TRansport Innovation for disabled People needs Satisfaction

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Topic:	**MG-4-5-2019**
Type of action:	**RIA**
Starting Date:	**01.02.2020**
Duration:	**36 months**
Deliverable No:	**D10**
Deliverable Title:	**D2.4 Quantitative survey report (2nd version)**
Date:	**31 January 2023**

Document Control

Deliverable	Deliverable (No 10) D2.4 Quantitative survey report (2nd version)
WP/Task Related	WP2 Task 2.4
Delivery Date	31 January 2023
Dissemination Level	Public
Lead Partner	TRI
Contributors	DLR, ENIL
Reviewers	ENIL, AAATE, TUE
Abstract	The TRIPS **Quantitative survey report** (D2.4) presents the findings of the 2nd round of the quantitative survey, comparing elderly, non-disabled and disabled user groups. Our findings corroborate D2.3 findings on the need for prioritising an accessible journey planner. The solution is highly desirable to non-disabled user groups. Ride-pooling and microtransit and robotaxis seem to be highly acceptable solutions for all user groups and perhaps the most promising in terms of societal acceptance and market potential. Persons with certain disabilities rely more than others on taxis; hence their requirements from robotaxis should be further investigated. Gendered analysis should also play a key role in accessibility research and responsible innovation. As in D2.3 cycle lanes will serve alternative purposes for the elderly and persons with disabilities and should be reflected in their design. Investment in two wheeled mobility systems – bike sharing, e-scooters, and motorbike taxis – should be re-examined as acceptability remains low across user groups.
Project website address	www.trips-project.eu

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Revision History

Version	Date	Author(s)	Reviewer(s)	Notes
0.1	05.01.2023	TRI (Tally Hatzakis, Ilaria Bonavita)	ENIL (Laura Alčiauskaitė)	First review
0.2	22.01.2023	TRI (Tally Hatzakis)	AAATE (Sabine Lobnig)	Second review
Final version	28.01.2023	TRI (Tally Hatzakis)	TUE (Diana Stah)	Final

Disclaimer

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Table of Contents

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

List of Figures

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

List of Tables

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

1. Executive Summary

1.1. Context

The previous **Deliverable 2.3 Quantitative survey report** presented persons with disabilities' mobility needs and challenges and initial attitudes toward future transport trends. This Deliverable 2.4 collected analyses and reports on the views of the elderly who also face some health issues and exclusion from urban transport.

To ensure comparability, the survey explored user views on the same mobility systems examined in the first round, namely ride-pooling, micro-transit, accessible journey planners, motorbike taxis, e-scooter sharing, bike-sharing, cycle lanes, cable cars, and robotaxis.

If our hypothesis that elderly and other user groups of urban public transport share some of the requirements of people with disabilities for accessible and barrier-free solutions, the number of beneficiaries of inclusive transport systems would go far beyond the estimated 135 million people with disabilities in Europe.

1.2. Objectives

The main aim of the survey study was to understand whether the views of persons with disabilities regarding future mobility systems are comparable to other user groups and hence to what extent their views should be considered in the design of quality transport services as standard.

1.3. The approach

A cut-down version of the initial questionnaire was used for Phase 2 that excluded questions related to attitudes towards assistive technologies. We asked, however, identical questions concerning future mobility systems, as in Phase 1. As per Phase 1, the survey was available in Italian, Portuguese, Greek, French, Dutch, Croatian, Swedish, and German (as anticipated in the DoA), as well as in six additional languages - Bulgarian, Polish, Russian, Spanish, Lithuanian and Romanian - to expand the European reach of the survey. The survey remained accessible until the end of the project.

1.4. Structure of this deliverable

To avoid repetition, we omit the literature review and overall methodology presented in D2.3; we only report on the following:

- **Section 2** explains changes to our methodology;
- **Section 3** presents findings and compares findings those of elderly and non-disabled cohorts;

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

- **Section 4** provides a discussion of findings and comparative analysis with findings from the elderly and non-disabled cohorts;
- **Section 5** Reflects on the survey and provides recommendations for future research;
- **Section 6** provides our conclusions, particularly on design and future investment**.**

2. Methodology

2.1. Survey development

The Phase 1 survey was considered interesting but lengthy. To address this point, we excluded questions about (i) user views on accessibility solutions and (ii) ICT technology competence and confidence view (STA). Instead, the questionnaire included the following sections:

2.1.1. User profile

The section profiled users with respect to sociodemographic characteristics. It comprised questions concerning age, gender, country, and city of residence, educational level and occupancy status, as well as questions regarding faced impairments and transport barriers (if any).

Respondents' mobility behaviour, as well possession of a driver's license, car and other modal use were also asked to understand their travel patterns and the market potential of shifting users away from private car use.

2.1.2. Technology use behaviour and use intention

In this section, respondents were asked to state how often they use different technologies in their daily life. As per Phase 1, the technologies were: smartphone/tablet, PC/laptop, online maps/ journey planning apps (like Google maps), virtual assistants (like Alexa), mobile payment app (like Apple Pay), online games, social media (like Facebook) and smart home systems (like Google home, Apple homeKit).

We excluded questions regarding assistive technologies (present in Phase 1) to reduce the length of the questionnaire.

2.1.3. Assessment of new mobility systems

The heart of the survey comprised the respondents' assessment of nine innovative mobility systems: ride-pooling, micro-transit, accessible journey planners, motorbike taxis, e-scooter sharing, bike-sharing, cycle lanes, cable cars and robotaxis. A full textual description of the nine mobility systems was given in Appendix 1. As per Phase 1, respondents were asked if that mobility system would motivate travel and how it fares against the five dimensions of the Mobility Divide Index (MDI): **autonomy, duration,**

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

convenience, comfort, safety. This allowed for comparative analysis with Phase 1 findings.

As per Phase 1, we maintained the open question "What would have to be improved for you to be more likely to use the mobility system?" to collect people's ideas on the technical improvements.

We also maintained a couple of questions with regards to user views on the overal accessibility of the transport system and the impact of COVID-19 on the users' travel perceptions.

2.1.4. Procedure

The survey was conducted online, using the software SoSciSurvey (Leiner, 2019), and can still be accessed through the following link: https://ts.dlr.de/survey/trips/. The survey could be completed by both persons with disabilities or non-disabled people. It took about 20 to 30 minutes to complete the survey. To avoid missing data, all questions were mandatory.

Invitations informed users about the purpose of our study and about the TRIPS project overall, as well as about the projects' data management policy and practices, the use and management of their data in line with GDPR. Participants were also given contact details, should they need to contact someone for clarifications and extra information. Participants were asked for their consent at the beginning of the study, although data was collected anonymously.

The survey was distributed via two comprehensive lists of contacted organisations[1], and via personal contact oy Local Coordinators (LCs) and Local User Leads (LULs) in the seven cities. Despite repeated bursts of email communications however participation remained low.

To increase participation to the survey 2, interns were recruited – one in the Netherlands and one in Spain – to conduct the questionnaire as an interview with elderly people and fill the online questionnaire on their behalf.

A market research company was recruited to return 250 responses via their cohort participants, but the collaboration ended in a dispute regarding informed consent practices and quality control. The case is currently under investigation by ESOMAR and the data is excluded from consideration.

[1] Lists are posted on TRIPS SharePoint and can be available on demand.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

2.2. Data preparation

In Phase 2 a total of 372 answers were completed between 1 April 2021and 30 November 2022 in 11 languages. 23 participant responses were discarded as questionnaire testing and incomplete data at the beginning of the data collection period. Responses to open-ended questions not given in English were either machine-translated to English or, where possible, translated by native speakers.

2.3. Sampling

Unlike Phase 1 which was dedicated to persons with disabilities, Phase 2 was open to everyone and particularly targeted to older citizens who constitute a large and increasing demographic section of the population and who are likely to also face barriers to accessing and using transport. Hence, the Phase 2 cohort allowed us to compare the views and preferences of persons with disabilities vis a vis those of senior citizens and non-disabled people to establish similarities and differences, assuming Phase 1 and Phase 2 samples are similar in other demographic respects. To this end, we present the characteristics of the Phase 2 sample in comparison to Phase 1 to understand any inherent sampling differences that may bias our interpretation.

The final Phase 2 sample that was analysed comprises 349 individuals. Of those, 89.1% of respondents filled in the surveys by themselves and (10.9%) responses were given by persons answering on behalf of the participant, comparable with Phase 1. Respondents from 28 countries (21 countries in Phase 1) are represented in the sample. However, the number of study participants varies strongly between the countries. The countries with the highest numbers of study participants are Italy (n =76), Germany (n = 56), as per Phase1, and Spain (n = 56), which was not as highly represented in Phase 1. In contrast, only one person participated from Estonia, France, Montenegro, Cyprus and 5 non-European countries, a negligible number to affect statistics.

