will increase (mean score of 0.13), but this will not have an impact on congestion (mean score close to zero: -0.02) (Table 110). About the same proportion (44-45%) think there will be no change in these indicators, but more participants (34%) think they will be an increase or significant increase in vehicles than those who think there will be a decrease or significant decrease (24%), while the distribution of perceptions in the case of congestion is more balanced (26% vs 28%). The results are consistent with those in the previous section: the increase in number of vehicles on the network is consistent with the belief that number of trips will increase. The almost neutral impact on congestion is also consistent with the perfectly neutral impact on travel time (although it should

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be noted that travel time is affected not only by road performance but also by trip distance, an aspect not captured in this survey).

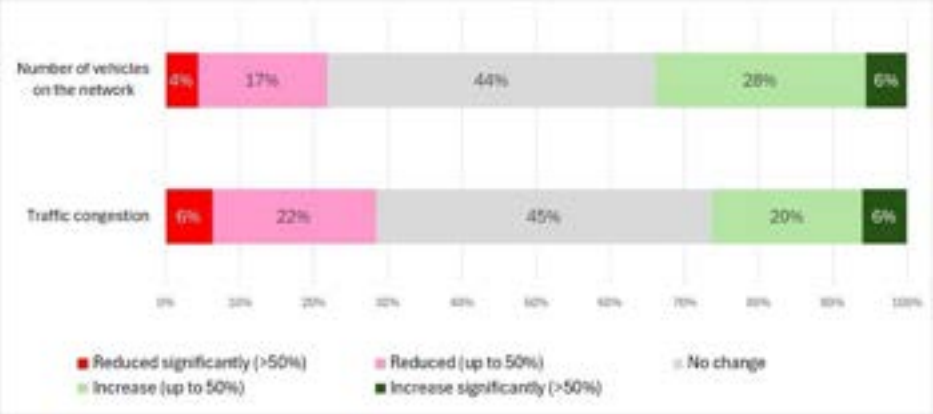

Figure 184. Indicators of impact on transport network

Table 110. Average impacts on the road network

	Number of vehicles on the network	Traffic congestion
ALL	0.13	-0.02
UK	0.23	0.13
Germany	0.22	0.02
France	0.10	0.04
Netherlands	0.21	-0.11
Spain	0.28	0.08
Poland	0.29	0.04
Greece	-0.11	-0.13
Cyprus	-0.43	-0.48
Women	0.16	0.00
Men	0.10	-0.05
18-34	0.22	0.08
35-64	0.11	-0.06
65+	0.08	-0.07

Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

Greece and Cyprus are distinct cases again, with a belief that number of vehicles and congestion will decrease. About half of Cyprus participants think these indicators will decrease (Figure 185 and Figure 186). In the Netherlands, the average perception is also that congestion will decrease. In the United Kingdom, the average perception is that road congestion will increase. On other countries, the perception is that the effect will be minimal.

On average, men think that number of vehicles will increase less, and congestion will decrease and women think vehicles will increase more and congestion will be unaffected. The expected increase in number of vehicles is inversely related with age. The 18-34 group think congestion will increase, while the 35-64 and 65+ groups think it will increase. As seen in Figure 186, gender and age differences in perceptions of changes in congestion apply mostly to the balance between

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participants who think it will increase (up to 50%) and those who think there will be no change. The proportions who think it will decrease are similar across genders and age groups.

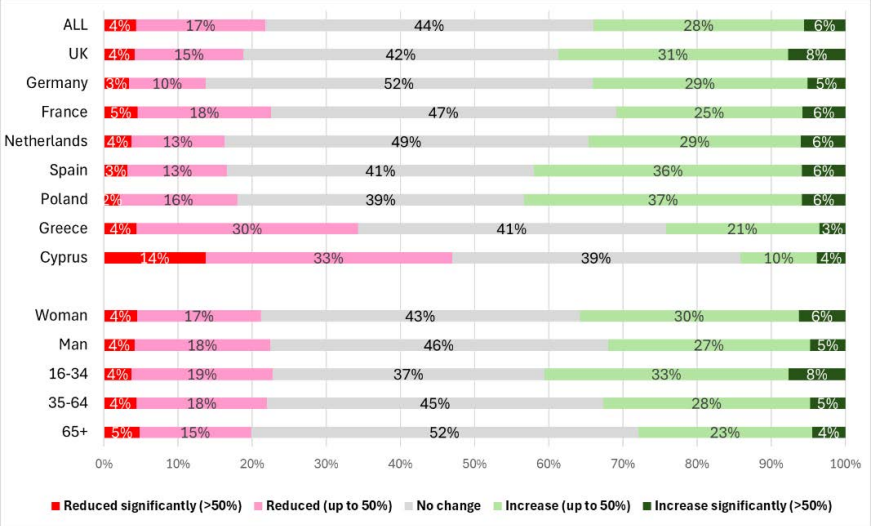

Figure 185. Impact on number of vehicles on the network

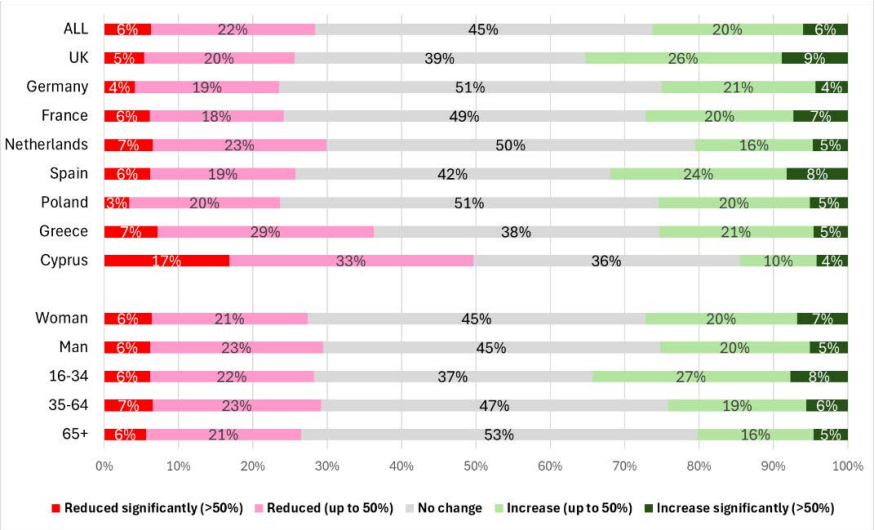

Figure 186. Impact on traffic congestion

5.14.4 Land use

Figure 187 compares the results for the four indicators of land use impacts and Table 111 shows the average impacts, on a -2 to +2 scale.

On average, there is a belief on both a move to rural area and to city centres, but slightly stronger for rural areas (mean scores of 0.15 vs. 0.07) (Table 111). However, 57% think there will be no change in residence location (Figure 187). These results are consistent with those reported by participants for their own intentions to move (Sections 5.7.75.10.8), which showed an almost perfect neutral view on average (linked to high proportions of participants indicating no change, and a balance between those reporting moving to more urbanised and less urbanised areas).

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Participants believe there will be slightly less demand for parking spaces in the city centre (-0.05) but a considerable increase demand for redesigned transport infrastructure (0.35) (Table 111). 26% of participants think demand for parking will increase, much smaller than the 43% who think demand for redesigned transport infrastructure will increase (Figure 187). The results for parking are consistent with those participants reported for their own parking needs (5.7.6 and 5.10.7), which showed a slight decrease in parking needs (mean scores of -0.2 to -0.20 depending on the self-driving vehicle considered. It should be noted however, that the question in the present section is specific to the city centre, so numbers are not fully comparable.

