Grant agreement No. 101069852

MOVE2CCAM

Methods and tools for comprehensive impact assessment of the CCAM solutions for passengers and goods

HORIZON-CL5-2021-D6-01

D3.3
Primary and secondary data and the MOVE2CCAM data warehouse

Submission date: 19/12/2023

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PROJECT

Project Acronym:	Move2CCAM
Project Full Title:	Methods and tools for comprehensive impact assessment of the CCAM solutions for passengers and goods
Grant Agreement No.	101069852 (HORIZON-CL5-2021-D6-01)
Project Coordinator:	BABLE
Website:	www.move2ccam.eu
Starting date:	01/09/2022
Duration:	30 months

DELIVERABLE

Deliverable No. & Title:	D3.3 Primary and secondary data and the MOVE2CCAM data warehouse
Dissemination level:	PU
Work Package No. & Title:	WP3 - Data, Impact Analysis and Mapping
Deliverable Leader:	UCL
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Due date of deliverable:	Month 16 – December 2023
Submission Date:	19/12/2023

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Document history

Version	Date	Released by	Comments
1	02-12-2023	Paulo Anciaes, UCL	Full draft
2	06-12-2023	Christos Gkartzonikas, Moby	Review
3	14-12-2023	Maria Kamargianni, OEIS	Review
4	18-12-2023	Paulo Anciaes, UCL	Final draft

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Acronyms and definitions

Acronyms	Definitions
CCAM	Cooperative, Connected, and Automated Mobility

1. Introduction

Cooperative, Connected, and Automated Mobility (CCAM) is a new frontier for mobility. It allows vehicles to communicate with each other, the infrastructure, and other users of the transport network. CCAM opens new possibilities for both passenger and freight transport and could contribute to more efficient, equitable, and sustainable mobility systems. However, the potential impacts of this radical change are still not well understood. There is little knowledge on the many possible inter-relationships between the impacts of CCAM in different domains (for example, mobility, economy, environment, health), as well as on how these inter-relationships evolve across time.

The MOVE2CCAM project (https://move2ccam.eu) is exploring these inter-related impacts, aiming at delivering methods and tools for systems-wide assessments of CCAM solutions. This exploration is done with input from the project "satellites", i.e., citizens and organisations in eight European countries (Cyprus, France, Germany, Greece, The Netherlands, Poland, Spain, and United Kingdom), who are invited to participate in a series of activities throughout the project. Citizens represent diverse groups in society, while organisations represent a range of stakeholders with interest in CCAM solutions. The engagement with the Satellites ensures that the methods and tools developed in the project acknowledge the wide diversity of perceptions, needs, objectives across and within the eight countries in this project and are potentially transferable to the rest of Europe.

The project collects primary data through:

- Activities where the Satellites co-create CCAM use cases, scenarios, and business models.
- Activities where the Satellites express their views on the impact of the use cases, business models, and scenarios, on eight domains (Mobility, Safety, Public Health, Economy, Environment, Land use, Network Efficiency, and Equity), considering their mutual-reinforcing relationships.

Deliverable 3.3 presents the materials used to collect this primary data, including questionnaires, discussion guides, and stimuli shown to activity participants. It also collects documents related to research ethics, such as information sheets and consent forms distributed to participants, and signed by them, before the project activities.

The materials are included in appendices and described in the main text, in Sections 2-9. Section 2 describes questionnaires that were answered by participants prior to the activities, collecting information on the satellite's characteristics and travel behaviour and attitudes, including attitudes and intentions towards self-driving vehicles. The next sections describe the materials used in the co-creation of CCAM use cases (Section 3) and CCAM business models (Section 4), discussion and qualitative assessment of CCAM impacts (Section 5), detailed case studies of impacts on organisations (Section 6), demonstration of self-driving vehicles (Section 7), virtual reality experiments about CCAM usage (Section 8), and a pan-European online survey to assess impact of CCAM use cases on citizens (Section 9)

Table 1 is an overview of the primary data collection tools developed in the project, the parts of this deliverable where the tools are described, and the timing of the tool application.

Table 1. Overview of primary data collection tools

Tool	Section	Appendix	Application timing
Preliminary data collection (characteristics of satellites, travel behaviour/attitudes) to populate the project's Satellite network	2	1-3	During and just after recruitment of participants (from February 2023)
CCAM use case co-creation	3	4-7	March 2023
CCAM business model co-creation	4	8-11	June 2023
Discussion and qualitative assessment of the impact of CCAM use cases	5	12-13	October-November 2023
In-depth discussion of the impact of CCAM use cases on selected organisations	6	14-15	January-February 2024
Demonstration of self-driving vehicles	7	16	January 2024
Virtual reality experiments for CCAM usage	8	17-19	December 2023-January 2024
Pan-European survey for exploring the impact of CCAM use cases' on citizens	9	20	December 2023-January 2024

The project also collects secondary data. This data is used to model the inter-relationships between variables in the MOVE2CCAM Impact Assessment Modelling Tool. The secondary data collected, and its sources, are described in Section 10.

Finally, Section 11 describes the MOVE2CCAM Warehouse, a secure environment where all the primary and secondary data collected by the project will be stored and accessed for analysis.

Appendices 1-20 show the English version of all materials used to collect data in the project. All materials were translated into local languages, in each country where they were used.

2. Data collection to populate the project's Satellite network

2.1 Overview

Data collection was conducted to populate the project's Satellite network, a group of citizens and organisations who would be invited to participate in the project's co-creation activities. Data was collected on the characteristics of citizens and organisations, in order to retrieve the samples needed for each activity, depending on its objective. Data was also collected on general travel context and behaviour and on attitudes and intentions towards self-driving vehicles. This data was collected in order to identify an initial set of attitudes, before the Satellites joined the project activities, to be compared later to their attitudes after they participated in the activities (collected in other questionnaires described in this deliverable).

Citizens answered a questionnaire at the recruitment stage, covering demographic characteristics (Section 2.2) and another questionnaire after recruitment, covering travel context and behaviour and attitudes and intentions towards self-driving vehicles (Section 2.3). Organisations answered a questionnaire about general characteristics of the organisation and views about self-driving vehicles (Section 2.4).

Citizens and organisations participated in a series of co-creation activities throughout the project. The data collection described in this section was conducted, for each satellite, before the first activity they joined. In most cases, this was the use case co-creation activities, described in the next section of this deliverable. Some satellites joined the network at a later stage.

2.2 Recruitment questionnaire - citizens

A questionnaire was designed to collect demographic information about citizens. The questionnaire is provided in Appendix 1. The questionnaire also worked as a recruitment tool, as it screened out participants not deemed to be in scope for the activities, while assisting recruitment agencies to keep track of quotas specified for certain groups, based on age, gender, disabilities, ethnic background, and type of area.

The questionnaire starts with a set of screening questions. Participants are informed that they cannot answer the questionnaire if they:

- Are currently participating, or scheduled to participate in any market research
- Have taken part in market research in the past 6 months
- Have taken part in market research in the past 12 months on the topic of transport
- Have taken part in any research with the recruitment agency
- Have been employed in market research, marketing, journalism, media, or transport
- Do not own an internet-enabled device
- Do not have access to a stable internet connection and a suitable spot

The rest of the questionnaire collects information about the participant characteristics, including both characteristics related to the sampling quotas and further information, as follows:

- Age
- Gender
- Ethnic background
- Situation in relation to having a driving licence and driving a vehicle
- Occupation
- Current employment situation

- Current household income
- Educational level
- Having, or being a carer of someone who has, a long-term illness, health problem, disability or impairment that affects daily life
- Household composition
- Type of area (city centre, city not in centre, small town, or village).

2.3 Pre-activity questionnaire - citizens

Citizens answered an online questionnaire before they joined their first Move2CCAM activity The questionnaire is in Appendix 2. It includes questions to capture the context in which the respondent travels, and the actual travel behaviour. This includes:

- Residential area characteristics (how far from the participant's home are four types of places (work/study place, shopping areas, health centre, leisure places)
- Mobility restrictions (long-term illness, health problem, disability or impairment affecting your daily life; how much that affects ability to move around; use of mobility aids or equipment)
- Travel frequency to the four types of places listed above
- Main travel mode used to go to those four types of places
- How the participant feels about driving
- Use of travel time while using public transport

The next set of questions captures attitudes and intentions regarding the use of self-driving vehicles, including:

- Awareness on self-driving vehicles
- Three main concerns about self-driving vehicles
- Adoption of self-driving vehicles (if the participant would use, would pay to use, and would buy a self-driving vehicle)
- Use of travel time in self-driving vehicles

2.4 Pre-activity questionnaire - organisations

Organisations answered an online questionnaire before they joined their first Move2CCAM activity. The questionnaire is in Appendix 3. It includes general characteristics about the organisation:

- Type of organisation (sector)
- Geographical coverage

It also included questions about the respondent's views about self-driving vehicles, including:

- Awareness of self-driving vehicles
- General view about self-driving vehicles (positive or negative)
- Concerns about self-driving vehicles
- How likely it is that specific groups will benefit from self-driving vehicles
- What will be the three most influential actors in the deployment of self-driving vehicle

3. Tools for CCAM use-cases co-creation

3.1 Overview

The first co-creation activities held in the project aimed at identifying potential services that can be provided by self-driving vehicles. These activities were conducted in March 2023. Results were reported in Move2CCAM Deliverable 1.2 (*CCAM Use Cases, Business Models, Scenarios and KPIs*).

Citizens and organisations were invited to co-design a set of CCAM solutions that could cover their mobility needs (e.g., to go to supermarket or go to work, in the case of citizens, or freight distribution and employees' commuting and business trips, in the case of organisations). Secondarily, these workshops intended to identify the associated challenges, potential impacts, and the time-horizon in which the CCAM solutions could be deployed.

Specifically, participants were asked to describe a set of CCAM solutions in terms of vehicle typology, size and ownership, service provided (e.g., trip purpose, locations served, distances travelled, time of the day, frequency of the service), target users, and payment methods. A template was prepared for the collection of these ideas from the participants, which also included space to compile the associated challenges and potential effects or impacts. For the identification of time-horizon of self-driving vehicles, participants were asked to provide their perceptions concerning the moment in which different types of self-driving vehicles could be more likely to be deployed. Participants were asked for three-time horizons (i.e., 2025, 2030 and 2050) that can capture short-, medium-, and long-term impacts. Figure 1 and Figure 2 show the templates used to compile participants' opinions.

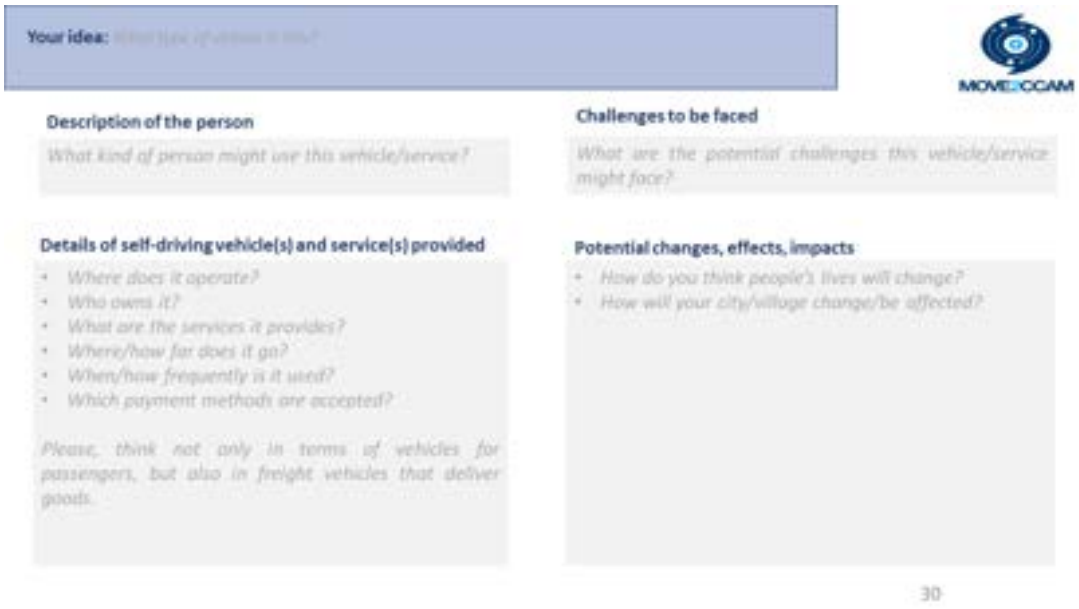

Figure 1. Use case co-creation: structure

Figure 2. Use case co-creation: scenario timeline

The workshops started with a brief introduction to the project and to the session by the moderator and a welcome to the participants. The workshops continued with an ice breaking exercise with the purpose to start thinking about the topic and prepare the participants for the collaboration of the group work. For this purpose, some materials were prepared to collect insights from each type of participant. In the case of organisations, they were asked to share the transport needs of the area where they operate, and the improvements needed. Citizens were asked questions about transport modes used in daily journeys, challenges faced, type of people most likely to suffer from transport constraints in the area where they live, and improvements needed.

So that all attendees were aware of what a self-driving vehicle is, a short video was displayed, showing how this type of vehicle can move. Additionally, some examples of CCAM vehicles that already have been designed to transport passengers and goods on land and for transport goods on air were shown as source of inspiration for new uses cases and scenarios (Figure 3).

Figure 3. Use case co-creation: existing CCAM solutions

In order to ensure that the co-created use cases are diverse, innovative, and cover different needs, a tailored strategy was applied to explore the demand, desires, and expectations from a diverse spectrum of attendees encompassing the wider society. The activities addressed to organisations were disseminated widely through different channels in order to reach organisations in different sectors (e.g., transport, information communication technology, health) and from different typologies (i.e., companies, municipalities, research entities). Citizens were recruited to ensure a good balance in terms of age and gender and the participation of vulnerable groups such as ethnic

minorities and individuals with mobility restrictions due to health, lack of driving license and/or living in areas with poor transport services such as rural areas. To avoid collecting individual travelling demands, proto-personas sheets were shown to participants to perceive the travelling needs of other people. A set of 10 proto-personas sheets was developed to cover different profiles in terms of age, gender, education, income, car ownership, needs, desires, and frustrations (Figure 4).

Figure 4. Use case co-creation: proto-persona sheet

Thus, given the different mobility needs of organisations and citizens, different types of activities were organised for a better collection of ideas. The activities were held in different formats to adapt to the contexts of the partners in charge of their organisation. Four formats were planned, depending on the type of attendee to involve (i.e., organisations and citizens) and according to the format of the workshop (face-to-face and online). Face-to-face activities with citizens and organisations were organised in the project's three prototypical regions (Helmond in the Netherlands, North Aegean Region in Greece, and GZM in Poland) and online activities with citizens and organisations were organised in the other 5 countries (Cyprus , France, Germany Spain, United Kingdom).

3.2 Citizens face-to-face activities

Appendix 4 contains the activity plan and Appendix 6 contains the slides presented to participants to introduce the project and the session. Key points compiled from the participants during the ice breaking activity were captured by the moderator on flipcharts whereas participants provided ideas on CCAM solutions and associated timeline for their deployment in printed papers. All this information was translated to an excel file for its further analysis.

3.3 Citizens online activities

The citizens online activity used Recollective, an online engagement platform (https://www.recollective.com). Appendix 5 contains the activity plan. A short version of the slides in Appendix 6 were included in the platform to familiarise participants on the research to perform. The participants could provide their ideas on CCAM solutions during the 5 days in which the platform was open. A person in charge of the organisation of the activity in each country followed up the activity and interacted with the citizens when a doubt was required to be clarified. Participants were asked for new inputs when the description of the CCAM solution was scarce. At the end of the individual exercise, group discussions on the topic were open to all the participants. This allowed to citizens have new ideas coming from other persons. All inputs were provided by the participants in templates designed in the online platform, including the ice breaking questions.

3.4 Organisations face-to-face activities

The materials used in the organisations face-to-face activities in the three prototypical regions were similar to the ones used in the citizens face-to-face activities (Appendix 4). The slides presented to participants were also similar (Appendix 6).

3.5 Organisations online activities

Organisations in the other five countries were invited to a single 2-hour online workshop. This event was organised with breakout rooms leaded by a moderator from each country where the uses cases were co-created in a joint way by participants also from the same country. Some time was allocated for two plenary sessions were all the attendees could hear the introduction of the project and to the session as well as the CCAM solutions compiled in each group. The materials used in the activities were similar to the ones used in the face-to-face activities with organisations (Appendix 4). The slides presented to participants were also similar (Appendix 6). CCAM solutions were defined in a power point and then translated to an excel file for further analysis.

3.6 Ethics

Both organisations and citizens were asked to give consent by completing the consent form (Appendix 7). This describes the modes of data collection, the personal data that would be collected and stored, for how long data will be stored, and who it will be shared with in order to complete the research. Participants were also given details on their right to opt out at any time.

4. Tools for CCAM business models co-creation

4.1 Overview

Workshops were organised to co-create business models for the CCAM use cases co-created in previous Move2CCAM activities (documented in the previous section). The workshops were conducted in June 2023. Results were reported in Move2CCAM Deliverable 1.2 (*CCAM Use Cases, Business Models, Scenarios and KPIs*).

Appendix 8 contains the workshop plan. Appendix 9 contains slides shown to participants before the co-creation stage of the workshop. Appendices 10-11 contain materials used during the workshops.

To define the business models, the workshops were designed to collect information following the Osterwalder Business Model canvas structure. This structure was modified to a simplified 3-section canvas (Figure 5), containing the value proposition, business structure, and business impact of the use case.

Value Proposition	Business Structure	Business Impact
Identified how the proposed CCAM solution solves local mobility challenges and the degree of differentiation with other transport modes offering the same service. The value proposition is the reason why users select a transport mode over another.	Defined pricing models and price range for the service. Mapping potential key stakeholders and their degree of interest. Establishing key activities to promote and distribute the service or product. The business structure describes how service providers can sustain operations	Identified the different ways in which the service could increase and maintain a high user satisfaction.

Figure 5. Business model co-creation: structure

Following this structure, a canvas was designed containing open and closed ended questions for participants to answer collaboratively (Appendix 10). In-person workshops were held in the three MOVE2CCAM prototypical regions and online workshops in the other five countries. All regions had a target of attracting at least 20 participants.

4.2 Use case selection

The use case co-creation activities (section 3 of this deliverable) resulted in 52 passenger and freight transport use cases. A smaller sample of 15 use cases was selected to be used in the business model co-creation workshops. The characteristics considered to select these 15 use cases, were:

- **Vehicle type and service**, avoiding having the same vehicle and service analysed more than once
- Type of **transport purpose**, having a balanced number of goods or passenger transport

- **Country** where the use case was co-created, prioritising the use cases co-created in the prototypical regions, as these should have 3 local use cases selected (2 passenger and 1 freight transport)

Having selected the 15 use cases to analyse, these were then distributed across all partners for them to develop the workshop. The following rationale was followed to appoint each partner the 15 scenarios:

- The three prototypical regions develop 3 business models from 3 scenarios co-created locally. Out of these 3 business models, 2 would be from passenger transport and 1 from freight transport. Therefore, in total, 6 passenger transport scenarios and 3 freight transport scenarios were selected.
- The three prototypical regions develop two scenarios from different regions and/or partner countries. Thus, one scenario from each MOVE2CCAM partner country was selected, having an additional six scenarios available, four from passenger transport and two from freight transport.
- The proposed service or transport purpose of the scenarios should be unique

Table 2 shows the selection of the eight **passenger transport** scenarios developed in the workshops, showing the country which developed the business model.

Table 2. Business model co-creation: selection of passenger transport scenarios

	Scenario name	Assigned to
1	Autonomous minibus	NL, UK, CY
2	Autonomous taxi	NL, FR
3	Autonomous pod for mobility-impaired passengers	FR, NL, DE, SP
4	Emergency transport pod	PL, UK
5	Rural autonomous shuttle bus	PL, CY
6	Autonomous e-hailing	PL, DE, SP
7	Mixed bus passenger and cargo	GR, SP, FR, DE
8	Autonomous Private Car	CY, GR

Table 3 shows the selection of the seven **freight transport** scenarios developed in the workshops, showing the country of the workshop where the business models was developed.

Table 3. Business model co-creation: selection of freight transport scenarios

	Scenario name	Assigned to
1	Package Delivery Bot	NL, DE
2	Long-distance freight truck	UK, SP, DE
3	Drone medicine delivery	PL, SP
4	Drone package delivery	FR, GR
5	Medicine Delivery Bot	GR, CY
6	Mixed Bus Passenger and Cargo	GR, SP, FR, DE
7	Delivery Vans	UK, FR

4.3 Organisations online activities

In the online activities, the canvas was developed in MURAL as shown in Figure 6. Each region was assigned a set of five scenarios (Table 2 and Table 3), therefore, participants were distributed across five groups. Each group was provided a scenario to work with during a 2-hour session.

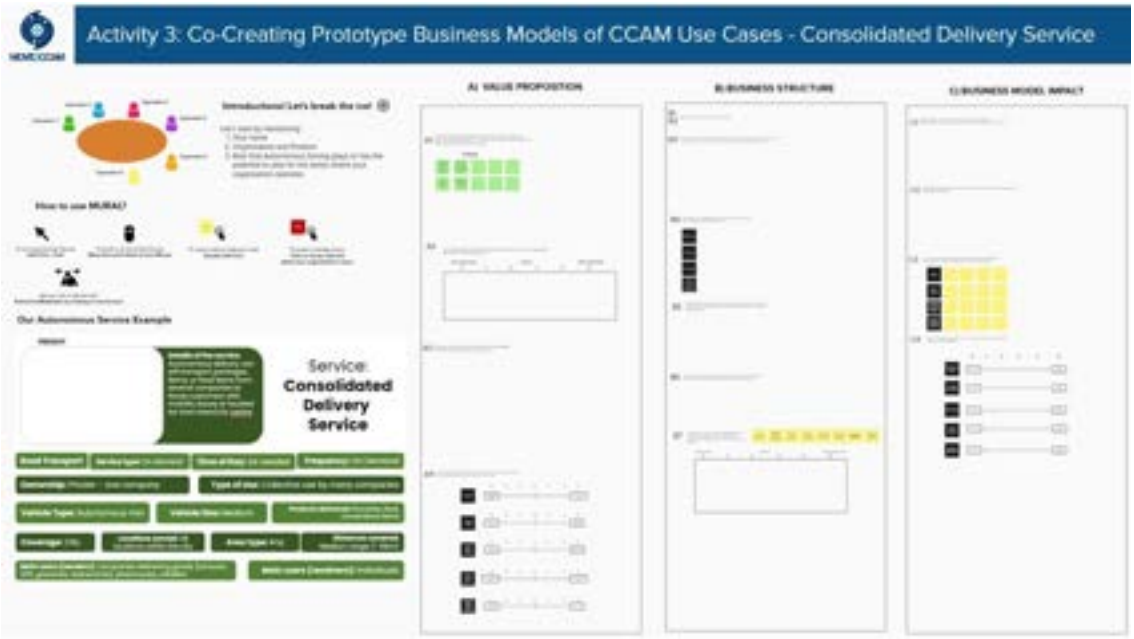

Figure 6. Business model co-creation: example of canvas (freight transport)

To facilitate the understanding of the scenario, use case scenario cards were prepared with all relevant information. Figure 7 is an example of these cards. Appendix 11 contains all the cards used in the workshop. These scenario cards contained exclusively data defined in the previous use case co-creation workshops and presented information of the user proto-persona, service or operation description, ownership of the service or vehicle, vehicle characteristics, service coverage and frequency, and specifications of the vehicle operations. These variables were the same across all 15 scenarios in order to maintain uniformity with the base material of the workshop.

To establish a framework to evaluate the economic and financial impact of CCAM use cases and scenarios, prototype business models need to be defined. To construct these prototype business models a business model canvas as shown in Figure 6 were used for each use case. The canvas was constructed to provide practical information to define the potential business viability of the selected use cases as well as of any CCAM use cases and scenarios. These prototypical business models can enable organisations to evaluate real-world scenarios, such as ridesharing, goods delivery, or public transportation, and analyse the associated revenue streams, cost structures, and market dynamics for future CCAM services and products.