Gender was nearly equally distributed in the sample. The gender distribution is relatively equal, though in Phase 2 **men were a bit less represented than women. With men comprising** (43%) and **women** (56.7%) as opposed to Phase 1 where **men** comprised (51.36%) than **women** (45.75%).

The **mean age** of the respondents in Phase 2 was 51.84 years (SD=17.91) as opposed to 46.41 years (SD = 15.7 years) in Phase 1. Due to the sampling strategy, where we targeted older and non-disabled citizens for this round to allow for comparisons, we expected a slightly different profile. The relative age distribution between Phase 1 and Phase 2 is as follows:

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

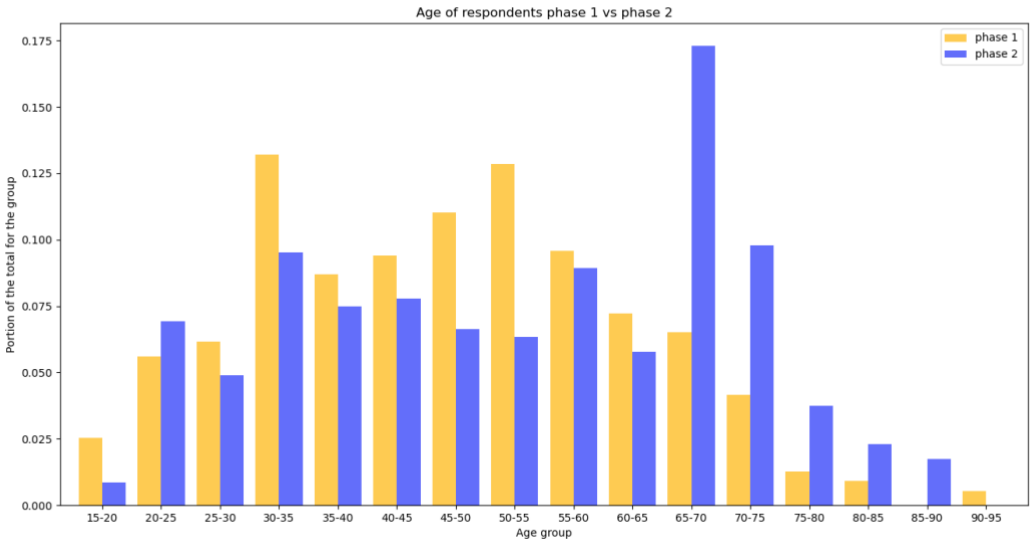


Figure 1: Age distribution of Phase 1 and Phase 2 cohorts

As shown in the table below, the samples of Phase 1 and Phase 2 are comparable in terms of educational level and occupancy, except for a 35% participation of retirees in Phase 2 in relation to 25.7% in Phase 1 due to targeting older citizens. Unemployment dropped from 15.7% to 4.9% between Phase 1 and Phase 2 and the prevalence of high school education in Phase 1 decreased by almost 10% which spread across other educational statuses.

Table 1: Description of sample according to highest educational level and occupancy

		Phase 1		Phase 2	
		Number	**Percent**	**Number**	**Percent**
Highest educational level	None	29	5.2%	28	8.0%
	High School degree	256	**46.3%**	125	**35.8%**
	Bachelor's degree	129	23.3%	80	22.9%
	Master's degree	107	19.3%	89	25.5%
	Ph.D.	14	2.5%	16	4.6%
	Missing data	18	3.3%	11	3.2%
Occupancy	Unemployed	87	**15.7%**	17	**4.9%**
	Work full-time	158	28.6%	121	34.7%
	Work part-time	63	11.4%	35	10.0%
	Study	39	7.1%	24	6.9%
	Retired	142	**25.7%**	122	**35.0%**
	Other	64	11.6%	30	8.6%

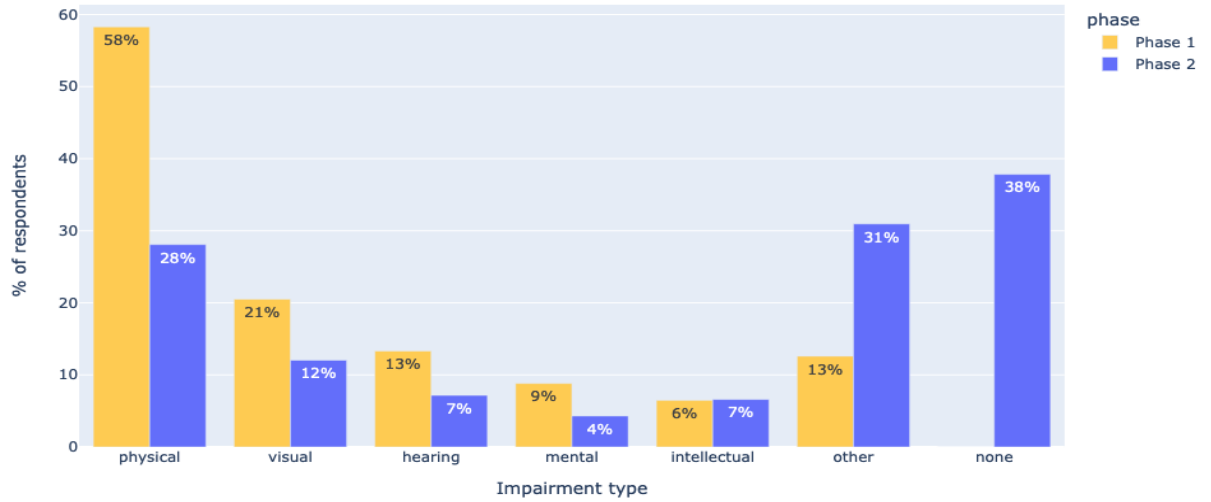
This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Figure 2 below compares the representation of different types of disabilities in Phase 1 and Phase 2 to establish any inherent sample biases.

Respondents with physical disabilities accounted for 28% in Phase 2 (as opposed to 58.4% in Phase 1) and this may introduce a slight bias in the overall findings to be accounted for; the share of visual impairments was 17% in Phase 1 and slightly higher than the 12.6% average in the general population, and 12% in Phase 2 at par with the general population. Hearing impairments were at 11.6% at par with the general population in Phase 1 and slightly under-represented in Phase 2.

Participants with cognitive impairments, including intellectual disabilities constituted 6.5% and 7% and those with mental health issues constituted 8.5% and 4% of respondents, which are less frequently represented in the sample compared to the general disability population statistics. In Phase 2, 31% (as opposed to 13% in Phase 1) faced other issues, such as chronic, temporary or other health issues, and 38% of our sample did not face any impairment. The latter were expected due to our targeting of non-disabled users to use as our control group for comparison purposes.

Figure 2: Representation of different impairments in our samples in Phase 1 and Phase 2



When comparing ICT use in Phase 1 and Phase 2 cohorts, there are similarities but also some important differences (see table 2 below). It is worth remembering that the Phase 1 cohort represents persons with disabilities exclusively, while Phase 2 is a mixed cohort of disabled and non-disabled citizens.

Table 2: ICT usage in Phase 1 and Phase 2 participant cohorts per age group

	Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2
	never		rarely		Some times		Frequently		always	
smartphone_tablet										
0-35	7.9%	1.3%	1.3%	3.8%	3.3%	2.5%	17.1%	21.5%	70.4%	70.9%
36-65	5.2%	4.0%	2.2%	1.3%	3.4%	2.7%	17.8%	24.2%	71.4%	67.8%
65+	9.2%	14.9%	6.6%	9.1%	5.3%	10.7%	26.3%	26.4%	52.6%	38.8%

