Deliverable 2.1

Engagement guidance for CCAM solutions

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Main author:	Dario Irrera (RE:LAB)
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Internal Reviewers:	Konstantinos Fokeas (ICCS), Matthew Shelton, Sarah Bayliss (TfWM)
Lead contractor:	RE:LAB
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Executive Summary

The SINFONICA project, funded by the European Union's Horizon Europe Research and Innovation Program, focuses on developing strategies and methodologies to engage various stakeholders in the context of Cooperative, Connected, and Automated Mobility (CCAM), with a specific focus on CCAM in public transport. This initiative aims to ensure that CCAM solutions are inclusive, accessible, and reflective of diverse user needs. One of the primary goals of SINFONICA is to create and implement an effective engagement strategy that gathers and understands the needs, desires, and concerns of CCAM users, including people with mobility challenges.

This document aims to describe the engagement strategy designed to meet the SINFONICA's ambition and report the engagement activities effectively implemented during the project.

Being at the core of the project structure, SINFONICA's engagement strategy was elaborated through a co-creation approach, in order to define a participatory framework within which to involve the different target groups, in turn identified and selected through a complex participatory procedure involving representatives from the 4 territories involved in SINFONICA, namely West Midlands (UK), Noord-Brabant (Netherlands), Hamburg (Germany), and Trikala (Greece). The result is an engagement strategy articulated with several specific engagement activities, addressed to different user groups and stakeholders, with a special focus on people with mobility challenges, implemented in multiple iterative rounds.

The SINFONICA project underscores the significance of social engagement in the development and deployment of CCAM solutions. By integrating diverse users and stakeholder perspectives, the project ensures that CCAM technologies are not only technically advanced but also socially inclusive and responsive to the needs of all users. The iterative engagement strategy adopted by SINFONICA can serve as a model for future research and innovation projects in the mobility sector. For more detailed insights and specific regional engagement outcomes, the full document elaborates on the methodologies, findings, and recommendations comprehensively.

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Abbreviations

CBPR	Community-Based Participatory Research
CCAM	Connected, Cooperative and Automated Mobility
Dx.x	Deliverable x.x (in SINFONICA, unless otherwise stated)
EU	European Union
GoI(s)	Group(s) of Interest
ITS	Intelligent Transport Systems
KPI	Key Performance Indicator
MROC	Market Research Online Community

PMC	People with Mobility Challenges
RRI	Responsible Research and Innovation
Tx.x	Task x.x (in SINFONICA)
VR	Virtual Reality
VRU	Vulnerable Road User
WPx	Work Package x (in SINFONICA)

1. Introduction

1.1 Purpose of this document

This D2.1 *"Engagement guidance for CCAM solutions"* aims to provide guidelines and recommendations for engagement strategies to be applied within research projects focusing on the topic of Cooperative, Connected and Automated Mobility (CCAM), in order to foster a rapid and successful deployment of innovative mobility solutions that are effectively inclusive and accessible, so that no one is left behind.

The document is part of a broader framework covering the entire engagement and data collection phase of the SINFONICA project. Indeed, the project aspires to understand the needs, expectations, concerns and desires of users and stakeholders concerning CCAM. This ambition goes hand in hand with the need to ensure the development of CCAM solutions that are effectively accessible, acceptable, safe and efficient, in order to exploit the full potential of such innovations in the context of urban and peri-urban mobility, with particular reference to public transport. The methodology chosen to realise these objectives was the co-creation approach, through which 4 different Groups of Interest were defined in 4 European territories (namely, the cities of Trikala in Greece and Hamburg in Germany, the province of Noord-Brabant in the Netherlands and the Region of the West Midlands in the United Kingdom), in which various users and stakeholders were involved in order to give them the opportunity to express their opinions on CCAM issues and on the topics of accessibility, inclusiveness and acceptability of new mobility solutions.

In this context, D2.1 stems from the work carried out in T2.1 *"Stakeholders engagement strategies"*, which was dedicated to supporting the Groups of Interest in their engagement activities. D2.1, as mentioned, is part of a broader framework, which also includes WP1 and, in particular, the participatory framework elaborated within T1.4 *"Definition of the research groups and creation of the Groups of Interest"* with the establishment of the Groups of Interest, the design of the co-creation approach and the selection of the categories of participants to be involved in the data collection phase in WP3; T2.2 *"Participatory methods to capture mobility needs and future expectations from CCAM"*, where the concrete activities through which to involve participants were actually defined; the WP3 *"Understanding expectations, concerns and desires toward CCAM"*, in which the participatory framework was actually implemented in the Groups of Interest and the data useful for the realisation of the objective of SINFONICA were collected.

Therefore, while the D2.1 serves as a report of what has been implemented within the 4 Groups of Interest and is intended to provide useful indications and recommendations for the benefit of the deployment of CCAM solutions and projects on the topic, it is also to be understood as a part of a bigger picture, which also includes other SINFONICA deliverables (especially those stemming from the same WP2) and which contributes to the comprehension of the project and the capitalisation of its outputs and results.

1.2   Intended audience

Given the purpose underpinning the document, D2.1 is primarily aimed at all researchers working on CCAM research and innovation projects, as well as large-scale demonstrators where experiments on innovative mobility solutions are carried out.

Another important target of this document are the stakeholders operating in this field and working on the development and deployment of services and technologies useful for CCAM. In this sense, the document aims to foster aspects and criteria of inclusiveness and acceptability in order to make public transport and mobility in general more accessible. The concept of stakeholders, in this case, is used in a broad sense, so as to include not only manufacturing companies and organisations but also public administrations, service providers and any other actor that, in one way or another, is involved in the deployment and use of CCAM solutions.

Finally, this document aims to form a knowledge base for the experiments and research focusing on social innovation and social engagement and the adoption of co-creation approaches and methodologies, as well as the definition of participatory frameworks similar to the one developed in SINFONICA.

1.3   Structure of the document

This deliverable is structured to provide an in-depth analysis of the social engagement activities implemented in SINFONICA.

Starting from an introductory chapter – Chapter 2 – dedicated to the definition of social engagement and the importance of its role in scientific research, with particular reference to research projects whose focus is on innovative mobility and CCAM. In Chapter 3, the engagement strategy adopted to maximise the impacts and give the right resonance to SINFONICA's results, is illustrated. This is the part where the genesis of the engagement strategy is described, and the planning of the activities is presented in detail.

In Chapter 4, a report of the engagement strategy applied in each Group of Interest is presented. In this regard, each territory concerned will have a dedicated paragraph, detailing the activities carried out and the methodologies and solutions chosen to meet the se KPIs and comply with the deadlines. Chapter 4 also reports on the experience and numbers of the European SINFONICA Survey, through which it was possible to collect data from a very wide audience.

Chapter 5 aims to capitalise on the experience made in SINFONICA and described in the previous chapters in terms of social engagement, summarising the lessons learnt and presenting a set of recommendations for future research project dedicated to CCAM but not only, fostering the adoption of engagement strategy and methodologies.

Finally, Chapter 6 is devoted to conclusions.

1.4 Interrelations

This deliverable should be read in conjunction with other outputs from SINFONICA. Each piece contributes to the comprehensive bottom-up approach SINFONICA employs to understand mobility needs and future expectations for CCAM. The following deliverables are particularly linked to D2.2, with brief explanations of the complementary information they provide:

- D1.1 Mobility needs and requirements of European citizens: identifies **relevant user groups** for SINFONICA.
- Internal Report on Work Package 1, Task 1.4: details the definition of research groups and the **creation of Groups of Interest**.
- D2.2 Participatory methods to capture mobility needs and future expectations from CCAM process: outlines the participatory framework and methodologies developed by the SINFONICA project to capture mobility needs and future expectations for CCAM.
- Internal Report on Task 2.3 **Surveys on the user factors** that affect the future deployment of CCAM: complements the qualitative data collection strategy of this deliverable with a quantitative method to capture user expectations of CCAM services.
- D3.1 Report for activities in the Groups of Interest: describes the **practical implementation** of the participatory methodologies outlined in this deliverable within the four Groups of Interest.
- D3.2 Evaluation of engagement and data collection activities: provides feedback on the **validity of the methodologies** set out in the current deliverable.
- D3.3 Data analysis, enrichment, and systematisation: supplied the **templates for data collection** to ensure information is reported in a uniform and easily comparable manner.
- D7.2 Ethics and Data Management Plan: includes details on the data expected to be acquired/generated during the SINFONICA project and outlines how to manage it. It also provides a handbook on managing ethical issues, including the **informed consent forms** for participants to sign before their involvement in the research.

2. The role of social engagement in scientific research

2.1 Defining Social Engagement

Engagement is defined as a dynamic, multi-dimensional relational concept that includes psychological and behavioural elements of connection, interaction, participation, and involvement, intended to achieve outcomes at individual, organisational, or societal levels (Johnston, 2018). More specifically, social engagement covers the extensive variety of activities and interactions through which individuals and representative groups contribute to and participate in their communities, strengthening social bonds, communal growth, and collective well-being.