Overall, the results for these two indicators suggest that on average participants think that the implementation of self-driving vehicles can be accommodated with redesigned infrastructure, rather than increasing the pressure on existing infrastructure such as parking space.

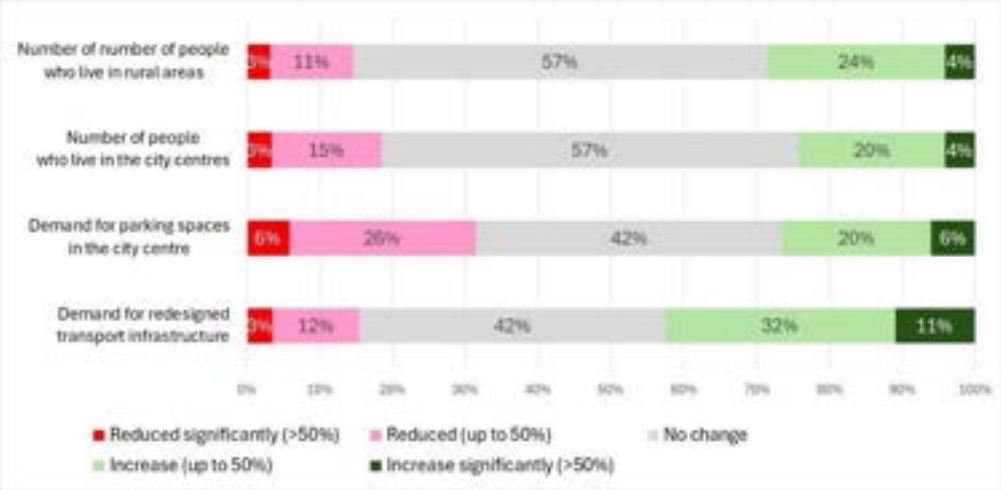

Figure 187. Impact on land use indicators

Table 111. Average impacts on land use

	Number of number of people who live in rural areas	Number of people who live in the city centres	Demand for parking spaces in the city centre	Demand for redesigned transport infrastructure
ALL	0.15	0.07	-0.05	0.35
UK	0.15	0.11	0.01	0.41
Germany	0.24	0.07	-0.09	0.29
France	0.15	0.08	0.04	0.36
Netherlands	0.13	0.05	-0.10	0.33
Spain	0.27	0.23	0.01	0.44
Poland	0.24	0.16	0.12	0.52
Greece	0.00	-0.10	-0.15	0.19
Cyprus	-0.16	-0.20	-0.44	0.08
Women	0.17	0.05	-0.04	0.35
Men	0.13	0.08	-0.06	0.34
18-34	0.20	0.18	0.07	0.40
35-64	0.13	0.03	-0.06	0.32
65+	0.11	-0.01	-0.19	0.33

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Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

Greece and Cyprus are still special cases, although not as much as for the previous impacts. All indicators tend to be lower in these two countries (Table 101). The belief that people will move is stronger in Spain, and Poland, both when considering moves to rural areas and to city centres. In Germany, the main tendency is to believe that people will move to rural areas (34%) than to city centres (25%) (Figure 188 and Figure 189). In Poland, there is a stronger tendency to believe that both demand for parking and for redesigned transport infrastructure will increase, compared with all other countries.

Perceptions do not vary much by gender. Age decreases the perceptions that residents will move, either to rural areas or to the city centre. On average, the 18-34 age group tends to believe that demand for parking spaces will slightly increase and is more likely to believe that demand for redesigned transport infrastructure will increase, compared with the older age groups. As shown in Figure 190 and Figure 191, this is driven mainly by differences in the proportion of participants who think these demands will increase (green bars in the figure) rather than the proportions who thing they will decrease (red bars).

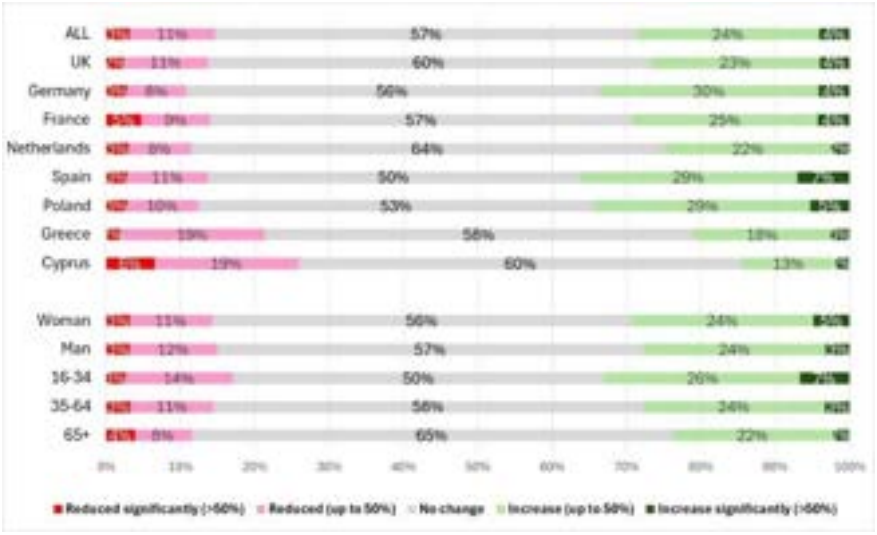

Figure 188. Impact on number of people who live in rural areas

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Figure 189. Impact on number of people who live in the city centres

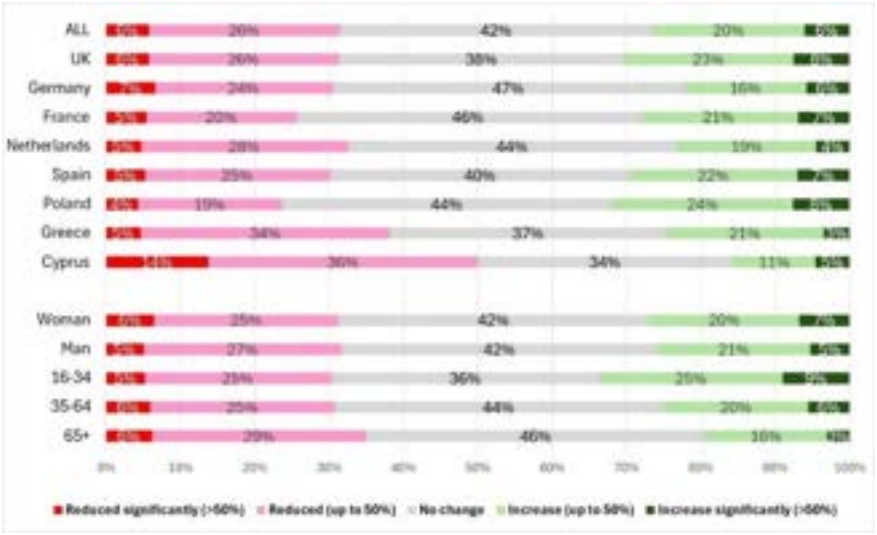

Figure 190. Impact on demand for parking spaces in the city centre

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Figure 191. Impact on demand for redesigned transport infrastructure

5.14.5 Environment

Figure 191 compares the results for the three indicators of environmental impacts and Table 112 shows the average impacts, on a -2 to +2 scale. On average people believe that emissions and noise will decrease and demand for electricity to charge vehicles will increase (Table 112). This suggests that people assume that self-driving vehicles will be electric. In absolute value, the impact on demand for electricity is higher than the impacts on emissions and noise. This is also visible in Figure 191, which shows that more than half of the sample (56%) think demand for electricity will increase or increase substantially, while 38% think emissions will decrease, and 44% think noise will decrease.