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

PC										
0-35	5.3%	3.8%	1.3%	0.0%	7.9%	10.1%	20.4%	26.6%	65.1%	59.5%
36-65	3.1%	4.0%	3.1%	2.7%	7.1%	9.4%	24.3%	23.5%	62.5%	60.4%
65+	17.1%	33.1%	3.9%	14.0%	5.3%	17.4%	19.7%	14.0%	53.9%	21.5%
online_maps										
0-35	15.8%	3.8%	10.5%	8.9%	19.7%	22.8%	29.6%	46.8%	24.3%	17.7%
36-65	7.7%	6.7%	11.1%	6.7%	25.8%	20.8%	29.2%	36.2%	26.2%	29.5%
65+	25.0%	53.7%	17.1%	14.0%	25.0%	19.0%	15.8%	9.1%	17.1%	4.1%
virtual_assistant										
0-35	57.9%	39.2%	14.5%	24.1%	9.9%	17.7%	10.5%	7.6%	7.2%	11.4%
36-65	54.5%	55.0%	19.7%	14.1%	12.3%	12.1%	6.2%	10.1%	7.4%	8.7%
65+	73.7%	88.4%	13.2%	5.0%	6.6%	3.3%	2.6%	2.5%	3.9%	0.8%
mobile_payment										
0-35	37.5%	29.1%	10.5%	17.7%	14.5%	15.2%	19.1%	21.5%	18.4%	16.5%
36-65	31.4%	40.3%	13.5%	14.1%	17.2%	18.8%	22.8%	15.4%	15.1%	11.4%
65+	52.6%	85.1%	14.5%	3.3%	6.6%	5.8%	13.2%	5.8%	13.2%	0.0%
online_games										
0-35	36.2%	32.9%	17.8%	16.5%	17.8%	17.7%	13.2%	17.7%	15.1%	15.2%
36-65	43.7%	55.0%	23.7%	22.1%	14.2%	11.4%	11.7%	6.7%	6.8%	4.7%
65+	50.0%	83.5%	13.2%	9.1%	15.8%	3.3%	14.5%	4.1%	6.6%	0.0%
social_media										
0-35	11.2%	6.3%	2.6%	0.0%	7.9%	10.1%	32.2%	36.7%	46.1%	46.8%
36-65	8.9%	6.0%	7.4%	6.7%	12.9%	15.4%	32.6%	36.9%	38.2%	34.9%
65+	38.2%	58.7%	18.4%	13.2%	6.6%	10.7%	10.5%	9.9%	26.3%	7.4%
smart_home										
0-35	59.9%	53.2%	11.2%	11.4%	7.2%	5.1%	10.5%	10.1%	11.2%	20.3%
36-65	52.3%	62.4%	13.2%	11.4%	12.9%	8.7%	11.1%	7.4%	10.5%	10.1%
65+	56.6%	89.3%	13.2%	4.1%	13.2%	1.7%	10.5%	3.3%	6.6%	1.7%

We present here insights about the ICT use of disabled younger adults (between 18-35 years old) in Phase 1 vis-a-vis ICT use of the mixed cohort in Phase 2. Only, 7.9% of disabled young adults never use a smartphone/table, compared to only 1.3% in the mixed cohort of Phase 2; 15.8% make no use of online maps compared to only 3.8%; 57.9% never use virtual assistants compared to 39.2% and 11.2% never use social media compared to 6.3%. These statistics denote differences in the access to and in effect familiarisation and confidence of the younger generation of persons with disabilities in developing the digital skills and confidence necessary for digital mobility. Differences are far less prominent when comparing PC use, but PCs are not as relevant as technology to operate the upcoming digital mobility systems.

When it comes to middle aged (36-65) participants, differences between Phase 1 and Phase 2 cohorts are negligible except for mobile payments and online games where Phase 1 participants, who have never used online payment systems, are slightly less (31.4%) than the mixed Phase 2 cohort (40.3%). Phase 1 participants who have never played online games are slightly less (43.7%) than the mixed Phase 2 cohort (55%). This

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

finding may indicate a slightly higher familiarisation of persons with disabilities with such systems and digital environments. This may inform the design of digital mobility system interfaces.

Regarding older people (65+), participant differences between Phase 1 and Phase 2 cohorts indicate that Phase 1 participants are more technologically savvy than Phase 2 participants. Perhaps this could be attributed to the fact that in Phase 2 around 100 questionnaires were done by researchers as interviews with elderly citizens, particularly to cover the fact that many elderly citizens do not have the appetite or the skills to complete an online questionnaire. People who completed the questionnaire in Phase 1 were by default internet savvy, as respondents completed the survey during COVID-19 lockdowns in Phase 1. While this does not annul sample differences per se, we should be cautious about attributing differences to disability status. With this cautionary note in mind, we should note that the Phase 2 cohort makes overall less use of smartphones; 14.9% never use it and only 38.8% use it daily as opposed to 9.2% and 52.5% of Phase 1 participants respectively. Similarly for PC, 33.1% never use it and only 21.5% use it daily as opposed to 17.1% and 53.9% of Phase 1 participants respectively. For online payments, a massive 85.1% don't use it and 0% use them daily, as opposed to 52.6% and 13.2% respectively in Phase 1. The impact of age on the digital divide and its knock-on effect should be considered when introducing digital mobility solutions.

Non-disabled respondents' profile: In Phase 1, we did not collect data from non-disabled citizens. In Phase 2, there are 131 non-disabled respondents in our sample. The age distribution compared to those facing barriers is as follows:

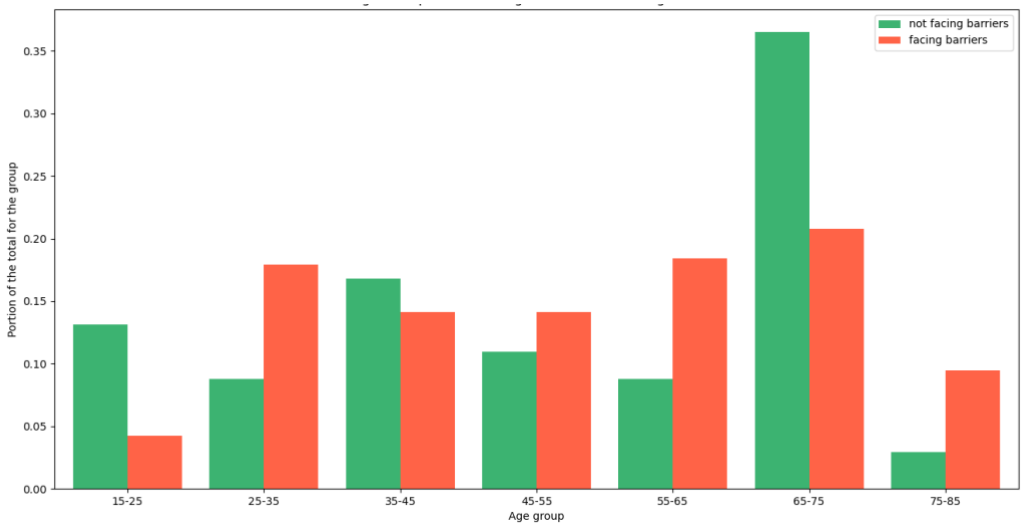


Figure 3: Age distribution of persons with disabilities and non-disabled users in Phase 2

The average age of those not facing barriers is 50.9 (with SD 18.6). By comparison, those facing barriers are on average 52.52 (with SD 17.4); for both groups, the median age is 54. T-test analysis confirms the similarities between the two cohorts. Given the

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

demographic similarities of the two cohorts, their views can be directly comparable and attributable to preferences as opposed to demographic differences.

3. Results

3.1. Modal use

Around 10% of people with impairments amongst our respondents cannot use cars, around 30% cannot use bike systems, on average 7% cannot use the bus, and approximately 6% cannot use the metro/train and taxi systems (see fig. 5 below). In addition, around 4% of those without impairment also declared that they cannot use certain modes of transport, and specialised/adapted transport.

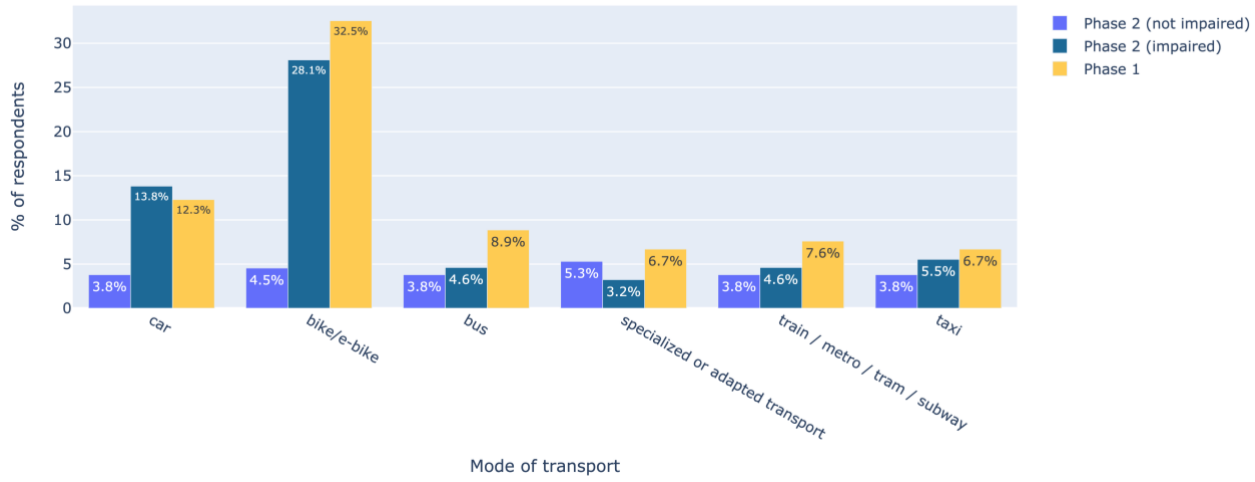


Figure 4: Percentage of respondents unable to use a mode of transport in Phase 1 (disabied only cohort), and in Phase 2 disabled cohort and non-disabled cohort.