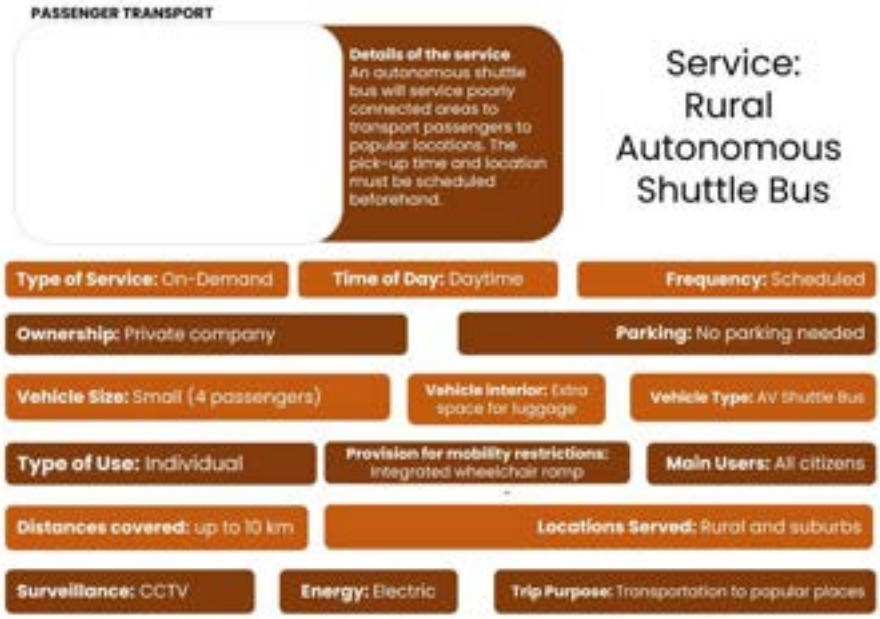

Figure 7. Business model co-creation: example of scenario card (autonomous shuttle bus)

Once each business model was constructed using the business model canvas in Figure 5, the information collected was presented in a structured format offering an easy understanding of its unique characteristics and potential implementation challenges. This structure comprised a concise description of the business model, along with a comprehensive user segmentation of the corresponding scenario. It further detailed the unique value proposition of the scenario, explaining how it serves the segmented users. The model also outlines the different potential revenue streams that can be tapped into. Equally important, it highlights potential threats that could impact the service offered by the scenario. Moving forward, the model provides insights into key activities that can augment user satisfaction and hence foster business growth. Finally, it identifies key partners that could bolster the operation of the service, ensuring that the business model is well-supported and operationally efficient. Table 4 is an example of a co-created business model (see full list in business models in Deliverable 1.2).

Table 4. Business model co-creation: example of co-created model (autonomous taxi)

<table>
<tr><th colspan="2">Autonomous Taxi</th></tr>
<tr><td>Description
Autonomous taxis offer driverless rides across a city. Passengers request the ride through an app, hop in, and enjoy a safe, efficient journey to their destination.</td><td>User segmentation
Individuals and families of every gender and age and for individuals located both in urban and rural areas.</td></tr>
<tr><td colspan="2">Value Proposition
The Autonomous Taxi helps all individual or family users by offering an all-day mobility service to reach any desired destination, whether short or medium distance. Moreover, the autonomous taxi—unlike the normal taxi—does not have a human driver involved and does not require parking spots. Consequently, it presents more available leg-space and other comforts like noise cancellation.</td></tr>
<tr><td>Revenue Stream
The service will primarily create revenue through its transportation service. Offering two payment options; pay-per-use (France) and a flexible subscription (Netherlands). The pay-</td><td>Pricing
Netherlands
Regarding the price for the Netherlands region such a mode of transport can cost more than public transport, therefore between 3.70€ and 4.59€.
France</td></tr>
</table>

per-use will combine variables such as duration of ride and travel distance to determine the price of the service.	For France as well, the price can be higher than public transport (which oscillates between 1.8€ and 5€) however this depends on the possibility to get it subsidised, covered or sponsored, depending on the purpose of the trip.
Potential Threats to the Service ***France*** Digital Divide Delays (maybe need for dedicated lanes) Technical issues and troubleshooting Responsibilities in case of accidents (special insurance) Security (special Assistance services) ***Netherlands*** Cybersecurity Privacy is difficult to ensure Social Safety (being able to use the service alone) Policies on parking Not enough space inside the vehicle	**Key activities to increase customer satisfaction** ***France*** Additional luggage space Assistance services for vulnerable passengers Table for PC Online support inside the vehicle ***Netherlands*** Emergency Button Control room always reachable Application for plannability of trips Lower Speed limit
Key Partners Local authorities, logistics companies, marketing partners, technology providers.	

4.4 Organisations face-to-face activities

The workshops held in-person followed the same workshop structure as in the online version, however these had to work with the canvas presented in Figure 6 in paper format.

4.5 Ethics

Both citizens and organisations were asked to give consent by completing an online MS Forms consent form (Appendix 7). The form outlined the modes of data collection they could expect from the research, such as audio and visual recordings. It also outlined the personal data that would be collected and stored and storage duration, as well as who it will be shared with in order to complete the research process. Participants were also given details at this stage on their right to opt out at any time.

5. Tools for qualitative assessment of CCAM use cases impact

5.1 Overview

The qualitative impact assessment focused on exploring citizens' and organisations' perceptions of the potential impacts of self-driving vehicle use cases presented to them. A series of activities were organised in each region during October-November 2023. Results of these activities will be reported in Deliverable 3.4 (*Satellites' Needs, Impact Analysis and Mapping*).

In each region, between 30 and 40 members of the public and 10 to 40 organisations considered a total of four use cases (shown in Table 5) using a questionnaire on an online engagement platform (citizens only), a set of scenarios representing each use case in action (examples shown in Figure 8 and Figure 9), and causal effect diagrams (example shown in Figure 10) combined with a semi structured discussion guide.

Particular attention was paid to the relevance of use cases to the regions, based on the results of the sessions organised to co-create use cases and business models (Sections 3 and 4 of this deliverable). Qualitative sessions were organised to understand impacts in terms of the eight MOVE2CCAM domains: mobility, safety, human health, environment, network efficiency, economy, land use, and equity. The materials used in the session are included in Appendix 12.

Each region had four use cases to explore with citizens and organisations. All regions shared a common passenger use case (self driving e-hailing - shared) and a common freight use case (consolidated delivery bot). This was for comparison across all regions.

Table 5. Impact workshops: allocation of use cases per region

Region	Passenger 1	Passenger 2	Freight 1	Freight 2
Greece	P1:Self driving e-hailing (shared)	P2. Self driving car (private)	F1. Consolidated delivery bot	F4. Single supplier Delivery bot
Poland		P5. emergency transportation		F5. medical delivery drone
Netherlands		P4. Mobility bus on demand		P3. Self driving bus service
UK		P3. Self driving bus service		F3. long distance truck
France		P4. Mobility bus on demand		F2. delivery drone
Germany		P5. emergency transportation		F3. long distance truck
Spain		P3. Self driving bus service		F5. Medical delivery drone
Cyprus		P2. Self driving car (private)		F2. delivery drone

5.2 Citizens online activities

Citizens across all regions were asked to complete a series of tasks on an online engagement platform, answering questions about four scenarios per region (one for each use case) focused around the eight domains. These scenarios (examples shown in Figure 8 and Figure 9) included:

- A brief overview of the use case including range, maximum occupancy, ownership, and power source
- How the use case might be utilised by particular people in particular circumstances, for example commuters, those with impaired mobility etc.

- Descriptions of some of the potential opportunities and challenges that the use case might provide
- Descriptions of how a worker in an affected sector might need to adapt, for example a local transport officer.

Citizens and organisations were shown scenarios for each use case. These included a brief overview of the use case, how the use case might be utilised by particular people in particular circumstances, a description of some of the potential opportunities and challenges that the use case might provide, and a description of how a worker in an affected sector might need to adapt.

Figure 8. Impact workshops: example of scenario description (self-driving e-hailing – shared)

Figure 9. Impact workshops: example of scenario description (long distance truck)

Using the data from the online engagement platform (data was extracted in excel format, with detailed transcripts per task and per region), a set of causal affect diagrams were produced (example shown in Figure 10). Citizens in Cyprus, France, Germany, Spain, and UK reviewed and added to them in a 2-hour online workshop.

Each group completed a causal affect diagram. Each segment of diagram covers one domain e.g., environment. The inner circle covers first order impacts whilst the outer areas cover secondary impacts. Black post it notes represent negative effects (otherwise they represent positive effects) and stars denote an identified causal loop.

Figure 10. Impact workshops: example of a completed causal effect diagram

Both citizens and organisations were asked to annotate a timeline for each use case their group worked on, showing how established each use case might be in 2026, 2035 and 2050 (Figure 11).

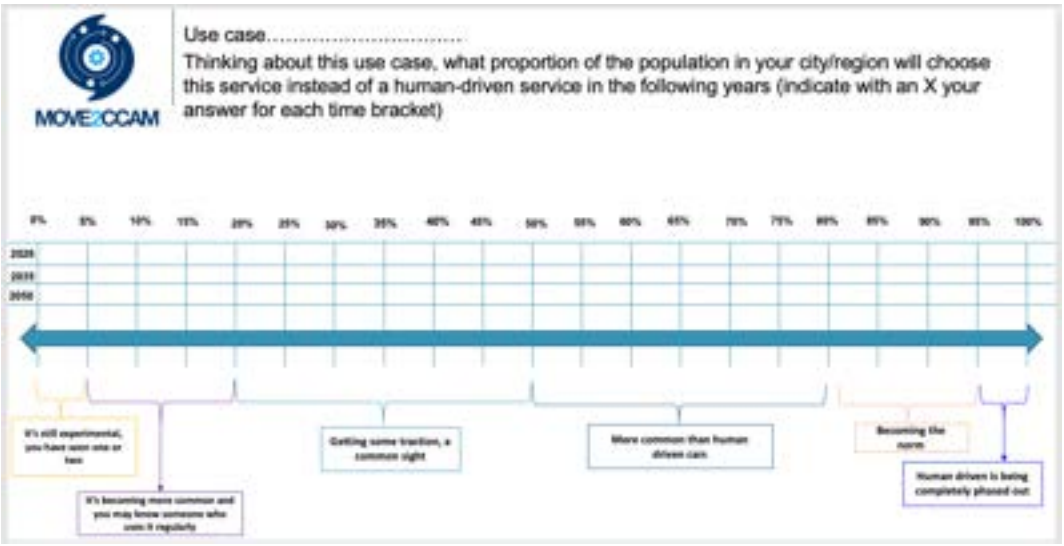

Figure 11. Impact workshops: timeline template

A detailed discussion guide with questions and prompts was designed to support citizens to talk through each use case in relation to the eight domains, exploring:

- What positive and negative impacts citizens imagine will arise from the use cases proposed, and which impacts are the most important to them
- What they see as the potential effects / consequences of identified impacts
- Citizens' views on the timeline for deployment of each use case in the next few years.

5.3 Citizens face-to-face activities

After taking part in the online engagement platform, citizens in the Netherlands, Poland and Greece took part in 2-hour face-to-face workshops, which used the exact same materials as the online workshops (Section 5.2), only in printed form.

5.4 Organisations face-to-face activities

Organisations in the Netherlands, Poland and Greece took part in 2-hour face-to-face workshops using the same materials as citizens' workshops (Section 5.2). While organisations did not take part in the online engagement platform (this was determined to be unnecessary due to their existing expertise and lack of time), they received the use case scenarios via email in order to familiarise themselves ahead of the workshops.

5.5 Organisations online activities

Organisations in the UK, Spain, Germany, France, and Cyprus also took part in 2-hour online workshops using the same materials described in Section 5.2.

5.6 Ethics

Both citizens and organisations were asked to give consent by completing an online MS Forms consent form (Appendix 13). This clearly outlined the modes of data collection they could expect from the research, such as audio and visual recordings. It also outlined the personal data that would be collected and stored and for how long, as well as who it will be shared with in order to complete the research process. Participants were also given details at this stage on their right to opt out at any time.

6. Tools for CCAM impact case studies for organisations

6.1 Overview

Detailed case studies will be conducted with 10 organisations that are part of the project's Satellites network. The objective of the case studies is to discuss with selected organisations the impact that self-driving vehicles may have on their operations and existence. The organisations will represent different sectors.

The project partners in each country will interview representatives of the organisations using a semi-structured approach, harmonized for all countries. The interview duration will be 60-90 minutes. The interviews will be conducted in January-February 2024. Results will be reported in Deliverable 3.4 (*Satellites' Needs, Impact Analysis and Mapping*).Interview topic guide

A topic guide was developed with a comprehensive set of questions to ask participants (Appendix 14). This topic guide will be adapted for each of the 10 organisations, selecting from the full set of questions only those relevant to the organisation's sector. Where relevant for the organisation's sector, specific use cases will also be discussed (from the ones co-created in the project, as described in Section 3 of this deliverable).

The interview starts with questions about the organisation and their current situation with regards to transport. These questions include:

- **General characteristics**: sector, age, size, products/services offered, business model, location, number of sites, and perceived competitive strengths and weaknesses.
- **Workforce**: number of employees, jobs they perform, skills/qualifications, drivers.
- If the organisation transports **goods**: receivers of the goods, frequency of delivery, type of vehicles used, vehicle ownership, details of a typical delivery trip, challenges.
- If the organisation transports **passengers**: number and type of vehicles used, details of a typical trip, challenges.
- If the organisation owns vehicles for the transport of **employees**: number and type of these vehicles, frequency of use, details of a typical trip.
- **Travel priorities**: reducing travel time or travel costs (including driver costs).

The second part of the interview introduces the topic of self-driving vehicles and asks about:

- **Perceptions**: which aspects of these vehicles are attractive/not attractive to the organisation.
- **Intentions**: Possible replacement of vehicle fleet with self-driving vehicles. If no: incentives needed. If yes: intended use of the vehicle, possible shared ownership.

The third part asks participants for the possible impact of self-driving vehicles on the activities of their organisation:

- **General impact**: aspects of the organisation's operations that would be affected, opportunities and threats
- **Business model**: possible changes, offer new products/services and/or stop offering others; possibility of expanding/narrowing the area covered; change in competitive position
- **Operational aspects**: If organisation transports goods: possible change in number of trips and size of vehicles used. If it transports paying passengers: possible change in operation days/times. Other questions: possible improvement in problems of parking vehicles, picking up/dropping off passengers, loading/unloading goods, and other operational activities

A series of questions then follow about the MOVE2CCAM eight impact dimensions:

- **Mobility**: would it be easier or more difficult to transport goods, passengers, and employees; would transport be faster or slower, more or less reliable
- **Safety**: would transport be safer or more dangerous (accidents), more or less secure (stolen goods, cyber attacks), other possible security aspects.
- **Public Health**: would the wellbeing of some employees be affected, positively or negatively
- **Economy (employment impacts)**: job security and possible new roles for drivers and other jobs, training or reskilling needed, new jobs that the organisation could offer
- **Economy (other impacts)**: would revenue increase or decrease; would transport costs increase or decrease as proportion of total costs; would non-transport costs change; would overall costs increase or decrease as proportion of revenue
- **Land use**: possible relocation of some of the organisation sites
- **Network efficiency**: would roads in the region be more or less congested
- **Environment**: would there be more or less pollution in the region
- **Equity**: would it be easier or more difficult to have a gender-balanced workforce; would more entry-level job positions be offered; would it be easier or more difficult for younger/older employees to be productive and motivated

Participants are then asked to think whether, from a society's point of view, self-driving vehicles would have a positive or negative impact in their region, also their main concerns about self-driving vehicles

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

6.2 Ethics

Appendix 15 shows the information sheet shown to participants before they agree to take part. This sheet answers the following questions:

- *Why have I been chosen?*
- *Do I have to take part?*
- *What will happen if I take part?*
- *Will I be recorded and how will the recorded media be used?*
- *What are the benefits of taking part?*
- *What are the possible disadvantages and risks of taking part?*
- *What if something goes wrong?* [including contact details]
- *Will my taking part in this project be kept confidential?*
- *What will happen to the results of the research project?*
- *Who is organising and funding the research*

Participants then give they consent by confirming (by ticking a box) that they understand what the research involves and what is expected of them. This is detailed as a series of 12 statements. Participants need to agree with all of them.

7. Tools to collect data from a demonstration of self-driving vehicles

7.1 Overview

A demonstration of self-driving vehicles will be organised in Helmond (Netherlands), one of MOVE2CCAM's prototypical regions. The objective is to gather data on people's needs and requirements when using this type of vehicles. 30 participants will ride in two types of self-driving passenger vehicle (a bus and a mini shuttle) and will observe a small self-driving delivery vehicle. The demonstration will be on 20 January 2024. Results will be reported in Deliverable 3.4 (*Satellites' Needs, Impact Analysis and Mapping*).

7.2 Post-activity questionnaire

Participants will answer a short questionnaire after the activity (Appendix 16).

The first section of the questionnaire asks for the participant's previous experience using self-driving buses, mini shuttles, cars, or another type of self-driving passenger vehicles, and also their experience observing a self-driving distribution vehicle

The following two sections ask about their experience using the self-driving bus and mini shuttle. The two sections include a similar set of questions, covering:

- Overall feelings during the experience. Participants can choose all that apply from a list of 18 possibilities
- What did they like and dislike about the experience (open ended question)
- How safe they felt (on a 5-point scale) during various parts of the trip: boarding, departing, moving forward, turning, pedestrian crossing in front of the bus (asked in the bus trip only), stopping, and getting off
- How self-driving buses will compare with buses with a human driver: which trips will be more interesting, faster, cheaper, more stressful, more comfortable, more dangerous (in terms of accidents), and more insecure (in terms of crime)
- Intention to use self-driving buses/mini shuttle in the future.
- Three main concerns about using a self-driving bus/mini-shuttle

The last two questions are similar to questions asked in the pre-activity questionnaire (see Section 2.3 of this deliverable)

In the section about the bus trip, two extra questions are included, to be answered only by participants who have joined the virtual reality experiment, which will be held on the same day in the same location (See Section 8). Half of the participants are scheduled to do the virtual reality first and the other half will try the real vehicles first. The intention is to compare possible differences in views of the two sets of participants. The questions asked to participants who have joined the virtual reality experiment are whether there was anything you liked in the real bus that they had previously disliked in the virtual bus, or the opposite.

The final section of the questionnaire asks participants about their experience observing the self-driving delivery vehicle:

- What they liked and disliked about the vehicle
- How deliveries made by this type of vehicles will compare with deliveries made by vehicles driven by humans (e.g., vans): which deliveries will be faster, cheaper, more dangerous, and more insecure (in terms of stolen deliveries.
- Intention to order goods delivered with this type of vehicles in the future

- Three main concerns about ordering goods delivered by these vehicles

7.3 Ethics

Possible ethical issues are addressed by providing participants with an information sheet and an informed consent form, which they fill before joining the activity. These documents are included in Appendix 19. They cover not only the demonstration but also virtual reality experiments, as participants join both activities in the same day.

The information sheet answers the following questions:

- *Why have I been chosen?*
- *Do I have to take part?*
- *What will happen if I take part?* – participants are informed about the types of vehicles they will use or see.
- *Will I be recorded and how will the recorded media be used?* – Participants are reassured of the uses of any footage taken on the day
- *What are the benefits of taking part?*
- *What are the possible disadvantages and risks of taking part?*
- *What if something goes wrong?*
- *Will my taking part in this project be kept confidential?*
- *What will happen to the results of the research project?*
- *Who is organising and funding the research*
- *Contact for further information*

Participants then give they consent by confirming (by ticking a box) that they understand what the research involves and what is expected of them. This is detailed as a series of 12 statements. Participants need to agree with all of them.

8. Tools to collect data from CCAM virtual reality experiments

8.1 Overview

Virtual reality experiments will be held in the project's three prototypical regions, involving 30 participants in each region. The objective is to gather data on people's needs and requirements when using private and public transport based on self-driving vehicles. This section presents the material used to collect data from the virtual reality experiments. The experiments were conducted in December 2023 (Greece and Poland) and January 2024 (The Netherlands). Results will be reported in Deliverable 3.4 (*Satellites' Needs, Impact Analysis and Mapping*).

8.2 Virtual reality game

A 6-minute virtual reality game was designed, to be experienced on Meta Quest Pro headsets. The game represents a future reality where self-driving vehicles are widely available. The experiment includes two scenarios: a trip on a car and a trip on a bus. Participants are given the option to choose between them at the start of the experiment (Figure 12). The car and bus trip both start at the city centre and end at the participants' home, travelling along the same route. Both are initially estimated to take the same time, but the car is more expensive.

During the run-time of trip, participants are presented with choice scenarios regarding a) the use of travel time (e.g., read a book, look at a phone or tablet computer, or just look around); b) mode-switch (from bus to car or from car to bus). The two scenarios incorporate attributes that assume different levels in each trip stage, possibly triggering a switch from/to car to/from bus, and/or physiological reactions. Each stage lasts for 40 seconds and ends at a bus stop.

Figure 12. Virtual reality experiment: initial choice between self-driving bus and car

8.2.1 Self-driving bus scenario

The participant boards the bus and sits in a vacant seat at the back of the bus (Figure 13). The bus departs travelling in a dedicated bus lane and moves faster than private cars. At each bus stop, new passengers join, and others leave the bus. At some point mid-journey, the participant is asked to choose what they would prefer doing (e.g., read a book, watch a movie, look outside). At each bus stop, some attributes of the scenario change (Table 6). The participant has the possibility, at any moment, to notify their intention to get off at the next bus stop and get on a car. The

participant is reminded of this option just before each bus stop, and relevant attributes (cost and travel time), are presented. If the participant decides to get off, the experiment continues with the car. If not, the bus continues. At the end of Stage 9, the bus stops and the passenger gets off. Their destination is just opposite.

Table 6. Virtual reality experiment: bus scenario attributes

Attribute	**Stage**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Landscape	City centre			Industrial	City centre	Industrial	City centre	Industrial	Destination
Crowding	Not crowded	Crowded		Not Crowded					
Supervision	Human assistant inside the bus				No human assistant				
Time of day	Daytime		Gradually starting to get darker					Night-time	
Behaviour of other passengers	Mind their own business					Anti-social			No other passengers

Figure 13. Virtual reality: example of bus scenario

Note: Attribute levels represented: city centre, not crowded, no human assistant, starting to get dark, passengers mind their own business

The selection of attributes put emphasis on personal security issues of travelling in unsupervised public transport, one of main concerns people have expressed about AVs (Salonen, 2018; Launonen et al. 2021). Several attributes test aspects that might influence perceived personal security in public transport: landscape (industrial wasteland with derelict industrial buildings); crowding; supervision (no human supervision), time of day (dusk and night-time); and behaviour of other passengers (some acting in anti-social manner, talking loud, playing music, and putting their feet on the seats).

The attributes are also important for other reasons. Human supervision is important because people are concerned with risk of collision if no human is present to take over vehicle if needed (Liljamo et al. 2018; Islam et al. 2022). Crowding and landscape type are part of the trip's perceived quality and can cause stress, regardless of perceptions of personal security. Time of day and crowding also interact with landscape: it is also more difficult to see the landscape at night and in a crowded bus.

8.2.2 Self-driving car scenario

The participant enters the vehicle. The vehicle starts moving while participant can see self-driving buses moving faster in the bus lane. At some point mid-journey, the participant is asked to choose what they would prefer doing (e.g., read a book, watch a movie, look outside). The traffic becomes denser progressively, almost reaching a standstill and the trip starts taking longer than expected. The participant is provided with information saying that delayed arrival is expected. Land use also changes (Table 7, Figure 14). The participant has the possibility, at any moment, of requesting to get off and get on a self-driving bus, at the next bus stop and relevant attributes (cost and travel time), are presented. If the participant chooses to do so, the experiment continues with the bus scenario. If not, the car continues. At the end of minute 9, the car stops. The participant's destination is opposite. The participant is asked to choose between: a) send the vehicle to a nearby parking area to reuse the following day (which has a cost), b) send the vehicle back to the city centre.