In the context of innovation and societal development, social engagement plays a crucial role in integrating diverse perspectives and expertise from a wide variety of stakeholders, as outlined by the quadruple helix model, which includes academia, industry, government, and civil society (Carayannis et al., 2010). In this sense, social engagement is a key means of ensuring a holistic approach to innovation and growth, so that no one is left behind. This broad approach enhances collaborative efforts, supports participation, and fosters the generation of new ideas and concepts, ensuring that innovations and solutions are socially inclusive and responsive to the needs of all stakeholders.

Incorporating a user-centred approach within the quadruple helix model further amplifies these benefits. In fact, a user-centred approach places the needs, preferences, and experiences of end-users at the core of the development process for new services, products, and solutions. This method ensures that the resulting innovations are not only technically sound, but also practically useful and accepted by the intended users. Moreover, by focusing on the end-users, the user-centred approach helps to tailor innovations more closely to the actual requirements and contexts of the people who will use them, thereby enhancing their relevance and effectiveness. For this reason, it is appropriate to analyse the benefit of social engagement in research for each actor of the quadruple helix.

2.1.1 Social engagement for academia

In academia, social engagement entails leveraging research and educational resources to address real-world problems and promote knowledge transfer. Universities and research institutions play a key role in generating new knowledge, developing technologies, and providing evidence-based insights that inform policy and practice. In order to exploit the full potential of social engagement, academic research cannot ignore the relationship with stakeholders and actors from industry partners, government agencies, and civil society organisations, to ensures that research results are relevant, applicable, and aligned with societal needs. Collaborative research projects, community-based participatory research (CBPR), citizen science and public dissemination of findings are some of the means through which academia can support and implement social engagement. In particular, CBPR emphasises equal partnership between researchers and community members, ensuring that research addresses community-identified needs and that outcomes are directly beneficial to the community (Israel et al., 1998).

2.1.2 Social engagement for industry

Industry related social engagement focuses on the development and commercialisation of innovative solutions, products and services that meet societal demands. There are several ways in which businesses and private enterprises can contribute to social engagement, for example by investing in research and development, creating jobs, and driving economic growth. Again, from the industry perspective it is important to consider the collaboration with academic institutions, which promises to help businesses to stay at the forefront of technological advancements, whereas partnerships with government agencies and public entities can facilitate regulatory support and access to public resources and fundings. Furthermore, engaging with civil society organisations often ensures that industrial innovations are socially responsible, supported by an ethical view, and beneficial to the wider community, including both social and built environment.

2.1.3 Social engagement for public institutions

Engagement in public institutions involves developing policies, regulations, and programs that address societal challenges in novel and innovative ways. In this regard, governments play a crucial role in setting the legal and regulatory frameworks that enable innovation, providing funding and resources for research and development, and facilitating fruitful public-private partnerships. From this point of view, the facilitating role played by public entities responsible for defining the "level playing field" is even more evident. Relations and debates with academia, industry, and civil society allows governments to develop policies that are informed by a diverse range of perspectives and are more likely to achieve desired outcomes, at the same time providing an opportunity for the other actors in the quadruple helix to play a role and make their voice heard in the definition of regulatory frameworks: public consultations, stakeholder fora, and collaborative policymaking processes are essential tools for effective government engagement. The concept of "collaborative governance" (Ansell and Gash, 2008) underscores the importance of engaging multiple stakeholders in governance processes, to enhance decision-making and policy implementation.

2.1.4 Social engagement for civil society

Civil society engagement focuses on representing the interests and needs of the public, advocating for social justice, and ensuring that innovations are inclusive and equitable. Among the actors that make up the quadruple helix, civil society is probably the one that best enables a bottom-up approach, capable of effectively gathering the needs and urgencies towards which research and innovation must focus, in order to deliver outputs that have a concrete and beneficial impact. Civil society organisations, including non-profits, community groups, and advocacy organisations, provide valuable insights into the experiences of diverse populations and help to ensure, on the one hand, that the benefits of innovation are widely distributed and, on the other hand, that research objectives are always oriented towards real societal needs. Engaging with academia, industry, and government enables civil society organisations to influence research agendas, contribute to policy development, and participate in the implementation of innovative solutions. Furthermore, social engagement promotes the democratisation of innovation, by involving a broader range of stakeholders in the innovation process. It empowers communities by giving them a voice in the development of solutions that affect their lives and ensures that the benefits of innovation are equitably shared. This inclusive approach enhances social cohesion, increase trust, and builds communities that are better equipped to adapt to change and uncertainty.

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In conclusion, social engagement is a crucial element for research. Having in mind the aforementioned quadruple helix model of innovation, social engagement fosters collaboration and co-creation among academia, industry, government, and civil society. Thus, by incorporating diverse perspectives and expertise, social engagement promotes sustainable and inclusive innovation, tackles complex societal challenges, and ensures that the research outcomes and advantages of innovation are broadly shared.

2.2 The importance of Social Engagement in CCAM

Connected, Cooperative, and Automated Mobility (CCAM) aims to revolutionise transportation by creating rapid, efficient, and intelligent mobility systems through seamless information exchange between vehicles, while using the revolutionary technologies that are power of advanced sensors, distributed control algorithms, machine learning, 5G, and connectivity (Ferreira, 2019). This technology seeks to enhance safety, efficiency, environmental impact, acceptability and accessibility in mobility.

Despite the significant benefits of CCAM solutions, public interest in these technologies remains limited. Research indicates that society is not fully aware of the potential positive impacts of these advanced mobility concepts (Jing, 2020), which ultimately affects people's trust in them. Some studies, for example, show that women tend to approach autonomous vehicles more cautiously compared to men (Rezaei & Caulfield, 2020). Additionally, research revealed that the ultimate success of CCAM significantly relies on user adoption (Grippenkoven et al., 2018). Therefore, the importance of social engagement in CCAM cannot be understated: it plays a critical role in introducing these innovative mobility solutions to the public, particularly diverse population groups, to gain their trust and explain the benefits. This includes, in particular, people with mobility challenges, ensuring that their specific needs are addressed. Engaging these groups not only fosters trust but also enables the development and implementation of CCAM solutions are inclusive and responsive to the needs of all users, ensuring that no one is left behind in the shift towards innovative mobility.

Within the scope of mobility and the SINFONICA co-creation framework, developed in T1.4 with the Groups of Interest, several categories of individuals and users have been identified for inclusion. These categories encompass individuals with mobility challenges (such as the elderly, people with cognitive disabilities, digitally vulnerable individuals, those with gender-related vulnerabilities, and youth), citizens' representatives (spanning different age groups, income levels, and accessibility to public transport), and stakeholders' user groups (including service providers, government and institutional entities, industry, non-profit organisations, representative bodies, universities, and knowledge institutions). Engaging these diverse groups facilitates the design of CCAM solutions that are inclusive, accessible, and responsive to the needs of all users. This approach fosters a comprehensive understanding of user requirements and promotes the development of mobility solutions that cater to the diverse needs of the entire community.

Table 1 - Benefit of social engagement in CCAM research for people with mobility challenges

Benefits of social engagement in CCAM research for people with mobility challenges	
Elderly people	For the elderly, social engagement in CCAM involves addressing their unique mobility challenges, such as reduced physical agility and increased safety concerns. Engagement activities with elderly participants can provide valuable feedback on the design and functionality of automated mobility solutions, ensuring that these technologies are accessible and user-friendly for older adults. This involvement helps to promote independence and enhance the quality of life, thus enabling them to remain active and connected within their communities.
People with disabilities	People with disabilities face a range of mobility barriers that can be mitigated through well-designed CCAM solutions. Engaging individuals with disabilities through engagement activities allow developers to understand their specific needs and preferences, leading to the creation of more accessible and inclusive transportation options. This involvement ensures that automated mobility technologies incorporate features such as wheelchair accessibility, tactile interfaces, and audio guidance systems, thereby empowering people with disabilities to travel more freely and confidently.
Digital vulnerable people	Digital vulnerability, which affects individuals with limited access to or proficiency with digital technologies, poses significant challenges in the adoption of CCAM solutions. By engaging digitally vulnerable people in engagement activities, developers and service provider can identify and address the barriers that hinder their access to automated mobility services. This engagement might involve simplifying user interfaces, providing digital literacy training, or offering alternative access methods to ensure that everyone can benefit from advanced transportation technologies, regardless of their digital skills.
People with gender-related vulnerabilities	Gender-related vulnerabilities in mobility, such as safety concerns and access disparities, require careful consideration in CCAM research projects. Engagement initiatives that include women and other gender minorities can highlight specific issues and priorities related to their mobility experiences. This involvement helps to ensure that automated and connected mobility solutions are designed with features that enhance safety, such as improved lighting, surveillance, and emergency response systems, and address gender-specific needs, contributing to a more equitable transportation environment.
Youth	Youth engagement is crucial for the long-term success and acceptance of CCAM technologies. Young people are often early adopters of new technologies and can provide innovative ideas and perspectives on the future of mobility. Involving youth and provide them with channels to make their voices heard allows researcher and stakeholders to understand their mobility habits, preferences, and expectations, leading to the creation of dynamic and adaptable transportation solutions that resonate with younger generations. Additionally, educating youth about CCAM can foster a culture of innovation and responsibility towards sustainable mobility practices.