These statistics strongly indicate **transport exclusion** as users do not have access to them for various reasons. As such, it is also a strong indication of transport inequity, as the higher the discrepancy between groups the higher the inequity in transport access. Findings suggest that bike and e-bike systems are highly inequitable regarding access, and to some extent cars.

3.1.1. Mode preferences between those with and without impairments

Disabled users have less preference for private cars, vis-a-vis non-disabled users, but overall car preference remains higher than public transport. Except for bikes, persons with disabilities use all other mobility systems more frequently than non-disabled users (see fig. 6 below).

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

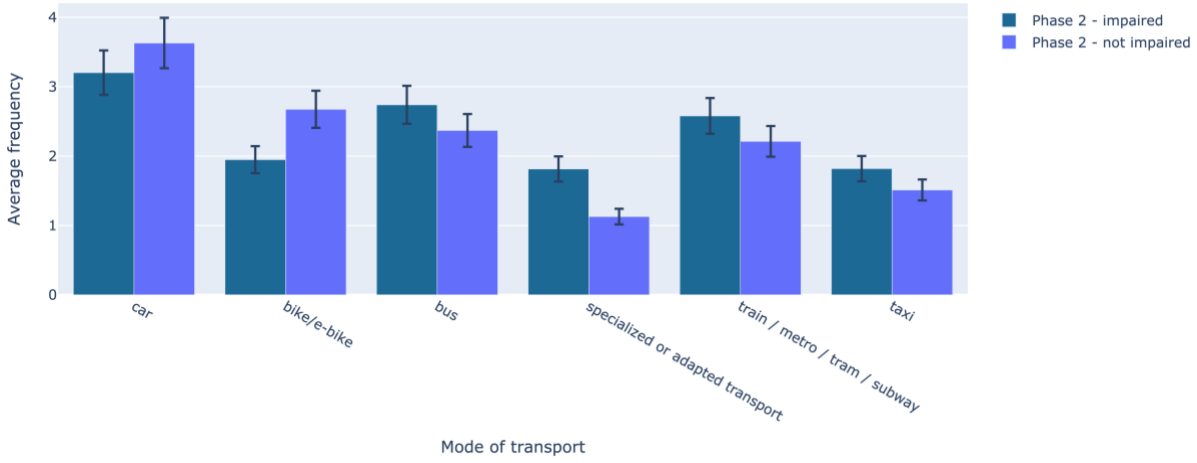


Figure 5: Comparative frequency of use of different modes of transport between persons with disabilities and non-disabled users in Phase 2

Younger people (18-35 in our sample) prefer buses and trains; those over 65 prefer cars; and middle age people (35-65) prefer equally the car and public transport systems like the bus, or metro/train systems.

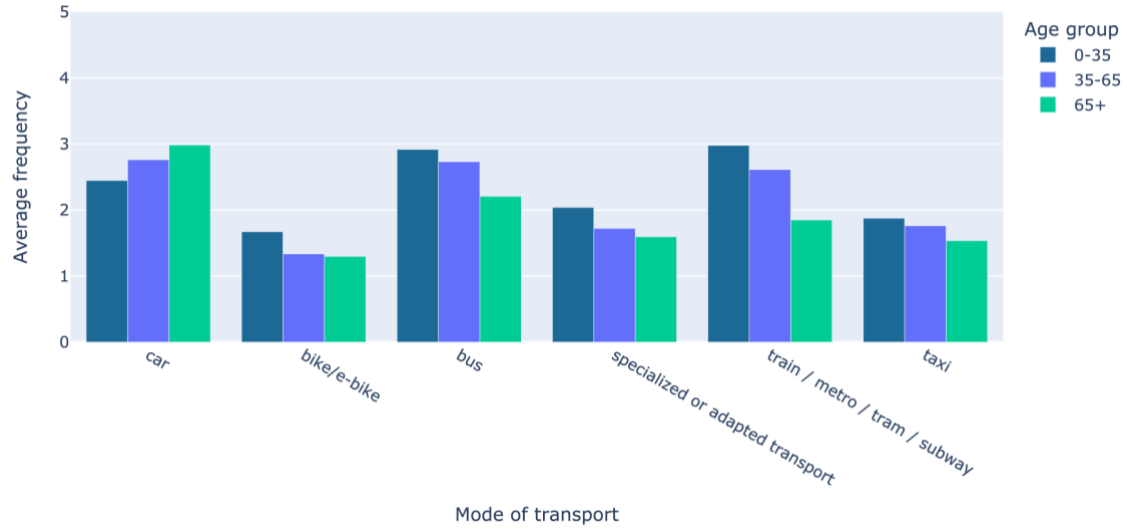


Figure 6: Average frequency of modal use per age group

Bike systems remain the least favored category for all age brackets. Given the sustantial investment in bike infrastructures, and the high inequity when it comes to accessibility (see fig. 6 above), the relationship of users with such systems requires further investigation as does the accessibility of the cycling infrastructure and cycling systems and services.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

3.1.2. Car Use

Nearly 60.2% of the respondents in Phase 2 **own a driver's license,** as opposed to 39.8% of respondents in Phase 1 where our sample comprise only persons with disabilities.

Non-disabled users are heavier car users, with almost 60% using their car either daily or weekly, vis a vis 40% persons with disabilities using their cars daily or weekly.

Table 3: Car use between persons with disabilities and non-disabled cohorts and across age brackets

	daily	several times a week	several times a month	few times a year	never	not able
Non-disabled	27.3%	31.8%	19.7%	9.1%	8.3%	3.8%
disabled	17.1%	22.1%	21.2%	12.9%	12.9%	13.8%
0-35	15.2%	24.1%	17.7%	17.7%	11.4%	13.9%
36-65	26.8%	19.5%	21.5%	10.1%	9.4%	12.8%
65+	17.4%	34.7%	21.5%	9.1%	13.2%	4.1%

Car use remains high amongst all age groups, though people in the middle age bracket (35-65) make substantially higher daily use (26.8%) versus 15.2% by younger people and 17.4% by older people, respectively. In addition, there are no substantial gender differences between car users with 68% of men and 67% of women in our sample using their cars daily or several times a week.

3.1.3. Use of Other Modes of Transport

Concerning use of other modes of transport, findings are relatively comparable between Phase 1 and Phase 2 except for **bikes. Weekly use of bike** rose from 7.8% in Phase 1 to 20.3%, whereas inability to use a bike dropped from 32.5% to 19.2%. The table below compares Phase 1 and Phase 2 current mode use per type of disability. Around 80% of persons with physical or visual disabilities never use or can't use **bikes**, and around 60% of persons with mental health issues and intellectual disabilities can't either. In addition, around 40% of persons with hearing impairments but also non-disabled citizens in our sample would never or can't use bikes either. Phase 1 percentages remain broadly the same as those of Phase2, with relative difference less than 10%.