Table 7. Virtual reality experiment: car scenario

Attribute	**Stage**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Landscape	City centre			Industrial	City centre	Industrial	City centre	Industrial	Destination
Time of day	Daytime		Gradually starting to get darker					Night-time	
Congestion	No congestion	Gets progressively worse						Starts to ease up	No congestion

Figure 14. Virtual reality: example of car scenario

Note: Attribute levels represented: city centre, daytime, starting to be congested

In the car scenario, the landscape (e.g., what the car passenger can see from the window) serves as an attribute because in the future, driving will no longer required, so passengers can enjoy the scenery, which becomes more important as a trip quality determinant. Time of day and congestion also prevent people from seeing the landscape. Congestion is an attribute because it is a major determinant of travel mode choice and of traveller stress. In this scenario, we test a situation where buses always move faster than cars, by using dedicated (and uncongested) lanes.

8.3 Physiological data collection

Physiological data (brain activity) is recorded using non-invasive electroencephalography (EEG) earbuds (EMOTIV MN8).

8.4 Post-experiment questionnaire

A post-experiment questionnaire will be filled immediately after the experiment (Appendix 17).

The first section is about the choices people made during the virtual reality game: which vehicle they chose in the beginning, if they switched to the other vehicle during the trip (and why), and if yes, if they regret switching (and why).

Two sets of questions then ask for the participants' views about the car and bus scenario. Participants only answer the questions about the scenario(s) they have experienced. The set of questions are similar for the car and bus scenario and cover:

- Overall feelings during the experience. Participants can choose all that apply from a list of 18 possibilities. These questions are similar to the ones asked in the self-driving vehicle demonstration (see Section 7.2 of this deliverable). This will allow comparisons of real-world and virtual experiences in one of the sites (Helmond), where both activities will be held on the same day in the same site.
- The three things the participant remembers the most from the scenario
- Awareness of the scenario stages, i.e., which changes they noticed. The question probes for all attributes of the scenarios, as described in Section 8.2.
- How realistic the scenario was (on a 5-point scale), and what was not realistic (open ended question).
- How self-driving cars/buses will compare with cars/buses with a human driver: which trips will be more interesting, faster, cheaper, more stressful, more comfortable, more dangerous (in terms of accidents), and more insecure (in terms of crime). Again, this question is similar to the one asked in the self-driving vehicle demonstration.

In the section about the virtual bus trip, two extra questions are included, to be answered only by participants who have joined the self-driving vehicle demonstration: whether there was anything they liked in the virtual bus that they had previously disliked in the real bus, or the opposite.

The final section is about travel intentions. Two questions ask whether the participant would use a self-driving car/bus in the future. These questions are similar to questions asked in the pre-activity questionnaire (see Section 2.3 of this deliverable). A final question ask travel behaviour would change, in terms of use of travel time, trip frequency, and modal choice

8.5 Post-experiment review

After filling the post-experiment questionnaire, participants are presented a series of slides (Appendix 18) containing images from the two scenarios and probed to give their views on different aspects of their experience.

Participants are first asked about their opinion of:

- The external design of the two vehicles
- The internal design if the two vehicles
- The scenery outside the vehicle (showing images of both the city centre and industrial areas, both at daytime and night-time).

Participants are then asked, if they were in the car when it happened, if they noticed buses started going faster in the other lane

Finally, they are asked if they were in the bus when it happened:

- How they felt when the bus became crowded with passengers, and if they considered switching to car at that time

- What they think about the human assistant and how they felt when the assistant left, and if they considered switching to car at that time
- How they felt when passengers started having anti-social behaviour, and if they considered switching to car at that time
- How they felt when the bus became empty of other passengers

8.6 Ethics

This activity needs to address several potential ethical issues, as it involves participants wearing two devices which they may be unfamiliar with. In Deliverable 1.3 of this project (CCAM Impact Analysis Roadmap) we described these issues. The design of the activity took into consideration those issues. Participants were provided with an information sheet and an informed consent form (Appendix 19). Participant were asked to read the information sheet and signing the form prior to joining the activity.

The information sheet answered the following questions:

- *Why have I been chosen?*
- *Do I have to take part?*
- *What will happen if I take part?* – This clarified the activity duration and mentioned the devices the participant will wear during the experiments. Pictures of the devices are included, as well as links to the manufacturers' web pages, which describe the devices in detail. Participants were also reassured that the devices are standard commercial products and are used by many people, to play games, or monitor their concentration or other types of brain activity. Participants are reassured that the equipment will be disinfected. Participants were also given a brief description of the virtual reality game (including a screenshot). They are also informed of the post-experiment activities (questionnaire, and review session)
- *Will I be recorded and how will the recorded media be used?* – Participants are reassured of the uses of any footage taken on the day
- *What are the benefits of taking part?*
- *What are the possible disadvantages and risks of taking part? – Participants are informed about possible discomforts, and what to do if they do happen. Participants with certain conditions are advised not to take part in the research*
- *What if something goes wrong?*
- *Will my taking part in this project be kept confidential?*
- *What will happen to the results of the research project?*
- *Who is organising and funding the research*
- *Contact for further information*

Participants then give they consent by confirming (by ticking a box) that they understand what the research involves and what is expected of them. This is detailed as a series of 12 statements. Participants need to agree with all of them.

9. CCAM use case impact pan-European survey

9.1 Overview

An online survey with 7500 respondents will be implemented in the eight MOVE2CCAM countries (500 respondents in Cyprus, 1000 in each of the other 7 countries). The objective is to estimate citizen perceptions about the possible impact of self-driving vehicles on several dimensions. Fieldwork will be conducted during December 2023-January 2024, with an initial pilot study in the UK with 100 participants. Final results will be reported in Deliverable 3.4.

9.2 Questionnaire

Appendix 18 shows the English version of the questionnaire, which covers the following aspects:

Participant characteristics

- Region, within country
- Age and gender
- Educational level
- Type of area (city centre, city not in centre, small town, or village)
- Seld-identified profile in terms of technology adoption

Travel behaviour and travel context

- Driver's licence
- Private vehicle ownership
- Destination and duration of most frequent trip
- Number of weekly trips per travel mode
- Monthly travel expenditure, per travel mode
- The 3 most important factors that affect mode choice for the most frequent trip
- Frequency of receiving deliveries
- Type of deliveries
- Number of people in the household
- Number of children in the household and need to escort them
- Employment situation
- Health issues hindering mobility (participant and family members)

Self-driving vehicles and services for personal mobility

Participants are first introduced to self-driving vehicles and asked if they were aware of them. Then they are asked to imagine that 50% of vehicles are self-driving ones. They are then presented with 2 passenger use cases and 1 freight self-driving vehicle use case, selected randomly from a set of 3 passenger use cases (taxi, private car, or public bus) and 2 freight use cases (private delivery/pick-up robot or delivery drones), all co-created in previous activities of the project (see Section 3).

For passenger transport use cases, participants are then asked:

- Likelihood of buying the product or using the service provided, by trip purpose
- Expected change in travel time, number of trips, parking needs, and residential location
- Substitution of trips currently made by other modes
- Willingness to pay for the product/service
- Willingness to share the ride with strangers

For freight transport use cases, participants are asked:

- Likelihood of using the service provided
- Expected change in number of deliveries, parking needs, residential location, and delivery costs
- Substitution of deliveries currently made by other modes
- Usefulness of the service for the organisation the participant works for

Needs and requirements

- Preferred self-driving vehicle type overall and for commuting trips
- Perception about when different types of self-vehicle will be implemented (2030-2050)
- Activities during travel in self-driving vehicles

Attitudes about the impact of self-driving vehicles in general

Participants are asked about the impact they think self-driving vehicles will have on several indicators, grouped in 11 dimensions. See full list of indicators in Appendix 20

- Mobility
- Network efficiency
- Land use
- Environment
- Economy
- Equity
- Public health
- Safety
- Security
- Public sector
- Other impacts (open ended question)

9.3 Ethics

Appendix 21 shows the information sheet shown to participants before they agree to take part. As in the case of other activities, this sheet answers the following questions:

- *Why have I been chosen?*
- *Do I have to take part?*
- *What will happen if I take part?*
- *Will I be recorded and how will the recorded media be used?*
- *What are the benefits of taking part?*
- *What are the possible disadvantages and risks of taking part?*
- *What if something goes wrong?* [including contact details]
- *Will my taking part in this project be kept confidential?*
- *What will happen to the results of the research project?*
- *Who is organising and funding the research*

Participants then give they consent by confirming (by ticking a box) that they understand what the research involves and what is expected of them. This is detailed as a series of 12 statements. Participants need to agree with all of them.

10. Secondary data collection

10.1 Overview

The holistic framework of the MOVE2CCAM project does not only include primary data that is thoroughly explained in the previous section of this deliverable, but also considers secondary data to evaluate the inter-relationships included within the variables of Move2CCAM Impact Assessment Modelling Tool. While the previous subsections meticulously discuss the primary data, the project also places emphasis on utilizing secondary data to scrutinize the intricate interconnections among the variables.

Overall, secondary data include variables that are sourced from external repositories and data sources outside of the project (Eurostat, national statistical repositories, completed CCAM-related research projects), which aim to provide supplementary insights and perspectives, while also enriching the analytical depth of the tool's impact assessment. These supplementary data streams aim to augment the tool's analytical depth and offer diverse perspectives, enriching the overall impact assessment process.

This amalgamated approach integrating primary and secondary data aims to provide a comprehensive foundation for meaningful analysis that will be hosted in the MOVE2CCAM data warehouse, which is discussed in the following section of this Deliverable.

10.2 List of variables

Secondary data that are considered in the research project are identified within the eight main components (domains) that are reflected throughout the MOVE2CCAM project:

- Mobility
- Safety
- Public Health
- Economy
- Environment
- Land Use
- Network Efficiency
- Equity

Secondary data, derived from sources like Eurostat, national statistical repositories, and past CCAM-related research projects, bring a broader spectrum of information. They offer varied dimensions and perspectives that enrich the depth of the analysis. This extension beyond the project's immediate activities provides a more comprehensive view of the subject matter.

External data repositories contain information that contextualizes and complements the primary data, which include questionnaires and discussion topics. They provide the setting that the findings and outcomes of the project can be analysed, but also validated, and understood within a broader context. This contextualization enhances the credibility and applicability of the research findings. Further, secondary data often present insights and perspectives that might not be readily accessible through primary data collection by offering statistical trends, and historical data that enrich the overall understanding of the interrelationships between variables across different domains of the tool. This richness of perspectives aids in painting a more nuanced picture of the impacts being assessed.

In the process that includes the review of secondary data, the following issues of data characteristics were considered:

- Level of analysis, i.e., the geographical reach, location, size, or scale.
- Unit of measurement, i.e., the distinct unit from which data is measured with
- Data format that considers whether data are available in a consistent manner, while also considers issues that can be further explored or directly modified by interested users of the tool and the respective databases
- Data type that includes issues related to privacy, ownership, and accessibility of further secondary databases.

These issues have been addressed in collaboration with the consortium to guarantee that the correct procedure on identifying and collecting secondary data is considered.

There are two main types of secondary data:

- Open-access data that are derived from administrative data sets or external repositories and data sources outside of the project (Eurostat, national statistical repositories).
- Restricted-access data that are either coming from public data set but requiring administrative authorization to access more specific and detailed data or coming from private datasets from private structures or include proprietary type of information and cannot be open to the public.

It is worth noting that the intention is to solicit information pertaining to secondary data collection that fall within the former category (open-access data), however for the cases that such open-access data cannot be found, restricted-access data were utilized.

The final selection of variables for the tool will stem from collaborative creation activities, wherein Satellites (comprising citizens and organisations) actively participate in identifying these variables. Therefore, given the fact that a number of activities are still undergoing, the variables shown below for each domain do not include the final list.

Table 8. Move2CCAM Impact Assessment Modelling Tool: variables

Domain	Variables
Mobility	• Number of trips • Kilometres travelled • Goods transferred • Congestion • Emissions • Modal shift • Travel/Transport time • Waiting time • Vehicle ownership • Attitudes towards automation • Vehicle occupancy rate • Educational attainment level
Land Use	• Parking space • Accessibility to developments • Infrastructure developments • Residential density • Population • Transit oriented developments • Road capacity
Environment	• Congestion • Amount of water and materials • Vehicle fuel efficiency • Number of trips • Kilometres travelled • Air emissions

	• Noise • Environmental concerns
Equity	• Equity in service distribution • Affordability • Social acceptance • Transportation cost • Connectivity • Accessibility to vulnerable groups • Employment opportunities • Industry and supply chains • Employment distribution
Safety	• Trust in AVs • Regulatory compliance • Safety perception • Errors in operation • Emergency response • Collision rate • Cybersecurity
Public Health	• Road traffic fatalities • Road traffic injuries • Access to healthcare • Access to services and leisure • Air pollution • Wellbeing and quality of life
Economy	• Societal benefit • Economic development (number of jobs) • Income • Consumer expenditure • Infrastructure investment • Employment rate • Transportation cost • Vehicle ownership
Network Efficiency	• Travel demand • ITS/ICT • Network capacity • Traffic flow • Travel time • Congestion

10.3 Data collection

The developing tool will be designed to gauge the multidimensional impacts stemming from CCAM passenger and freight use cases within specific regions. To facilitate this assessment, it adopts the 'Nomenclature of Territorial Units for Statistics' (NUTS) 2 classification system. This classification system has been deliberately chosen as it captures a balance between granularity and inclusivity, making it an ideal level of analysis for shaping policies, devising strategies, and unifying regional statistics across Europe. Moreover, the selection of the NUTS 2 system is strategic as it provides a level of detail, which is sufficiently comprehensive for meaningful analysis, while also maintaining a manageable scope. This balance allows for a nuanced understanding of the impacts of CCAM scenarios at a regional level without overwhelming complexity, an important aspect for a user-friendly tool. Furthermore, the standardized nature of the NUTS 2 system brings an added advantage by facilitating direct comparisons and cross-country analyses. This standardization proves invaluable, especially in the context of CCAM solutions that are still in their early stages and have not diffused. The ability to ‘compare and contrast’ regional data at this

standardized level is pivotal for insightful policy analysis, especially when considering the evolving landscape of CCAM technologies and their implications across diverse regions.

The upcoming tool's development will involve demonstrating and testing its functionality across the MOVE2CCAM prototypical regions: Helmond (Netherlands), GZM (Poland), and North Aegean Islands (Greece). These regions are intentionally diverse, varying in technological advancement, infrastructure maturity, and population demographics. This deliberate selection aims to ensure the tool's practical applicability across a broad spectrum of regions, thereby facilitating its usefulness in various contexts. By encompassing regions with contrasting technological landscapes, infrastructural setups, and demographic compositions, the tool's adaptability and relevance are underscored. This diversity enables a comprehensive range of policy scenario analyses within the tool, achieved by controlling parameters and variables. Through the simulation of diverse policy scenarios across these regions, the tool's capacity to accommodate different contexts and its flexibility in responding to varying conditions will be tested and demonstrated. This broad spectrum of scenarios enables a thorough exploration of the tool's capabilities and ensures its adaptability to address multifaceted challenges across different regional contexts.

The tables below serve as comprehensive references outlining the specifics of data collection of the variables. These details include a comprehensive breakdown of each variable, categorizing whether it aligns with secondary data, its availability at the NUTS2 level, and its availability to each prototypical region. Additionally, these tables include information such as the data type, distinguishing between open-access and restrictive-access data, the unit of measurement, the data format and source/database, data year, and a brief description for each variable. Furthermore, the tables provide the source or link for each variable, offering a direct reference point for further exploration. This comprehensive breakdown and categorization of variables can also serve as a guide that facilitates a structured approach to data collection that ensures transparency and accessibility for interested researchers and practitioners.

It should be noted that some rows of these tables are deliberately empty, as the final list of the variables (including the ones pertaining to secondary data) will be produced by analysing the data produced by the qualitative assessment of impact (See Section 5). During the time that this deliverable is prepared, this analysis has not been concluded. Therefore, the final list of variables will be included in Deliverable 4.1.

Table 9. Secondary data collection: mobility variables

Variable	GZM	NAR	HEL	Data Type	Unit	Data format	Data Year	Source
Number of trips								
km travelled								
Goods transferred	Yes	Yes	Yes	open data	Thousand tonnes	csv file	2019-2022	NUTS 3 (EUROSTAT)
Congestion								
Emissions	Yes	Yes	Yes	open data	Thousand tonnes of CO2 eq.	csv file	2014-2021	County level (OECD)
Modal shift								
Travel/Transport time								
Waiting time								
Vehicle ownership	Yes	Yes	Yes	open data	thousand hours worked		2013-2022	County level (OECD)
Attitudes towards automation								
Vehicle occupancy rate								
Educational attainment level	Yes	Yes	Yes	open data	number	csv file	2011	NUTS 2 (EUROSTAT)

Table 10. Secondary data collection: land use variables

Variable	GZM	NAR	HEL	Data type	Unit	Data format	Data year	Source
Parking space								
Accessibility to developments								
Infrastructure developments	Yes	Yes	Yes	open data	Europ	csv file	2018-2021	County level (OECD)
Residential density	Yes	Yes	Yes	open data	Square meters per capita	csv file	2000-2014	County level (OECD)
Population	Yes	Yes	Yes	open data	# of inhabitants	csv file	2018-2022	NUTS 2 (EUROSTAT)
Transit oriented developments								
Road capacity	Yes	No	Yes	open data	km	csv file	2017-2021	

Table 11. Secondary data collection: environmental variables

Variable	GZM	NAR	HEL	Data type	Unit	Data format	Data year	Source
Congestion								
Amount of water and materials	Yes	Yes	Yes	open data	million cubic meters	csv file	2014-2020	County level (OECD)
Vehicle fuel efficiency								
Number of trips								
km travelled								
Air emissions	Yes	Yes	Yes	open data	Air pollution exposure	csv file	2000-2019	County level (OECD)
Noise	Yes	Yes	Yes	open data	mean volume (dBA)	csv file	2022	CAPITAL LEVEL (NoISE PROJECT)
Environmental concerns								

Table 12. Secondary data collection: equity variables

Variable	GZM	NAR	HEL	Data type	Unit	Data format	Data year	Source
Equity in service distribution								
Affordability								

Social acceptance								
Transportation cost								
Connectivity								
Accessibility to vulnerable groups								
Employment opportunities	Yes	Yes	Yes	open data	thousand persons	csv file	2018-2022	NUTS 2 (EUROSTAT)
Industry and supply chains	Yes	Yes	Yes	open data	number	csv file	2018-2022	
Employment distribution	No	Yes	Yes	open data	number	csv file	2002	NUTS 2 (EUROSTAT)

Table 13. Secondary data collection: safety variables

Variable	GZM	NAR	HEL	Data type	Unit	Data format	Data year	Source
Trust in AVs								
Regulatory compliance								
Safety perception	Yes	Yes	Yes	open data	number	csv file	2021	NUTS 2 (EUROSTAT)
Errors in operation								
Emergency response								
Collision rate								
Cybersecurity								

Table 14. Secondary data collection: public health variables

Variable	GZM	NAR	HEL	Data type	Unit	Data format	Data year	Source
Road traffic fatalities	Yes	Yes	Yes	open data	rate	csv file	2011-2020	NUTS 2 (EUROSTAT)
Road traffic injuries	Yes	Yes	No	open data	number	csv file	2017-2021	NUTS 2 (EUROSTAT)
Access to healthcare	Yes	Yes	No	open data	number		2015-2021	NUTS 2 (EUROSTAT)
Access to services and leisure								
Air pollution	Yes	Yes	Yes	open data	Thousand tonnes	csv file	2014-2021	County level (OECD)
Wellbeing and quality of life								

Table 15. Secondary data collection: economy variables

Variable	GZM	NAR	HEL	Data type	Unit	Data format	Data year	Source
Societal benefit								
Economic development (# of jobs or GDP)	Yes	Yes	Yes	open data	Million Euro	csv file	2012-2021	NUTS 2 (EUROSTAT)
Income	Yes	Yes	Yes	open data	Million Euro	csv file	2012-2020	NUTS 2 (EUROSTAT)
Consumer expenditure								
Infrastructure investment								
Employment rate	Yes	Yes	Yes	open data	Thousand hours worked	csv file	2015-2021	NUTS 2 (EUROSTAT)
Transportation cost								
Vehicle ownership								

Table 16. Secondary data collection: network efficiency variables

Variable	GZM	NAR	HEL	Data type	Unit	Data format	Data year	Source
Travel demand								
ITS/ICT								
Network capacity								
Traffic flow								
Travel time								
Congestion								

11. Move2CCAM Data Warehouse

11.1 Overview

The Move2CCAM Data Warehouse serves as a central repository for data collection, storage, and sharing within the Move2CCAM project. The design is tailored to meet the project's unique data management needs, ensuring efficient handling, security, and accessibility of data.

To aid users in interacting with the Data Warehouse platform, a comprehensive manual quick guide is available (Appendix 22). This guide includes detailed instructions and illustrative screenshots, assisting users in navigating and utilizing the platform effectively. Additionally, an instructional video is provided, offering a step-by-step visual walkthrough on how to use the Data Warehouse platform.

The primary purpose of the Data Warehouse is to provide a scalable, and secure platform for storing a wide variety of data collected from various sources that includes primary and secondary data. The scope of this platform extends to ensuring data integrity, facilitating easy access for authorized partners, and supporting the project's overall objectives.

11.2 Data Warehouse specifications

Data Collection and Storage

Data collection methods can be effectively carried out through manual approaches, ensuring detailed and controlled data input. Primary data can be gathered by partners who upload or utilize the drag-and-drop feature to move folders and files directly into the platform. This hands-on approach allows for meticulous organisation and immediate verification of data. Similarly, secondary data, encompassing both open and restricted datasets, is stored in the Data Warehouse. This storage is facilitated through manual methods, which include direct uploads or the drag-and-drop mechanism. Such manual processes ensure precise control over the data being incorporated, allowing for thorough validation and categorization as it enters the system.

Data Storage Infrastructure and Technical Architecture

The technical architecture of the Data Warehouse encompasses advanced database systems, high-performance computing resources, and secure network configurations. This infrastructure is built to support large-scale data processing and analysis, while ensuring data integrity and accessibility.

Data Security and Privacy

Data security and privacy are paramount. The Data Warehouse platform is on a secure connection with the appropriate security protocols, including encryption and access controls, to protect data against unauthorized access and breaches. In the pursuit of ensuring the utmost security and confidentiality of data within the infrastructure, a security evaluation was conducted by Nextcloud Official Security Scan. This evaluation assigned the Data Warehouse platform as a 'Rating A' for its security posture, indicating an absence of any vulnerabilities. Advanced hardening measures, including but not limited to Bruteforce protection, CSPv3, Same-Site-Cookies, and password verification against the HaveIBeenPwned database. Additionally, our server configuration Data Warehouse is aligned with security practices, as evidenced by the activation of critical security headers like X-Frame-Options and X-Content-Type-Options.

Finally, the Data Warehouse fully embraces the General Data Protection Regulation (GDPR). Users’ data remains private and secure under the GDPR's principles. At Data Warehouse, we also

make sure our data handling aligns with the FAIR principles, meaning that data is made easily findable, accessible, interoperable, and reusable.

Data Sharing and Distribution

Data sharing with project partners is streamlined through secure channels, ensuring partners have timely and controlled access to relevant data sets, fostering collaboration and knowledge exchange.

WebDAV (Web Distributed Authoring and Versioning) is a key feature of the Data Warehouse, offering a flexible, secure, and efficient method for accessing and managing files stored on the server. By leveraging WebDAV, we can easily mount the partners' Data Warehouse storage as a network drive, allowing for seamless file operations like copying, moving, and editing directly from the file manager or any WebDAV-compatible application. This integration will allow the flow and use of the various data accordingly for the IAMT tool.

Data Ownership and Responsibility

Clear guidelines on data ownership and responsibility ensure accountability and clarity in data handling and usage within the project.

The primary data, owned by the consortium, is intended to be made openly available in a manner compliant with GDPR regulations while ensuring anonymity and produced according to FAIR principles.

Secondary data results from the data collection process sourced from European, national, regional, and local repositories. These datasets may be open data, such as those retrieved from Eurostat, or may have restricted access. The latter can be collected from partners or other sources and might include proprietary information that requires careful handling.

Metadata Standards and Tagging

Metadata standards and tagging protocols are in place to enhance data discoverability and usability, facilitating easier data interpretation and analysis.

Data Warehouse Maintenance

The partner responsible for leading the efforts of the Data Warehouse will be conducting maintenance and support when needed to keep the Data Warehouse platform running smoothly, ensuring its performance and reliability.