Benefits of social engagement in CCAM research for people with mobility challenges	
Representative bodies	Engagement in CCAM research projects can focus not only on individual users but also on citizens' representative bodies, including those representing individuals from various age groups, income levels, and type of accessibility to the public transport, play a critical role in ensuring that CCAM solutions are inclusive and equitable. Engaging these representative bodies helps to capture a wide range of perspectives and experiences, hence input sources for the design of mobility solutions that cater to the diverse needs of the community.
Stakeholder user groups	Stakeholders' user groups, including service providers, government entities, industry players, non-profit organisations, and academic institutions, are essential for the successful implementation of CCAM solutions. Engaging these groups through collaborative efforts and discussions ensures that the developed technologies are practical, feasible, and aligned with regulatory and industry standards. This multi-stakeholder approach helps to create a comprehensive and well-rounded understanding of the challenges and opportunities in CCAM deployment, leading to more effective and sustainable mobility solutions.

To reach society, and understand their needs in a better way, engagement activities such as surveys, interviews, focus groups and workshops, serve as important methods for gathering in-depth insights and feedback from specific demographics, including the groups mentioned above.

In conclusion, social engagement in CCAM through targeted initiatives is essential for creating inclusive, equitable, and effective mobility solutions. By actively involving different categories of users and stakeholders, CCAM projects can address the diverse needs of these populations, ensuring that automated mobility technologies enhance accessibility, safety, and overall quality of life for all community members. Correspondingly, recent research (Grosso et al.,2023) on connected and automated mobility highlights that technological innovations can yield societal benefits if the technology is comprehended and accepted at a societal level, with knowledge sharing and dissemination being pivotal. This inclusive approach not only improves the design and functionality of CCAM solutions but also fosters greater public trust and acceptance, paving the way for the successful implementation of these advanced mobility technologies.

2.3   Current trends and approaches

Current trends and approaches for social engagement in research emphasise inclusivity, collaboration, and the integration of diverse perspectives and disciplines through a multidisciplinary methodology, to enhance the relevance, impact, and ethical integrity of research outcomes (Daedlow, K. et al., 2016). Given these reasons, it is essential to understand how everyone can benefit from a newly developing service or research outcome, ensuring diversity by gathering opinions and ideas from different user groups, particularly the end-users.

Here are some key trends and approaches in this evolving field:

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Table 2 - List of engagement activities for research

Engagement activities for research	
Participatory research methods	Participatory research methods actively involve community members and stakeholders in the research process. This approach ensures that research addresses real-world needs and concerns. Community-Based Participatory Research (CBPR), for example, involves researchers collaborating e with community members from the outset, co-designing the research questions, methods, and dissemination strategies (Collins et al., 2018). This approach empowers communities and ensures that the research is grounded in their lived experiences. Similarly, Action Research is an iterative process that involves researchers and participants working together to diagnose a problem, develop solutions, and implement actions (Kemmis & McTaggart, 2000). It emphasises practical outcomes and continuous learning.
Citizen science	Citizen science engages public participation in the research process, often through data collection, analysis, and dissemination (Haklay et al., 2021). This democratises science, making it more accessible and fostering a sense of ownership among participants. Examples include environmental monitoring projects where community members track changes in local ecosystems or health studies where individuals contribute data about their own health behaviours.
Public engagement platform	The use of digital platforms and social media to facilitate public engagement in research is on the rise. These platforms allow researchers to reach broader audiences, gather diverse input, and share findings widely. In addition, such solutions are often also more engaging for the participants involved in the research, compared to traditional engagement methodologies. Examples include online surveys, virtual focus groups, and interactive websites where participants can contribute data and insights.
Living Labs	Living labs are real-life environments where researchers, users, and stakeholders co-create and test innovations (Huang & Thomas, 2021). These labs provide a dynamic setting for developing and refining solutions in areas like urban planning, healthcare, and transportation. The living lab approach emphasises user-centred design, continuous feedback, and iterative development.
Ethics in research	Ethics in research refers to the principles and standards that guide researchers in conducting studies responsibly and with integrity (Resnik, 2015). Ethical research practices ensure the protection of participants, maintain honesty and transparency, and promote the credibility of research findings. Key ethical principles include respect for persons (autonomy), beneficence (maximising benefits while minimizing harm), justice (fairness in distribution), and respect for communities. This usually goes along with responsible data management and with the protection of personal data from the participants. Researchers must obtain informed consent, ensure confidentiality, and avoid conflicts of interest.

Responsible Research and Innovation (RRI)	Responsible Research and Innovation (RRI) is an approach that anticipates and assesses potential impacts and societal expectations with the aim of fostering inclusive and sustainable research and innovation (Von Schomberg, 2013). RRI involves various stakeholders — including researchers, policymakers, industry, and the public — in the entire research and innovation process, to ensure that outcomes align with societal values, needs, and expectations. Key dimensions of RRI include public engagement, open access, gender equality, science education, ethics, and governance. By incorporating these dimensions, RRI seeks to make research and innovation processes more transparent, accountable, and responsive to societal challenges.
Feedback loops and iterative processes	Modern engagement strategies often incorporate feedback loops, where stakeholders and participants provide continuous input that informs subsequent stages of the research. This iterative process ensures that research remains relevant and responsive to stakeholder needs and concerns. It can involve regular workshops, surveys, and other forms of engagement, distributed in multiple rounds of activities, throughout the project lifecycle.
Use of visual and interactive tools	Visual and interactive tools, such as infographics, interactive maps, and virtual reality (VR) simulations, are increasingly used to engage end-users and stakeholders in research. These tools simplify complex information, enhancing accessibility and comprehension, and promoting active participation. VR technologies, in particular, are highly relevant for vulnerable road users, providing them with the opportunity to safely experience and interact with technologies that are not available and are under development.

The current trends and approaches in social engagement in research are geared towards creating more inclusive, participatory, and impactful research processes. By involving diverse stakeholders, leveraging digital tools, and fostering continuous collaboration, these methods aim to ensure that research is relevant, ethical, and beneficial to society as a whole.

3. Engagement strategies in SINFONICA

3.1   Background and context

The domain of transport and mobility, particularly in the automotive sector, has long been a focal point of research and development within the European Union (EU). As highlighted by scientific research (Alonso Raposo et al., 2018), this strategic sector is crucial for Member States, significantly impacting the labour market, trade, and the EU's Gross Value Added. Europe remains a leading player in the automotive value chain, with substantial private investment in research, development, and technological advancements, playing a pivotal role in the international market.

The SINFONICA project addresses a specific topic outlined by the European Commission through a "top-down" approach, focusing on the "Analysis of socioeconomic and environmental impacts and assessment of societal, citizen and user aspects for needs-based CCAM solutions (CCAM Partnership)." This project aims to develop practical, efficient, and innovative strategies, methods, and tools to engage CCAM users, providers, and other stakeholders, including vulnerable users, transport companies, public administrations, service providers, researchers, and technology providers.

SINFONICA's objective is to create practical, effective, and innovative strategies, methods, and tools to engage CCAM users, providers, and other stakeholders (such as citizens, including vulnerable groups, transport companies, public administrations, service providers, researchers, and vehicle and technology suppliers). The ambition is to gather and understand their needs, desires, and concerns related to CCAM. The primary goal of SINFONICA is the development of an effective engagement strategy to understand and analyse the various barriers that distress certain user groups from accessing public transportation. To achieve this, the SINFONICA framework followed a social innovation approach. This approach emphasises the active participation and engagement of users and stakeholders throughout the process. By utilising the diverse expertise of the Consortium, the innovative engagement strategy has been created through a co-creation process. The process involved the collaborative development of solutions with the input and feedback from all relevant parties.

The engagement strategy has been designed to be iterative, and therefore made to be tested, evaluated, and refined in multiple cycles or "rounds", to ensure its effectiveness. This iterative approach involved CCAM users (in the case of SINFONICA, the focus was on people with mobility challenges), stakeholders, and citizens from four different European locations: the West Midlands in the UK, the Province of Noord-Brabant in the Netherlands, the Municipality of Hamburg in Germany, and the city of Trikala in Greece. By involving these diverse groups, called in fact "Groups of Interest", the project aimed to stimulate broad participation in discussions about new mobility paradigms and foster the development of CCAM technologies that that concretely meet the needs of all users.

Through these efforts, SINFONICA seeks to create a more inclusive and equitable public transport system that leverages advanced CCAM technologies. The active engagement of users and stakeholders will help ensure that the developed solutions are not only technically sound but also

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socially acceptable and beneficial to a wide range of individuals, particularly those who face challenges in accessing traditional public transport systems.

To support this engagement strategy, various activities have been implemented to ensure comprehensive involvement and feedback from all stakeholders. This approach aligns with Chiesa et al. (2023), who emphasise the importance of stakeholder engagement in CCAM development, noting that inclusivity and acceptability are crucial for the success of these technologies. Their study underscores the need for tailored communication strategies and participatory methods to effectively engage diverse stakeholders, ensuring that the developed solutions are both technically robust and socially beneficial.