Around 59% of respondents **without disabilities** reported that they would use their cars daily or weekly. In addition, 35% would use bikes, 21% would use buses, 20% metro/rail/trams/rails and only 2% taxis. In contrast, around 39% in our sample reported they can't or would never use bikes, 30% buses, 40% metro/rail/trams/rails, 58% taxis.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Table 4 Modal use by users with different types of disabilities and non-disabled users

	Phase 1						Phase 2					
	daily	several times a week	several times a month	few times a year	never	not able	daily	several times a week	several times a month	few times a year	never	not able
car												
physical	27,0%	26,4%	16,5%	11,2%	9,9%	9,0%	17,3%	15,3%	18,4%	19,4%	17,3%	12,2%
visual	9,6%	13,2%	15,8%	14,9%	18,4%	28,1%	9,5%	23,8%	14,3%	9,5%	14,3%	28,6%
hearing	32,4%	18,9%	12,2%	10,8%	18,9%	6,8%	12,0%	36,0%	0,0%	8,0%	20,0%	24,0%
mental	20,8%	22,9%	18,8%	16,7%	10,4%	10,4%	20,0%	26,7%	6,7%	13,3%	6,7%	26,7%
intellectual	19,4%	16,7%	27,8%	16,7%	5,6%	13,9%	8,7%	13,0%	26,1%	21,7%	13,0%	17,4%
other	21,4%	20,0%	20,0%	12,9%	12,9%	12,9%	22,2%	17,6%	24,1%	10,2%	12,0%	13,9%
no impairment	na	na	na	na	na	na	27,3%	31,8%	19,7%	9,1%	8,3%	3,8%
bike												
physical	2,8%	3,7%	4,7%	5,6%	41,6%	41,6%	4,1%	2,0%	5,1%	8,2%	43,9%	36,7%
visual	2,6%	4,4%	0,0%	7,0%	57,9%	28,1%	2,4%	4,8%	4,8%	9,5%	45,2%	33,3%
hearing	2,7%	6,8%	10,8%	12,2%	48,6%	18,9%	8,0%	20,0%	20,0%	12,0%	12,0%	28,0%
mental	4,2%	10,4%	6,3%	8,3%	39,6%	31,3%	6,7%	6,7%	13,3%	13,3%	26,7%	33,3%
intellectual	0,0%	8,3%	5,6%	5,6%	33,3%	47,2%	4,3%	4,3%	17,4%	13,0%	17,4%	43,5%
other	2,9%	5,7%	7,1%	12,9%	47,1%	24,3%	5,6%	6,5%	9,3%	9,3%	39,8%	29,6%
no impairment	na	na	na	na	na	na	17,4%	17,4%	12,1%	13,6%	34,8%	4,5%
bus												
physical	7,1%	14,0%	12,1%	28,6%	25,8%	12,4%	4,1%	16,3%	19,4%	31,6%	20,4%	8,2%
visual	34,2%	18,4%	18,4%	19,3%	5,3%	4,4%	23,8%	19,0%	16,7%	26,2%	9,5%	4,8%
hearing	23,0%	16,2%	13,5%	32,4%	6,8%	8,1%	36,0%	20,0%	16,0%	28,0%	0,0%	0,0%
mental	14,6%	20,8%	18,8%	27,1%	14,6%	4,2%	20,0%	13,3%	13,3%	46,7%	6,7%	0,0%
intellectual	11,1%	8,3%	13,9%	33,3%	19,4%	13,9%	34,8%	4,3%	17,4%	34,8%	8,7%	0,0%
other	12,9%	10,0%	17,1%	35,7%	18,6%	5,7%	11,1%	14,8%	19,4%	30,6%	22,2%	1,9%
no impairment	na	na	na	na	na	na	3,0%	18,2%	16,7%	31,8%	26,5%	3,8%
spacialised transport												
physical	4,0%	5,6%	7,8%	23,9%	52,2%	6,5%	11,2%	12,2%	18,4%	24,5%	30,6%	3,1%
visual	1,8%	2,6%	3,5%	10,5%	73,7%	7,9%	0,0%	9,5%	2,4%	9,5%	76,2%	2,4%
hearing	4,1%	4,1%	0,0%	6,8%	75,7%	9,5%	0,0%	12,0%	0,0%	8,0%	80,0%	0,0%
mental	0,0%	2,1%	2,1%	8,3%	70,8%	16,7%	0,0%	0,0%	13,3%	6,7%	73,3%	6,7%
intellectual	2,8%	8,3%	11,1%	11,1%	52,8%	13,9%	0,0%	0,0%	8,7%	17,4%	65,2%	8,7%
other	2,9%	4,3%	2,9%	12,9%	71,4%	5,7%	5,6%	5,6%	9,3%	12,0%	64,8%	2,8%
no impairment	na	na	na	na	na	na	0,8%	0,0%	1,5%	6,1%	86,4%	5,3%
metro tram subway												
physical	7,5%	12,1%	10,6%	32,6%	27,6%	9,6%	8,2%	14,3%	19,4%	31,6%	19,4%	7,1%
visual	21,1%	14,0%	20,2%	23,7%	16,7%	4,4%	11,9%	16,7%	26,2%	28,6%	9,5%	7,1%
hearing	24,3%	14,9%	9,5%	27,0%	20,3%	4,1%	32,0%	28,0%	16,0%	20,0%	4,0%	0,0%
mental	10,4%	22,9%	6,3%	25,0%	27,1%	8,3%	20,0%	6,7%	20,0%	46,7%	0,0%	6,7%
intellectual	2,8%	11,1%	2,8%	38,9%	30,6%	13,9%	13,0%	26,1%	17,4%	30,4%	13,0%	0,0%
other	11,4%	14,3%	12,9%	30,0%	24,3%	7,1%	6,5%	14,8%	13,0%	31,5%	30,6%	3,7%
no impairment	na	na	na	na	na	na	4,5%	15,2%	12,9%	27,3%	36,4%	3,8%
taxi												
physical	1,2%	2,5%	12,4%	43,2%	30,7%	9,9%	0,0%	4,1%	8,2%	36,7%	40,8%	10,2%
visual	0,9%	7,9%	14,0%	46,5%	27,2%	3,5%	2,4%	4,8%	26,2%	45,2%	19,0%	2,4%
hearing	2,7%	4,1%	9,5%	47,3%	31,1%	5,4%	0,0%	4,0%	8,0%	72,0%	16,0%	0,0%
mental	0,0%	4,2%	10,4%	35,4%	45,8%	4,2%	0,0%	20,0%	0,0%	46,7%	26,7%	6,7%
intellectual	2,8%	2,8%	13,9%	41,7%	30,6%	8,3%	0,0%	17,4%	13,0%	43,5%	26,1%	0,0%
other	0,0%	7,1%	18,6%	34,3%	40,0%	0,0%	0,9%	3,7%	7,4%	42,6%	40,7%	4,6%
no impairment	na	na	na	na	na	na	0,8%	0,8%	4,5%	34,8%	55,3%	3,8%

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

By comparison, respondents with **physical disabilities** mostly specified the **car to be their most often used means of transport daily or weekly** (34%). Only 6% would use bikes, 20% buses, 22% metro/rail/trams/rails, 4% taxis; surprisingly only 25% would use specialised transport. Even compared to other categories, this group of persons with disabilities feels the most excluded from public transport with around 80% reporting they can't or would never use bikes, 30% buses, 55% metro/rail/trams/rails, 50% taxis and even 33% specialised transport.

People with sensory disabilities have similar travel preferences.

Around 32% of persons with **visual impairments** would use private cars daily or weekly and only 7% bikes. Around 43% use buses, 28% metro/rail/trams/rail several times a week or daily, vis a vis 54% and 35% respectively in Phase 1. Only 7% use taxis daily or weekly, slightly higher than non-disabled populations (2%). In contrast, 35% can't or would never use cars, 78% bikes, 14% buses, 17%% metro/rail/trams/subways, 21% taxis.Almost 80% of persons with **hearing impairments** can't or would never use specialised transport. Almost half (48%) of them specified using a private car at least several days per week. About 28% use bikes several times a week while buses (56%) and trains (58%) are the most often used modes. Only 4% use taxis regularly. About (44%) declared that they can't or won't use a private car, 40% can't or won't use a bike, everyone would use a bus, while about 24% would not use metro/rail/tram/subway. Almost 60% would never use a taxi.

For those facing **mental health issues**, the car is preferred as a regular mode of transport by 47% who would use it daily or several times a week; while 13% would use a bike and 39% would use a bus, and 27% the metro/rail/tram/subway. Around 20% would use taxis weekly, at par with persons with intellectual impairments (17%). Around 20% declared that they would never use a car, 40% would never use a bike, 43% would never use a bus and 46% the metro/rail/tram/subway, while 73% would never use a taxi. Statistics are comparable to those of Phase 1.

Around 22% of respondents with **intellectual impairments** would travel by car several times per week, about 8% by bike. Like those with mental health issues, 39% will travel regularly by bus and equally by metro/rail/tram/subway. Around 8% will travel regularly by taxi. Almost 35% can't or won't use a car and 30% a bike. About 43% can't or won't use a bus and equally the metro/rail/tram/subway. Almost 70% can't or won't use a taxi. It is worth noting that many facing intellectual impairments often travel with a companion.

Of those that indicated **other impairments**, 41% will use cars regularly (daily/weekly), 23% the bus, 26% the metro/rail/tram/subway and 7% taxis. Approximately, 22% can't or won't use the car, 49% bikes, 53% buses and 62% the metro/rail/tram/subway. Almost 83% won't use taxis.