Product Life Cycle

The Data Warehouse is designed to evolve through a five-stage product lifecycle, encompassing development, growth, maturity, saturation, and decline, ensuring it remains relevant and effective over time.

a) Development: Setting up and configuring the Data Warehouse environment.

b) Growth: Expanding usage, adding users, and integrating with other systems.

c) Maturity: The platform is fully operational with established processes.

d) Saturation: Growth plateaus, and the focus shifts to optimization.

e) Decline: Transition to new solutions as technology evolves, allowing adaptations to emerging needs.

11.3 Ethics

Compliance with data privacy laws and regulations is rigorously maintained, protecting the privacy rights of individuals and entities represented in the data.

Ethical considerations form a critical aspect of data management practices, emphasizing the importance of upholding individual rights and adhering to societal norms. The approach to data handling and protection adheres to specific legislative frameworks. Notably, MOVE2CCAM partners, irrespective of their location within or outside the European Union, are guided by the Data Protection Act 2018 (DPA) and the General Data Protection Regulation (GDPR), the latter also being part of UK law. Additionally, operations conducted in non-EU countries, such as the UK and USA, will align with the legal requirements of those respective nations, ensuring compliance across areas.

Appendices

Appendix 1: Recruitment questionnaire - citizens

SECTION 1: INTRODUCTION

Good morning/afternoon/evening,

I am looking to recruit people to take part in a research project. The research is being conducted by [INSERT COMPANY NAME], an independent market research company, on behalf of MOVE2CCAM, a pan-European project aimed at understanding people's views on Connected, Cooperative & Automated Mobility (CCAM).

The research consists of a face-to-face focus group in March 2023 and an online dialogue in October 2023. The face-to-face focus groups will be conducted at [VENUE] and the online dialogue will be via an online research platform called RECOLLECTIVE. The face-to-face focus groups will last about 2 HOURS and would be facilitated by experienced researchers from [INSERT COMPANY].

To thank you for your time, you will receive [€X] paid [in cash/via an independent incentive payment platform, Ayda / bank transfer], for each activity you take part in. Provided that you are able to take part in the two activities, this would be a total of [€X].

The face-to-face activity will take place on [INSERT DATE/TIME]. We will provide more detail about the timings for the online activity.

You will also be asked to complete a short paper 'pre-task' which you should bring along with you to the session.

Further activities will be planned after October. We will be in touch at that time.

Everyone taking part in the research will come from different backgrounds and will have a range of different experiences to talk about so don't worry, there are no 'right' or 'wrong' answers to the questions I am about to ask you.

If you are interested in taking part, I just need to ask you a few questions.

SECTION 2: DECLARATION

Q1: Are you currently participating, or scheduled to participate in any market research?

Yes	*Thank and close*
No	*Continue*

Q2: Have you taken part in market research in the past 6 months?

Yes, in the past 12 months	*Continue*
Yes, in the past 6 months	*Thank and close*
Not in the past 12 months	*Go to Q5*

Q3: Please list all topics covered in all previous market research discussions you have attended in the past 12 months

Record Thank and close if attended any market research topic of transport in the past 12 months

Q4: Have you taken part in any research with [INSERT NAME OF AGENCY] in the last 12 months?

Yes	*Thank and close*
No	*Continue*

Q5: Have you ever been employed in any of the following occupations?

Market Research	*Thank and close*
Marketing	
Journalism	
Media	
Transport	
None of these	*Continue*

Q6: Which, if any, of the following internet-enabled devices do you personally own or have access to?

Smartphone or other internet-enabled smartphone	*Record*
Tablet/iPad	
Laptop	
Desktop	
I do not own an internet-enabled device	*Thank and close*

Q7: During the activity in October 2023, you will need to have access to a stable internet connection and be in a quiet area so that you can participate in the session undisturbed. Do you have access to a stable internet connection and a suitable spot?

Yes	*Continue*
No	*Thank and close*

Please note that we cannot accept participants if they are currently in transit, such as on a train or in a moving car.

SECTION 3: ABOUT YOU

Q8: How old are you?

18-34	*Recruit at least 8 people in this group*
35-64	*Recruit at least 16 people in this group*
65+	*Recruit at least 8 people in this group*

Ensure a good age spread within each group.

Q9: How would you describe your gender?

Do not read out list of options – code answer against the following so that participants can self-describe.

Woman	*Recruit at least 16 women*
Man	*Recruit at least 16 men*
Other	*Record*

Q10: How would you describe your ethnic background?

Do not read out list of options – code answer against the following so that participants can self-describe.

White	*Record*
Mixed	*Record and recruit at least 4 people in these groups*
Asian	
Black / African / Caribbean	
Other (please specify)	

Q11: Which of the following best describes your situation in relation to having a driver's license / driving a vehicle?

I have a valid driver's licence and I am able to drive	*Record*
I don't have a driver's licence	*Record and recruit at least 4 people in these groups*
I have a driver's licence, but I do not have a car in my household that I can use	
I have a driver's licence, but I am unable to drive because of health or other personal reasons	

SECTION 4: SOCIO-ECONOMIC INFORMATION

Q12: What is your occupation? (If retired, occupation prior to retirement)

Record

Q13: Which of the following best describes your current employment situation?

I work full time (30+ hours per week)	Record
I work part time (8-29 hours per week)	
I am not working, but seeking work or temporarily unemployed / sick	
I am not working and not seeking work	
Student	Recruit at least 2 students for Group 1 (aged 18-34)
Retired	Record
Homemaker / house person / housewife / househusband etc.	

Q14: What is your annual household income? By household income we mean overall income from anybody who contributes financially to your home. If you have a partner or children who also work and contribute to the household finances this would include their income as well as yours.

Under £5,000	Record
£5,000 to £14,999	
£15,000 to £24,999	
£25,000 to £34,999	
£35,000 to £49,999	
£50,000 to £99,999	
£100,000 +	
Prefer not to say	
Don't know	

Q15: What is the highest educational level that you have achieved to date?

No formal education	*Record*
Primary school	
Secondary school up to GCSE / NVQ levels 1 to 2 / equivalent	
Secondary school up to A Level / NVQ level 3, etc.	
University degree or equivalent professional qualification, NVQ level 4, etc.	
Higher university degree, doctorate, MBA, NVQ level 5, etc.	
Still in full time education	
Don't know	
Prefer not to say	

SECTION 5: HEALTH AND DISABILITY

Q16: Do you have a long-term illness, health problem, disability or impairment that affects my daily life or are you a carer of someone who has a long-term illness, health problem, disability or impairment that affects their daily life?
Please remember that your answers are always treated confidentially.

I have a long-term illness, health problem, disability or impairment that affects my daily life	*Record - Recruit at least 8 people (Group 5*)
I am a carer for someone who has a long-term illness, health problem, disability or impairment that affects my daily life	
None of the above applies to me	*Record*

SECTION 6: FAMILY, HOUSING, AND LOCATION

Q17: Who, if anyone, do you live with?

I live alone	*Record*
I live with friends / in a house share	

I live with my partner / spouse, with no children	*Recruit at least 8 people for Group 2 (aged 35-64)*
I live with my partner and my child(ren) who are under 15	*Recruit at least 8 people for Group 2 (aged 35-64)*
I live with my partner and my child(ren) who are over 15	*Record*
I live with my parents or other family members	

Q18: Which of the following best describes where you live?

City centre	*Record*
City, not in centre	*Record*
Small town	*Record*
Village (with less than 2000 people)	*Recruit minimum of 4 from this group*

If clarification is needed:

- City: population over 10,000
- City centre: less than 10 minutes (by car or other mode of transport) to the centre
- Small town: 2,000 to 10,000 people
- Village: less than 2,000 people

SECTION 7: ADDITIONAL, CONSENT AND PERMISSIONS

Q19: As part of this research, we will be audio recording the session. This is for internal use by [INSERT COMPANY NAME] only and will not be shared with anyone. Are you happy to be audio recorded during the research?

Yes	Continue
No	Thank and close

Q20: [INSERT COMPANY NAME] will keep your information on file for a period of up to 24 months; this is for [INSERT COMPANY NAME] quality monitoring purposes only and your information will not be passed along to any other third party or marketing organisations. Are you happy for [INSERT COMPANY NAME] to store your data for a period of up to 24 months?

Yes	*Continue*
No	*Thank and close*

Q21: [INSERT COMPANY NAME] will be contacting you again to ask you to take part remaining two stages of this research. You would only be contacted within the next 24 months for research related to this project. Would you be happy to be re-contacted, and participate in the next two stages of this research?

Yes	*Continue*
No	*Thank and close*

Q22: As part of the research, we might ask you to record some videos and share some photos with us. Would you be happy for any videos and photos you choose to share with us to be shared with [INSERT COMPANY NAME]? These would only be seen by [INSERT COMPANY NAME] internally and would not be published or shared anywhere outside [INSERT COMPANY NAME].

Yes	*Record and continue*
No	*For online sessions: Thank and close*

Q23: [ASK ONLY IF PAYING VIA Ayda] [INSERT COMPANY NAME] will process your incentive using the payment platform Ayda. Do you consent to having your name and email address shared with the incentive payment platform Ayda (previously known as Particity), so they

can contact you to process any incentive being offered. You must collect the incentive payment within 6 months.

Yes	*Record and continue*
No	*Tell participant that it will not be possible to process incentive*

SECTION 10: YOUR DETAILS

Do you have any needs or requirements that you would like us to consider for the research (for example, dyslexia, wheelchair use)?

Record

Finally, I just need to take details of your name, email address, and telephone number:

Name:	
Email address:	
Telephone number:	

No two people should know each other.
Please note telephone numbers are mandatory.

SECTION 11: INTERVIEWER DECLARATION

Is there anything else the interviewer should be made aware of?

Record

THIS IS A TRUE RECORD OF AN INTERVIEW WHICH HAS BEEN CONDUCTED WITH A RESPONDENT WHO IS NOT A RELATIVE OR FRIEND OF MINE

INTERVIEWER'S SIGNATURE: ……
DATE: ……

Appendix 2: Pre-activity questionnaire - citizens

Topic	Question	Options
Residential area characteristics	Q1: How far from your home are the following places? Q1.1. The place where you work or study Q1.2. Shopping areas Q1.3. Health centre Q1.4. Leisure places (e.g., park, sport facilities)	• Less than 1 km • 1-2 km • 2-5 km • More than 5 kms
Mobility restrictions	Q2: Do you have a long-term illness, health problem, disability or impairment affecting your daily life? *Please remember that your answers are always treated confidentially*	• Yes • No [GO TO Q5] • Prefer not to say [GO TO Q5]
	[ASK IF Q2=1] Q3: Does your long-term illness, health problem, disability or impairment affects your ability to move around?	• Yes, a lot • Yes, a little • No • Prefer not to say
	[ASK IF Q2=1] Q4: Do you use any mobility aids or equipment?	• Yes, a wheelchair • Yes, a mobility scooter • Yes, walking stick or crutches • Yes, a guide dog • Other • No • Prefer not to say
Travel behaviour	Q5: How often do you travel to the following places? Q5.1. The place where you work or study Q5.2. Shopping areas Q5.3. Health centre Q5.4. Leisure places (park, sport facilities)	• Less than once a month (or never) • Once a month • 2-3 times a month • Once a week • 2-4 times a week • 5 or more times a week
	Q6: Which transport mode do you use for going to these places? *You can choose more than one option* Q6.1. The place where you work or study Q6.2. Shopping areas Q6.3. Health centre Q6.4. Leisure places (park, sport facilities)	[MULTIPLE CHOICE] • Bus or tram • Train • Private car as driver • Private car as passenger • Taxi (or ride-sharing such as Uber) • Walking • Cycling • Scooter
Use of travel time	[ASK IF Q6.1=3 OR Q6.2=3 OR Q6.3=3 OR Q6.4=3] Q7: How do you feel about driving?	• I enjoy driving and I do not mind spending time doing it • I would prefer to use the time for doing something else, instead of driving
	[ASK IF Q6.1=3 OR Q6.2=3 OR Q6.3=3 OR Q6.4=3]	[MULTIPLE CHOICE] • Talk to other passengers • Talk on the phone

	Q8: What else do you do while you are travelling by bus, tram, or train? Choose all that apply	• Work • Listen to music or audiobooks • Watch videos • Other activities on my phone or laptop (e.g., games, social media, browse internet) • Sleeping • Look outside window • Think • Nothing • Other (please add)
Awareness on self-driving vehicles	Q9: Were you aware that self-driving vehicles are being developed and will be used in the future?	• I am aware I and have been following developments • I am aware but I do not know much about it • I was not aware [END QUESTIONNAIRE]
General perceptions on concerns	[ASK ONLY IF Q9=1 OR Q9=2] Q10: Which are your three main concerns about self-driving vehicles?	[MULTIPLE CHOICE] • Traffic safety (collisions) • Legal issues (will the vehicle owner be liable if something goes wrong?) • Vehicle software can be hacked • Vehicle is too expensive to buy • Who will have access to data from my trips • Vehicle software fails during the trip • Jobs lost (e.g., drivers) • Others (please add) • I do not know
Adoption of self-driving vehicles	[ASK ONLY IF Q9=1 OR Q9=2] Q11: Would you use a self-driving vehicle in the future?	• Yes • No • I am not sure
	[ASK ONLY IF Q9=1 OR Q9=2] Q12: Would you pay to use (but without buying) a self-driving vehicle in the future?	• Yes • No • I am not sure
	[ASK ONLY IF Q9=1 OR Q9=2] Q13: Would you be likely to buy a self-driving vehicle in the near future?	• Yes • No • I am not sure
Use of travel time in self-driving vehicles	[ASK IF Q11=1] Q14: If you used a self-driving vehicle, what would you do during the trip?	[MULTIPLE CHOICE] • Talk to other passengers • Talk on the phone • Work • Listen to music or audiobooks • Watch videos • Other activities on my phone or laptop (e.g., games, social media, browse internet) • Sleeping • Look outside window • Think • Nothing

Appendix 3: Pre-activity questionnaire - organisations

Topic	Question	Options
Type of organisation	Q1: Which type of organisation do you represent?	• Freight and logistic operators • Passenger transport operator • Transport infrastructure operators • Vehicle manufacturer/developer • Fuel provider • Health expert • Telecommunications & cybersecurity expert/organisation • Authority or regulatory body • Autonomous vehicle demonstration areas • Research organisation • NGO • Other (please specify)
	Q2: What is the geographical coverage of the organisation you represent?	• International • Europe • Country (which one) • Region (which one) • City (which one)
Awareness on self-driving vehicles	Q3: Were you aware that self-driving vehicles are being developed and will be used in the future?	• I am aware I and have been following developments • I am aware but I do not know much about it • I was not aware [END QUESTIONNAIRE]
General perceptions	[ASK ONLY IF Q3=1 OR Q3=2] Q4: Do you have a positive or negative view of self-driving cars?	• Positive • Negative • Uncertain
	[ASK ONLY IF Q3=1 OR Q3=2] Q5: Which are your three main concerns about self-driving vehicles?	[MULTIPLE CHOICE] • Traffic safety (collisions) • Legal issues (will the vehicle owner be liable if something goes wrong?) • Vehicle software can be hacked • Vehicle is too expensive to buy • Who will have access to data from my trips • Vehicle software fails during the trip • Jobs lost (e.g., drivers) • Others (please add) • I do not know
Beneficiaries	[ASK ONLY IF Q3=1 OR Q3=2] Q6: How likely it is that the following groups will benefit from self-driving vehicles? Q6.1: Individuals who cannot drive because of age or disability Q6.2: Individuals who do not want to drive or do not have a driving licence Q6.3: Tourists Q6.4: Individuals with high income Q6.5: Individuals with low income Q6.6: Companies delivering goods	• Extremely likely • Likely • Neither likely nor unlikely • Unlikely • Extremely unlikely

	Q6.7: Consumers receiving goods	
Actors	[ASK ONLY IF Q3=1 OR Q3=2] Q7: What will be the three most influential actors in the deployment of self-driving vehicles?	[MULTIPLE CHOICE] • Freight and logistic operators • Passenger transport operator • Transport infrastructure operators • Vehicle manufacturer/developer • Fuel provider • Health expert • Telecommunications & cybersecurity expert/organisation • Authority or regulatory body • Autonomous vehicle demonstration areas • Research organisation • NGO • Other (please specify)

Appendix 4: Use case co-creation – face-to-face activity guide

These materials were used in the activities with citizens and organisations

Section	Key discussion points and probes	Materials	Time (min.)
Participants arriving	Participants are asked to arrive 15 minutes in advance • Sign people in • Get settled in the room • For disabled/mobility issues participants, ensure comfort and check in on accessibility requirements, point out where toilets are, etc. • Provide support to anyone who has not completed the pre-workshop questionnaire and informed consent form	• List of participants, including whether they have completed the questionnaire • Links/paper copies of questionnaire and informed consent form	-
Welcome, introduction to the research and introduction to the session	Moderator to welcome participants and introduce the research: • Introduce organiser name, self, and any other parties/people in the room attending • Introduce project, purpose of the research and the session • Ground rules for participating in the session (phones switched off / in silent mode, speaking one at a time etc.) • Housekeeping and venue information (where toilet facilities are, exit, start and finishing times, recording taking place)	Running slides	Citizens: 5; Organisations: 10
Introductions and warm up	Moderator to go around the table asking participants to introduce themselves: • Name • [Citizens] Where they live, who they live with, best and worst thing about your city/village • [Organisations] A short introduction to their organisation, and the role that CCAM solutions plays or has the potential to play for their organisation		5
Ice breaking exercise	[Citizens] I'd like to start now by talking about how you get around on a regular basis. It would be helpful for me to understand how each of you tend to get around and how this might differ depending on the journey (moderator to capture transport modes and journeys on flipchart). Reflecting on how you tend to get around… • How easy or difficult would you say it is to get around? Why? • What makes it easy / difficult?	• Running slides • Flipchart • Flipchart pens	10

	• Specifically, how easy or difficult is it for people like you? • Who (else) in your community do you think would find it easy / difficult to get around? Why? • What are the main issues / challenges in relation to getting around? • What, if anything, would you most like to change / improve about how you get around? Why? [Organisations] I'd like to start now by talking about what transport looks like in the area where your organisation operates, from the perspective of your organisation (moderator to capture key points on flipchart). It would be helpful for me to understand: • The transport needs in this area. Any particularities that this area has in relation to transport • Any transport-related issues/challenges that this area is facing • The types of people, who are most likely to face issues with transport in this area • What, if anything, would you most like to change / improve about how you get around? Why?		
Introducing self-driving vehicles and proto-personas, and explaining workshop activities	I would now like to share some information about what we mean by self-driving vehicles and different ways these can be used. I also want to show you some different types of people and their travelling needs. Moderator to share video / present information on self-driving vehicles (including different types of self-driving vehicles, use cases, and proto-personas and explain the co-creation focus for the rest of the session, and what we are aiming to achieve. Now that you have seen some information about self-driving vehicles, and different types of people and their needs, I'd would like you to spend the next minutes thinking in pairs about some potential services that self-driving vehicles could provide in the future, for yourselves and different types of people in your area. [Citizens] I want you to work in pairs and come up with as many ideas as possible within the time that we have got and populate the worksheets with your ideas.	• Running slides • Video	10

	[Organisations] We want you to come up with as many ideas as possible within the time that we have got and populate the worksheets with your ideas. Each table should pick one representative to feed back the ideas from their table in plenary, to the rest of the workshop participants.		
Self-driving vehicles and mobility services co-creation and presentation	Moderator to distribute worksheets and talk through how participants will work to complete the exercise. I want you to imagine that self-driving vehicles were being introduced as a transport option… • What would this / these vehicle (s) be? (i.e., shuttle, pod, traditional car/bus, etc.) • What kind of mobility service (s) will it / they provide? (e.g., where is it going, how often does it go there and at what times, how many people use it, how people will pay for it, how frequently will people use it) • What will these services allow you to do that you cannot do now? (for you personally, for people in your household, for the wider society) • What kind of person (i.e., referring back to different types of people) might need or use this service? • What are the potential challenges that it might face? • How do you think people's lives will change / How will your city/village change/be affected? (thinking about positive / negative impacts, and for whom?) Each pair to spend a couple of minutes talking through the mobility services / vehicles they came up with, giving an opportunity to the rest of the group to ask to questions / reflect on the ideas presented (including sharing any concerns they might have).	• Worksheets (in A3) • Pens • Post-its • Cut out images of self-driving vehicles • Cut out proto-personas • Glue	Citizens: 40; Organisations: 45
[organisations only] Services with self-driving vehicles presentation	Each table to give a short presentation of the mobility vehicles and services they created (2-3 minute each), with an opportunity for other tables to ask to questions/reflect on the ideas presented	Completed worksheets	Citizens: N/A; Organisations: 20
Thinking about the future	Now that we've discussed the different ideas, we have all come up with, I'd like you to think about the future, and the transport needs you might have in the coming years.	• Timeline • Post-its • Cut out self-driving vehicle template and	15

	I'd like us to populate this timeline as a group, thinking about potential ideas and self-driving vehicle types and mobility services that we might need in 2025, 2030 and 2050. Please consider how your/people's transport needs might change during these different times in the future. In your opinion, which mobility services/ self-driving vehicle types will be used in the next 2-3 years? Why? And which need to happen more urgently? Why? For whom will these vehicles/services be more useful? Which are more likely to be used in 2030? Why? And which are more likely to be introduced in the longer-term by 2050? Why?	they can write what type of vehicle it is, and plot the timeline • Glue	
Thank and close	Moderator to: • Thank participants for their time today • Ask if anyone has any final questions / comments • Flag next steps for this research programme (all details to be confirmed via email)		

Appendix 5: Use case co-creation – online activity guide - citizens

Welcome to this online community about self-driving vehicles!

Hello everyone!

Welcome to this online community about self-driving vehicles. We're really excited about kicking off this project and getting to hear from you over next few days.

We're conducting this research to understand how self-driving vehicles might impact people's lives and different areas in the future. This research programme involves citizens and organisations from a number of different countries, including Poland, the Netherlands, Greece, Cyprus, the UK, Spain, Germany, and France.

This research project is funded by the European Commission and is taking place between September 2022 and February 2025.

To reassure you, any information you share on the online community will remain confidential and your responses will be anonymised.

Over the next five days we'll be asking you to complete 5 activities. Members of the [INSERT TEAM NAME] team may also ask you additional questions about your responses to better understand your thoughts and ideas. Please make sure to look at your notifications on this website to check whether you've received any follow-up questions – you can do this by clicking on the bell icon in the top right-hand corner of the screen.

Please make sure to log in at least three times to complete all activities, take part in discussions, and answer any follow up questions before the online community ends on Sunday 12th March 2023. Please also log in on the morning of Monday 13th March 2023 to answer any final follow up questions from the [INSERT TEAM NAME] team.

Each activity will take between 15 and 30 minutes to complete, and you will receive [INSERT INCENTIVE AMOUNT] as a thank you for your time, once you have completed the research.

Here is a quick summary of what we have planned:

Activity number	Title	Time needed for activity
1	Welcome and getting to know you	15 minutes
2	Your ideas for self-driving vehicles	30 minutes
3	Thinking about the future	15 minutes
4	Discussion on ideas for self-driving vehicles	15 minutes
5	Discussion about future mobility needs and self-driving vehicles	15 minutes

If you have any questions at any point or are struggling to complete any of the activities, then please get in touch with [INSERT MODERATOR DETAILS] by email at [MODERATOR EMAIL ADDRESS] or send us a message via the online community platform. We are all very happy to help.

Thanks for taking part, and we very much look forward to engaging with you and reading your thoughts!

Activity 1: Welcome and getting to know you!