The activities chosen to be part of SINFONICA's engagement strategy include:

- Large-scale surveys to gather population-level data on user factors that affect the future deployment of CCAM. These surveys will help identify the needs, preferences, and concerns of a broad demographic, providing a solid foundation for developing inclusive mobility solutions.
- Interviews with people with mobility challenges. These interviews will provide in-depth insights into specific issues and opportunities related to CCAM deployment, allowing for a deeper understanding of individual experiences and perspectives.
- Focus Groups discussions organised with different categories of citizens, to facilitate detailed conversations among diverse user groups. Focus groups will help capture the nuanced views and ideas of these participants, ensuring that the engagement strategy addresses the unique needs of various populations.
- Interactive workshops will be held with representatives from user groups, industry experts, policymakers, and community leaders to bring them together in a collaborative environment. These workshops will be designed to encourage brainstorming, problem-solving, and co-creation of solutions. Participants will work together to develop and refine CCAM strategies, fostering a sense of ownership and commitment to the project's goals.

3.2   The SINFONICA engagement strategy

SINFONICA's primary objective is to gather and understand the needs, wishes, and concerns related to CCAM from diverse stakeholders. The collected data will be structured to provide useful information, guidelines, and recommendations for the development, implementation, and deployment of innovative, connected, and autonomous mobility solutions. The project will also develop decision support tools for designers and decision-makers to enhance the inclusive and equitable delivery of CCAM for all citizens.

Given the project's emphasis on co-creation and co-design processes, an effective engagement methodology has been carefully developed, to foster the exchange of visions and knowledge among participants involved. As mentioned, this approach is based on the engagement of citizens and relevant stakeholders through various methods (survey, interviews, focus groups and workshops).

The SINFONICA engagement strategy is structured as follows:

A large-scale survey was circulated to gather population-level data on user factors affecting CCAM deployment, helping identify the needs, preferences, concerns of a broad demographic and future deployment of CCAM. Initially, this survey aimed to include 500 participants from each research site partner (Trikala, Hamburg, Noord-Brabant, West Midlands) using a quota sampling strategy. This strategy included specific quotas for age and gender to reflect how these demographics are distributed within the population. A detailed description of the SINFONICA survey will be provided in par. 4.5.

Series of interviews with people with mobility challenges provided in-depth insights into specific issues and opportunities related to CCAM deployment. For this reason, based on the insights gained from previous activities in WP1 of SINFONICA, various groups of individuals with mobility challenges have been identified among different categories of potential future users. According to the definition provided in T1.1 "*Mobility needs and requirements of European citizens*", these individuals are described as «physically, mentally, or socially disadvantaged persons who may be unable to meet their basic needs and may therefore require specific assistance. Persons exposed to and/or displaced by conflict or natural hazards may also be considered as having mobility challenges. People with mobility challenges may experience a higher risk of poverty and/or social exclusion». Within this conceptual framework, five categories of people with mobility challenges have been identified and included in all the GoIs, following these definitions: Elderly, people with cognitive disabilities, digital vulnerable people, gender-related vulnerabilities and youth. Furthermore, GoIs were given the possibility to interview additional categories of people with mobility challenges to those identified for each of them (e.g. in the case of the Hamburg GoI, the additional category of cyclists was selected), with the aim of reaching a defined number of users interviewed.

After defining the categories of people with mobility challenges, the next step involved organising the phases of the participatory approach and determining how information will be collected. Thus, the identified groups of people with mobility challenges were interviewed to assess their needs, desires, and concerns regarding CCAM. Specifically, 290 interviews were conducted across the four GoIs.

Focus groups discussions facilitated detailed conversations among diverse categories of citizens. These focus groups helped capture nuanced views and ideas, ensuring the engagement strategy addresses the unique needs of various populations. Therefore, alongside the strategies aimed at involving groups of people with mobility challenges, the participatory process established in SINFONICA also included the involvement of citizens' representatives to better understand users' needs, concerns, and expectations. These focus groups have been conducted during the three rounds of engagement, following the guidelines provided by WP2.

More specifically, the focus groups have been organised as follows:

- First Round: This consisted of different age groups, including participants aged 26-35, 36-45, 46-65, and over 65.
- Second Round: This round included groups categorized by income levels, specifically low income, medium income, and high income.

- **Third Round:** This round focused on accessibility to public transport, with one group composed of individuals who can easily access public transport and another group of those who cannot.

This structured approach ensured a diverse range of perspectives and experiences, enhancing the overall understanding of how CCAM solutions can be tailored to meet the varied needs of the community.

Interactive workshops target stakeholders and experts in a collaborative environment, encouraging brainstorming, problem-solving, and co-creation of solutions. Within the co-creation framework developed in T1.4, the stakeholders' groups have been divided into five categories: service providers, government/institutional entities, industry, non-profit organisations and representative bodies, universities and knowledge institutions. The stakeholders' involvement in the SINFONICA framework aimed at enhancing engagement strategies and improving the data collection process. Based on the discussions within the co-creation framework, three workshops have been planned in three rounds with involvement of previously defined groups.

- The first workshop is dedicated to a critical analysis of current mobility, examining the results from focus groups and semi-structured interviews. This stage helps identify obstacles and potential solutions for implementing CCAM.
- The second workshop explore the potential of CCAM to address mobility needs by discussing participants' expectations, desires, and concerns.
- The third and final workshop focus on collaboratively defining the requirements for deploying an
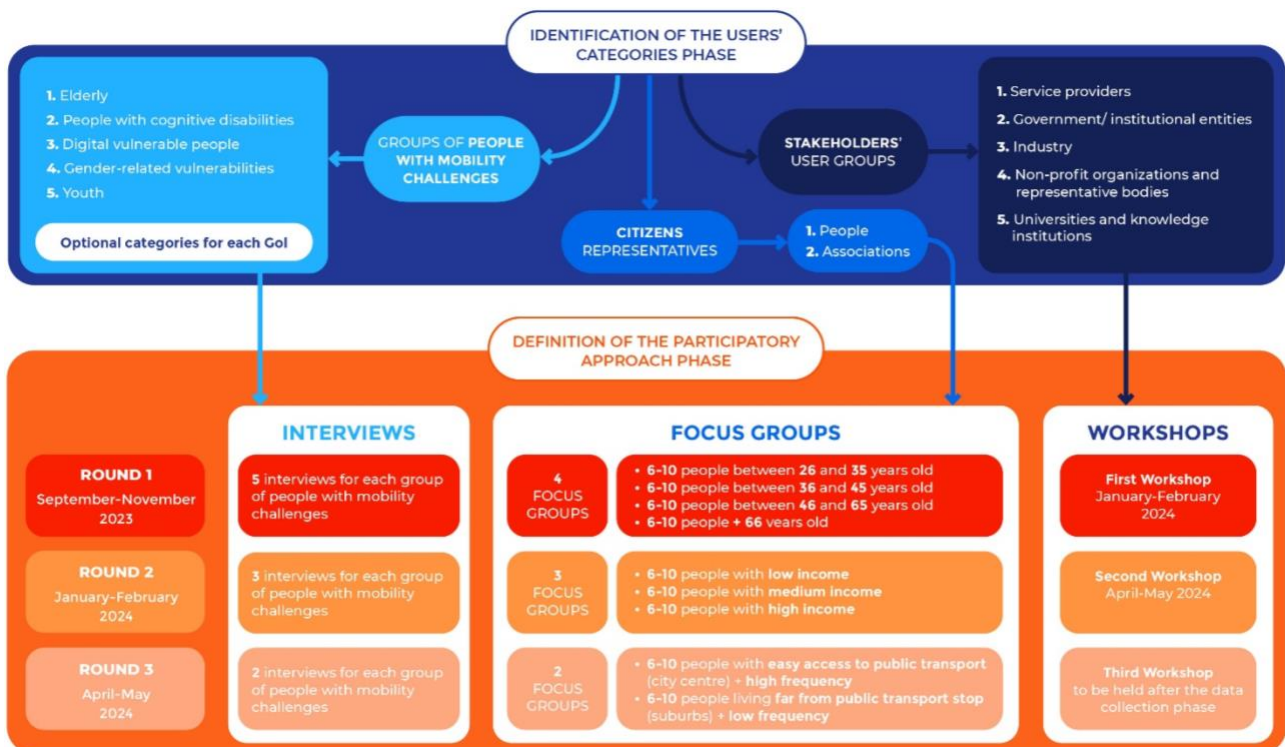
Figure 1 - Overview of SINFONICA participatory approach to implement in the engagement phase

inclusive, equitable, and accessible CCAM.

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By integrating this strategy, SINFONICA aimed to identify the most suitable engagement methods for specific user types, ensuring sustained interest and involvement throughout all project phases. This comprehensive approach will help develop CCAM solutions that are not only technically advanced but also socially inclusive and beneficial for all user groups.