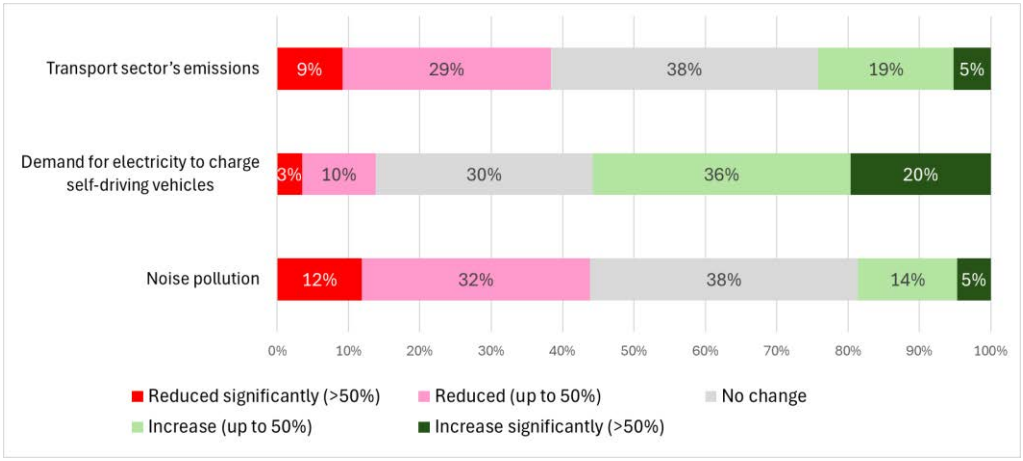

Figure 192. Impact on environmental indicators

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Table 112. Average impacts on environment

	Transport sector's emissions	Demand for electricity to charge self-driving vehicles	Noise pollution
ALL	-0.18	0.58	-0.32
UK	-0.11	0.75	-0.23
Germany	-0.10	0.53	-0.23
France	-0.05	0.58	-0.25
Netherlands	-0.18	0.65	-0.38
Spain	-0.06	0.67	-0.24
Poland	0.01	0.63	-0.19
Greece	-0.54	0.40	-0.55
Cyprus	-0.74	0.30	-0.76
Women	-0.13	0.59	-0.27
Men	-0.24	0.57	-0.38
18-34	-0.02	0.57	-0.17
36-64	-0.20	0.56	-0.35
65+	-0.37	0.67	-0.49

Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

As with other impacts, Greece and Cyprus are special cases, with the three indicators assuming a more negative value. All countries share the belief that emissions and noise will decrease and demand for electricity will increase. The only exception is Poland, where people do not expect emissions to change, on average - as shown in Figure 193, in Poland about equal numbers think emissions will increase and decrease. The expectation that demand for electricity will grow is highest in the United Kingdom, with 61% thinking demand will increase and only 9% thinking it will decrease.

As shown in both Table 112 and the figures below, men and women think about the same regarding demand for electricity, on average, but men believe emissions and noise will decrease more. Age increases the belief that emissions and noise will decrease and that demand for electricity will increase.

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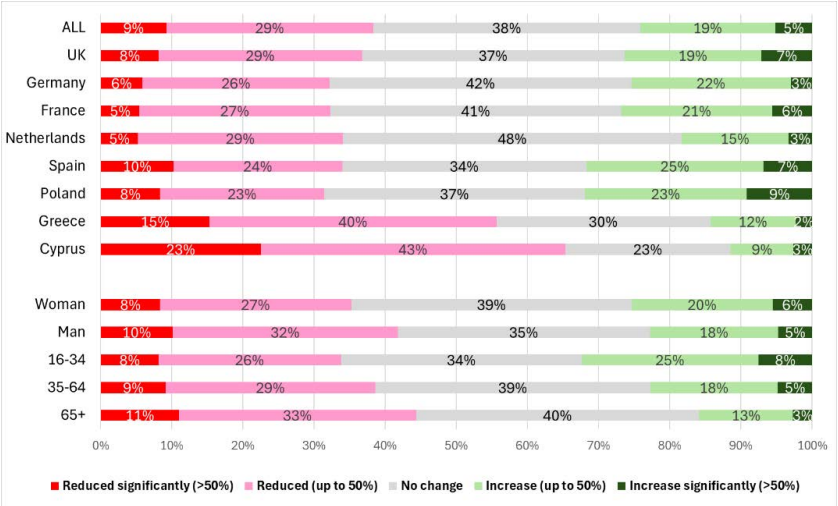

Figure 193. Impact on transport sector's emissions

Figure 194. Impact on demand for electricity to charge self-driving vehicles

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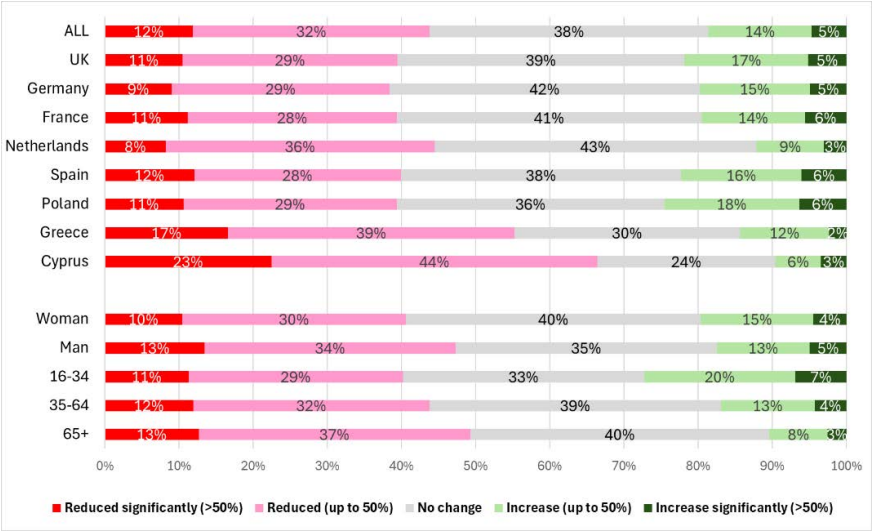

Figure 195. Impact on noise pollution

5.14.6 Economy

Figure 196 compares the four indicators of economic impacts and Table 113 shows the average impacts on a -2 to +2 scale. On average, participants think that economic growth (0.28), investments (0.44), and new skills requirements (0.38) will grow. 42%, 50%, and 47% share the view that these three indicators will increase, or increase substantially, compared with 12-16% who think they will decrease or decrease substantially.

Potential job losses are only one of the main concerns regarding self-driving vehicles, as found in previous literature and in other activities of this project. However, in this survey, there is only a slight tendency among participants to think job losses will increase (mean score of 0.04) on the -2 to +2 scale. This is mainly because opinions are split. Only about a third of participants think job losses will not change. 34% think they will increase and 32% think they will decrease.