Task	Task type	Task name	Summary of task content
1	Prompt	Welcome to your first activity!	Hello and welcome to your first activity. In this activity, we'd like to get to know you better by asking you some questions about you, and how you tend you get around. Please note that your responses to this activity will be shared with other people from your country taking part in this research to exchange your thoughts about how getting around looks like.
2	Open text response	Introducing yourself	First, tell us a bit about yourself, including where you live, who you live with, and the best and worst thing about your city/village. [OPEN TEXT]
3	Fill in the blanks (with multiple open text boxes)	How do you tend to get around?	Now please tell us a bit about how you tend to get around, and all the different types of journeys you make, telling us about the mode of transport you tend to use for each journey, and why. • I tend to go to work… • I tend to go to the supermarket… • I tend to go to the shopping centre… • I tend to go to the health centre or hospital… • I tend to go to the park / green area… • Other
4	Fill in the blanks (with multiple open text boxes)	How easy or difficult is it to get around?	Now please consider the following questions: • How easy or difficult would you say it is to get around? Why? • What makes it easy / difficult? • What are the main issues / challenges in relation to getting around? • Specifically, how easy or difficult is it for people like you? • Who (else) in your community do you think would find it easy / difficult to get around? Why? • What are the main issues / challenges in relation to getting around? • What would you most like to change/improve about how you get around?
5	Prompt	Thank you for completing your first activity!	Thank you for completing your first activity! Don't forget to complete the rest of the activities before the end of Sunday 12th March – the sooner the better, to give us time to ask any follow-up questions. And keep checking back for any follow-up questions from the [INSERT TEAM NAME] team! Please click the button below to move onto your second activity.

Activity 2: Your ideas for self-driving vehicles!

Task	Task type	Task name	Summary of task content
1	Prompt	Welcome to your second activity!	Hello again, and welcome to your second activity for this study. In this activity, we'd like to share some information

			about what we mean by self-driving vehicles and different ways these can be used. Self-driving vehicles can be a reality in the short / long future as many countries and companies around the world are moving rapidly towards this type of vehicles. Please check the video included here [insert link to YouTube video of self-driving vehicle). You don't need to watch the entire video, just the first couple of minutes to see how the vehicle drives itself, turning around and stopping at different points. Also, please check the attached file with some slides here showing different types of self-driving vehicles and how they can be used. Please note that your responses to this activity will be shared with other people from your country taking part in this research to share thoughts and ideas on mobility services.
2	Fill in the blanks (with multiple open text boxes)	Your ideas	Now that you have seen some information about self-driving vehicles, we would like you to think about some potential mobility services that self-driving vehicles could provide in the future, for yourselves and different types of people in your area. I want you to imagine that self-driving vehicles were being introduced as a transport option… • What would this / these vehicle (s) be? (i.e., shuttle, pod, traditional car/bus, etc.) • What kind of mobility service (s) will it / they provide? (e.g., where is it going, how often does it go there and at what times, how many people use it, how people will pay for it, how frequently will people use it) • What will these services allow you to do that you cannot do now? (for you personally, for people in your household, for the wider society) • What kind of person (i.e., referring back to different types of people) might need or use this service? • What are the potential challenges that it might face (e.g., financial, social, legal, technical etc.) • How do you think your life / other people's lives will change / How will your city/village change/be affected? (thinking about positive / negative impacts, and for whom?)
3	Fill in the blanks (with multiple open text boxes)	More ideas	If you have any other ideas for self-driving vehicles, please share them here. • What would this / these vehicle (s) be? (i.e., shuttle, pod, traditional car/bus, etc.) • What kind of mobility service (s) will it / they provide? (e.g., where is it going, how often does it go there and at what times, how many people use it, how

			people will pay for it, how frequently will people use it) • What will these services allow you to do that you cannot do now? (for you personally, for people in your household, for the wider society) • What kind of person (i.e., referring back to different types of people) might need or use this service? • What are the potential challenges that it might face (e.g., financial, social, legal, technical etc.) • How do you think your life / other people's lives will change / How will your city/village change/be affected? (thinking about positive / negative impacts, and for whom?) We have also included here a file with some slides showing different people in society, who have different types of mobility needs, desires, and frustrations. Please take a look as it can help us consider different people's circumstances and needs for our ideas.
4	Prompt	Thank you for completing your second activity!	Thank you for completing your second activity! Don't forget to complete the rest of the activities before the end of Sunday 12th March – the sooner the better, to give us time to ask any follow-up questions. And keep checking back for any follow-up questions from the [INSERT TEAM NAME] team! Please click the button below to move onto your third activity.

Activity 3: Thinking about the future!

Task	Task type	Task name	Summary of task content
1	Prompt	Welcome to your third activity!	Hello again, and welcome to your third activity. In this activity, we'd like you to think about the future, and the transport needs you might have in the coming years. Please note that your responses to this activity will be shared with other people from your country taking part in this research to exchange thoughts and ideas on future mobility needs.
2	Fill in the blanks (with multiple open text boxes)	Your thoughts on the future	I'd like you to take a look at this timeline and think about potential ideas and self-driving vehicle types and mobility services that you might need in 2025, 2030 and 2050. Please consider how your/people's transport needs might change during these different times in the future. You can go big and think freely about mobility services and vehicles that are different to the ones you have already seen / mentioned today and could be needed in the future. • In your opinion, which mobility services/ self-driving vehicle types will be used in the next 2-3 years? Why? And which need to happen more urgently? Why? For whom will these vehicles/services be more useful? • Which are more likely to be used in 2030? Why? • And which are more likely to be introduced in the longer-term by 2050? Why?

3	Prompt	Thank you for completing your third activity!	Thank you for completing your third activity! Don't forget to join and contribute to discussions about self-driving vehicles and future mobility needs before the end of Sunday 12th March – the sooner the better, to give us time to ask any follow-up questions. And keep checking back for any follow-up questions from the [INSERT TEAM NAME] team! Please click the button below to join and take part in your discussions.

Discussion on ideas for self-driving vehicles

We now want you to exchange ideas for self-driving vehicles and mobility services. We are going to be posting some of your ideas that have already come up here, but please feel free to mention any new ideas that you can think of.

When sharing your ideas, please keep in mind the following questions:

- What would this / these vehicle (s) be? (i.e., shuttle, pod, traditional car/bus, etc.)
- What kind of mobility service (s) will it / they provide? (e.g., where is it going, how often does it go there and at what times, how many people use it, how people will pay for it, how frequently will people use it)
- What will these services allow you to do that you cannot do now? (for you personally, for people in your household, for the wider society)
- What kind of person (i.e., referring back to different types of people) might need or use this service?
- What are the potential challenges that it might face?
- How do you think your life / other people's lives will change / How will your city/village change/be affected? (thinking about positive / negative impacts, and for whom?)

Discussion about future mobility needs and self-driving vehicles

We now want you to exchange ideas for future self-driving vehicles and mobility services. We are going to be posting some of your ideas that have already come up here, but please feel free to mention any new ideas that you can think of.

When sharing your ideas, please keep in mind the following questions:

- In your opinion, which mobility services/ self-driving vehicle types will be used in the next 2-3 years? Why? And which need to happen more urgently? Why? For whom will these vehicles/services be more useful?
- Which are more likely to be used in 2030? Why?
- And which are more likely to be introduced in the longer-term by 2050? Why?

Appendix 6: Use case co-creation – slides presented to participants

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Appendix 7: Use case co-creation – informed consent form

Informed Consent Form

Dear participant,

You are taking part in a study organised by [local partner] in the framework of the MOVE2CCAM research project, which is funded by the European Union. Please read through this form and feel free to let us know if you need some clarifications through this contact (xxx).

Description of the study and data to be collected

The MOVE2CCAM project will quantify the impact of the deployment of self-driving vehicles through the development of a tool based on perceptions of citizens and organisations collected in collaborative activities.

For this purpose, you are invited to fill a questionnaire and participate in activities where we will ask you to provide your opinions on self-driving vehicles. All the opinions collected (from you and from the rest of participants) will be anonymized and then analysed as a whole to include these results in the tool of the project, in reports and scientific articles. The information will only be kept during the length of the project, until February 2025, and will be kept securely. This information will only be used by the project partners that will collect and analyse the data: [local partner], CARTIF, UCL, Britain Thinks and Moby. None of the information that you provide will be passed along to other third party or marketing organisations.

Rights as a data subject and exceptions to these rights

Participation in the study is voluntary. However, if you withdraw from the study, data collected prior to your withdrawal may still be used in the study. If unexpected or incidental findings are discovered during the development of the project or they belong to your private life, note that they will be treated appropriately according to the applicable personal data protection policy.

Please read the following statements:

- I have read the above project description and had opportunity to ask questions about the research and received satisfactory answers to any questions.
- I have had sufficient information to decide whether or not I wish to take part in the study.
- I understand that I am free to withdraw from the research at any time by informing the researcher of this decision.
- I understand that the information I give will be treated in the strictest confidence.
- I give permission to be (recorded, photographed) whilst participating and use these in social media and documents.
- I agree to take part in the project.

I confirm that data obtained can be used during the development of MOVE2CCAM project in order to achieve the mentioned objectives. I understand that the data will be used anonymously and aggregated. I understand that I will be informed, and asked again for consent, in the event of changes to the data processing policy.

Full Name _____

Date _____

If you have any questions, please contact [contact of local partner]

Appendix 8: Business model co-creation - activity guide

Section	Key discussion points and probes	Materials	Time (mins.)
Participants arriving	Participants will be asked to arrive 15 minutes in advance For in-person workshop: Sign people in and distribute name tags Get settled in the room Provide support to new organisations who have not completed the pre-workshop Qualtrics questionnaire online. Also, the Ethics & Data consent form must be signed and handed-in. Online workshop: While waiting for participants to join the Zoom call, remind them to fill the Qualtrics questionnaire and Ethics & Data consent form	• List of participants, including whether they have completed the questionnaire • Electronic/paper copies of Ethics & Data consent form and informed consent form (for anyone who didn't complete it) • Name tags	-
Welcome, introduction to Move2CCAM, co-creation activities and to the session	Lead facilitator to welcome all participants and introduce the research: Introduce organizer name and any other parties / people in the room attending Introduce the Move2CCAM project, brief overview of the outcomes of Activity 1, and the upcoming co-creation activities Ground rules for participating in the session (phones switched off / in silent mode, speaking one at a time etc.) Housekeeping and venue information (where toilet facilities are, exit, start and finishing times, recording taking place) Lead facilitator to introduce the session: Purpose of Activity 3 and expected outcomes Agenda for the day Distribution of the breakout rooms or tables From the final participant list, partners must define a distribution among the tables, keeping in mind the diversity of Satellites Lead facilitator to hand over to the table moderators for introductions.	Running slides	10
Introductions and warm up	Table moderator to introduce itself and go around the table asking participants to introduce themselves by saying: Name A short intro to their organisation, their role, and the role that CCAM solutions plays or has the potential to play for their areas where their organisations operate.		5
Introducing the activity	Lead facilitator will share the MURAL link containing the Service & Product Definition Canvas and	MURAL whiteboard	15

and the Use Case	Service/Product Example Card to participants in their Breakout room (if the workshop is in person the Canvas and Cards will be distributed in paper) and explain how to use MURAL. Once the usage of the platform has been understood, the facilitator will proceed to explain the activity. For in-person workshops, the Canvas and Cards will need to be printed out before the workshop. MURAL explanation (online workshop only): MURAL is an interactive digital whiteboard in which multiple collaborators can work simultaneously. By left clicking and holding, you can move across the Whiteboard. Scrolling up and down will allow you to zoom in and out, respectively. Double clicking on any part of the Whiteboard will create a Sticky Note that will allow you to write down your contributions. Finally, if you double click on any existing Sticky Note you are able to edit or add any content inside. Activity explanation: You will be able to see two things on your table/whiteboard, a Service & Product Definition Canvas and Service/Product Example Card. We will be working with this specific Service/Product and answering the questions inside canvas according to the Service/Product description. The canvas is divided into three sections, we will be working in one section before passing to the next. Participants will answer each of the questions after the moderator reads them out. First, participants will have 5 minutes to write down their answer individually on a Sticky Note. After the time is out, we will start the discussion part, which will take 15 minutes. Here, the moderator will ask for any volunteer to start sharing their initial answers. After this participant has finalized, the moderator will ask if someone has similar answers. If so, these will be grouped together. If there are different answers, we will ask for a volunteer to share theirs. It is important to ask here the reasoning behind their answers. Likewise, ask the rest of the participants if they have similar answers. Group them if possible. If we have opposing answers for a question, ask the participants to select the one. When answering, please write down one idea per Sticky Note. There is no limit of ideas to write, the more the merrier. Please write down the name of your	Paper Business Model Canvas Paper Example Cards	

	organisation at the end of your idea to be able to identify the owner of the idea. Now let's take a look at the Service/Product Example card. Read through the card and explain each section as shown in the Moderators briefing.		
Canvas work	Table moderator to start the timer with the corresponding duration time for the section If there are no further questions with the methodology, let's start with the first section "Value Proposition". 5 minutes for individual work. Time is over, pencils down. Does anyone want to share their answers to the group? If someone sees a similar answer place your Sticky Note on top [Name of participant]´s Sticky Note. After [Name of Participant] is done, ask for other participants answers (these should be different than the already given. Finally, the group should select the answer that has the most buy-in from all participants. Repeat the same approach for the following two sections. Keep in mind the difference in the duration of each of the sections.	• Canvas • Use Card • Sticky Notes • Pens	60
Table conclusion	Each table to give a short presentation of the final canvas for their Example card to the large group (2-3 mins each), with an opportunity for other tables to ask to questions / reflect on the ideas presented.	Completed Canvas	15
Thank and close	Lead facilitator to: • Thank participants for their time today • Flag next steps for this research programme (all details to be confirmed via email)		5

Appendix 9: Business model co-creation – slides presented to participants

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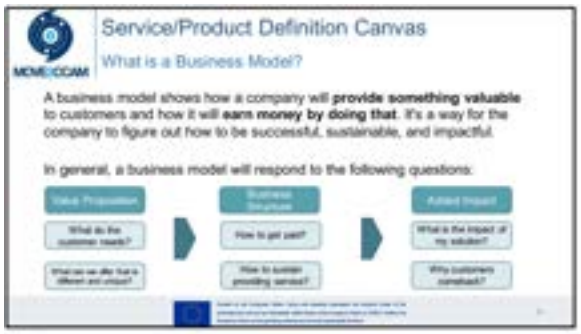

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Appendix 10: Business model co-creation – canvas questionnaire

Questions on Value Proposition

Q	Value Proposition	Answers	
A1	From the end-user described in the Use Case, what are the main transport challenges faced by this user/organisation? Please select the ones applicable and add missing ones:	Challenge 1	
		Challenge 2	
		Challenge 3	
		Challenge 4	
		Challenge 5	
		Challenge 6	
		Challenge 7	
A2	How addressable are these challenges by the Service once fully deployed? Rank them in the following chart:		Ranking
		Challenge 1	0
		Challenge 2	0
		Challenge 3	0
		Challenge 4	0
		Challenge 5	0
		Challenge 6	0
		Challenge 7	0
A3	Could you list other transport modes that currently offer the same transport service in your country?	Transport Mode 1	
		Transport Mode 2	
		Transport Mode 3	
		Transport Mode 4	
		Transport Mode 5	

			Transport Mode 1	Transport Mode 2	Transport Mode 3	Transport Mode 4	Transport Mode 5
A4	How does this service differentiate to the above-mentioned transport modes? Rank each mode of transport mentioned above on the scale.	Cost of Usage					
		Service Time Duration					
		Service Coverage (how available it is)					
		Vehicle Safety (while onboard)					
		Environmental Impact					
		Additional differential factor					

Questions on Use Cases potential business structures

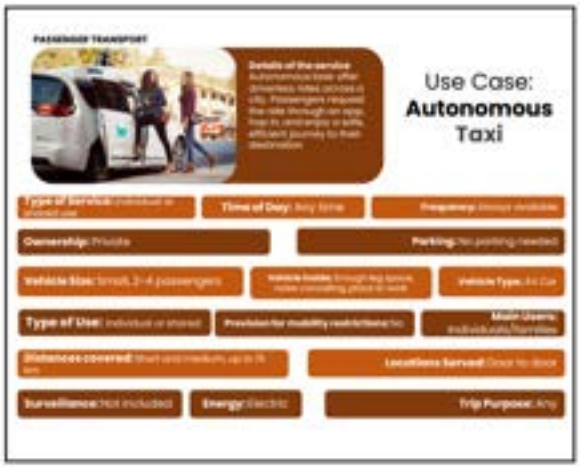
	Business Structure	Answers
B1	What is the cost of a one-way journey ticket in either the bus or metro in your city?	
B2	Considering the distance mentioned in the Use Case, how much do you think a citizen will be willing to spend in a one-way trip with this service? Select one.	Equal to a Public Transport Ticket
B3	If the ownership is marked as private in the Use Case, would the end-user want to own the vehicle? If so, do you think they would be interested to rent and/or purchase it?	
B4	If ownership is not applicable, then which payment type do you think will suit this service? Select them.	Subscriptions
B5	Where would the potential buyer or fnal user inform themselves about the existence of this vehicle/service? Think about the type of user described in the Example card	
B6	Which threats could jeopadize the operation of the automated transport service? Which measures could be taken to mitigate these risks?	

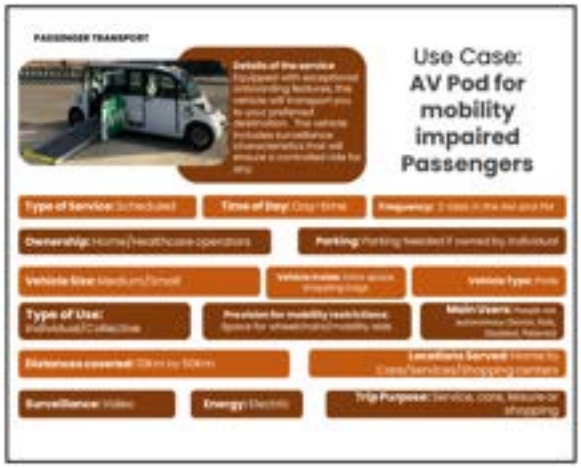
		Ranking
B7	According to you, which other organisations would support the operation of this service/vehicle? Order them in following scale to define the degree of support	
	Local Authorities	1
	Mobility Service Operators	2,5
	Vehicle Providers	3
	Communication Provider	2
	Logistic Companies	4
	Marketing Partners	5,5
	Research Institute	3,5
	Technology Provider	4,5

Questions on Business Model Impact

	Business Model Impact	Answers	
C1	Which features of the vehicle could improve the user experience? Think of features in *functionality, performance, comfort, safety, or convenience.*		
C2	What things would discourage users/owners to stop using this vehicle or avoid it at all? If possible provide examples.		
C3	Consider residents. How will they want this vehicle to operate in their neighbourhoods? Define characteristics on the following areas:	Noise	
		Visual Impact	
		Navigation on street, sidewalk or air	
		Preferred operation schedule	
C4	Rate the following steps in the service to defne the intensity of support or assistance needed by users.		**Ranking** *(not at all / high intensity)*
		Purchase of Service	3
		Locating the vehicle	1
		Onboarding	5
		Vehicle journey	2
		Arrival to destination	4

Appendix 11: Business model co-creation – scenario cards



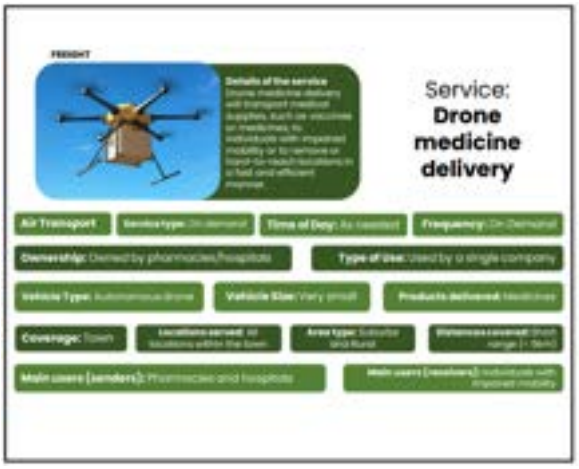


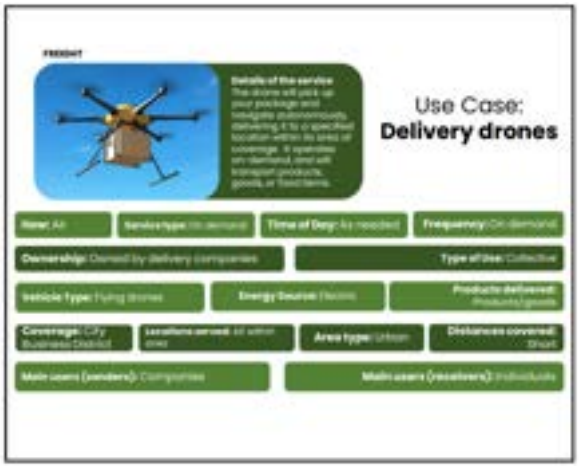

PASSENGER TRANSPORT
Use Case:
Mixed Bus Passengers – Freights


PASSENGER TRANSPORT
Use Case:
AV Private Car


FREIGHT
Use Case:
Delivery bot


FREIGHT
Use Case:
Long distances freight trucks


FREIGHT
Service:
Drone medicine delivery


FREIGHT
Use Case:
Delivery drones


FREIGHT
Use Case:
Medicine
Delivery bot


FREIGHT
Service:
Consolidated
Delivery
Service

Appendix 12: Qualitative assessment - activity guide

Materials used both in workshops with citizens and organisations, both physical and online

Task name and aim	Script	Materials	Time (min.)
Welcome and introduction. Participants understand aim of session and research consent	*Thank you very much for joining us this evening. The aim of today's session is to build on ideas and thoughts from previous sessions, as well as what you have told us last week during the online community, to consider the potential impacts of different scenarios for self-driving vehicles for you and your local area. My name is xx, I'm also joined by my colleagues xx* Lead moderator to briefly outline T&Cs of the research: *As a research organisation, we abide by the Market Research Society Code of Conduct and (it goes without saying) GDPR legislation. We will never include your name within our research reports.* *Nothing you say here today will be directly attributed to you. The only exception to this is if you tell me something that gives me reason to think that you or someone else is at risk of harm. In the unlikely event that this happens, we do have a duty to report this to the relevant authorities.* Lead moderator to present running slides including information on session's purpose, (including what we are trying to find out and why) and go through agenda for the day. *In order for cities and regions to introduce self driving vehicles in ways that benefit citizens, they need to understand the potential impacts. As you know the Move2CCAM project aims to develop a computer model that will help cities and regions test the impacts of self driving vehicles. One important element of the model is predicting the impacts of different types of vehicles or transport service. That's what we're going to look at today. At the end of the session, we will have worked together to draw a map of the impacts that you think four different vehicles/services could have in your city/region. It will look something like this* Lead moderator to show simplified causal feedback diagram *This might seem complex, but we will build it up from simple questions and discussion. There are no right or wrong answers, we just want to hear your opinions.*	Introduction slides	10

Introducing the first use case. Participants are familiar with the use case and warm up to participating	Participants join a breakout group (max 5 people in online workshop, or 8 in physical workshop). See table for allocation of use cases. Moderator to introduce themselves and go around the table asking participants to share their name and something that stood out to them taking part in previous activities of the project Moderator to refresh participants on the baseline conditions then introduce the first use case.	• Baseline conditions and use case slides • [Physical workshop]: post-it notes and pens	5
Exploring impacts in each domain Participants share their views on the impacts specific to each use case/ domain, online community data is validated by wider group	Moderator to screen share draft impact diagram, printed [in physical workshop] or on Miro [in online workshop]. *Now, imagine that we are 12 years in the future and this service has been operating in your area for a while now. This diagram shows the main impacts you told us you would expect. Let's review them together.* Moderator to spend around 15 minutes reviewing central part of diagram and discussing. Each moderator to start with a different domain and work clockwise around the diagram to ensure all domains are covered. *Which impacts are most important to you?* NB: this will help moderators to focus on the areas about which they are most concerned, given that it is not possible to discuss all possible impacts. *Are there any which you disagree with? Or are uncertain about? What's missing from this diagram so far?* Moderator to prompt participants to think about each domain. For each impact moderator to prompt on whether it would be positive or negative, and why and record.	• [Physical]: printed or hand-drawn impact diagram (use case specific), post-it notes, pens • [Online] Impact diagram on Miro board (use case specific)	15
Exploring causal loops Participants contribute their views on the causal feedback loops of impacts	*Now let's take a step back. Let's look in more detail at each domain. Starting with the impacts you think are most important, I want you to think about what the consequences of these impacts are (for example, if there is less air pollution, does this lead to better health outcomes for local people, does it make the city a more appealing place to live and therefore increase house prices).* • *What are the additional impacts in each domain?* • *Are they positive or negative?* • *Do you think any of these impacts will then affect the number of self driving vehicles in use? (for example, if people see that air quality is improved by using self driving vehicles are they more likely to use them?)* Moderator to capture these feedback loops in the diagram.	As above	20

Timeline and penetration analysis	*Now we'd like to get your views on a different question. When do you think this use case will be deployed in your city/region?* [Physical workshop]: Show questions on screen/read out, and have printed slips on tables for ease, table moderators to distribute and collect. [Online workshop]: Moderator to invite participants into the Miro board to individually complete the timeline chart (moderator will share Miro board link in the zoom chat where they can each place-coloured dots where appropriate on the timeline. OR moderators can do this for them if they/participants prefer. *Thinking about this use case, what proportion of the population in your city/region will choose this service instead of a human-driven service in the following years? 2026, 2035, 2050* Moderators can move on to next use case before the allotted time if everything has been covered.	[Physical]: Timeline worksheet (printed). Enough for 3 for each participant. [Online]: Timeline chart on Miro board	10
[Physical workshop only] Repeat exploring impacts. Causal loops and timeline for second use case	See table for allocation of use cases	Impact diagram (use case specific)	30
Identify differences in impacts and causal loops for third use case (Verifying data by sharing between groups)	Moderator to explain that they will now be leaving to go to another group to show them their ideas. They will have a new moderator that will present other groups ideas for the group to review. New moderator to briefly introduce themselves and then spend a few minutes introducing the third use case. *Now we're going to look at a different passenger/freight use case. What do you think would be different in this use case?* Moderator to encourage participants to identify differences based on the application, vehicle type, journey type, operating model etc. *Let's go back to the impact diagram, are there new impacts that you think are important in this use case? Or impacts that wouldn't happen?*	Impact diagram and timeline completed for earlier use case	25

	Moderator to share copy of impact diagram and adapt in response to participant discussion. *Let's have a look at the timeline for this use case. Would it differ from the others?* Moderator to share copy of timeline for participants to complete. If there is time left moderator to repeat for the fourth use case.		
Close	Moderator to thank participants and remind about next steps.		5

Appendix 13: Qualitative assessment – informed consent form

MOVE2CCAM

Consent form | research on behalf of Thinks Insight and Strategy /Horizon Europe

Organisations | MOVE2CCAM | 11191807 | SCORO NUMBER | March 2023

* Required

We are Thinks Insight and Strategy (CM Monitor BritainThinks Ltd), a research agency registered in the UK (07291125). For the purposes of research Thinks Insight and Strategy and Horizon Europe Research and Innovations Programme will be processing your personal data.