4. Report on recruitment and engagement in the Groups of Interest and the European SINFONICA survey

4.1 Hamburg

Hamburg, known as the Free and Hanseatic City, is one of Germany's 16 federal states and is distinguished as one of its three city-states. As the second largest city in Germany, with a population of approximately 1.8 million, Hamburg faces significant challenges due to its growing and aging population, leading to increased transport demands. Since 2016, Hamburg has been implementing an Intelligent Transport Systems (ITS) strategy to use digital technologies to make transportation more efficient, safer, environmentally friendly, and comfortable. This aligns with the objectives of the SINFONICA project, where Hamburg aims to develop innovative, citizen-focused solutions for multimodal mobility, including CCAM. The city's approach emphasizes inclusivity, particularly for individuals with reduced perception and mobility, and engages various stakeholders, including public institutions, to create a comprehensive mobility framework that addresses the diverse needs of its population.

4.1.1 Defining user and stakeholder groups

In addition to the five predefined groups of people with mobility challenges to be participated in the interviews (elderly people, young people, cognitively disabled people, people with gender-related vulnerabilities, digitally vulnerable people), two further groups were selected for Hamburg: physically disabled people and bicycle users. The bicycle users were selected because Hamburg has a strong focus on cycling, and the input from SINFONICA is therefore particularly interesting for this GoI. People with physical disabilities still face a variety of barriers in public transport in Hamburg that need to be taken into account.

The categories for conducting the focus groups were developed by the project partners and taken over by the GoIs. For Hamburg, a challenge was foreseen for the category "income", as this is a criterion that may be seen as rather difficult in Germany due to data protection and privacy issues.

For the workshops many stakeholders could be identified from previous projects and activities at LSBG and the Senate Chancellery. Additionally, the workshops were promoted widely through social media channels.

The aim was to make the VRU/PMC groups to be involved as diverse as possible in order to include as many people with different limitations as possible.

4.1.2 Engagement techniques and methods

Originally, the GoI Hamburg was not intended to involve citizens, but rather stakeholders from the public administration. Therefore, no budget was earmarked for participation formats. There were insufficient funds to outsource the participation formats to an external institution.

Interviews:

For the interviews, various associations in Hamburg had been contacted directly that work for the different groups of Vulnerable Road Users (VRU) and People with Mobility Challenges (PMC) to

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invite people to participate in an interview. In addition, the project was presented at various public events, where participation in the interviews has also been advertised and possible points of contact have been identified.

For example:

- conducting interviews with students after giving a lecture on autonomous driving at one school in Hamburg;
- conducting interviews with elderly people as part of a digital consultation hour in a public library;
- conducting interviews with disabled people or elderly people with mobility issues as part of a public mobility training provided by a public transport operator;
- advertising and conducting interviews as part of public events on the topic of mobility or at associations.

Focus groups:

In Hamburg, there is currently no existing group of citizens who can be approached for participation formats in the mobility context. The plan here was to advertise the focus groups in general via social media channels and concretely via specific points of contact on the topic of mobility.

However, it proved difficult to get citizens to participate in the focus groups. This was partly because the available social media channels did not have the right reach or target the right group of people, and it was difficult to find enough participants through widespread advertising. This led to some focus groups having to be cancelled and postponed due to insufficient participants.

The strategy was adapted, and citizens were invited to the focus group via specific contacts, topics or points of contact.

For example, the "65+" focus group was held in a residential facility for senior citizens, where a communal lunch was offered. The "26-35" focus group was held in the LSBG (with colleagues from other departments) as part of a lunch break. The "46-65" focus group was held in Hamburg City Hall and thus motivated the participants to take part in the focus group with a great location.

Workshops:

For the workshops, existing contacts with stakeholders were used to invite them or to spread the invitation to the workshops through them. This worked well, so that it has been possible to attract enough participants for the workshops.

In all participation formats, it worked best to address specific contacts and invite them to participate, or to distribute the events via existing contacts. For the focus groups, it also worked better to offer additional incentives for participation (catering, nice location, etc.).

Some of the interviews were conducted with advocates of VRU/PMC groups, for example in the groups for people with cognitive vulnerabilities. In this case, some questions were not discussed, or the statistical indicators were not asked. This must be considered in the documentation. In some cases, the interviewees did not have that much time (generally, it has been allocated one hour per

interview) to answer all the questions, so the focus has been concentrated on the most important questions and the questionnaire was shortened.

4.1.3 Communication and awareness

For all participation formats, the focus was placed on giving interested parties the opportunity to actively shape the future of transportation in Hamburg through their participation. It was also made clear that it is important for the project to receive as many suggestions and feedback as possible.

Educational tools and campaigns implemented to raise public awareness on the topic of SINFONICA:

- Interviews with young people: presentation on CCAM and related activities and projects in Hamburg at schools.
- Focus groups: short presentation on SINFONICA and CCAM in Hamburg in the beginning of the focus groups.
- Citizens: public presentations at events related to mobility or Europe.
- Workshops: knowledge transfer through keynote speeches on various topics (autonomous driving, CCAM projects in Hamburg, barriers in mobility etc.).

4.1.4 Challenges and solutions

Interviews:

The questionnaire for the interviews was too long and the provided format could have better been used as a questionnaire for people to fill in by themselves. In some cases, the questions in the interviews were very narrowly formulated. It would be easier to use only open questions for a good exchange.

Focus groups:

As described above, it was sometimes difficult to recruit sufficient participants, particularly in the focus groups.

Possible reasons for lower participation levels could be that the topic of CCAM currently offers too few real points of contact in Hamburg, so that the participants are not directly affected by it. When advertising the focus groups, the focus was always on citizens helping to shape the future of transport. In addition, the range of civic events, activities and participation formats in Hamburg is very large, which limits the resources of citizens, to take part in such activities.

Therefore, the strategy was to invite citizens to the focus groups through specific contacts, topics related to autonomous driving or mobility in Hamburg or points of contact, e.g. during lunchbreaks. The goal was to set the barriers for participation as low as possible. This also ensured that interested people could register for the appointments via various channels.

Regarding data privacy, in most cases, there were no concerns about participating in the different participation formats. In the "65+" focus group, there were concerns about data security with the audio recording. In this case, the process of data collection, storage and documentation was described more in more detail.

When conducting focus groups in other projects, care should be taken to link the focus groups to specific projects or activities. It would also be helpful if the content of the focus groups were very specific and the participants had points of contact with them in their everyday lives, for example.

It would also be helpful to work together with other projects that are related to the topic of research. This was the aim of the GoI, but the timelines did not coincide with a suitable project, so it was not possible to carry out joint participation activities.

In order to motivate people to take part in the participation formats, it is important to provide incentives, e.g. through cash vouchers or non-cash prizes.

4.1.5 Impact and outcomes

SINFONICA offered several associations and organisations the opportunity to explicitly present their views and to be heard. In addition, the colleagues of the Hamburg team were made aware of the concerns of the different groups of people.

The focus groups offered a good opportunity to inform citizens about the topic of CCAM and the related projects in Hamburg. At the same time, the participants were made aware of the mobility barriers and requirements of the other participants.

The workshops were a good opportunity for the participating stakeholders to network with other institutions - also across disciplines - which has already brought great added value to some stakeholders. In addition, stakeholders were made aware of the needs of different groups of people regarding mobility.

The potential for a continuous working group with associations and organisations is seen in order to jointly discuss and promote topics in the area of CCAM.

4.1.6 Collaboration and coordination

The methods for the interviews, focus groups and workshops were taken from the guidelines developed in the project. The interviews, focus groups and workshops were organised, conducted and documented by the project team itself. The team was supported by colleagues at larger events.

During the focus groups and workshops, the moderators made sure that all participants had a chance to speak and contribute. In the workshops, care was also taken to distribute the participants to the round tables in advance in order to obtain the broadest possible input.

4.2   Noord Brabant

The province of Noord-Brabant is one of the twelve provinces in the Netherlands. The province has a population of approximately 2.5 million, divided over 56 municipalities. The province is located in the south of the Netherlands and is characterized by its diverse landscapes: for example, there is a lot of nature with small villages around it, but there are also five large cities by Dutch standards. With the Brainport region around Eindhoven, it is one of the most important economic regions in the Netherlands. A hundred years ago, it started with Philips and now ASML is the major player.

The province is the public transport authority and has considerable challenges in this regard. For example, rural areas are less accessible by public transport because there are relatively few passengers and therefore the costs do not outweigh the income. That is why demand-driven public transport is being considered. In 2025, the province will start with this new concept. In this, the ambition is to ensure that sparsely populated areas also have easier access to regular public transport by bus and train.

It is possible that these smaller buses will consist of CCAM vehicles in the near future. In any case, the overall objective is to ensure that public transport in Brabant remains accessible to everyone.

4.2.1 Defining user and stakeholder groups

In addition to the five predefined groups of people with mobility challenges to be participated in the interviews (elderly people, young people, cognitively disabled people, people with gender-related vulnerabilities, digitally vulnerable people), three further groups were selected for Province Noord-Brabant: people living in rural areas, single parent families and migrants.

Migrants were selected because of their language barrier. There are few bus lines in the province who connect asylum seekers' centres with the city centres. Single parent families face more than others financial struggles for especially transport. And the people living in rural area often have less access to regular public transport. It is possible that demand-driven public transport is profitable with CCAM.