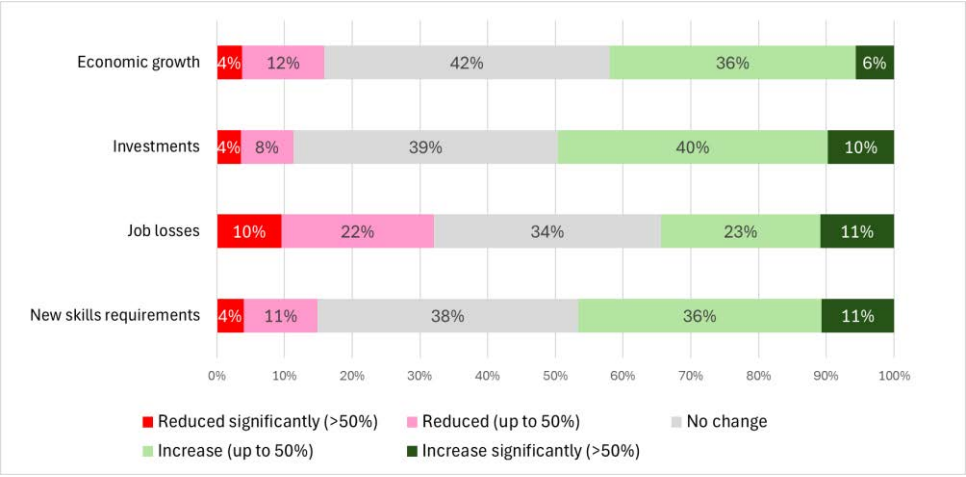

Figure 196. Impact on economic indicators

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Table 113. Average impacts on the economy

	Economic growth	Investments	Job losses	New skills requirements
ALL	0.28	0.44	0.04	0.38
UK	0.32	0.41	0.28	0.31
Germany	0.35	0.39	-0.17	0.37
France	0.18	0.41	0.19	0.36
Netherlands	0.26	0.54	0.40	0.41
Spain	0.36	0.54	-0.27	0.37
Poland	0.38	0.47	-0.04	0.35
Greece	0.18	0.38	-0.05	0.50
Cyprus	0.08	0.39	-0.18	0.44
Women	0.27	0.44	0.04	0.37
Men	0.29	0.45	0.03	0.40
18-34	0.30	0.47	0.13	0.35
36-64	0.30	0.46	0.03	0.41
65+	0.20	0.36	-0.09	0.36

Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

Indicators of economic growth and investment are positive in all countries and for all genders and age.

As seen in Table 113 and in the figures below, belief that self-driving vehicles will increase economic growth is, on average, higher in the United Kingdom, Germany, Poland, and Spain, compared with the other countries. Belief that they will increase investment is higher in Netherlands and Spain. In Greece and Cyprus, there is a weaker belief that economic growth and investment will increase but also higher belief that new skills requirements will increase (Figure 200). Beliefs about job loss are split into three groups, with participants in the United Kingdom, France, and the Netherlands thinking, on average, that they will increase, those in Germany, Spain, and Cyprus thinking they will decrease, and those in Poland and Greece having an opinion close to neutral. The differences in these three groups of countries are clear in the balance between red and green bars in Figure 199.

Perceptions about economic impact are similar for men and women. The 65+ age group is more sceptical that self-driving vehicles will increase economic growth and investment than the other age groups. On average, the 18-34 and 35-64 groups have almost identical views on the change in these indicators, as seen in Table 113. However, this average masks variations in opinions within these two age groups. As seen in Figure 197 and Figure 198, the youngest age group (18-34) have the highest proportions (of all three age groups) thinking economic growth and investment will increase, but also the highest proportions thinking it will decrease.

The perception that the vehicles will increase job losses is inversely related with age, which is mostly driven by the differences in proportions of participants thinking job losses with increase, rather than the ones thinking they will increase.

Perceptions about demand for new skills requirements are slightly higher among the 35-64 age group.

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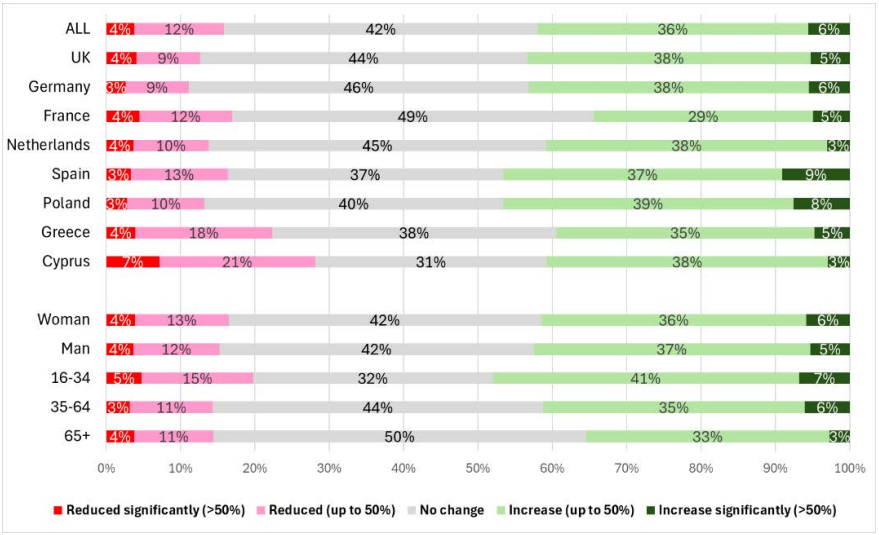

Figure 197. Impact on economic growth

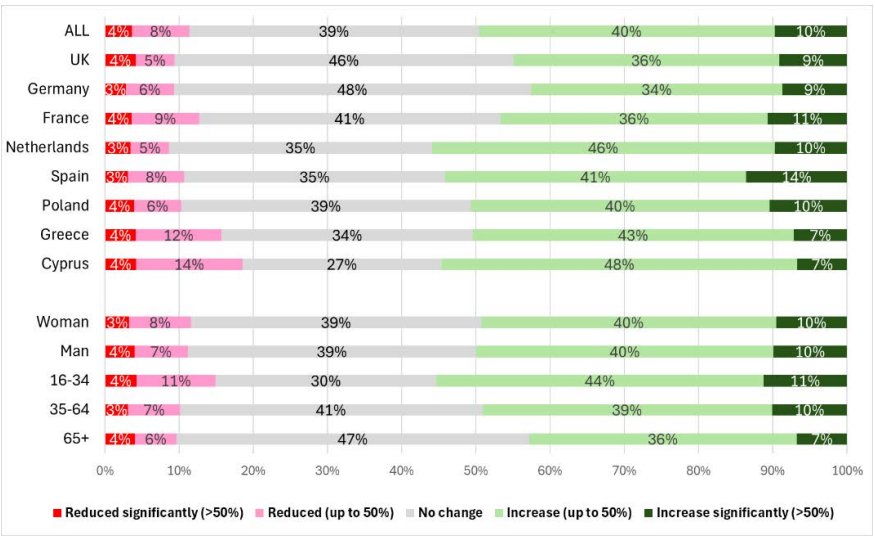

Figure 198. Impact on investments

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Figure 199. Impact on job losses

Figure 200. Impact on new skills requirements

5.14.7 Equity

Figure 201 shows the results for the five indicators of equity and Table 114 shows the average impacts on a -2 to +2 scale. All four indicators of accessibility are expected to increase, as seen by positive mean scores in Table 114. Accessibility of specific groups (individuals with special mobility needs, older people, families with children) is expected to increase more than general accessibility. 40% think general accessibility will increase or increase significantly (Figure 201), compared with 51% (individuals with special mobility needs, and older people) and 45% (families with children). The values of the indicator for individuals with special mobility needs have similar distributions as the one for older people.

The perceived change in employment opportunities is close to neutral (-0.09). This is consistent with perception about job losses, examined in the previous section, with on average is also close to neutral. 39% think employment opportunities will not change, 29% think they will increase and 32% think they will decrease (Figure 201).