The main objective of the MOVE2CCAM project is to quantify the impact of the development of self-driving vehicles through the development of a tool based on perceptions of citizens and organisations, collected via collaborative activities.

You will be invited to complete one online questionnaire and participate in activities with other organisations. During these activities you will be encouraged to share your opinions on transport needs and self-driving vehicles.

Opting Out

You can opt out of this research at any time by contacting a member of the Thinks Insight and Strategy team

Your privacy is protected by law, and by our own privacy policies. Our Privacy Notice (www.thinksinsight.com/privacy/) outlines your rights and how we process your data in more detail.

Your personal data will be processed in accordance with the Market Research Society Code of Conduct, meaning that personal data you provide will not be passed on to any third party without your consent and it will not be possible to identify you from the research findings without your consent unless we have a legal obligation to.

By writing your FULL NAME below, you acknowledge that you have read, understood, and agree to the following statements:

- I understand that I am not required or obliged to take part in this research.
- I understand that this research is being [AUDIO RECORDED and FILMED] and this information will be used by Thinks Insight and Strategy only research purposes only.
- I agree to having my name and information held by Thinks Insight and Strategy for a period of UP TO 12 MONTHS for their internal quality monitoring purposes only.
- I agree to having my name and email address shared with the incentive payment platform Ayda so they can contact me to process any incentive being offered. Note: The Privacy notice can be found here www.helloayda.com/privacy-policy
- I understand that I must collect my incentive payment within 6 months of it being released to me.
- I understand this is confidential research and I will not share or distribute information or content from this research outside of the Thinks Insight and Strategy research team.

Should you disagree with any of the above statements please do not complete this form as you will be unable to participate in this project. Please contact Thinks Insight and Strategy to opt out of the research, details below.

(info@thinksinsight.com / 0207 845 5880), though you may forfeit your right to any incentive or benefit being offered. *

PERMISSION TO RECONTACT Please enter your FULL NAME below.

I understand that that Thinks Insight and Strategy might be interested in contacting me again to hear my thoughts and to ask me to take part in further research on this topic. I consent to being re-contacted by Thinks Insight and Strategy within the next 12 months for research related to this project.

FILM / MEDIA

I give my permission to be filmed / photographed whilst participating, and for my image and any interviews or contributions I make to be used in media formats including, but not limited to social media/the internet and internal Horizon Europe use.

I am aware that these recordings may be publicly broadcast.

IF PARTICIPANT WILL BE IDENTIFIABLE BY THE REPORT/FINDINGS
I agree to have this record of my consent be kept on file by Thinks Insight and Strategy indefinitely. Due to the nature of this media, I will be unable to withdraw my consent for the publication of this data once it has been published. *

Please enter your FULL NAME below.

Appendix 14: Organisation case studies - interview topic guide

CASE STUDIES WITH ORGANISATIONS

60-90 minutes semi-structured interview

Organisation Move2CCAM ID number	
Organisation name	

TOPIC GUIDE

For each organisation, select from this list only the questions relevant to the organisation's sector

1. Organization characteristics	
Let's start with a few questions about your organisation	
General characteristics	• What is your role in the organisation? • Which sector does the organisation operate on? • How old is the organisation? • How would you define your organisation's size: small, medium, or large? • What products or services does the organisation offer? • What is the business model? • Where is the organisation located? Is there more than one site? • What are the strengths and weaknesses of your organisation, compared with your competitors?
Workforce	• How many employees the organisation has? • What types of jobs they perform? • What are their skills and qualifications? • Are there employees whose many role in the organisation is driving? How many?
Transport of goods	• Does the organisation transport goods? If yes: • Are they delivered to companies or to final customers? • How often are these deliveries made? • Which type of vehicles do you use for this transport? • Do they belong to the organisation? • How many vehicles does the organisation owns for the transport of goods? • Tell me about a typical trip using these vehicles. How far is the trip? How frequently is it made? • What are the main challenges you face in the transport of goods?
Transport of passengers	• Does your organisation transport paying passengers (as a commercial activity)? If yes: • How many and which type of vehicles does the organisation own to transport passengers? • Tell me about a typical trip using these vehicles. How far is the trip? How frequently is it made? • What are the main challenges you face in the transport of passengers?
Transport of workforce	• Does your organisation own vehicles for the transport of employees (from/to the workplace, for business trips, or to travel between different sites)? If yes: • How many and which type of vehicles? • How often are they used? • Tell me about a typical trip using these vehicles. How many occupants? Who is driving? How far is the trip and how frequently is it made?
Travel priorities	• What is more important for your organisation: reducing travel time or travel costs (including driver costs)? Why?

2. Perceptions and intentions	
Let's imagine that self-driving vehicles become widely available, both for passenger and freight transport	
Perceptions	• Which aspects of self-driving vehicles are attractive to your organisation? • Which aspects are not attractive?
Intentions	• Would you consider replacing some of your vehicle fleet with self-driving vehicles? • If no: Why? Which incentives would the organisation need before replacing the vehicle fleet with self-driving vehicles? • If yes: Why? What would you use the vehicles for? • If yes: Would you consider sharing the ownership of the vehicles with other organisations? Why?/Why not?

3. Impact of self-driving vehicles	
Keep imagining that self-driving vehicles are widely available, both for passenger and freight transport	
Impact – open questions	• Which aspects of the organisation's operations would be affected? • What new opportunities will there be for your organisation? • What difficulties do you foresee? Could self-driving vehicles threaten your organisation?
Business model	• Would your business model change? How? • Would you consider offering new products or services? • Would you consider stopping offering some products or services you offer now? • Would you consider expanding the area you operate in (e.g., selling to customers in other regions?). Or would you consider narrowing it? • Would you be in a better position, comparing with your competitors, if you could use self-driving vehicles?
Operational aspects	• If you transport goods: would you increase or decrease the number of trips to deliver goods? • If you transport goods: would you use larger or smaller vehicles, compared with the ones you use now? • If you transport paying passengers: would you consider changing the days or times you transport passengers? • Would it solve any problems you may face now regarding parking vehicles, picking up/dropping off passengers, or loading/unloading goods? • What other operational activities could you do that you cannot do or find it difficult to do now?
Mobility	• Would it be easier or more difficult for the organisation to transport goods, passengers, and employees? Why? • Would transport be faster or slower? • Would it be more or less reliable?
Safety	• Would transport be safer or more dangerous, when it comes to accidents? • If you transport goods: would self-driving vehicles be more or less secure, when it comes to stolen goods, cyber attacks, or other aspects? • Are there any security aspects you think might change? For example, product damage during travelling?
Public Health	• Would self-driving vehicles affect the wellbeing of some of your employees? Who? Why? Would that impact be positive or negative?
Economy (employment impacts)	• If your workforce currently includes drivers: could they still be employed by the organisation? • If yes: what would be their new role? • Would self-driving vehicles threaten the job or change the role of other employees in the organisation (apart from drivers)? • What training or reskilling would it be needed? • What new jobs could be offered by the organisation?

Economy (other impacts)	• Could the organisation grow, in terms of sales, as a result of using self-driving vehicles? Why? • Would transport cost more or less, as a proportion of the organisation's total costs? • Would some of the non-transport costs change? Which ones? • Overall, would costs be higher or lower than now, as a proportion of your revenue?
Land use	• Would you consider changing the location of some of the organisation sites (offices, warehouses)? To where? Why?
Network efficiency	• Do you think roads in your region would be more or less congested than now?
Environment	• Will there be more or less pollution in your region?
Equity	• Would it be easier or more difficult to have a gender-balanced workforce in your organisation? • Could you offer more entry-level job positions? Which ones? • Would it be easier or more difficult for your younger employees to be productive and to remain motivated? • How about your older employees?
Societal impact	• From a society's point of view, do you think self-driving vehicles would have a positive or negative impact in your region? • Also from a society's point of view, what are your main concerns about self-driving vehicles?

4. Further comments	
Open question	• Is there anything about self-driving vehicles that we have not talked yet and you would like to talk?

Appendix 15: Organisation case studies – informed consent form

Participant Information Sheet

We invite you to participate in an interview about self-driving vehicles, as a part of the MOVE2CCAM project. This project is assessing the impact of the development of self-driving vehicles. Before you decide to take part, please take your time to read this sheet.

1. Why have I been chosen?

You have been chosen because you work for an organisation based in Europe and have participated in previous activities of this project.

2. Do I have to take part?

Participation in this study is voluntary. You may discontinue your participation at any time. Any data that you have provided up to that point will be deleted unless you agree otherwise.

3. What will happen if I take part?

You will be interviewed for around 45-60 minutes. We will ask you questions about your views about self-driving vehicles.

4. Will I be recorded?

We will record your answers on audio. The recording will only be used to help us organising the information you provide. The information you provide is anonymous. You will not be able to be identified in any ensuing reports or publications using that information. Recordings will be destroyed after the project ends in February 2025.

5. What are the benefits of taking part?

You will be able to express your views about a new technology (self-driving vehicles) that can improve people's lives in the future. The resulting data can help governments and businesses to implement measures that enable a smooth introduction of these vehicles.

6. What if something goes wrong?

In case you have any complaints, for instance, in case you have concerns about your data, you can contact our Principal Researcher through: m.chaniotakis@ucl.ac.uk. If you feel that your complaint has not been handled to your satisfaction, you can contact the Chair of the University College London Research Ethics Committee through ethics@ucl.ac.uk.

7. Will my taking part in this project be kept confidential?

All the information that we collect about you will be kept strictly confidential. You will not be able to be identified in any ensuing reports or publications. Please note that assurances on confidentiality will be strictly adhered to unless evidence of wrongdoing or potential harm is uncovered. In such cases we may be obliged to contact relevant statutory bodies/agencies.

8. What will happen to the results of the research project?

The results of the study will be used in reports and academic publications.

9. Who is organising and funding the research?

This research is organised by University College London and [local partner] and is funded by the European Commission

Consent form

Please complete the form below after you have read the Information Sheet

I understand that by ticking/initialling each box below I am consenting to participate in this research. I understand that by not giving consent for any one element that I may be deemed ineligible for the study

		Tick Box
1	I have read and understood the Information Sheet for the above study. I have had an opportunity to consider the information and what will be expected of me. Therefore, I would like to take part in the research	
2	I understand that I will be able to withdraw my data up to 30 April 2023.	
3	I consent to the processing of my data and that this will be used for the purposes explained to me. I understand that such information will be handled in accordance with all applicable data protection legislation.	
4	I understand that all information will remain confidential and that all efforts will be made to ensure I cannot be identified	
5	I understand that my information may be subject to review by responsible individuals from UCL for monitoring and audit purposes.	
6	I understand that my participation is voluntary and that I am free to withdraw at any time. I also understand that if I decide to withdraw, any data I have provided up to that point will be deleted unless I agree otherwise.	
7	I understand the benefits of participating	
8	I understand that the data will not be made available to any commercial organisations and is solely the responsibility of the researchers undertaking this study.	
9	I understand that the information I have submitted will be published as part of a report and/or academic journal	
10	I am aware of who I should contact if I wish to lodge a complaint.	

_____ _____ _____

Name of participant Date Signature

Appendix 16: Self-driving vehicle demonstration – post-activity questionnaire

Thank you for participating in the self-driving vehicle demonstration!

Now we will ask you some questions about your experience

Please fill your ID number below. This is a number from 1 to 100 given to you by the event organisers

SECTION 1: Previous experience

Q1. Had you had any experience involving real self-driving vehicles <u>before today</u>?

<u>Click all that apply</u>

Yes, I used a self-driving bus			
Yes, I used a self-driving mini-bus or mini-shuttle			
Yes, I used a self-driving car			
Yes, I used another type of self-vehicle		Which one?	
Yes, I saw a self-driving distribution vehicle			
No, I had never had any of these experiences before today			

SECTION 2: Bus

Today you've experienced using two self-driving vehicles (a bus and a mini-shuttle) and you observed a self-driving distribution vehicle. Think about the bus first

[photo]

Q2. How did you feel while you were riding on the self-driving? Circle all that apply

Sad	Scared	Happy
Alert	Active	Irritated
Confident	Worried	In control
Motivated	Safe	Bored
Content	Annoyed	Pleased
Melancholic	Amused	Surprised

Q3. What did you like about the experience?

Q4. And what did you dislike?

Q5. How safe did you feel during these parts of the trip?

	Very unsafe	Unsafe	Not safe nor unsafe	Safe	Very safe
Boarding					
Bus starting					
Bus moving forward					
Bus turning					
Pedestrian crossing in front of the bus					
Bus stopping					
Getting off the bus					

Q6. Based on your experience riding in the self-driving bus, think about how self-driving buses will compare with buses with a human driver. Which trips you think will be…

	Human driven bus	Self-driving bus	Both will be similar	I don't know
More interesting				
Faster				
Cheaper				
More stressful				
More comfortable				
More dangerous (in terms of accidents)				
More insecure (in terms of crime				

Q7. If self-driving buses become widely available in your area, would you use one?

Yes	
Maybe	
No	

Q8. Which would be your three main concerns about using a self-driving bus?

Answer the next two questions if you have already tried the virtual reality experiment today. If you have not tried it yet, go to Q11

Q9. Was there anything you liked in the real bus that you had previously disliked in the virtual bus?

Q10. Was there anything you disliked in the real bus that you had previously liked in the virtual bus?

SECTION 3: Mini shuttle

Now think about the mini shuttle

[photo]

Q11. How did you feel while you were riding on the mini shuttle? Circle all that apply

Sad	Scared	Happy
Alert	Active	Irritated
Confident	Worried	In control
Motivated	Safe	Bored
Content	Annoyed	Pleased
Melancholic	Amused	Surprised

Q12. What did you like about the experience?

Q13. And what did you dislike?

Q14. How safe did you feel during these parts of the trip?

	Very unsafe	Unsafe	Not safe nor unsafe	Safe	Very safe
Boarding					
Shuttle starting					
Shuttle moving forward					
Shuttle turning					
Shuttle stopping					
Getting off the shuttle					

Q15. Based on your experience riding in the self-driving mini shuttle, think about how self-driving shuttles will compare with human-driven shuttles. Which trips you think will be…

	Human driven shuttle	Self-driving shuttle	Both will be similar	I don't know
More interesting				
Faster				
Cheaper				
More stressful				
More comfortable				
More dangerous (in terms of accidents)				
More insecure (in terms of crime				

Q16. If self-driving mini shuttles become widely available in your area, would you use one?

Yes	
Maybe	
No	

Q17. Which would be your three main concerns about using a self-driving mini shuttle?

SECTION 4: Delivery vehicle

Now think about the delivery vehicle

[photo]

Q18. What did you like about these vehicles?

Q19. And what did you dislike?

Q20. Based on your experience observing this vehicle, think about how deliveries made by this type of vehicles will compare with deliveries made by vehicles driven by humans (e.g., vans). Which trips you think will be…

	Human driven vehicles	Self-driving vehicles	Both will be similar	I don't know
Faster				
Cheaper				
More dangerous (in terms of accidents)				
More insecure (in terms of stolen deliveries)				

Q21. If self-driving delivery vehicles become widely available in your area, would you order deliveries using one?

Yes	
Maybe	
No	

Q22. Which would be your three main concerns about ordering goods delivered by these vehicles?

Appendix 17: Virtual reality experiment – post-activity questionnaire

Thank you for participating the virtual reality experiment!

Now we will ask you some questions about your experience

Please fill your ID number below. This is a number from 1 to 100 given to you by the event organisers

SECTION 1: Your choices

Q1. When the experiment started, which vehicle did you choose?

Car	
Bus	

Q2. Why did you choose that vehicle?

Q3. Did you switch to the other vehicle during the trip (from car to bus or from bus to car)?

Yes		Go to Q4
No		Go to end of this page

Q4: Why did you switch to the other vehicle?

Q5: Did you regret switching to the other vehicle?

Yes		Go to Q6
No		Go to end of this page

Q6: Why do you regret switching to the other vehicle?

If you switch modes during the trip, fill all sections (2, 3, 4)

If you tried only the bus, without switching to car, fill sections 2 and 4 only

If you tried only the car, without switching to bus, fill sections 3 and 4 only

SECTION 2: Bus

Answer only if you travelled in the virtual bus (in the beginning or after switching from car). If you did not travel in the bus at all, go to Section 3

Q7. How did you feel during the virtual bus trip? Circle all that apply

Sad	Scared	Happy
Alert	Active	Irritated
Confident	Worried	In control
Motivated	Safe	Bored
Content	Annoyed	Pleased
Melancholic	Amused	Surprised

Q8. What are the three things you remember the most from the bus trip?

Q9. Which changes have you noticed in the things you saw during the bus trip? Choose all that apply.

Type of buildings outside			
Time of day			
Speed of the bus			
Speed of cars in the other lanes			
Number of other passengers in the bus			
Behaviour of other passengers			
Presence or absence of a human assistant			
Other		What?	
I did not notice any change			

Q10. Overall, how realistic was the bus scenario?

Very realistic	
Realistic	
Neither realistic nor unrealistic	
Unrealistic	
Very unrealistic	
I don't know	

Q11: What was not realistic in the scenario?

Q12. Based on what you experienced in virtual reality, think about how trips on self-driving buses will compare with trips on buses with a human driver. Which trips you think will be…

	Human driven bus	Self-driving bus	Both will be similar	I don't know
More interesting				
Faster				
Cheaper				

More stressful				
More comfortable				
More dangerous (in terms of accidents)				
More insecure (in terms of crime				

Q13. Answer this question only if you have already tried the real self-driving bus today Was there anything you liked in the virtual bus that you had previously disliked in the real bus?

Q14. Answer this question only if you have already tried the real self-driving bus today Was there anything you disliked in the virtual bus that you had previously liked in the real bus?

SECTION 3: Car

Answer only if you travelled in the virtual car (in the beginning or after switching from bus). If you did not travel in the car at all, go to Section 4

Q15. How did you feel during the virtual bus trip? <u>Circle all that apply</u>

Sad	Scared	Happy
Alert	Active	Irritated
Confident	Worried	In control
Motivated	Safe	Bored
Content	Annoyed	Pleased
Melancholic	Amused	Surprised

Q16. What are the three things you remember the most from the car trip?

Q17. Which changes have you noticed in the things you saw during the car trip? <u>Choose all that apply.</u>

Type of buildings outside			
Time of day			
Speed of the car			
Speed of buses in the other lanes			
Other		What?	
I did not notice any change			

Q18. Overall, how realistic was the car scenario?

Very realistic	
Realistic	
Neither realistic nor unrealistic	
Unrealistic	
Very unrealistic	
I don't know	

Q19: What was not realistic in the scenario?

Q20. Based on what you experienced in virtual reality, think about how trips on self-driving cars will compare with trips on cars with a human driver. Which trips do you think will be…

	Human driven car	Self-driving car	Both will be similar	I don't know
More interesting				
Faster				
Cheaper				
More stressful				
More comfortable				
More dangerous (in terms of accidents)				
More insecure (in terms of crime				

SECTION 4: Your future travel

Q21. If self-driving buses become widely available in your area, would you use one?

Yes	
Maybe	
No	

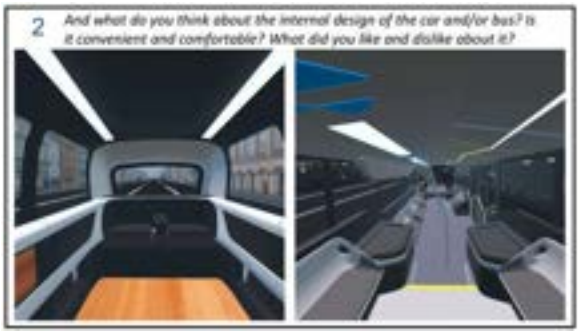
Q22. If self-driving cars become widely available in your area, would you use one?

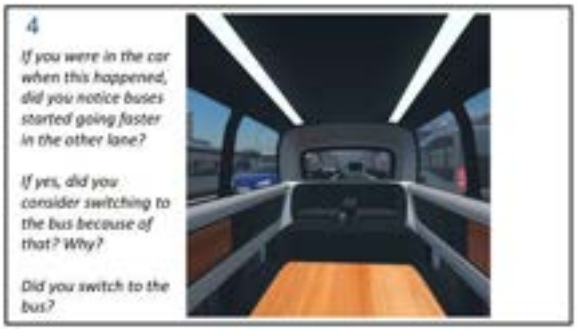
Yes	
Maybe	
No	

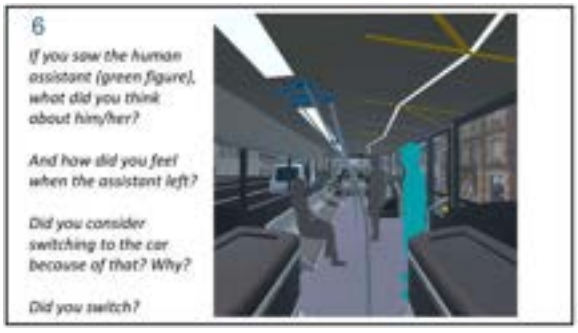
Q23. How do you think your travel would change if you could use self-driving vehicles?

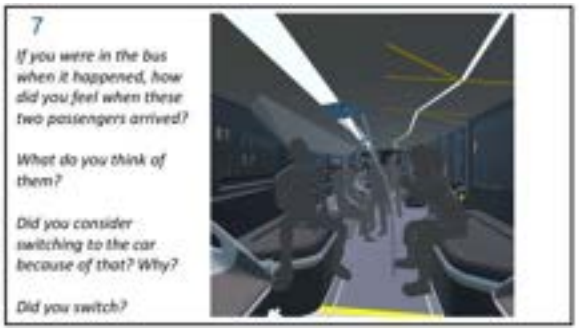
I would do something productive while travelling, which I cannot do now	
I would do something enjoyable or relaxing while travelling, which I cannot do now	
I would worry less about parking	
I would travel by car more often	
I would travel by bus more often	
Regardless of vehicle, I would make more trips than I do now	

Appendix 18: Virtual reality experiment – post-activity review – slides shown to participants









8

If you were in the bus when it happened, how did you feel when all passengers left?