The categories for conducting the focus groups were developed by the project partners and taken over by the GoIs.

For the workshops many stakeholders could be identified from the province's network from the different departments of the Province. Also, member states and contact persons from universities of Eindhoven and Breda participate in the workshops.

4.2.2 Engagement techniques and methods

Interviews:

For the interviews, local community centres and libraries were visited to meet people who are part of one of the target groups. Most of the participants were found at these kinds of locations. Besides that, municipalities were contacted to bring get in contact with the people. Participation in the interview was made attractive by giving away a 15 euro gift voucher. For some participants it was quite a challenge to answer all the interview questions.

Focus groups:

To find participants for focus groups, social media channels were used, but also traditional local newspapers. In addition, various traveller organisations were approached to invite their members to the focus groups.

Finding participants in the various target groups was relatively easy. Only for a certain age category was it difficult to find sufficient participants. It was not possible to find a reason for this.

Reasons why it was relatively easy were that researchers had a lot of experience in organising such small-scale group meetings. In addition, the preconditions were also inviting for participants. They received a gift voucher worth 25 euros. In addition, the locations of the focus groups were linked to the target group of the meeting. For example, a meeting was held in a small rural village to approach people from the rural area. And people with a lot of access to public transport could go to a meeting near the station of Tilburg, one of the large cities of the province.

Workshops:

For the workshop, researchers exploited the various networks that the province is part of. Think of public transport, infrastructure, cycling and people's travel behaviour. But also, the national network of CCAM in which the province is a partner. Furthermore, various universities were invited from the province that are involved with CCAM, vulnerable target groups and accessibility of public transport. Other traveller organisations were also present, as were developers. Finally, several member states were also invited to this meeting. After all, they make decisions for provincial public transport. It was good to involve them from the start.

It was quite easy to find participants for the workshops. This meant that the turnout for all three workshops was good. It was difficult to attract all participants for all three workshops. This was because workshops were organised in a relatively short period of time.

Bringing together the various stakeholders was very valuable. This allowed them to exchange knowledge and get to know each other.

4.2.3 Communication and awareness

The focus was on sharing experiences in current public transport and how accessible it is. In addition, researchers showed to the participants videos of what CCAM means for public transport. In this way, participants could imagine what changes in public transport are, and how it could possibly change their journey. They could then share what necessary adjustments to CCAM vehicles are needed to be able to continue travelling by public transport. It was also made clear that it is important for the project to receive as many suggestions and feedback as possible.

Educational tools and campaigns implemented to raise public awareness on the topic of SINFONICA:

- Interviews with young people: presentation on CCAM and related activities and projects in Hamburg at schools.
- Focus groups: short presentation on SINFONICA and CCAM in Hamburg in the beginning of the focus groups.
- Citizens: public presentations at events related to mobility or Europe.
- Workshops: knowledge transfer through keynote speeches on various topics (autonomous driving, CCAM projects in Hamburg, barriers in mobility etc.).

4.2.4 Challenges and solutions

Interviews:

The questionnaire for the interviews was too long and the provided format could have better been used as a questionnaire for people to fill in by themselves. In some cases, the questions in the

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interviews were very narrowly formulated. It would be easier to use only open questions for a good exchange, but that was not an option because it was necessary to work through Excel so that an overall analysis had to be performed.

Focus groups:

As described above, it was sometimes difficult to recruit sufficient participants, particularly in the focus groups about the different age groups. Furthermore, it was sometimes difficult to give all participants an equal say: one participant found it more difficult to talk about something unknown than the other.

It was also difficult to write the conversation reports in an Excel format. This was because each focus group had its own dimension. This had to do with the composition of the group, each participant had their own input from their own expertise. A lot of valuable data was lost because the Excel format was mandatory.

Workshops:

It was also difficult to report well for the workshops. Especially because round table discussions were used for some components. It was not always possible to write down everything. Furthermore, the period in which the three workshops took place was relatively short. As a result, it was not possible for all participants to attend all three workshops due to the agenda.

4.2.5 Impact and outcomes

The three forms of participation of vulnerable target groups made it possible to collect input from many different angles for future policy regarding CCAM in public transport. With this input, the province of Noord-Brabant can future-proof its accessibility policy regarding public transport. It is possible to draw up requirements for carriers and municipalities when CCAM actually makes its entrance in public transport.

In addition, a great community with the workshops was set up thanks to the activity implemented in SINFONICA. It was agreed to meet twice more in the coming year. This is to discuss developments in the SINFONICA project and also other developments in the field of CCAM.

4.2.6 Collaboration and coordination

The methods for the interviews, focus groups and workshops were taken from the guidelines developed in the project. The interviews, focus groups and workshops were organised, conducted and documented by the project team itself.

During the focus groups and workshops, the moderators made sure that all participants had a chance to speak and contribute. In the workshops, care was also taken to distribute the participants to the round tables in advance in order to obtain the broadest possible input.

4.3   Trikala

The city of Trikala is located in central Greece, Thessaly and hosts a population of approx. 81,000 inhabitants: 75% of the are living in urban areas and the rest of them on suburban and rural areas.

Trikala is one of the Climate Neutral and Smart Cities until 2030 mission cities and is also in the process of redesigning its mobility systems and services. Over the last decade the city has been a test bed for sustainable mobility services, piloting driverless automated vehicles, electric vehicles, drones and mobility apps under realistic conditions.

To accomplish successful implementation of these projects, the support of the local stakeholders and citizens has been crucial (the city created a very active mobility community by using an early engagement and participatory methodology). What is more, the close collaboration with the Greek Ministry of Transport and other authorities was essential. The problem in Trikala is that the rural sites are underserved by public transport. As a result, mobility largely depends on individual car use, with circa 50,000 car owners currently being registered in the municipality. This has a negative impact on the environment, causes severe traffic congestion in the city centre and has a social impact for people who cannot afford to use their car daily or do not own a car. The last few years there has been an effort to provide to the citizens alternative and sustainable mobility solutions that allows them to use bicycles instead of their private cars and combine different public transportation services more efficiently.

4.3.1 Defining user and stakeholder groups

During the SINFONICA project Trikala's Group of Interest applied the SINFONICA engagement strategy in order to examine issues such as transport habits, use of technology in transport, motivations behind transport choices, special mobility needs, knowledge/experience of CCAM and future expectations for transport, citizens' attitudes towards connected, automated transport (CCAM), the different levels of automation they would like as well as the priorities & features they would choose for transport services in general

In following engagement activities were conducted in Trikala:

- 70 interviews: 3 rounds of interviews in 9 categories of vulnerable people;
- 9 focus groups with 50 participants in total: 4 focus groups of different age group, 3 focus groups of different income and 2 focus groups of rural and urban area citizens;
- 3 different workshops with stakeholders such as, public transport operators, mobility providers, transport authorities, road authorities, municipality authorities, IT solution providers, driver's associations, cyclists, NGOs etc;
- An online survey that gathered 508 responses from citizens of Trikala and Greece in general.

The Trikala team along with the rest of the SINFONICA Consortium had many discussions and meetings in order to decide the groups of interest. In other words, the group of people who are considered vulnerable and opinion and perspective should be documented via the participatory activities.

As already mentioned, the city already has a very active mobility community due to the previous projects.

Taking into consideration our previous expertise we choose the following groups in order to:

- Invest on the existing mobility community;

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- Focus on those that face the biggest challenges in every day transportation;
- Include differentiated population groups and, in particular, people with reduced perception and mobility in the planning, design and decision making;
- Explore their real needs, worries, challenges and ambitions.

The groups of interest chosen were:

- Elderly;
- mobility challenged citizens;
- digitally vulnerable;
- women;
- young people (18-25);
- residents of rural areas;
- university students.

During all 3 rounds of interviews, an equal number of interviews was conducted for each category and during the focus groups it was ensured that women and men were equally represented. During the online survey, the dedicated partner circulated weekly reports with the survey's quotas, allowing the partner E-Trikala to adjust along the way the dissemination and promotion activities to reach out all Groups of Interest.

4.3.2 Engagement techniques and methods

Depending on the participatory activity and the specific category targeted, different approaching techniques were implemented. Several recruitment methods were considered for the application of the SINFONICA engagement strategy. During the interviews and the focus groups, to reach each group was selected the most convenient and practical way possible. Here are some examples:

- most of the elderly and digitally vulnerable citizens were recruited at the local daily elderly centres and the interviews were conducted either there or at their homes.
- for the young people, we collaborated with the local youth council, that helped us recruit citizens from the age of 18 to 25.
- For the rural area residents, we reached out to them via the local chairman and conducted the interviews in their homes.
- For people with mobility issues, we collaborated with the local NGO and conducted the interviews mostly in their homes.
- For university students we collaborated with the local university and conducted most of the interviews at the Mill of Matsopoulos, where the control room of the automated shuttle is located. This automated vehicle is a part of another EU projects and supports students with daily routes to/from the university. Therefore, it was easier to engage the students, let alone document their opinion on CCAM services
- For women, there were no restrictions in terms of age or area of living, therefore it was easier to recruit them via an open call to our local network.