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Figure 201. Impact on equity indicators

Table 114. Average impacts on environment

	Accessibility of general population	Accessibility of people with special mobility needs	Accessibility of older people	Accessibility of families with kids	Employment opportunities
ALL	0.21	0.48	0.44	0.37	-0.09
UK	0.26	0.53	0.48	0.40	-0.05
Germany	0.25	0.44	0.41	0.34	0.13
France	0.09	0.41	0.39	0.31	-0.02
Netherlands	0.18	0.43	0.43	0.26	-0.08
Spain	0.17	0.55	0.47	0.40	-0.12
Poland	0.26	0.48	0.40	0.47	0.05
Greece	0.27	0.52	0.46	0.40	-0.43
Cyprus	0.28	0.58	0.59	0.43	-0.38
Women	0.20	0.48	0.41	0.37	-0.14
Men	0.23	0.49	0.47	0.37	-0.04
18-34	0.30	0.50	0.42	0.39	0.00
35-64	0.24	0.53	0.51	0.41	-0.11
65+	0.04	0.36	0.31	0.24	-0.17

Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

Mean indicators of accessibility are positive in all countries and for all genders and age (Table 114). They tend to vary across countries less than other indicators examined in previous sections. They are also similar between men and women and the 18-34 and 35-64 age group. The 65+ age group, on average, has lower mean scores for the four indicators of accessibility. As shown in the figures below, this is mainly because of lower proportions thinking accessibility will decrease.

Perception about employment opportunities is negative in Greece and Cyprus and closer to neutral in other countries (Table 114, Figure 206). This contrasts with the results on job losses examined in the previous section, where participants in Greece and Cyprus were slightly more likely to think that job losses will decrease, rather than increase. The two results are compatible,

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as job losses reflect mainly professions that may disappear with the implementation of self-driving vehicles, while changes in employment opportunities encompass both these job losses but also the creation of new jobs.

Men and less likely than women to think employment opportunities will decrease. Participants in the 18-34 age group are neutral, but those in older age groups tend to think opportunity opportunities will decrease (Table 114, Figure 206).

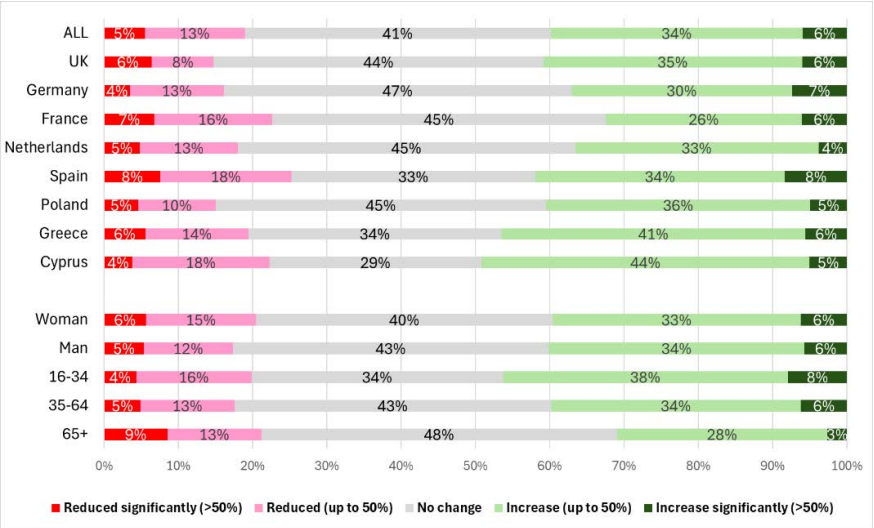

Figure 202. Impact on accessibility of general population

Figure 203. Impact on accessibility of people with special mobility needs

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Figure 204. Impact on accessibility of older people

Figure 205. Impact on accessibility of families with kids

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Figure 206. Impact on employment opportunities

5.14.8 Public health

Figure 207 shows the results for the three public health indicators and Table 115 shows the average impacts on a =2 to +2 scale. The overall perception about travel stress is almost neutral (-0.04). 29% think stress will increase or increase significantly and 31% think it will decrease or decrease significantly. Access to health care and emergency response are expected to increase (mean scores of 0.29). Both have similar distributions of perceptions (Figure 207), with 37-38% thinking they will increase and 12-14% thinking they will decrease.

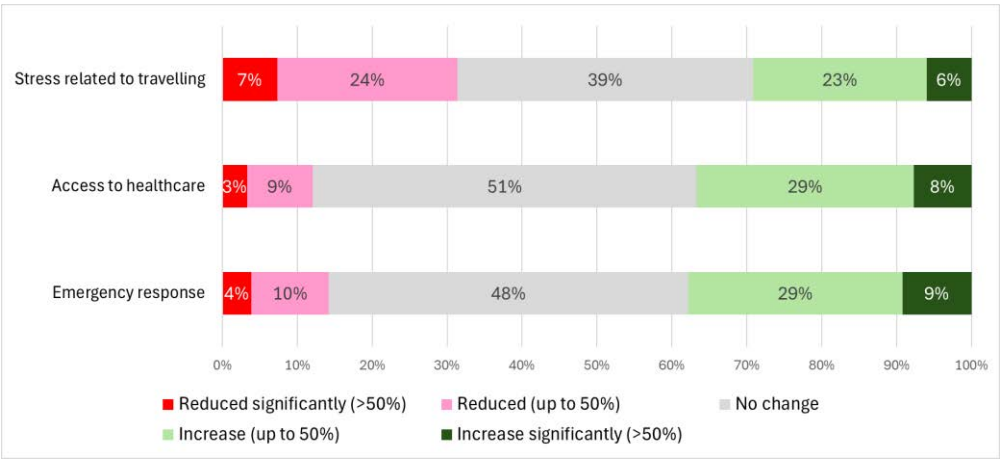

Figure 207. Impact on public health indicators

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Table 115. Average impacts on public health

	Stress related to travelling	Access to healthcare	Emergency response
ALL	-0.04	0.29	0.29
UK	0.04	0.33	0.28
Germany	-0.04	0.22	0.21
France	0.04	0.34	0.35
Netherlands	-0.01	0.27	0.24
Spain	0.03	0.28	0.38
Poland	0.21	0.39	0.32
Greece	-0.35	0.22	0.30
Cyprus	-0.53	0.23	0.17
Women	-0.05	0.30	0.30
Men	-0.02	0.27	0.28
18-34	0.00	0.38	0.35
35-64	-0.07	0.29	0.32
65+	0.01	0.15	0.13

Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

While impact on travel stress is neutral in most countries, it is positive in Poland and negative in Greece and Cyprus (Table 115). On average, it varies little across genders and age groups. While the youngest age group is more likely to believe stress will increase, it is also more likely to believe it will decrease (Figure 208).

The impacts on access to healthcare and emergency response are positive in all countries and across all genders and ages groups. They vary less, across countries, than other indicators examined in this chapter. The two impacts are similar for men and women, and inversely related to age.