Like in Phase 1, specialised transport will be used almost equally by those facing physical disabilities (10%), intellectual disabilities (11%) and other impairments (7%). While modal split varies across the different types of disabilities, the car, buses, and metro/rail/tram/

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

subway remain the most popular options. Consequently, train and bus are the most frequently used modes of transport in Phase 1 and Phase 2 cohorts.

3.1.3.1. Comparison of mode use between user groups depending on disability

Table 5 below provides comparative statistics on modal preferences by disable and non-disabled cohorts in Phase 2.

Non-disabled users prefer private cars over public transport. They are heavier car users with 27.3% using their cars daily and 31.5% several times a week vis a vis 17.1% and 22.1% respectively to persons with disabilities. Also, non-disabled users use bikes daily (17.4%) or several times a week (17.4%) whereas only 5.5% and 6% of persons with disabilities do.

Table 5: Modal preferences by persons with disabilities and non-disabled cohorts in Phase 2

	daily	several times a week	several times a month	few times a year	never	not able
car						
non disabled	27,3%	31,8%	19,7%	9,1%	8,3%	3,8%
disabled	17,1%	22,1%	21,2%	12,9%	12,9%	13,8%
bike/e-bike						
non disabled	17,4%	17,4%	12,1%	13,6%	34,8%	4,5%
disabled	5,5%	6,0%	9,2%	9,7%	41,5%	28,1%
bus						
non disabled	3,0%	18,2%	16,7%	31,8%	26,5%	3,8%
disabled	11,5%	18,0%	17,1%	31,8%	17,1%	4,6%
specialized or adapted transport						
non disabled	0,8%	0,0%	1,5%	6,1%	86,4%	5,3%
disabled	5,5%	7,8%	9,2%	14,7%	59,4%	3,2%
rail / metro / tram / subway						
non disabled	4,5%	15,2%	12,9%	27,3%	36,4%	3,8%
disabled	9,2%	15,7%	18,4%	30,0%	22,1%	4,6%
taxi						
non disabled	0,8%	0,8%	4,5%	34,8%	55,3%	3,8%
disabled	0,9%	3,7%	9,7%	43,3%	36,9%	5,5%

Nevertheless, about 34.8% of non-disabled and 41.5% of persons with disabilities never use a **bike**.

In contrast, only 3% of non-disabled use the **bus** daily vis a vis 11.5% of persons with disabilities and 26.5% of non-disabled over 17.1% of persons with disabilities never use a bus; other statistics remain comparable.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Similarly, for **rail/metro/tram/subway**, 4.5% of non-disabled citizens use them vis a vis 9.2% of persons with disabilities and 36.4% of non-disabled over 22.1% of persons with disabilities never use them; other statistics remain comparable.

Persons with disabilities use **taxis** a few times a year more (43.3%) than non-disabled (34.8%). Fewer of them (36.9%) report they never use them as opposed to 55.3% of non-disabled, which possibly indicates the reliance of this group on taxis for certain travel as opposed to private travel and thus the imperative for accessibility to inform the design of future taxi systems.

As expected, most of those not facing impairments never use **specialised transport**, but surprisingly almost 60% of those who face impairments also never use specialised transport. However, as seen in table 4 below specialised transport is used by people with physical disabilities, as over 70% of those with sensory impairments (blind, hearing) never use specialised transport. This corroborates our Phase 1 findings that persons with disabilities prefer common transport options and the need for accessible design of mainstream transport (see D2.3).

3.1.3.2. Comparison of mode use between persons with disabilities vs elderly users

Do the elderly have similar mobility preferences and habits to persons with disabilities? If so, then designing for accessibility does not only cater for persons with disabilities but for a much wider section of the population. Thus, mainstreaming accessibility in transport systems becomes a wider social imperative.

For this analysis, we have aggregated Phase 1 and Phase 2 disability cohorts to balance the representation of different disabilities and avoid any inherent sampling biases and statistical errors.

At par with other age groups, the elderly use their cars more than persons with disabilities. Around 65% of the elderly use their cars daily or weekly as opposed to 47% of persons with disabilities. Unexpectedly, around 35% of those over 65 use a bike weekly, whereas only 8% of persons with disabilities. Around 30% of both persons with disabilities and elderly use the bus every week and around 25% use trains, metros, trams or subways. A small percentage of persons with disabilities (5%) use taxis weekly and 0% of the elderly. Around 7% of persons with disabilities use specialised transport but 0% of the elderly do. 98% of the elderly never or few times a year take a taxi, whereas only 75% of persons with disabilities report that they never or only few times a year take a taxi, making them a bigger taxi customer group.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Table 6: Modal preferences by persons with disabilities in Phase 1 and Phase 2 and elderly cohorts in Phase 2 (only).

	daily	several times a week	several times a month	few times a year	never	not able
car						
Persons with disabilities	25.1%	22.1%	15.2%	12.7%	12.7%	12.3%
Elderly (65+)	24.1%	40.7%	13.0%	5.6%	16.7%	0.0%
bike e-bike						
Persons with disabilities	2.7%	5.1%	5.4%	8.1%	46.1%	32.5%
Elderly (65+)	16.7%	18.5%	7.4%	3.7%	51.9%	1.9%
bus						
Persons with disabilities	14.3%	15.6%	13.9%	28.0%	19.3%	8.9%
Elderly (65+)	1.9%	27.8%	14.8%	25.9%	29.6%	0.0%
specialized or adapted transport						
Persons with disabilities	3.4%	4.9%	5.6%	17.7%	61.7%	6.7%
Elderly (65+)	0.0%	0.0%	1.9%	3.7%	92.6%	1.9%
train / metro / tram / subway						
Persons with disabilities	11.6%	13.2%	11.9%	30.2%	25.5%	7.6%
Elderly (65+)	1.9%	24.1%	14.8%	13.0%	46.3%	0.0%
taxi						
Persons with disabilities	1.1%	4.2%	12.5%	43.6%	32.0%	6.7%
Elderly (65+)	0.0%	0.0%	1.9%	40.7%	57.4%	0.0%

In summary, we **should consider the requirements of both the elderly and persons with disabilities regarding bus and train systems** and **ensure the accessibility of taxis**.

3.1.4. Attitudes towards future transport systems in Phase 2

The intention of respondents in Phase 2 to use the proposed mobility solutions is presented in table 7 below. The accessible journey planner remains the most preferred solution (75.9%) followed by robotaxis 70.5%. Micro-transit (66.8%) and ride-pooling (63%), cable cars (61.9%) and cycle lanes (61.6%) show promise. The least preferred solutions are the motorbike taxis (83.4%) followed by e-scooter solutions (78.2%) and bike sharing (67.3%).

Due to differences in methodology between Phase 1 and Phase 2, we cannot make direct statistical comparisons. However, the ranking of modal preferences remained broadly the same across the two phases (see D2.3); accessible journey planner being the most desirable solution and bike/scooter/motorbikes being the least desirable solutions and other solutions remaining widely acceptable.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Table 7: Users' intention to use any of the future mobility solutions

mobility solution	Phase 2	
	Yes	No
Accessible journey planner	75.9% (265)	24.1% (84)
Bike sharing	32.7% (114)	67.3% (235)
Cable car	61.9% (216)	38.1% (133)
Cycle lane	61.6% (215)	38.4% (134)
E-scooter	21.8% (76)	78.2% (273)
Microtransit	66.8% (233)	33.2% (116)
Motorbike taxi	37.0% (129)	83.4% (291)
Ride-pooling	63.0% (220)	37.0% (129)
Robotaxi	70.5% (246)	29.5% (103)

To anticipate the future use pattern of such systems, Table 8 below presents the anticipated travel purposes for which respondents would use these mobility solutions. This will help us understand how and when such systems are expected to be in demand.