For the workshop, the objective was to have the biggest impact possible and invite all the key stakeholders. Therefore, the workshop was organised as a joined event with similar projects or activities:

- For the first workshop, titled "Critical Analysis of the mobility of the present: Discussing the findings of the focus groups and the semi- structured interviews". Taking into consideration that this was the first and therefore introductory workshop to the local stakeholders, the focus was on introducing the SINFONICA methodology and present some of the major outcomes of the first round of interviews and focus groups. Considering that: 1) Trikala is a part of the Intelligence Cities Challenge, 2) is a member of the 100 Climate neutral and smart cities by 2030 inititiative and 3) is under a digital reformation (mobility services included) via the City's Restart My City Strategic Plan, it was decided to add these initiatives as a part of this workshop in order to give to the stakeholders attending a more complete idea on the city mobility challenges and vision and how this can me reflected on SINFONICA's focus groups and interviews.

- The second workshop, titled "How can technology help address mobility challenges? Expectations, desires and concerns in the era of advanced digital and autonomous transportation" took place on the 28 of June in the Mill of Matsopoulos. It was a joined event with another project on sustainable mobility where Trikala is a pilot city, called IN2CCAM[1]. The meeting started with IN2CCAM, where sustainable mobility was thoroughly presented along with SMARTA 2 app, that provides CCAM services to the city and continued with SINFONICA and the results of the interviews and focus groups along with 2 interactive sessions.

- The third workshop will take place 9 of September 2024 as a part of the biggest yet event on automated mobility. During 9 and 10 of September the final event of SHOW project[2] will take place in Trikala and will attract not only local stakeholders but also representatives from the Ministry of Transport and Ministry of Digital Governance as well as universities, IT companies and automated mobility manufacturers. Therefore, it was decided to conduct the third workshop as a joined event with SHOW in order to have a bigger impact and visibility.

Trikala's GoI also disseminated the online survey (see par. 4.5) via the municipality's social media channels and website, local media and nationwide sites. A promo video was also produced and widely disseminated. Furthermore, the online survey was promoted via email to the institutional network and among universities throughout the country. As far as elderly people were concerned there was the risk that the social media posts and email would not reach them. For this reason, it was decided to conduct regular visits at the elderly centres, informing the elderly and assisting them in filling in the survey.

4.3.3 Communication and awareness

Trikala's communication strategy used to reach out people during SINFONICA participatory activities has been explained above. Depending on the participatory activity and the targeted category of users, different approaches and techniques were adopted.

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[1] https://in2ccam.eu
[2] http://show-project.eu
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During the interviews and focus groups there were of course few people that had concerns or were reluctant to take part. Dedicated personnel spend some time with them, addressing these worries and analysing the importance of documenting their opinion.

Lastly, Trikala conducted a number of activities to promote SINFONICA and raise awareness. Apart from dedicated articles on the projects site and other press releases, SINFONICA project was also disseminated via two conferences:

- During the Annual Conference "Trikala 2030" that took place in Trikala (April 2023);
- During the Annual conference of Major Cities of Europe, that took place in Prato, Italy (October 2023).

4.3.4 Challenges and solutions

One of the biggest challenges faced during the first round of interviews and focus groups was time allocation. The number of interviews and focus groups was high and needed to take place in a specific timeframe, which made it challenging. What is more, due to an outside factor (Trikala experienced a catastrophic flood in September 2023, that left the city in a bad shape with many areas both urban and rural unreachable or even uninhabitable) it was necessary to postpone the first round for a couple of weeks. However, activating Trikala's mobility community, the goal was reached, and the first round was completed successfully.

Another challenge has been the difficulty in reaching out elderly for the online survey via online press releases. This difficulty was overcome by conducting regular visits on the elderly centres, informing the elderly in person and having the personnel assisting them in filling in the survey.

4.3.5 Impact and outcomes

Engaging citizens through interviews, focus groups and workshops to discuss about CCAM and sustainable mobility lead to several positive outcomes:

- Activate and empower the existing mobility community in Trikala by offering the opportunity to express their opinion, worries and needs and therefore enhance user acceptance for any future mobility service;
- Allowed to come one step closer to designing inclusive mobility solutions by taking into consideration the diverse needs of all citizens, including those with disabilities or those living in remote areas;
- By communicating the interviews and focus groups data to the authorities and stakeholders via the workshops, it was possible to highlight the importance of making transport more affordable, safe, inclusive, and sustainable;
- At the same time, engagement activities supported Policy Development by informing policymakers about public opinion and concerns, that will lead to more effective and supported mobility policies.

4.3.6 Collaboration and coordination

For the interviews, one person conducting the interview and reporting the answers was adequate. More than half of the interviews were also recorded, allowing to review the answers.

For the focus groups, 2 people facilitated the procedures. One person was conducting the focus group, and the other was taking notes. In addition, the sessions were also recorded, in order to go back and see if anything was missed.

For the workshops, there were always 4 people facilitating the process. One to conduct the workshop, make the presentations and introduce the interactive sessions and 3 more to conduct, monitor and report. The coordination of the procedure was organised in 3 practises:

- Clear role assignment of each member, including recruiters, interviewers, and moderators. That helped in managing the flow of the workshop;
- Always be ready to adapt the agenda or activities as needed to keep the participants engaged and on track;
- The final report of the workshop, was reviewed by all, ensuring that everyone was aligned on the outcomes.

4.4 West Midlands

The West Midlands is a county within the larger West Midlands region, made up of seven local authorities: Birmingham, Coventry, Dudley, Sandwell, Solihull, Walsall, and Wolverhampton. The area is governed by these seven local authorities and the West Midlands Combined Authority which allows for collaboration across the county. With a population of 2.9 million, the county is the second most populous after Greater London and just ahead of Greater Manchester.

Many international companies have their headquarters based in the county, especially those linked to the automotive industry. For example, Jaguar Land Rover operate their corporate HQ, a research facility and two vehicle assembly plants. In turn many suppliers, not only for automotive, have their UK operations based in the county and this is supported by 10 universities, 7 general and 3 specialists. Another supporting feature are the various transport links that include an international airport, rail links (including HS2 when complete), and multiple motorways and main trunk roads. Transport within the county is covered by Transport for West Midlands (TfWM) who operate West Midland Metro along with working with bus operators on bus services and management of the Key Route Network.

The West Midlands faces significant transport challenges including congestion, air pollution, and public transport reliability. The region's growing population and economy exacerbate these issues, demanding innovative solutions. Self-driving vehicles offer potential benefits. By optimising traffic flow and reducing accidents, they could alleviate congestion. Their electric powertrains would contribute to cleaner air quality. Moreover, autonomous vehicles could expand mobility options, particularly for those unable to drive, and improve public transport efficiency through autonomous bus fleets. However, challenges remain. Infrastructure needs adaptation, regulations must be established, and public acceptance fostered. Despite these hurdles, the potential advantages of self-driving vehicles make them a promising component of the West Midlands' transport future.

4.4.1 Defining user and stakeholder groups

During the SINFONICA project, TfWM conducted interviews, focus groups, workshops and supported an online survey. This was carried out to examine issues such as transport habits, use of technology in transport, motivations behind transport choices, special mobility needs, knowledge/experience of CCAM and future expectations for transport, citizens' attitudes towards CCAM, and their familiarity of the technology in the UK and Europe.

TfWM conducted:

- 70 Interviews: 3 rounds of interviews in 9 categories of vulnerable people;
- 9 Focus groups with 70 participants in total: 4 focus groups of different age group, 3 focus groups of different income and 2 focus groups of rural and urban area citizens;
- 3 different workshops with stakeholders such as, public transport operators, technology providers, local authorities, Mobility Associations, consultancies, Universities, research groups etc;
- An online survey that gathered 521 responses from residents in the West Midlands.

Transport for West Midlands worked with the rest of the SINFONICA consortium and had various discussions regarding the decision of the Groups of Interest. For this project the Groups of Interest are those that are considered vulnerable and their opinions and perspective should be documented via the participatory activities.

The groups of interest selected for West Midlands were:

- elderly;
- digitally vulnerable;
- women;
- young people (18-25);
- People on low income;
- People with physical disabilities.

During the three rounds of interviews, TfWM conducted an equal number of interviews for each category and during the focus groups it was ensured that women and men were equally represented. During the online survey, weekly reports were issued from the dedicated partner with the survey quotas, allowing TfWM to adjust along the way the dissemination and promotion activities to reach out all Groups of Interest.

4.4.2 Engagement techniques and methods

The methodology behind recruitment of participants for the interviews and focus groups centred around TfWM and their market research partner Mustard Research who manage their TfWM's online community (Keep West Midland Moving!) and also TfWM's databases of West Midlands residents willing to take part in market research activities. The first attempt at recruitment has been made via the Keep West Midland Moving! (KWMM!) Market Research Online Community (MROC).

Any supplementary participants could be recruited by TfWM using their database contacts.