Figure 208. Impact on stress related to travelling

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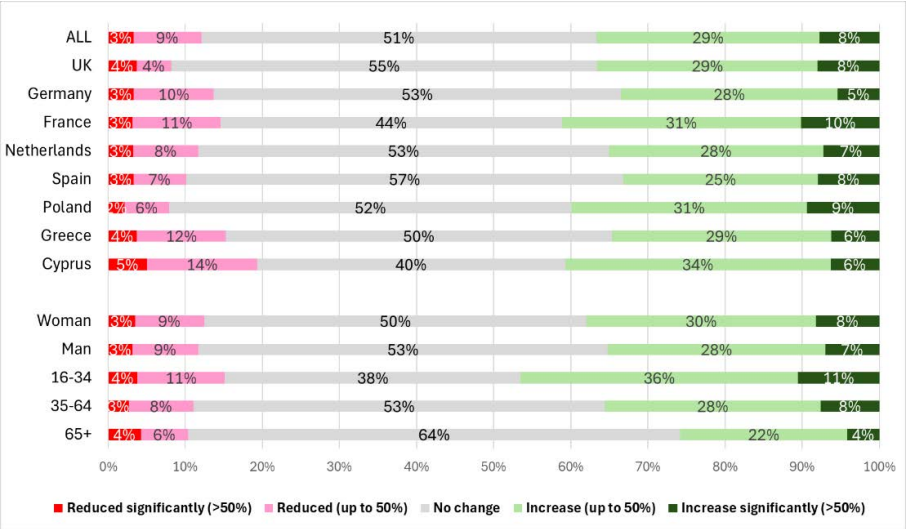

Figure 209. Impact on access to health care

Figure 210. Impact on emergency response

5.14.9 Safety

Figure 211 and Table 116 show the results for the four indicators of safety. Whether self-driving vehicles are safer than human-driven ones is one of the essential questions at the centre of research on self-driving vehicles. As seen in the figure and table, participants in this survey lean slightly more towards the belief that self-driving vehicles are safer. 28% think that “accidents” (i.e. traffic collisions[5]) will increase, compared with 38% who think they will decrease. The mean score is -0.12. The perceptions about traffic fatalities are even more optimistic (23% vs. 44%, mean score of -0.23). The results are consistent with those of the qualitative assessment (Section 2),

[5] While the use of the word “accident” is discouraged in research and journalism (https://www.rc-rg.com/guidelines), we use it in this survey as it is more likely to be understood by participants in all eight countries as more accurate alternatives such as “collisions” and “crashes”

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which showed that citizens generally think that safety might increase because of lack of human error, but they also have some concerns about possible malfunctions.

On average, survey participants also think that traffic violations and tickets (-0.42) and harassment events (-0.25) will decrease.

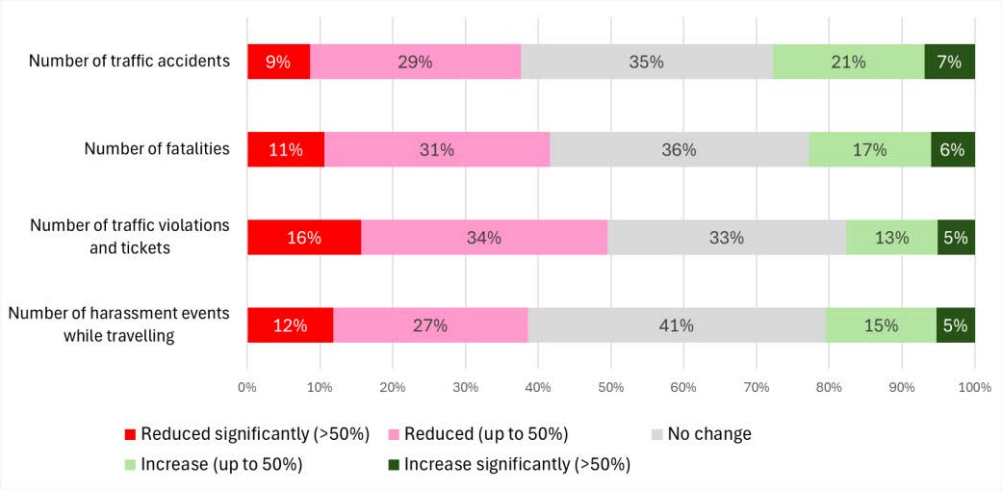

Figure 211. Impact on safety indicators

Table 116. Average impacts on safety

	Number of traffic accidents	Number of traffic fatalities	Number of traffic violations and tickets	Number of harassment events while travelling
ALL	-0.12	-0.23	-0.42	-0.25
UK	0.05	-0.06	-0.31	-0.15
Germany	-0.01	-0.08	-0.27	-0.11
France	-0.13	-0.22	-0.39	-0.14
Netherlands	-0.06	-0.14	-0.43	-0.23
Spain	-0.03	-0.24	-0.47	-0.14
Poland	0.01	-0.16	-0.25	-0.23
Greece	-0.34	-0.47	-0.62	-0.50
Cyprus	-0.70	-0.77	-0.91	-0.73
Women	-0.09	-0.20	-0.39	-0.21
Men	-0.14	-0.27	-0.46	-0.28
18-34	-0.06	-0.16	-0.34	-0.19
35-64	-0.14	-0.27	-0.45	-0.26
65+	-0.14	-0.26	-0.48	-0.28

Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

As seen in the table and in the figures that follow, participants in Greece and Cyprus are considerably more optimistic than those in other countries, regarding the reduction in all four indicators. In particular, the table shows that these two countries drive the overall mean score of number of traffic accidents to be negative, as in other countries the perception is close to be neutral. The balance between participants believing accidents will increase and decrease in these

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other countries is clear in Figure 212. For the other three indicators, all countries show mean negative values.

All indicators are negative, on average, for all genders and age groups. Men and the 35-64 and 65+ age groups are more likely to believe that all four indicators will decrease.