Table 8: Users' intention to use of the future mobility solutions for different travel purposes

mobility solution	educational purposes / commuting / scheduled appointments		shopping / to make purchases		leisure and socialising	
	Yes	Maybe	Yes	Maybe	Yes	Maybe
Accessible journey planner	69.4% (170)	25.7% (63)	64.5% (162)	29.5% (74)	74.4% (189)	22.8% (58)
Bike sharing	59.4% (63)	30.2% (32)	49.5% (52)	33.3% (35)	60,5% (75)	30,6% (38)
Cable car	53.5% (106)	40.9% (81)	50.8% (99)	38.5% (75)	67.2% (137)	31.9% (65)
Cycle lane	72.8% (147)	23.8% (48)	65.7% (134)	26.5% (54)	78.9% (161)	18.6% (38)
E-scooter	47.8% (32)	34.3% (23)	41.8% (28)	34.3% (23)	58.8% (40)	35.3% (24)
Microtransit	65.6% (141)	28.4% (61)	61.9% (135)	26.6% (58)	70.8% (155)	23.7% (52)
Motorbike taxis	45.1% (23)	43.1% (22)	28.6% (14)	55.1% (27)	52.9% (27)	41.2% (21)
Ride-pooling	60.7% (122)	33.3% (67)	56.0% (116)	34.3% (71)	65.4% (138)	30.8% (65)
Robotaxi	61.2% (139)	34.8% (79)	60.7% (142)	35.9% (84)	64.4% (152)	32.6% (77)

Most mobility solutions would be used for all purposes commuting (educational purposes /commuting /scheduled appointments), shopping, leisure, and socialising. This highlights that when people are open to using a system, such system is to be used for any purpose.

As an exception, moto-bike taxis which would not be used for shopping to the same degree as community and leisure activities and a slightly higher preference in using cable cars for leisure. The latter may indicate a certain preconception about this mode of transport in Europe, where most cable cars are used for sight sighting and leisure activities (e.g., skiing) as opposed to commuting purposes.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

3.1.4.1. Gendered statistics

The table below shows the percentage of respondents who answered 'yes' to the question "would you use this [future mobility] solution?" broken down by gender. The percentage is computed by dividing the number of respondents who answered yes to the question on each given mobility solution by the total respondent of that gender present in the dataset. We report only the male and female statistics here as the number of respondents who preferred to not declare their gender is negligible (2 respondents).

Table 9: Female vs male intention to use of the future mobility solutions for different travel purposes

	female	male	female	male
mobility solution			**926**	**714**
Accessible journey planner	**75.3%**	**77.3%**	149	116
Bike sharing	30.3%	36.0%	60	54
Cable car	57.6%	68.0%	114	102
Cycle lane	59.6%	64.0%	118	96
E-scooter	19.7%	24.7%	39	37
Microtransit	71.2%	61.3%	141	92
Motorbike taxi	**16.2%**	**17.3%**	32	26
Ride-pooling	64.6%	60.7%	128	91
Robotaxi	73.2%	66.7%	145	100

Both men and women have a high preference for accessible journey planners and an equally low preference of motorbike taxis. Men have a slightly bigger preference for bike sharing systems, cable cars, cycle lanes, and e-scooters. While women prefer slightly more micro-transit, ride-pooling and robotaxis; hence the requirements of women in the design of such systems merit distinct consideration.

3.1.4.2. Intention to use comparisons between persons with disabilities, non-disabled and elderly cohorts

The table below indicates similarities and differences in the attitudes of persons with and without disabilities, as well as the elderly when it comes to their intentions to use future mobility systems. The table presents how many responded positively (‘yes”) to the question: “Would you use this mobility solution?” in Phase 2.

This project has received funding from the European Union’s Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Table 10 Comparison between persons with disabilities, Non-disabled and Elderly cohorts

mobility solution	Non-disabled	Persons with Disabilities	Elderly
Accessible journey planner	73.5%	77.4%	53.7%
Bike sharing	54.5%	19.4%	14.0%
Cable car	61.4%	62.2%	43.0%
Cycle lane	79.5%	50.7%	53.7%
E-scooter	36.4%	12.9%	5.0%
Microtransit	65.2%	67.7%	67.8%
Motorbike taxis	20.5%	14.3%	7.4%
Ride-pooling	63.6%	62.7%	67.8%
Robotaxi	74.2%	68.2%	76.9%

Similarities across all user groups: This comparative analysis yields some interesting general insights regarding the acceptance of future mobility solutions. **Ride-pooling** seems to be equally acceptable across all user groups; non-disabled (63.6%); persons with disabilities (63.7%) and elderly (67.8%), as is **micro-transit**; non-disabled (65.2%); persons with disabilities (67.7%) and elderly (67.8%) **Robotaxis** are equally accepted across groups to an extent; non-disabled (74.2%); persons with disabilities (68.2%) and elderly (76.9%). This finding indicates the prospects of on-demand mobility and autonomous vehicles across society, and we should ensure that the accessibility needs of those groups are catered for. This in effect points to the need for wider and deeper engagement of elderly and persons with disabilities in the design of the vehicles, the services and the customer interfaces.

Similarities between persons with disabilities and non-disabled user groups: Accessible journey planners are favoured by both persons with disabilities (77.4%) and non-disabled (73.5%) user; yet a bit less so by the elderly (53.7%). The same is true for **cable cars** favoured by persons with disabilities (62.2%) and non-disabled (61.4%) users; yet a bit less so by the elderly (43%). The two groups share similar views on **motorbike taxis** with 20.5% of non-disabled and 14.3% of persons with disabilities willing to use them in contrast to only 7.4% of the elderly.

Similarities between persons with disabilities and elderly user groups: Bike sharing is equally non-favoured by persons with disabilities (19.4%) and elderly (14%) users; whereas 54.5% of non-disabled respondents would use them. **E-scooters** are also least favoured with only 12.9% of persons with disabilities and only 5% of the elderly users declaring that they would use them., whereas 36.4% of non-disabled users would. The two groups share similar view on **cycle lanes** with 50.7% of persons with disabilities and 53.7% of the elderly willing to use them, whereas 79.5% of non-disabled respondents would use them. Findings indicate that we need to rethink the accessibility requirements and our investment in cycling infrastructure given our aging demographic in Europe.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

3.1.5. Assessment of travel behaviour based on MDI components

This section tries to establish to what extent respondents feel that a mobility system can improve their independence, safety, convenience, comfort, enable independence and motivate travel. We compare Phase 1 and Phase 2 findings to establish if there are any significant differences in perception between the exclusively persons with disabilities cohorts in Phase 1 in relation to the mixed cohorts of Phase 2. In both phases we asked respondents to indicate if a solution would motivate travel and make one's journey more independent, faster, easier, nicer and safer; these correspond to the five dimensions of the MDI (the sixth "affordability" is excluded from consideration).

Table 11: Respondents' answer was positive ('Yes' or 'Quite a bit') in Phase 2

Mobility	travel more	Independent	faster	easier	nicer	safer
Accessible journey planner	57%	65%	57%	64%	54%	51%
Bike sharing	24%	26%	25%	24%	25%	19%
Cable car	38%	33%	38%	34%	42%	30%
Cycles lanes	51%	48%	48%	50%	52%	51%
E-scooter	14%	19%	21%	17%	15%	10%
Microtransit	52%	54%	51%	56%	50%	55%
Motorbike taxis	10%	15%	21%	13%	9%	7%
Ride-pooling	44%	41%	36%	44%	39%	46%
Robo taxi	54%	55%	48%	50%	48%	43%

Table 12: Respondents' answer was positive ('Yes' or 'Quite a bit') in Phase 1

Mobility	travel more	independent	faster	easier	nicer	safer
Accessible journey planner	60%	67%	56%	67%	64%	57%
Bike sharing	23%	22%	22%	22%	23%	18%
Cable car	53%	54%	52%	58%	56%	42%
Cycles lanes	47%	47%	47%	51%	50%	46%
E-scooter	28%	30%	34%	31%	29%	19%
Microtransit	53%	54%	46%	57%	48%	44%
Motorbike taxis	36%	35%	41%	34%	28%	22%
Ride-pooling	42%	40%	32%	38%	35%	35%
Robo taxi	46%	48%	35%	44%	43%	32%

Perhaps a little surprisingly, an **accessible journey planner** remained the solution that would motivate most respondents to travel more even though the sample in Phase 2 also comprised non-disabled and elderly users. This indicates the need of other groups to know the accessibility of their end-to-end journey as well and the potential benefits of such knowledge for other purposes besides catering for the access needs of persons with disabilities. Almost 60% of users expect accessible journey planners to make them more

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

independent and make their journey easier, but more than 55% also expect them to make their journey faster, nicer and safer. These findings merit further investigation with the wider base of transport users and the need to include such information in mainstream transport planners to improve service provision. It also indicates the need to include all upcoming mobility services (e.g. ride-pooling, robotaxis, micro-transit) into a unified transport planner for all.

The next most motivating solution is **robotaxis**. Around 55% declared that robotaxis would make them travel more and become more independent and almost 50% expect robotaxis to make their journeys faster, easier and nicer, though some concerns around safety remain with only 43% expecting it to be safer. Research on the safety features of autonomous vehicles should address the concerns of various societal groups given their willingness to use them. By comparison to Phase 1, statistics are slightly higher in every respect, which indicates that persons with disabilities may have distinct concerns when it comes to the functionality of AV systems.