Is there anything else you would like to share with us about the virtual reality experiment?

Appendix 19: Virtual reality and vehicle demonstration – information sheet and consent form

Participant Information Sheet

We invite you to participate in a study about self-driving vehicles (vehicles that do not need a driver). Before you decide to take part, it is important for you to understand why the research is being done and what participation involves. Please take your time to read the following information. Please ask us if there is anything unclear or if you would like to have more information.

1. What is the projects' purpose?

You will experience, in virtual reality, a short ride in a self-driving car and/or bus. During the game we would like to assess how you feel, through a method called 'Electroencephalography' (EEG). This records electrical activity in the brain. The virtual reality headset will also record which parts of the virtual reality you look at. We will use the EEG data of all participants in the experiment to understand how people feel about various aspects of travelling in a self-driving car or bus.

2. Why have I been chosen?

You have been chosen because you are a resident in the GZM Region and you either participated in previous activities of this project or you are within the age range of residents that we would like to hear the opinion from (all people aged 18 or more).

3. Do I have to take part?

Participation in this study is voluntary. You may discontinue your participation at any time without giving any reason. You can simply approach a member of our team. Any data that you have provided up to that point will be deleted unless you agree otherwise.

4. What will happen if I take part?

Your participation will last 1 hour. You will wear a virtual reality headset (https://www.meta.com/gb/quest/quest-pro). This is a device used by many people to play games. You will also wear EEG earbuds, similar to clip-on earphones to listening to music (https://www.emotiv.com/mn8-eeg-headset-with-contour-app). This is a device also used by many people, for example to monitor their concentration. You will be wearing these two devices for around 5-6 minutes. Both will be disinfected before you use them.

Virtual reality headset

EEG earbuds

You will see virtual scenarios in the headset and will be asked to choose between using a car and a bus (see figure below). Then you will see scenarios of a trip on the car or bus.

The EEG earbuds will record electrical activity in your brain. A member of our team will help you wearing the two devices, ensuring that the headset fits you comfortably. There will be other 3 participants in the room doing the same experiment. At the end of the experiment, we will ask you to fill a short questionnaire about your opinion of the game. We will also ask you to view, together with the other 3 participants, a few images of the scenes you saw in the virtual reality game, and we will ask you your opinion about those scenes.

Example of the virtual reality scenario

5. Will I be recorded and how will the recorded media be used?

We will record photos and video footage of some parts of the experiments. This footage will only be used for illustration, as a part of activities to communicate the results of our research, for example in our website, social media, or presentations in conferences or other events. No other use will be made of the footage without your written permission, and no one outside the project team will be allowed access to the original recordings.

6. What are the possible benefits of taking part?

You will have the opportunity to participate in a virtual reality experiment, which is an experience that many people consider interesting and fun. You will also be able to express your views about a new technology (self-driving vehicles) that can improve people's lives in the future. The resulting data will be used to research how people respond to self-driving vehicles. This will help governments to implement measures that enable a smooth introduction of these vehicles in the best way possible. It will also help businesses to better design these vehicles.

7. What are the possible disadvantages and risks of taking part?

Whilst the virtual reality headset and the EEG earbuds are comfortable to wear, radio emissions from the EEG earbud could interfere with appliances and medical equipment. There is also a slight chance that using virtual reality headset causes motion sickness, headache, skin irritation, or other discomforts. In this case, it is advised to discontinue wearing the headset. Just contact a member of our team and we will help you removing the headset. It is also possible that you will have faint red marks on the forehead after using the headset. These marks will disappear after a few minutes.

We do not advise you to take part in the experiment if you have one of these conditions: epilepsy, serious heart conditions, severe visual impairments, psychiatric disorders, post-traumatic stress disorder, or implanted medical devices (cardiac pacemakers, hearing aids, defibrillators).

We also do not advise you to take part in the experiments if you experienced any of these symptoms on the day before or the day of the experiment: eye infections (e.g., conjunctivitis), skin or scalp infections, or severe headaches.

8. What if something goes wrong?

Please let us know immediately if wearing the virtual reality headsets or the EEG earbuds is uncomfortable for you, and we will disconnect them for you. In case you have any complaints, for instance, in case you have concerns about how you are treated by our team, you can contact our Principal Researcher through: m.chaniotakis@ucl.ac.uk. If you feel that your complaint has not been handled to your satisfaction, or in case of a serious adverse effect, you can contact the Chair of the UCL Research Ethics Committee through ethics@ucl.ac.uk.

9. Will my taking part in this project be kept confidential?

All the information that we collect about you will be kept strictly confidential. It will not be possible for anyone to identify you in any reports or publications using this information. Please note that assurances on confidentiality will be strictly adhered to unless evidence of wrongdoing or potential harm is uncovered. In such cases, we may be obliged to contact relevant statutory bodies/agencies.

11. What will happen to the results of the research project?

The results of the study will be used in reports and academic publications.

12. Who is organising and funding the research?

This research is organised by University College London and [local partner], and is funded by the European Commission, as a part of the Move2CCAM project (https://move2ccam.eu)

13. Contact for further information

Manos Chaniotakis: m.chaniotakis@ucl.ac.uk, Paulo Anciaes: p.anciaes@ucl.ac.uk, [local partner].

Consent form

Please complete the form below after you have read the Information Sheet

I confirm that I understand that by ticking/initialling each box below I am consenting to participate in this research. I understand that by not giving consent for any one element that I may be deemed ineligible for the study

		Tick Box
1	I confirm that I have read and understood the Information Sheet for the above study. I have had an opportunity to consider the information and what will be expected of me. I have also had the opportunity to ask questions which have been answered to my satisfaction. Therefore, I would like to take part in the research	
2	I understand that I will be able to withdraw my data up to 31 December 2023.	
3	I consent to the processing of my data and that this will be used for the purposes explained to me. I understand that such information will be handled in accordance with all applicable data protection legislation.	
4	I understand that all information will remain confidential and that all efforts will be made to ensure I cannot be identified	
5	I understand that my information may be subject to review by responsible individuals from University College London for monitoring and auditing.	
6	I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. I also understand that if I decide to withdraw, any data I have provided up to that point will be deleted unless I agree otherwise.	
7	I understand the possible disadvantages of participating and the support that will be available to me during my participation	
8	I understand the benefits of participating	
9	I understand that the data will not be made available to any commercial organisations and is solely the responsibility of the researchers undertaking this study.	
10	I understand that the information I have submitted will be published as part of a report and/or academic journal.	

11	I consent to my participation being captured as photos or videos and understand that these photos and videos will be used to communicate the results of the research, in the project website, social media, or events.	
12	I am aware of who I should contact if I wish to lodge a complaint.	

_____ _____ _____

Name of participant Date Signature

Appendix 20: Pan-European survey – questionnaire

* : Non-mandatory questions

Section 1: Participant characteristics

Now we will ask you some questions about yourself. Please remember that your answers to this and all other questions are always treated confidentially. You can choose not to answer if you don't feel comfortable answering this question.

Q#	Variable name	Question	Response type/ format	Coding and response options
Q0	region	In which region do you live?	Single choice	• UK: 1: North East; 2: North West; 3: Yorkshire and The Humber; 4: East Midlands; 5: West Midlands; 6: East of England; 7: London; 8: South East; 9: South West; 10: Wales; 11: Scotland; 12: Northern Ireland; 13: Do not know • SPAIN: 1: Noroeste; 2: Noreste; 3: Comunidad de Madrid; 4: Centro; 5: Este; 6: Sur; 7: Canarias; 8: Do not know • NETHERLANDS: 1: Noord-Nederland; 2: Oost-Nederland; 3: West-Nederland; 4: Zuid-Nederland; 5: Do not know • POLAND: 1: Poludniowy; 2: Pólnocno-Zachodni; 3: Poludniowo-Zachodni; 4: Pólnocny; 5: Centralny; 6: Wschodni: 7: Województwo Mazowieckie; 8: Do not know
Q1	age	How old are you?	Open-ended (2-digit number 18+)	
Q2	Gender	How would you describe your gender?	Single choice	1: Woman; 2: Man; 3: Other; 4: Prefer not to say
Q3	Educ	What is the highest educational level that you have achieved to date?	Single choice	1: No formal education; 2: Primary school; 3: Secondary school or vocational education; 4: University degree or equivalent professional qualification; 5: Higher university degree; 6: Still in full time education; 7: Prefer not to say
Q4	Resid	Which of the following best describes where you live?	Single choice	1: City centre; 2: City, not in centre; 3: Suburbs; 4: Village
Q5	Adopt	How would you describe yourself in terms of adopting technologies and innovations? I consider myself	Single choice	1: Innovator; 2: Early adopter; 3: Early majority; 4: Late majority; 5: Laggard
Q6	TechConf	How would you describe yourself in terms of using technologies and innovations in your daily life? I consider myself	Single choice	1: Very confident in using technology in my daily life; 2: Somewhat confident in using technology in my daily life; 3: Neutral; 4: Somewhat not confident in using technology in my daily life; 5: Not confident in using technology in my daily life

Section 2: Your Travel Behaviour Characteristics

Let's start with some questions about how you travel.

Q#	Variable name	Question	Response type/format	Coding and response options
Q7	DrivLic	Do you have a valid driver's licence?	Single choice	1: Yes; 2: No; 3: I'd rather not say

Q8	Carown	How many private vehicles does your household own?	Number (min value 0; max value 10)	
Q9	FreqTripPurp	What is the most frequent trip you make?	Single choice	1: To go to the place I work/study; 2: To go shopping; 3: To meet friends and family; 4: For leisure activities (e.g., go to park); 5: For personal businesses (e.g., go to health centre, go to bank); 6: To pick-up /drop-off family members; 7: Other
Q10*	FreqTripDur	What is the duration (in minutes) of your most frequent trip	Number (0-120)	
Q11		**How many trips do you conduct with each of the below transport modes within a week? Consider the following example to calculate your trips: home-work is one trip, home-work-home are two trips.**		
	NTripsMode1	Private car as driver (driving alone)	Number [0-40]	
	NTripsMode2	Private car as a driver (driving with other passengers on board)		
	NTripsMode3	Private car as passenger		
	NTripsMode4	Bus or tram		
	NTripsMode5	Train or underground		
	NTripsMode6	Taxi or ride-sharing (such as Uber)		
	NTripsMode7	Walking		
	NTripsMode8	Cycling or e-scooter		
	NTripsMode9	Motorcycle		
Q12		**How much do you spend each month (in "each country's currency") on the following transportation modes?**		
	TpCostCar	Car	Number (0 -999), depending on currency	
	TpCostTaxi	Taxi/Uber		
	TpCostBus	Public transport		
Q13		**Rank the three most important factors below that affect the most your transport mode choice for your main trips.**		
	Rank1	Travel time	Rank [1 to 3]	
	Rank2	Travel cost		
	Rank3	Convenience and comfort		
		Parking availability		
		Reliability (mode to be on time)		
		No need to combine or change transport modes		
		Waiting time		
		Safety		
		Other		
Q14	FreqDeliv	How often do you receive deliveries for things you order online or by phone?	Single choice	1: Never; 2: Few times per year (1-5 times per year); 3: Few times per month (4-5 times per month); 4: Few times per week (4-5 times per week); 5: Almost every day (1 or more times a day)
Q15	DelivType	What are these deliveries about? Please, select all that apply.	Multiple choice	1: Food delivery; 2: Super market delivery; 3: Clothes delivery; 4: Other
Q16*	hhsize	How many people live in the same household with you (including yourself)?	Number (>=1)	
Q17*	kids	How many children (under 18 years old) live with you?	Number	

Q18*	kidsfreq	[if kids >0 (Q17) How often do you escort them to school or after-school activities in a week?	Single choice	1: Never; 2: Once times per w ek; 3: Few times per week; 4: Once per day; 5: Several times per day
Q19	Employm	How do you describe your employment situation?	Single choice	1: Currently not working; 2: Working part-time; 3: Working full-time; 4: Student; 5: Retired; 6: Homemaker; 7: Prefer not to say
Q20	Disab	Do you have any health issue that hinders your mobility?	Single choice	1: Yes; 2: No
Q21	Disab2	Does any of your family members have any health issue that hinders their mobility?	Single choice	1: Yes; 2: No

Section 2: Self-driving vehicles and services for your personal mobility

This section is about self-driving vehicles. A self-driving vehicle is a vehicle that is capable of traveling without human input. Self-driving cars are responsible for perceiving the environment, monitoring important systems, and control, including navigation. In other words, a self-driving vehicle does not need a driver any more.

Q#	Variable name	Question	Response type/ format	Coding and response options
Q22	ccamaware	How well aware are you about self-driving vehicles?	single choice	1: I am not aware of self-driving vehicles; 2: I have only listened about self-driving vehicles, but I do not know much; 3: I am aware of self-driving vehicles; 4: I am well aware of self-driving vehicles
		Imagine that now almost half of the current vehicles in your city are self-driving. By having this in mind, please see below scenarios of self-driving vehicles and services and answer the questions that follow each scenario. The questions are related to the impact each specific scenario may have in your daily travel behaviour. *[There are 3 blocks of questions: a) Q23-Q29; b) Q30-Q38; Q39-Q44 Each respondent will be randomly answering 2 blocks of questions* *There are 2 blocks of questions: a) Q45-Q48; b) Q49-Q52. Each respondent will be randomly answering 1 block of questions]*		
		Self driving taxi 		
Q23	taxiint1 taxiint2 taxiint3	**Self-driving taxis are now available in your city. Given that the cost and travel time are the same as of using a conventional taxi today, how likely is that you will be using a self driving taxi:** for your commute trips? for your non-commute trips? for your kids to go to their activities?	single choice	1: Highly unlikely; 2: Somewhat unlikely; 3: Neutral; 4: Somewhat likely; Highly likely

Q24	taxitt	How do you expect your current travel time of your most frequent trip (that currently is X) to change in minutes? *[X represents the answer in Q9 (FreqTripPurp)]*	number (-120 to +120)	
Q25		**Assuming that the cost and travel time of self-driving taxis are the same as of today's taxis, how do you expect the below to be affected?**		
	taxiimp1	the total number of your current weekly trips (you can insert negative or positive numbers).	number (-20 to +20)	
	taxiimp2	your current parking needs	slider	-2: Reduced significantly (50% reduction or more); -1: Reduced (up to 50% reduction); 0: No change; 1: Increase or Improve (up to 50% increase): 2: Increase or Improve significantly (50% increase or more)
	taxiimp3	your current residential location	slider	-2: Relocate to a rural area; -1: Relocate to city's suburbs; 0: No change: 1: Relocate closer to the city centre; 2: Relocate to the city centre
Q26	 taxiSubstPatt1 taxiSubstPatt2 taxiSubstPatt3 taxiSubstPatt4 taxiSubstPatt5 taxiSubstPatt6 taxiSubstPatt7 taxiSubstPatt8 taxiSubstPatt9	**How many of your current weekly trips would you substitute with self-driving taxi?** Private car as driver (driving alone) Private car as a driver (driving with other passengers on board) Private car as passenger Bus or tram Train or underground Taxi or ride-sharing (such as Uber) Walking Cycling or e-scooter Motorcycle	slider	1: None of them (0%); 2: Few of them (up to 33%); 3: About half of them (33%-66%); 4: Most of them (66%-99%); 5: All of them (100%)
Q27	taxiSubstTripP1 taxiSubstTripP2 taxiSubstTripP3 taxiSubstTripP4 taxiSubstTripP5 taxiSubstTripP6	For which trip purpose(s) would you use a self-driving taxi?	Multiple choice [dummy for each option | 0=no, 1=yes]	1: To go to the place I work/study; 2: To go shopping; 3: To meet friends and family; 4: For leisure activities (e.g., go to park) ; 5: For personal businesses (e.g., go to health centre, go to bank): 6: To pick-up /drop-off family members; 7: Other (specify)
Q28	taxiwtp	How much would you be willing to pay for an up to 3km (around 15min) ride with a self-driving taxi?	Number 0-999,depending on currency	
Q29	taxishare	Would you be willing to share the ride with one or more strangers?	Single choice	1: Yes; 2: No, I would like to be alone or with people I know; 3: I am not planning to use one

		Self driving private car 		
Q30	carbuy	How likely is it to buy/lease a private self-driving car? There is no need to have a driving license to purchase one.	single choice	1: Highly unlikely; 2: Somewhat unlikely; 3: Neutral; 4: Somewhat likely; Highly likely
Q31	carwtpbuy	How much would you be willing to pay for a self-driving sedan (5-seat) car? Take as a basis that the average current value of an electric sedan is around 30,000 Euro.	Number 0-999,depending on currency	
Q32	cartype	What type of car would you like your self-driving vehicle to be?	single choice	1: city car; 2: sedan; 3: SUV; 4: sports car / roadster; 5: pickup truck; 6: pod; 7: I do not want to buy a self-driving private car
Q33	 carint1 carint2 carint3	**Given that the cost and travel time are the same as of using a conventional electric car, how likely is that you will be using a self driving private car:** for your commuting trips for your non-commuting trips for your kids to go to their activities *[if kids >0 (Q17)]*	 single choice	 1: Highly unlikely; 2: Somewhat unlikely; 3: Neutral; 4: Somewhat likely; Highly likely
Q34	cartt	How do you expect your current travel time of your most frequent trip (that currently is X) to change in minutes? *X represents the answer in Q9 (FreqTripPurp)*	Number (-120 to +120)	
Q35	 carimp1 carimp2 carimp3	Assuming that the cost and travel time of self-driving private car are the same as of today's cars, how do you expect the below to be affected? the total number of your current weekly trips (you can insert negative or positive numbers) your current parking needs your current residential location	 number (-20 to +20) slider slider	 -2: Reduced significantly (50% reduction or more); -1: Reduced (up to 50% reduction); 0: No change; 1: Increase or Improve (up to 50% increase): 2: Increase or Improve significantly (50% increase or more) -2: Relocate to a rural area; -1: Relocate to city's suburbs; 0: No change: 1: Relocate closer to the city centre; 2: Relocate to the city centre
Q36	 carSubstPatt1 carSubstPatt2 carSubstPatt3 carSubstPatt4 carSubstPatt5	How many of your current weekly trips would you substitute with self driving private car? Private car as driver (driving alone) Private car as a driver (driving with other passengers on board) Private car as passenger Bus or tram Train or underground	 slider	 1: None of them (0%); 2: Few of them (up to 33%); 3: About half of them (33%-66%); 4: Most of them (66%-99%); 5: All of them (100%)

	carSubstPatt6 carSubstPatt7 carSubstPatt8 carSubstPatt9	Taxi or ride-sharing (such as Uber) Walking Cycling or e-scooter Motorcycle		
Q37	busSubstTripP1 busSubstTripP2 busSubstTripP3 busSubstTripP4 busSubstTripP5 busSubstTripP6	For which trip purpose(s) would you use a self-driving private car?	Multiple choice [dummy for each option | 0=no, 1=yes]	1: To go to the place I work/study; 2: To go shopping; 3: To meet friends and family; 4: For leisure activities (e.g., go to park) ; 5: For personal businesses (e.g., go to health centre, go to bank): 6: To pick-up /drop-off family members; 7: Other (specify)
Q38	carwtpom	You pay X ("each country's currency) monthly for operating and maintaining your private car(s). How much would you be willing to pay per month to use and maintain a self-driving private car? *X represents the answer in Q12 (TpCostCar)*	Number 0-999,depending on currency	
		Self driving public bus 		
Q39	busint1 busint2 busint3*	**Self-driving public buses are now available in your city. Given that the cost and travel time are the same as of using a today's conventional public bus, how likely is that you will be using a self driving public bus** for your commuting trips for your non-commuting trips for your kids to go to their activities? *[if kids >0 (Q17)]*	single choice	1: Highly unlikely; 2: Somewhat unlikely; 3: Neutral; 4: Somewhat likely; Highly likely
Q40	bustt	How do you expect your current travel time of your most frequent trip (that currently is X) to change in minutes? *X represents the answer in Q9 (FreqTripPurp)*	Number (-120 to +120)	
Q41		**Assuming that the cost and travel time of self-driving public buses are the same as of today's public buses, how do you expect the below to be affected?**		
	busimp1	the total number of your current weekly trips	number (-20 to +20)	
	busimp2	your current parking needs	slider	-2: Reduced significantly (50% reduction or more); -1: Reduced (up to 50% reduction); 0: No change; 1: Increase or Improve (up to 50%

				increase): 2: Increase or Improve significantly (50% increase or more)
	busimp3	your current residential location	slider	-2: Relocate to a rural area; -1: Relocate to city's suburbs; 0: No change: 1: Relocate closer to the city centre; 2: Relocate to the city centre
Q42		**How many of your current weekly trips would you substitute with self-driving bus?**		
	busSubstPatt1	Private car as driver (driving alone)	slider	1: None of them (0%); 2: Few of them (up to 33%); 3: About half of them (33%-66%); 4: Most of them (66%-99%); 5: All of them (100%)
	busSubstPatt2	Private car as a driver (driving with other passengers on board)		
	busSubstPatt3	Private car as passenger		
	busSubstPatt4	Bus or tram		
	busSubstPatt5	Train or underground		
	busSubstPatt6	Taxi or ride-sharing (such as Uber)		
	busSubstPatt7	Walking		
	busSubstPatt8	Cycling or e-scooter		
	busSubstPatt9	Motorcycle		
Q43	busSubstTripP1 busSubstTripP2 busSubstTripP3 busSubstTripP4 busSubstTripP5 busSubstTripP6	For which trip purpose(s) would you use a self-driving bus?	Multiple choice [dummy for each option | 0=no, 1=yes]	1: To go to the place I work/study; 2: To go shopping; 3: To meet friends and family; 4: For leisure activities (e.g., go to park) ; 5: For personal businesses (e.g., go to health centre, go to bank): 6: To pick-up /drop-off family members; 7: Other (specify)
Q44	buswtp	How much would you be willing to pay for a one-way ticket with the self-driving bus?	Number 0-999,depending on currency	
		Private delivery/pick-up bot 		
Q45	PrDelBotInt	How likely is that you will be using a private delivery/pick-up robot?	single choice	1: Highly unlikely; 2: Somewhat unlikely; 3: Neutral; 4: Somewhat likely; Highly likely
Q46		**Assuming that the cost and time of private delivery/pick-up robots are the same as of today's conventional delivery service, how do you expect the below to be affected?**		
	PrDelBotimp1	your current number of monthly online orders	number (-20 to +20)	

	PrDelBotimp2	the total number of your current weekly trips	number (-20 to +20)	
	PrDelBotimp3	the current travel time of your most frequent trip type	Number (-120 to +120)	
	PrDelBotimp4	your current parking needs	slider	-2: Reduced significantly (50% reduction or more), -1 :Reduced (up to 50% reduction), 0 :No change, 1 :Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	PrDelBotimp5	your current residential location	slider	-2: Relocated to a more rural area, -1 :Relocated to city's suburbs, 0 :No change, 1 :Relocated closer to the city centre, 2: Relocated to the city centre
	PrDelBotimp6	your current delivery costs	slider	-2: Reduced significantly (50% reduction or more), -1 :Reduced (up to 50% reduction), 0 :No change, 1 :Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
Q47	PrDelBotSubstPatt	How many of your deliveries would you substitute with private delivery/pick-up robots within a month? *[if FreqDeliv >0 (Q14)]*	slider	1: None of them (0%), 2: Few of them (up to 33%), 3: About half of them (33%-66%), 4: Most of them (66%-99%), 5: All of them (100%)
Q48	PrDelBotOrgUse	How useful would you think that the private delivery/pick-up robot would be for your work (the organisation you work for)? *[If Employm = 2 OR Employm = 3 (Q19)]*	single choice	1: Not useful at all; 2: Somewhat not useful; 3: Neutral; 4: Somewhat useful; 5: Very useful
		Delivery drone 		
Q49	DelivDrInt	How likely is that you will be using a delivery drone?	single choice	1: Highly unlikely; 2: Somewhat unlikely; 3: Neutral; 4: Somewhat likely; Highly likely
Q50		**Assuming that the cost and time of delivery drones are the same as of today's conventional delivery service, how do you expect the below to be affected?**		
	DelivDrtimp1	your current number of monthly online orders	number (-20 to +20)	
	DelivDrtimp2	the total number of your current weekly trips	number (-20 to +20)	
	DelivDrtimp3	the current travel time of your most frequent trip type	Number (-120 to +120)	

	DelivDrtimp4	your current parking needs	slider	-2: Reduced significantly (50% reduction or more), -1 :Reduced (up to 50% reduction), 0 :No change, 1 :Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	DelivDrtimp5	your current residential location	slider	-2: Relocated to a more rural area, -1 :Relocated to city's suburbs, 0 :No change, 1 :Relocated closer to the city centre, 2: Relocated to the city centre
	DelivDrtimp6	your current delivery costs	slider	-2: Reduced significantly (50% reduction or more), -1 :Reduced (up to 50% reduction), 0 :No change, 1 :Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
Q51	DelivDrSubstPatt	How many of your deliveries would you substitute with delivery drone within a month? *[if FreqDeliv >0 (Q14)]*	slider	1: None of them (0%), 2: Few of them (up to 33%), 3: About half of them (33%-66%), 4: Most of them (66%-99%), 5: All of them (100%)
Q52	DelivDrOrgUse	How useful would you think that the delivery drone would be for your work (the organisation you work for)? *[If Employm = 2 OR Employm = 3 (Q19)]*	single choice	1: Not useful at all; 2: Somewhat not useful; 3: Neutral; 4: Somewhat useful; 5: Very useful

Section 3: Needs and requirements

Now that you have seen different scenarios of self-driving vehicles, we would like to ask you about further requirements that you may have in terms of the vehicle type of self driving vehicles.