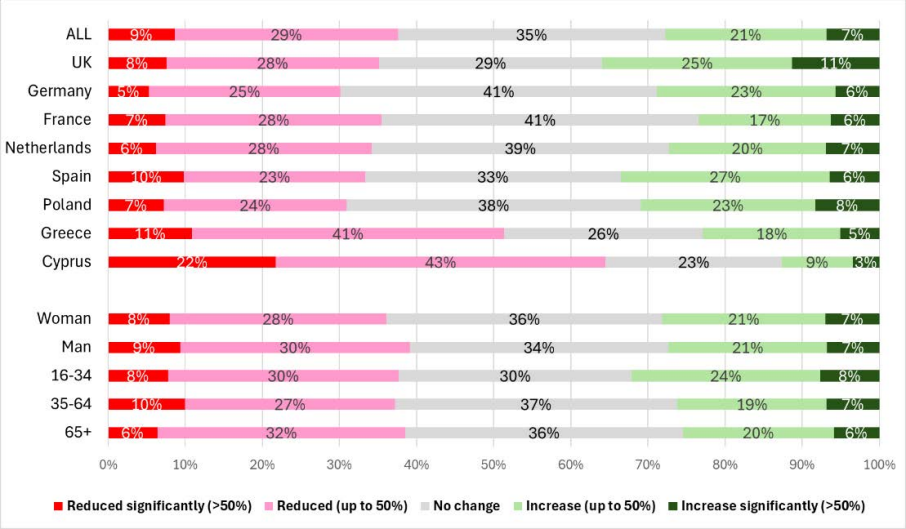

Figure 212. Impact on number of traffic accidents

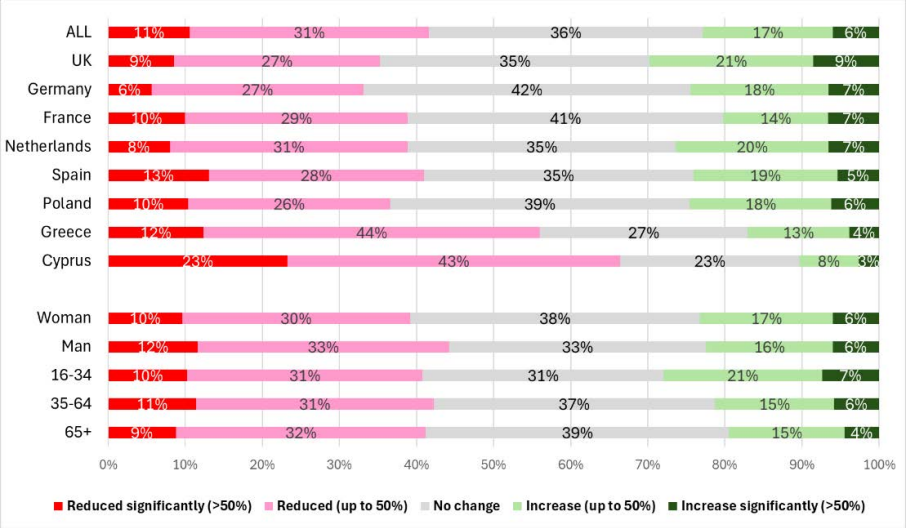

Figure 213. Impact on number of traffic fatalities

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Figure 214. Impact on number of traffic violations and tickets

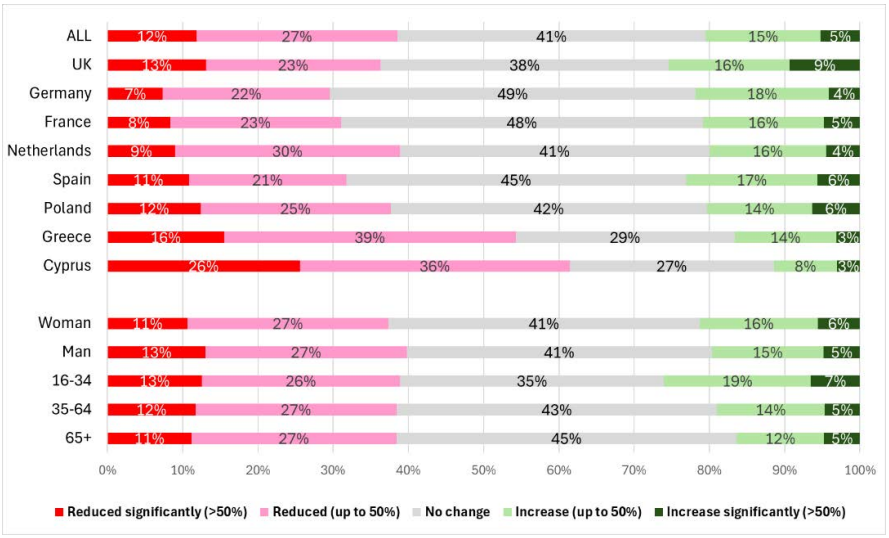

Figure 215. Impact on number of harassment events while travelling

5.14.10 Security

Finally, the following figures and table show the impact on the single indicator of security: number of cyber attacks related to the transport sector. This has been identified in previous literature, and previous activities of this project, as one of the main potential problems with self-driving vehicles. 15% of the sample think these attacks will increase significantly and a further 38% think they will increase. Only 12% think they will decrease or decrease significantly (Figure 205). This translates into a mean score, on a -2 to +2 scale of 0.53, i.e. roughly the middle point between “no change” and “increase” (Table 117).

The mean scores of this indicator are positive for all countries, in the range of 0.43-0.62 (Table 117). The proportions thinking cyber attacks will increase are above 50% or close to 50% in all

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countries (Figure 217). On average, men and individuals in the 35-64 age group are more likely to think that cyber attacks will increase than decrease, compared with other survey participants.

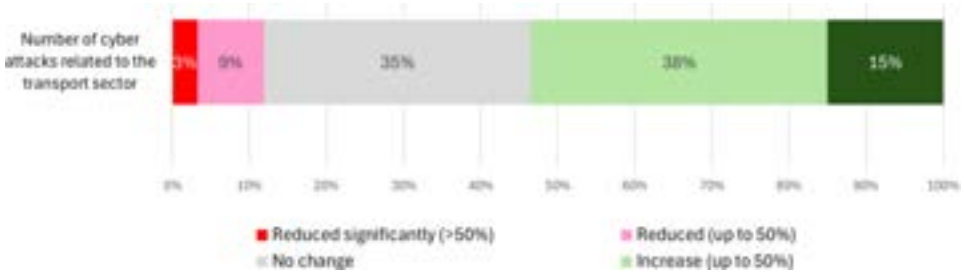

Figure 216. Impact on security indicators

Table 117. Average impacts on security

	Number of cyber attacks related to the transport sector
ALL	0.53
UK	0.57
Germany	0.59
France	0.44
Netherlands	0.61
Spain	0.62
Poland	0.45
Greece	0.51
Cyprus	0.43
Women	0.48
Men	0.59
18-34	0.50
35-64	0.57
65+	0.49

Notes: Scale from -2 to +2. Assumes equal importance of distances between the points on the 5-point ordinal scale shown to participants. Cyprus sample is 18-64 only and is not gender-balanced.

Figure 217. Impact on number of cyber-attacks related to the transport sector

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5.14.11 Inter-relationships between impacts

The previous sections showed some similarities in the patterns followed by some indicators. This suggests they are inter-related. We ran a factor analysis to reduce the set of indicators of all dimensions (i.e. all indicators in the previous sections) to a smaller set of unobserved factors retaining most of the variance of the original data set. As the sample was split into two groups (both answering questions on mobility and a separate set of other questions), two analyses are needed, one for each group.

Some variables were excluded from the analysis after preliminary runs found that they did not fit patterns of correlations with other variables. These were: ownership of conventional private vehicles, ownership of self-driving vehicles, job losses, and cyber attacks related to transport.

Both analyses extracted two factors, both explaining 97% of the variance of the respective data. Figure 125 show the correlations between these factors and the original variables. Correlations above 0.40 are highlighted.

Table 118. Factor analyses

Impact	Analysis 1		Analysis 2	
	F1 Mobility resources	F2 External effects	F3 Mobility benefits	F4 Mobility costs
Citizens' number of trips	0.65	-0.01	0.41	0.50
Citizens' travel time	0.55	0.21	0.12	0.60
Travel costs for citizens' trips	0.56	0.22	0.03	0.65
Usage of self-driving shared services	0.60	-0.12	0.45	0.39
Citizens' number of trips for shopping	0.66	-0.03	0.41	0.50
Delivery costs	0.50	0.24	0.08	0.60
Number of vehicles on the network	0.62	0.27		
Traffic congestion	0.45	0.52		
Number of people who live in rural areas	0.52	0.10		
Number of people who live in the city centres	0.47	0.21		
Demand for parking spaces in the city centres	0.46	0.37		
Demand for redesigned transport infrastructure	0.60	0.10		
Transport sector's emissions	0.35	0.53		
Demand for electricity to charge vehicles	0.50	-0.01		
Noise pollution	0.22	0.62		
Economic growth			0.57	0.29
Investments			0.53	0.30
New skills requirements			0.40	0.25
Accessibility of general population			0.67	0.13
Accessibility of people with special mobility needs			0.78	0.06
Accessibility of older people			0.79	0.04
Accessibility of families with children			0.74	0.08
Employment opportunities			0.38	0.16
Stress related to travelling			-0.03	0.38
Access to health care			0.54	0.30
Emergency response			0.51	0.24
Number of traffic accidents	0.08	0.75		

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Number of traffic fatalities	0.01	0.83		
Number of traffic violations and tickets	-0.02	0.81		
Number of harassment events while travelling	0.04	0.73		
Number of observations	3425		3461	
% of variance explained	66	31	77	20

In the first group of data, the first factor (F1) explains 66% of the variance of the original set of indicators. We label this factor *Mobility Resources*, as it is related to an increase in mobility (more and longer trips, and residence relocation) and in the resources to support that mobility, including financial ones (i.e., travel and delivery costs), parking space, redesigned infrastructure, and electricity.