Motorbike taxis overtook bike sharing as the least favoured solution on all counts in Phase 2, indicating perhaps the impact of age. Only 10% would be motivated to travel more by motorbike taxis, and while 21% expect motorbike taxis to make their journey faster;15% more independent and 13% easier, only 9% expect it to be nicer and 7% safer.

Statistics are lower for **e-scooters** too for all dimensions in comparison to Phase 1. These findings require further investigation.

The views of **bike-sharing** systems remain low on all dimensions but at similar levels to Phase 1.

Ratings between Phase 2 and Phase 1 remained similar in relation to **cycle lanes, micro-transit, ride-pooling and robotaxis** and perhaps explain the similarities in the preferences for these systems across groups as described in the section above.

4. Discussion

The survey provides insights into whether the wishes and needs of the elderly and even those without disabilities are similar or different from those of persons with disabilities. The provided insights can help build the business case and establish the market potential for accessible public transport services as well as their societal importance. Hence, Phase 2 of the mobility survey tried to answer the following 3 key questions:

To what extent are the views of persons with disabilities similar or different from those without disabilities?

Non-disabled citizens make more frequent use of cars, whereas around 13% of persons with disabilities cannot use them at all. Of those who can, car is a popular mode of transport albeit not daily. By comparison, around 59% of respondents **without**

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

disabilities reported that they would use their cars on a daily or weekly basis as opposed to 34% of respondents with **physical disabilities,** 32% of respondents with **visual impairments,** 48% of respondents with **hearing impairments,** 47% **mental health issues**, 22% of respondents with **intellectual impairments** and 41% of respondents with **other impairments**.

Only 20% of non-disabled users use **buses** and **rail/metro/tram/subway systems,** at par with participants with physical disabilities, but considerably less to those with visual impairments that rely heavily on such systems. While ramps, elevators, step free access are considered typical accessibility features and indeed important to facilitate access for persons with physical disabilities, the accessibility needs for those with sensory disabilities (visual/hearing) and those with intellectual impairments/mental health issues should also be considered in the design of mobility systems with similar characteristics, such as micro-transit and cable cars.

Disabled citizens are also regular users of taxi services, possibly relying on taxis in the absence of access to cars, as around 12% cannot use cars. While statistics remain low overall, they are considerably higher than average. Taxis are used regularly by 4% of those with physical impairments, 7% of those with visual impairments, 4% by those with hearing impairments, 20% by those with mental health issues and 17% of those with intellectual impairments; only 2% of non-disabled users in our sample use taxis regularly. This has implications for the design of robotaxi vehicles, user interfaces and services.

With respect to their views about future mobility systems, 77.4% of persons with disabilities and 73.5% of non-disabled users favour **accessible journey** planners, 62.2% and 61.4% respectively favour **cable cars**. In contrast, only 20.5% of non-disabled users and 14.3% of persons with disabilities are willing to use **motorbike taxis**.

To what extent are the views of persons with disabilities similar or different from those of the elderly?

The elderly are heavy car uses. Around 65% of the elderly use their cars daily or weekly, which is more than the average non-disabled population where 59% of respondents without disabilities reported that they would use their cars on a weekly basis. By comparison, 47% of persons with disabilities would use their car on a weekly basis. Elderly and persons with disabilities have similar use patterns in regard to main modes of transport; around 30% of both persons with disabilities and elderly use the bus on a weekly basis and around 25% use trains, metros, trams or subways. On average persons with disabilities will use taxis more than the elderly and they possibly rely on them on certain occasions as only 75% of persons with disabilities report that they never or only few times a year take a taxi, making them in fact a bigger taxi customer group. These findings highlight the importance to **consider the accessibility requirements of both the elderly and persons with disabilities when it comes to bus and train systems** and **ensure the accessibility of taxis**.

With respect to their views about future mobility systems, both persons with disabilities and elderly users dislike bike sharing and e-scooters; only 19.4% and 14% respectively

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

would use **bike sharing** and only 12.9% and 5% respectively would use **e-scooters**. The two groups also share similar views on **cycle lanes** with 50.7% of persons with disabilities and 53.7% of the elderly willing to use them, albeit perhaps in different ways. Further investigation of the accessibility requirements and our investment priorities for the cycling infrastructure given our aging demographic in Europe should be considered.

To what extent are the views of persons with disabilities similar or different from those of the general population on future mobility systems?

Our findings suggest that in relation to the intention to use certain mobility systems the views of persons with disabilities coincided with those of other non-disabled and elderly cohorts. As such, **ride-pooling and microtransit** seem to be equally acceptable by more than 60% of the respondents and **robotaxis** by approximately 70% across all groups. These findings point to the need ensure the accessibility of those systems for everyone but also the need for wider and deeper engagement of elderly and persons with disabilities in the design of the vehicles, the services and the customer interfaces.

5. Reflections on the Survey

The Phase 2 survey indicated findings of mixed cohorts and draws comparisons between user groups. Our findings suggest that there are similarities but also differences in the views and preferences of persons with disabilities regarding mobility systems. This indicates the need for including persons with disabilities in mobility surveys and conducting disability specific analysis of results similar to gendered analysis to support responsible, and evidence-based innovation.

Analysis of open questions with respect to users' suggestions about improving the accessibility of mobility systems did not yield any alternative insights from those in Phase 1 which were already reported in D2.3 and disseminated more widely in the White Paper. Therefore, in the interest of keeping this deliverable brief we have excluded these from consideration.

As our survey is one of its kind at an EU level, we suggest that our findings are confirmed at an EU-wide level study, with different methodologies and study cohorts to ensure findings are replicable and to assess the market potential for accessible public transport services.

This study is also not without its limitations that we should highlight for readers and future researchers. The study was conducted primarily online, hence there may still be a sample bias in that people with online skills were more likely to complete it. We conducted 100 interviews to balance out this bias. Perhaps a survey using face to face interviews or diverse cohorts that can account for differences between urban and rural areas will yield different findings. Such findings can then be modelled into transport demand models by transport planners.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588

Overall, we question whether surveys are the best way to collect user information. People are resistant to answering surveys for various reasons. First, different organisations are enquiring their views on similar topics to survey different purposes which is tiresome. Second, they feel disillusioned about the degree that these surveys lead to any meaningful action or change, denoting the lack of action and feedback to participants with respect to the outcomes and impact of surveys. Contacting NGOs/CSOs to publicise the survey was met with resistance, indifference and bear little results in terms of reaching their members; hence their role as potential amplifiers of messages to user groups should be rethought. Finally, respondents are suspicious of the informed consent process, particularly when this involves signing, as opposed to ticking a box, as they feel this can be used for fraudulent reasons.

Given how difficult it is to collect survey data perhaps we should create a mobility observatory with databases open to researchers for meta-analysis and perhaps coordinate between cluster projects to conduct surveys in unison via market research organisations with an EU-wide reach.

6. Conclusions

The TRIPS Quantitative survey report (D2.4) presents the findings of the second round of the quantitative survey, mainly targeting the elderly to identify their user requirements and commonalities with persons with disabilities about their views towards future mobility trends.

With respect to designing and investing in future mobility systems, findings corroborate the need for prioritising an accessible journey planner which seems to be a highly desirable solution across user groups. The reasons why such a solution is desirable for other user groups except those with disabilities bears further investigation, as are the ways in which such a solution should be designed. Findings also suggest that ride-pooling and micro-transit and robotaxis seem to be highly acceptable solutions for all user groups and perhaps the most promising in terms of societal acceptance and market potential. We suggest that future research on the functionality of autonomous vehicles for public transport (such as autonomous buses and taxis) should focus on the degree of reliance and the role that they can play in the lives of persons with different disabilities. Gendered analysis should also play a key role in accessibility research and responsible innovation. Cycle lanes are relatively accepted as an infrastructure, but we expect it to be used in alternative ways by the elderly and persons with disabilities. The accessibility and implications of alternative use of the infrastructure – e.g., to ride one's mobility scooter or wheelchair – need to be explored. The public investment and design of two-wheeled mobility systems, like bike sharing, e-scooters, and motorbike taxi solutions and services need to be rethought as their acceptability remained low among various user groups.

TRI is committed to translating findings into a white paper for dissemination to all those contributing to the study and advocacy with the European Disability Intergroup, European Disability Forum and AGE platform as part of our stakeholder engagement. We will also translate findings into a scientific publication to Open Research Europe to complement our previous findings.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme Under Grant Agreement no. 875588