Q#	Variable name	Question	Response type/format	Coding and response options
Q53	VehTypePrefComm1 VehTypePrefComm2 VehTypePrefComm3	When considering self driving vehicles and services, which three of the below options would you use the most for your trips? Rank from 1=the most preferred, to 3=preferred	Rank 1-3	1: Self driving taxi; 2: Self driving private car; 3: Self driving pod (small 2-seater vehicle for short trips); 4: Self driving public bus; 5: Self driving on-demand shuttle bus; 6: None
Q54	VehTypePrefNonComm	Which one of the below options would you use the most for your commute trips?	Rank 1-3	1: Self driving taxi; 2: Self driving private car; 3: Self driving pod (small 2-seater vehicle for short trips); 4: Self driving public bus; 5: Self driving on-demand shuttle bus; 6: None
Q55	 TaxiTime CarTime PodTime PubBusTime DRTBusTime	**By when do you think that the below self-driving services or vehicles will start being implemented in your city?** Self-driving taxi Self-driving private cars Self driving pods (small 2-seater vehicle for short trips) Self driving public bus Self driving on-demand shuttle bus	Slide bar	1: 2030; 2: 2035; 3: 2040; 4: 2045; 5: 2050; 6: Never
Q56	 caract1 caract2 caract3 caract4	**What activities would you make while travelling with a self-driving taxi?** Work / Study Talk on the phone Surf the web Sleep	Multiple choice [dummy for	0: No; 1: Yes

	caract5 caract6 caract7 caract8	Watch movies Have a meal Focus on the road Other	each option | 0=no, 1=yes]	

Section 4: Your attitudes regarding the impact self-driving vehicles will have in general

This section presents potential impacts that self-driving vehicles may have in different sectors. Please, indicate what the impact in each one of the below statements you think it would be

[Q57-Q58 to be answered by all respondents. Randomly, half answers Q58, Q59, Q60, Q64, and the other half answers Q61, Q62, Q63, Q65]

Q#	Variable name	Question	Response type/format	Coding and response options
Q57		**Mobility - with the introduction of self-driving vehicles**		
	mob1	Citizens' number of trips	slider	-2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	mob2	Citizens travel time	Slider	
	mob3	Travel costs for citizens' trips	Slider	
	mob4	Ownership of conventional private vehicles	slider	
	mob5	Ownership of self-driving vehicles	slider	
	mob6	Usage of self-driving shared services	slider	
	mob7	Citizens' number of deliveries	slider	
	mob8	Citizens' delivery time	slider	
	mob9	Delivery costs for citizens' deliveries	slider	
Q58		**Network - with the introduction of self-driving vehicles:**		-2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	net1	Number of vehicles on the network	slider	
	net2	Traffic congestion	slider	
Q59		**Land use - with introduction of self-driving vehicles:**		-2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	land1	Number of people who live in rural areas	slider	
	land2	Number of people who live in the city centres	slider	
	land3	Demand for parking spaces in the city centres	Slider	
	land4	Demand for redesign transport infrastructure	slider	
Q60		**Environment - with introduction of self-driving vehicles:**		-2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	env1	Transport sector's emissions	slider	
	env2	Demand for electricity to charge self-driving vehicles	slider	
	env3	Noise pollution	slider	
Q61		**Economy**		-2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	econ1	Economic growth	slider	
	econ2	Investments	slider	
	econ3	Job losses	slider	
	econ4	New skills requirements		

	econ5	Consumers expenditures	slider	
Q62		**Equity - with the introduction of self-driving vehicles**		
	equity1	Accessibility of general population	slider	-2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	equity2	Accessibility of people with special mobility needs	slider	
	equity3	Employment opportunities	slider	
	equity4	Connectivity among places	slider	
Q63		**Public health**		
	pub1	Stress related to travelling	slider	--2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	pub2	Access to healthcare	slider	
	pub3	Emergency response	slider	
Q64		**Safety**		
	safe1	Number of traffic accidents	slider	-2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
	safe2	Number of fatalities	slider	
	safe3	Number of traffic violations and tickets	slider	
	safe4	Number of harassment events while travelling	slider	
Q65		**Security**		
	security1	Number of cyber-attacks related to transport sector	slider	-2: Reduced significantly (50% reduction or more), -1: Reduced (up to 50% reduction), 0: No change, 1: Increase or Improve (up to 50% increase), 2: Increase or Improve significantly (50% increase or more)
Q66*	impact-open	Feel free to write any other impacts that self-driving vehicles will have.	Text	

Appendix 21: Pan-European survey – information sheet and consent form

Participant Information Sheet

We invite you to participate in a study about self-driving vehicles (vehicles that do not need a driver). Before you decide to take part, it is important for you to understand why the research is being done and what participation involves. Please take your time to read this sheet.

1. Why have I been chosen?

You have been chosen because you are a resident in a European country and are within the age range of residents that we would like to hear the opinion from (people aged 18 or more).

2. Do I have to take part?

Participation in this study is voluntary. You may discontinue your participation at any time. Any data that you have provided up to that point will be deleted unless you agree otherwise.

3. What will happen if I take part?

You will answer an online questionnaire that will last less than 15 minutes.

4. Will I be recorded?

You will not be recorded on audio or video.

5. What are the benefits of taking part?

You will be able to express your views about a new technology (self-driving vehicles) that can improve people's lives in the future. The resulting data can help governments and businesses to implement measures that enable a smooth introduction of these vehicles.

6. What if something goes wrong?

In case you have any complaints, for instance, in case you have concerns about your data, you can contact our Principal Researcher through: m.chaniotakis@ucl.ac.uk. If you feel that your complaint has not been handled to your satisfaction, you can contact the Chair of the University College London Research Ethics Committee through ethics@ucl.ac.uk.

7. Will my taking part in this project be kept confidential?

All the information that we collect about you will be kept strictly confidential. You will not be able to be identified in any ensuing reports or publications. Please note that assurances on confidentiality will be strictly adhered to unless evidence of wrongdoing or potential harm is uncovered. In such cases we may be obliged to contact relevant statutory bodies/agencies.

8. What will happen to the results of the research project?

The results of the study will be used in reports and academic publications.

9. Who is organising and funding the research?

This research is organised by University College London and is funded by the European Commission.

Consent form

Please complete the form below after you have read the Information Sheet

I understand that by ticking/initialling each box below I am consenting to participate in this research. I understand that by not giving consent for any one element that I may be deemed ineligible for the study

		Tick Box
1	I have read and understood the Information Sheet for the above study. I have had an opportunity to consider the information and what will be expected of me. Therefore, I would like to take part in the research	
2	I understand that I will be able to withdraw my data up to 15 February 2023.	
3	I consent to the processing of my data and that this will be used for the purposes explained to me. I understand that such information will be handled in accordance with all applicable data protection legislation.	
4	I understand that all information will remain confidential and that all efforts will be made to ensure I cannot be identified	
5	I understand that my information may be subject to review by responsible individuals from UCL for monitoring and audit purposes.	
6	I understand that my participation is voluntary and that I am free to withdraw at any time. I also understand that if I decide to withdraw, any data I have provided up to that point will be deleted unless I agree otherwise.	
7	I understand the benefits of participating	
8	I understand that the data will not be made available to any commercial organisations and is solely the responsibility of the researchers undertaking this study.	
9	I understand that the information I have submitted will be published as part of a report and/or academic journal	
10	I am aware of who I should contact if I wish to lodge a complaint.	

_____ _____ _____

Name of participant Date Signature

Appendix 22: Data Warehouse manual

1. Introduction

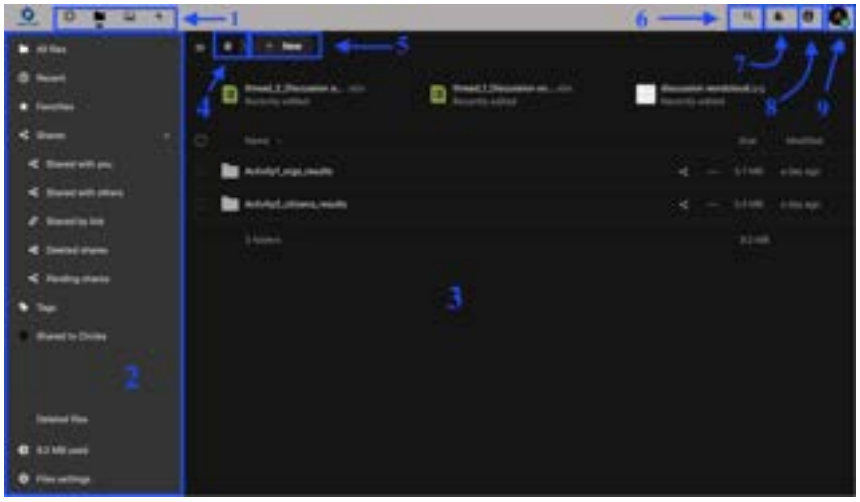
Welcome to Data Warehouse! This Platform is a secure and private self-hosted file sharing and collaboration platform. This manual will guide you through the features and functionality. This manual provides a comprehensive overview of the interface and its features. Use it as a reference guide to effectively use the Data Warehouse for file management, sharing, collaboration, and more.

2. Accessing Data Warehouse

To access the platform, open your preferred web browser and enter the URL https://datawarehouse.mobyapp.app . You will be presented with a login screen where you can enter your credentials to log in.

3. Interface Overview

Once logged in, you will see the interface, which consists of several sections. On the top of the screen click on the “Files icon”.



Apps Selection Menu (1): Located in the upper left corner, you'll find all your available apps.

Apps Information field (2): Located in the left sidebar, this provides filters and tasks associated with your selected app. For example, when you are using the Files app you have a special set of filters for quickly finding your files, such as files that have been shared with you, and files that you have shared with others. You'll see different items for other apps.

Application View (3): The main central field in the Nextcloud user interface. This field displays the contents or user features of your selected app.

Navigation Bar (4): Located over the main viewing window (the Application View), this bar provides a type of breadcrumbs navigation that enables you to migrate to higher levels of the folder hierarchy up to the root level (home).

New button (5): Located in the Navigation Bar, the New button enables you to create new files, new folders, or upload files.

Note

You can also drag and drop files from your file manager into the Files Application View to upload them to your instance.

Search field (6): Click on the Magnifier in the upper right corner to search for files and entries of the current app.

Notifications button (7): This button will notify you when there is new activity

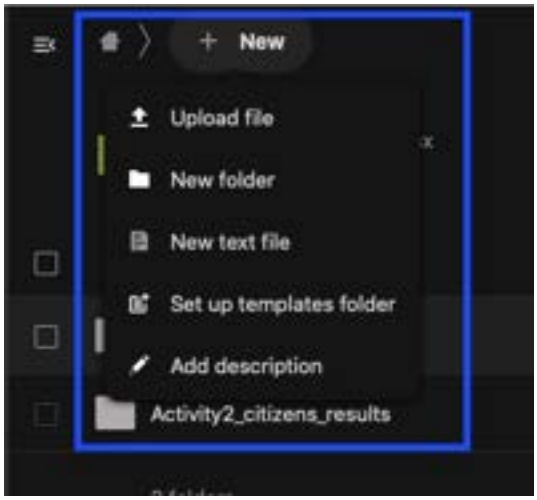
Contacts Menu (8): Gives you an overview about your contacts and users . Dependent on the given details and available apps, you can directly start a video call with them or send emails.

Settings menu (9): Click on your profile picture, located to the right of the Search field, to open your Settings dropdown menu. Your Settings page provides the following settings and features:

- Links to download desktop and mobile apps
- Password management
- Name, email, and profile picture settings
- Manage connected browsers and devices
- Group memberships
- Interface language settings
- Manage notifications

3.1. Files

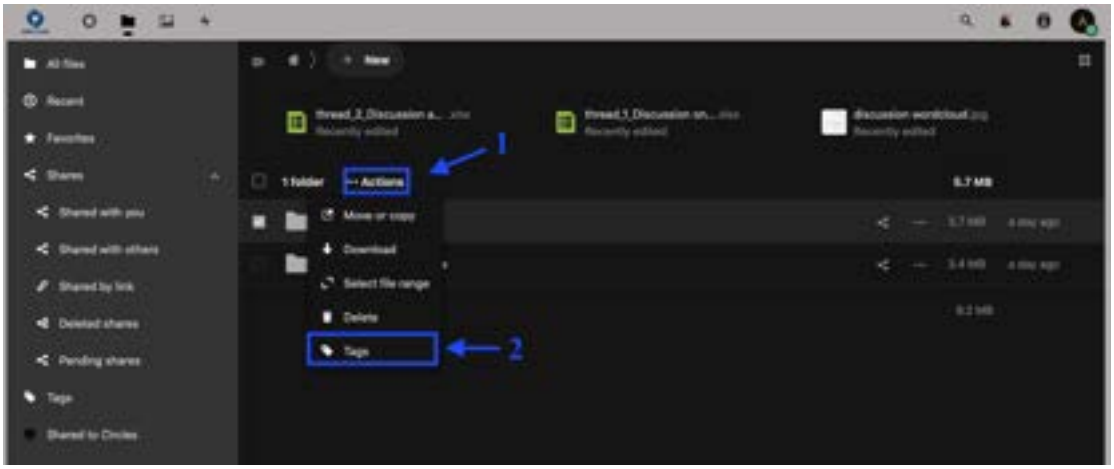
The Files section is the central hub for managing your files and folders. It provides various options to upload, organize, and share your data.

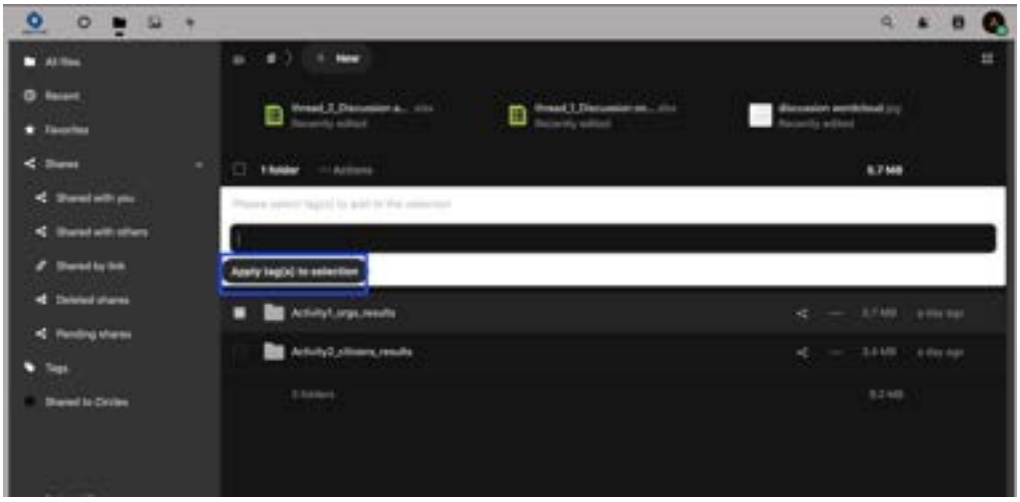


Tagging

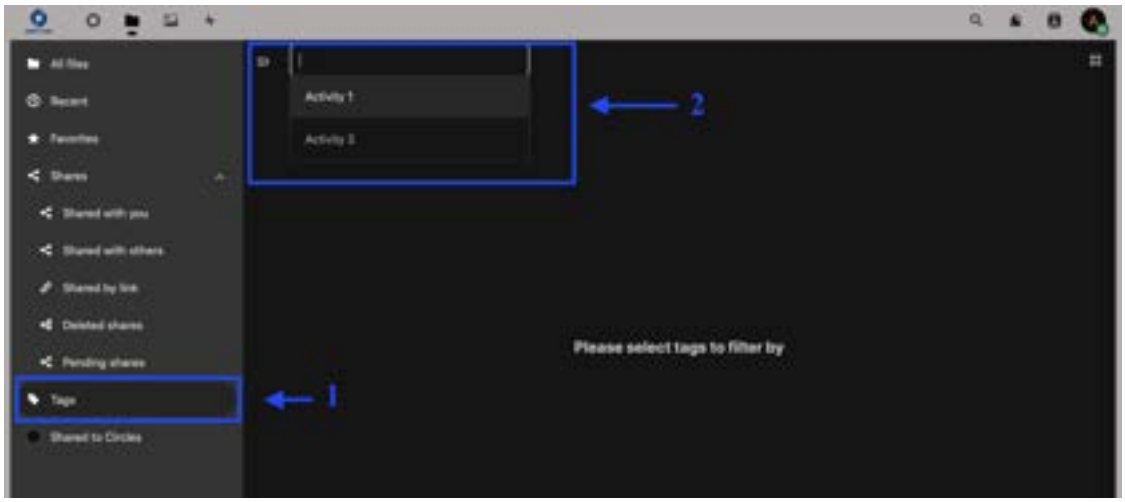
You can access files with the Data Warehouse Web interface and create, preview, edit, delete, share, and re-share files

You **must always** assign tags to files. This will boost the searchability of the file. Open a file to the Details view click on the left the check box and then the “Actions” button. Then type your tags. To enter more than one tag press the return key after creating each tag.





Then use the Tags filter on the left sidebar to filter files by tags:



The left sidebar on the Files page contains several filters for quickly sorting and managing your files.

All files

The default view; displays all files that you have access to.

Favourites

Files or folders marked with the yellow star.

Shared with you

Displays all files shared with you by another user or group.

Shared with others

Displays all files that you have shared with other users or groups.

Shared by link

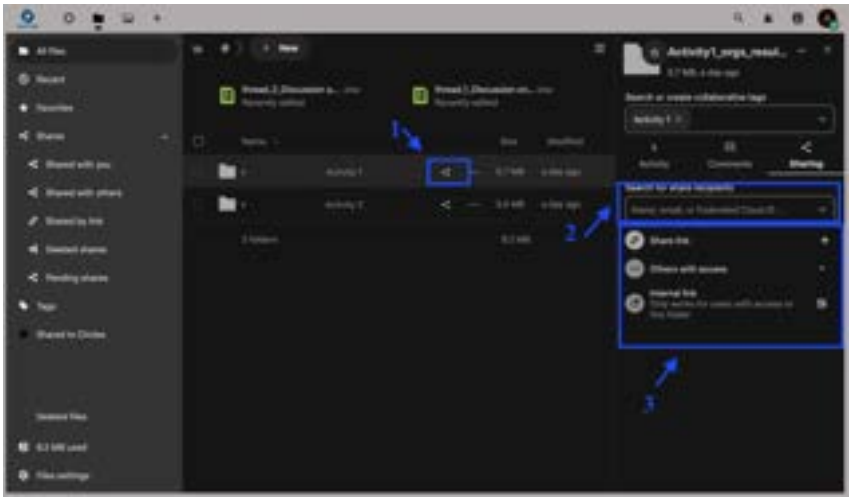
Displays all files that are shared by you via public link.

External Storage (optional)

Files that you have access to on external storage devices and services such as Amazon S3, SMB/CIFS, FTP…

3.2 Sharing

The Sharing section allows you to view and manage files and folders shared with you by others, as well as files and folders you have shared with others.



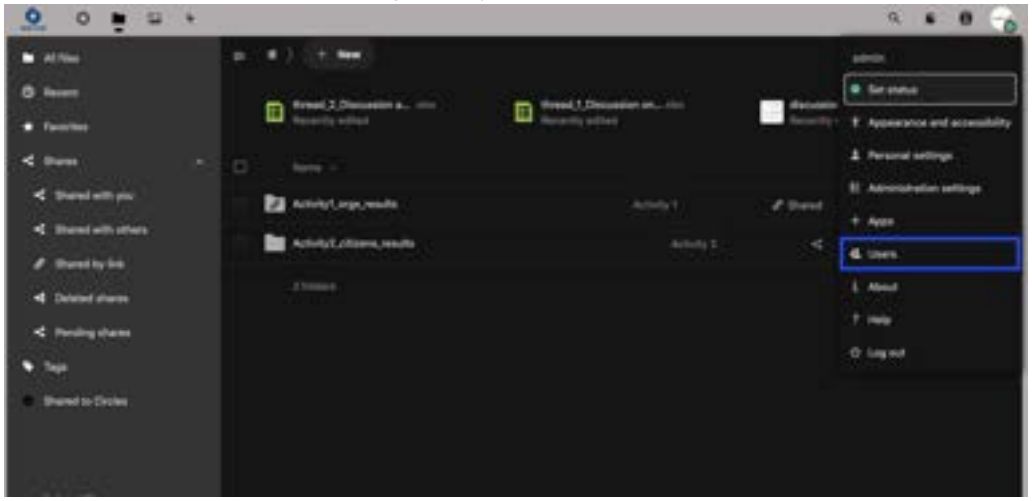
Share button (1): Select the folder or file you want to share and click the share button.

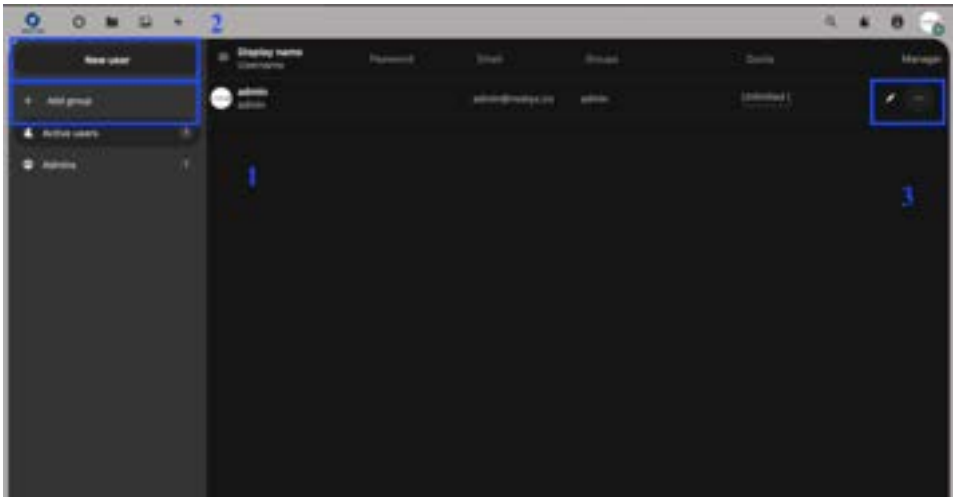
Select user (2): Choose the user you want to share the folder or file with.

Select Sharing option (3): Choose the desired sharing option.

3.3 Adding Users

To add team members and Users, navigate to your profile picture and select “Users from the menu”





Create a group (1) to include team members and then click New User (2) to add the details of your user. Finally, you can edit all user properties by click the three dots and the pencil button (3).

3.4 Settings

The Settings section provides access to various customization options and account settings. You can modify your profile, set up security features, and configure application preferences.

4. Customizing your Profile

You can personalize your account and enhance its functionality. Click on your profile picture in the top-right corner and select "Settings." Here, you can customize your profile information, change your password, and manage other account settings.

For further information and instructions you may also visit the Data Warehouse video guide.