The second factor (F2) explains 31% of the variance. We label this factor *External Effects*. It is associated with negative social and environmental effects: emissions, noise, accidents and fatalities, traffic violations, and harassment

In the second group of data, the first factor (F3) explains 77% of the variance of the original set of indicators. We label this factor *Mobility Benefits*. It is related to increases in mobility (number of trips) and their benefits in term accessibility, and economic dynamism.

The second factor (F4) explains 20% of the variance. We label this factor *Mobility Costs*. It is related to mobility and associated increases in travel and delivery costs. The factor partially covers the same aspects as F1 in the first analysis.

5.14.12 Models of wider impacts

This section estimates statistical models to identify the variables related to the factors extracted above. The dependent variables are Factors 1 to 3. Factor 4 is not modelled because it overlaps with Factor 1, partially capturing the same aspects.

The objective of the models is to determine whether specific participants characteristics and other variables are significantly related to these factors, when controlling for other relevant variables. The groups of explanatory variables are the same as in the models of impacts on individual behaviour shown in previous sections: participant demographic characteristics and current travel context and behaviour, attitude in relation to technology adoption, level of previous awareness of self-driving vehicles, and location. It also includes the impacts that participants expect that self-driving vehicles would have in their individual behaviour (i.e. the dependent variables of the models in previous sections). Linear models were used. Variables were removed from the models when they were not significant at the 10% level in any of the three models. We report only the signs of the significant variables. Appendix 12 contains the full models.

Table 119 shows the results. In the F1 (*Mobility Resources*) model, women have a positive coefficient i.e. women are more likely than men to think that self-driving vehicles will increase mobility together with an increase of resources to support that mobility. Higher levels of awareness of self-driving vehicles are also associated with stronger views that mobility will increase and will require resources. People living in villages, and those who label themselves as “innovators” are associated with weaker views. As expected, *Mobility Resources,* which aggregates a series of wider impacts on mobility and resources (i.e. impacts at the level of the whole region), is associated with the corresponding impacts at the individual level (i.e. increases in individual number of trips, parking needs, and delivery costs, as well as relocation to central areas).

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In the F2 (*External Effects*) model, women, the 18-34 group, and individuals who do not have a driving licence have a positive coefficient, i.e., these participants are more likely than others to think that self-driving vehicles will have negative social and environmental effects. Individuals with no car are more likely to think these effects will not occur. Awareness of self-driving vehicles is not significant. People living in richer regions, and those who label themselves as “laggards” in terms of technology adoption are associated with weaker views. *External Effects* is also associated with expected positive impacts on individual parking needs and delivery costs and with expected negative impacts on delivery orders

In the F3 (*Mobility Benefits*) model, individuals without car have a positive coefficient, i.e. they are more likely to think self-driving vehicles will have wider benefits, while both the 18-34 and 65+ age groups are less likely to have that view. Higher levels of technology adoption and of awareness of self-driving vehicles are also associated with stronger views that mobility will have wider benefits. *Mobility Benefits* is also associated with expected positive impacts on number of trips and delivery costs, negative impacts on travel time, and relocation to city centre. It is related to both positive and negative impacts on parking needs (compared with no impacts].

Table 119. Models of wider impact of self-driving vehicles

	F1 Mobility resources	F2 External effects	F3 Mobility benefits
Woman	+	+	
Age: 18-34		+	-
Age: 65+			-
No driving licence		+	
No car		-	+
Technology: “innovator”	-		
Technology: “late majority”			-
Technology: “laggard”		+	-
Not aware of self-driving vehicles	-		
Aware of self-driving vehicles	+		+
Well aware of self-driving vehicles	+		+
Village	-		
Region: Income per capita (log)		+	
Impact on travel time: negative		-	+
Impact on travel time: positive			
Impact on number of trips: negative			
Impact on number of trips: positive	+		+
Impact on parking needs: negative	-	-	+
Impact on parking needs: positive	+	+	+
Relocate to rural	-		
Relocate to suburban			
Relocate to city centre	+		+
Impact on number of delivery orders: negative	-	+	-
Impact on number of delivery orders: positive			
Impact on number of delivery costs: negative	-	-	
Impact on number of delivery costs: positive	+	+	+

Notes: Table shows only the sign of significant variables. Appendix 12 contains full models.

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5.15 Other impacts

Participants were asked to indicate any other impact of self-driving vehicles not included in the previous questions. The answers were translated into English for analysis. The translated answers included a total of 48,564 words, i.e. an average of 6.1 words per participant.

Most participants provide either a variation of “I don’t know” or “nothing to add” or a variation of the indicators they were asked about in the previous questions (especially safety and jobs). Others gave their general opinion about self-driving vehicles (often polarised, i.e. strong support or opposition) or their opinions about the timeline for deployment (with many participants saying they will probably not be alive when self-driving vehicles are implemented). Others talked about their own propensity (or reluctance) to use self-driving vehicles, or that of people in their region or country.

Figure 218 is a word cloud with the most common 50 words in all answers. Words related to the subject in question (e.g. “self-driving”, “vehicle”, “autonomous”), the opinion process (e.g. “think”, “believe”), and evolution (“e.g. “change”, “increase”, “reduce”, “possible”) were removed. The most common word was “accidents”. This was accompanied by frequent references to related terms such as “safe”, “safety”, “dangerous”, “risk”, “errors”, “fear”, “malfunctions”, and “failure”. This is consistent with the results of the qualitative assessment in Chapter 2: possible technology failure was a concern identified in citizen discussions about all passenger and freight use cases.

Another topic frequently mentioned is the implications of the implementation of self-driving vehicles for humans (e.g., “drivers”, “driving”, “people”).

Other concerns include dependence on “technology”, “costs”, effects on “jobs” (plus “unemployment” and “work”), pollution, and (traffic) jams. There is a mix of optimism (“improve”, “positive”, “better”, “easier”, “trust”) and pessimism (“problems”, “difficult”, “issues”, “lack”, “loss”).

The word clouds for men and women are not very different. The ones for age groups have some differences (Figure 219). While all have high frequencies of the words “accidents” and “dangerous”, “safety and ”safe”), these are more frequent for the oldest age group (65+). This age group also has more frequent negative words, especially “problems”, but also “concerns” and “difficult”. In addition, “trust” and “confidence” are more important for this age group (often mentioned in answers in the negative, i.e. lack of trust or confidence).

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Note: Created with https://tagcrowd.com. Only 50 most frequent words shown. Removed common words of English grammar as well as other general words related to the process of giving an opinion and to the subject matter (self-driving vehicles).

Figure 218. Word cloud of answers to open-ended questions on other impacts

18-34

35-64

65+

Figure 219. Word clouds of answers to open-ended questions on other impacts, by age group

We then coded all answers, to identify only impacts, and only impacts that were indeed new (as this was the main objective of the question), rather than impacts already covered in the previous questions (such as safety, congestion, pollution).

Table 120 shows impacts mentioned by at least 10 participants (i.e. 0.2% of the sample). The most common impacts were more vehicle breakdowns and software failure (1.6%), more freedom

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