The only Group of Interest that proved challenging to recruit was the digitally vulnerable. With this group participants were reached out to via letter or either arranging a telephone interview or inviting them into TfWMs offices, paying for their travel to and from the office. Recruitment remained challenging so TfWM and Mustard conducted face to face interviews at Wolverhampton Bus Station, where an on-site office was set to be used for interviews: this method proved successful as it was possible to recruit 5 target respondents. The final two participants were interviewed in-home.

For the workshops TfWM used its existing network of organisation involved in CCAM and public transport. As members of the team sit on a number of national committees and groups, they have been raising awareness of the SINFONICA project which gained a lot of traction. As many organisations were interested in either getting involved or staying informed with the project it made recruitment for the workshop simpler and ultimately, TfWM was oversubscribed with organisations wanting to be involved.

4.4.3   Communication and awareness

Communication of the project to potential participants was made via an email bulletin to members of the MROC, this bulletin informed members that TfWM were looking for participants for interviews and focus groups regarding their perceptions on CCAM. The email also contained a paragraph of information on what CCAM is and linked it to projects that are ongoing in the West Midlands.

During the interviews, the research team used the provided guidance and supplemented that with information that the team had written in regard to what was happening in the UK and the region with CCAM.

It was possible to reuse this information for the focus groups, however, as many at the Stakeholder workshops were familiar with CCAM the team used examples of Horizon Europe projects to make the participants aware of what SINFONICA is trying to achieve.

4.4.4   Challenges and solutions

Whilst much of the participatory approach ran smoothly, TfWM did face some challenges. One challenge, as illustrated above, was recruiting the digitally vulnerable. It was already established that this group would be the hardest to reach via conventional methods, however, as TfWM own and manage the bus stations in the region, it was possible to use the facility to recruit members of that cohort.

Another challenge faced was with encouraging people to complete the online survey. Originally, TfWM returned to its database, however, consistent requests to the community had exhausted them with the subject of CCAM. To reach our quota the team wrote to the organisation's Marketing & Communications team requesting the link to the online survey to be published in the company newsletter. They also asked that colleagues passed the link on to their friends and family which enabled to reach and surpass the target.

4.4.5   Impact and outcomes

The overall impact for the TfWM Group of Interest of the SINFONICA project has been positive. It has enabled TfWM to engage with the region's residents on the subject of CCAM. It was discovered that CCAM has been a polarising subject and the team found that opinions are divided along generational lines with the older generations generally more averse and the younger generations more open to the idea. However, with SINFONICA's focus being on people with mobility challenges this has given a voice to those that are not normally considered and how CCAM will benefit those that have mobility challenges.

SINFONICA has also had a major impact on how TfWM approach CCAM projects, and also given the personnel the ability to lobby other organisations on adopting the same attitude with their initiatives and schemes. TfWM have also been able to build out from the information collected as part of this project and inform its policy teams on future policy developments. TfWM is also able to advise local authorities, universities and research organisations and reinforce this advice with the data.

4.4.6   Collaboration and coordination

TfWMs approach to collaboration and coordination were based upon the guidelines issued beforehand. As TfWM were assisted by a partner organisation in Mustard, there was one member of each team on each interview with one member asking questions and the other taking notes and adding supporting information.

For the focus groups and stakeholder workshops, two members of the TfWM team were present, one to moderate and one to encourage participation. A member of Mustards team was also present to take notes for these sessions.

4.5   The European SINFONICA Survey

For the SINFONICA project, an EU wide online survey was developed and conducted (see milestone report 12 by TUD). The survey was intended to analyse user factors that affect people's attitude towards and use of CCAM as part of their future mobility. It was aimed to reach at least 500 participants per research site (Hamburg, Noord Brabant, Trikala, West Midlands).

Being online from 15/03/2024 until 07/06/2024, the survey collected data of 4472 participants. As the response rates were initially insufficient and the commissioning of survey panel service providers (Respondi) took longer than planned, the survey period was extended from the planned 4 weeks to 12 weeks.
After initialising the survey, TUD provided weekly feedback on the response rates and reached quotas of gender and age in comparison to the country level statistics. These reports were given 12 times to all project partners.

To engage citizens to participate the online survey, the following recommendations and tips were given before launching of the survey:

1. **Utilise existing subject pools/ mailing lists.**
2. **Utilise social media platforms:** Share the survey link across various social media channels such as Facebook, Twitter, LinkedIn, and Instagram to reach a wider audience. Please write motivational messages (...to shape future transport) and advertise the options for incentives/lottery.
3. **Engage with community influencers:** Collaborate with local influencers or community leaders who can help promote the survey to their followers or members.
4. **Email newsletters:** Send newsletters to community members, subscribers, stakeholders, or organizations within the municipality's network, inviting them to participate in the survey.
5. **Utilise the municipal website:** Place a prominent banner or link on the municipality's official website directing visitors to the survey page.
6. **Partner with local businesses or organisations:** Collaborate with local businesses, schools, or community organisations to share the survey link with their customers, students, or members.
7. **Targeted advertising:** Invest in online advertising through platforms like Instagram / TikTok Ads, ensuring the survey reaches individuals within the municipality's demographic and geographic target audience.
8. **Collaborate with neighbouring municipalities:** Extend the survey's reach by partnering with neighbouring cities to share resources and promote the survey to a larger audience.
9. **Utilize online forums and communities:** Share the survey link on relevant online forums, community groups, or discussion boards where municipality members may be active.
10. **Leverage local media:** Reach out to local newspapers, radio stations, or online news outlets to request coverage or inclusion of the survey in their publications or broadcasts.

The research site partners stepped up their activities to increase the number of questionnaire participants. The single activities are reported in milestone report 12. A summary of the activities is given here:

- All partners used social media (Instagram, LinkedIn, Facebook) to promote the survey. The official SINFONICA LinkedIn account being administered by RE:LAB has done a particularly good job in reposting. In addition, a blog post was written especially to promote the survey on the official SINFONICA project website, which was also promoted through social media.
- The partners UNIMORE, Noord-Brabant and Transport for West Midlands used panel lists and participant databases to contact potential participants. TUD used universities e-mail lists of employees and students.
- The partner e-Trikala used face-to-face interviews in retirement homes to survey elderly persons. In addition, they used local TV spots and promotions on local media sites as well as the municipalities website
- The partner FHH contacted several stakeholder groups and did distribute additional physical flyers to libraries, universities and public locations. The municipalities website was also used to promote the survey.
- Several partners used newsletters and contacted companies to distribute the link to the online survey.

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5. Lessons learnt and recommendations for future research activities

Based on the experiences and findings documented in the previous chapter, the following lessons learnt and recommendations are proposed to enhance future research activities and engagement strategies for Cooperative Connected and Automated Mobility (CCAM) solutions.

Table 3 - Lesson learnt and recommendation for future research activities focused on CCAM

Lessons learnt from the implementation of the SINFONICA engagement strategy	
Importance of Qualified Personnel	The success of engagement activities largely depends on the qualifications and experience of the personnel involved. Engagement activities are more effective when conducted by individuals with a background in social sciences and experience in managing group dynamics.
Effective Communication Patterns	Establishing clear and effective communication patterns at the beginning of engagement activities is crucial. Clear communication helps participants understand the purpose of the study, their role, and ensures they feel their privacy and confidentiality are respected. These builds trust and encourages honest feedback.
Diverse Representation in Engagement Activities	It is important to ensure all Groups of Interest are equally represented. A diverse group of participants provides a comprehensive understanding of different perspectives. This includes, for example, considering various demographics such as age, gender, socioeconomic status, and geographic location.
Flexibility and Adaptability in Engagement Methods	Engagement methods should be flexible and adaptable to the needs of participants Moderators should be open to adjusting the format of focus groups or interviews to make participants more comfortable and willing to share their honest opinions.
Building Trust and Interaction	Building a trusting and interactive experience is essential for successful engagement. Additionally, educating youth about CCAM can foster a culture of innovation and responsibility towards sustainable mobility practices. Moderators should be polite, unbiased, open, and empathetic to make participants feel safe and valued.
Tailored Settings for Different Participant Groups	The setting of engagement activities should be adjusted according to the characteristics of the participants. For example, elderly participants might feel more comfortable in familiar and accessible locations.
Managing Group Dynamics	Identifying and managing group dynamics is crucial, especially in group activities. Moderators need to create conditions that allow all participants to express their opinions equally and manage dominant personalities effectively.
Centralised Coordination for Better Resource Utilisation	Centralised coordination of engagement activities can improve resource utilisation and efficiency. For example, centralising requests for interviews and cooperation with associations can help reduce the burden on these organisations and streamline the process.

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Recommendations are proposed to enhance future research activities and engagement strategies for CCAM solutions	
Invest in Skilled Moderators	Future projects should invest in moderators with social science backgrounds and experience in group management to enhance the quality of engagement activities.
Establish Clear Communication Channels	Spend time at the beginning of each engagement activity to establish clear and effective communication patterns, ensuring participants understand their role and the study's purpose.
Ensure Diverse Participation	Actively work to include a diverse range of participants in terms of demographics and socio-economic backgrounds to capture a wide array of perspectives.
Foster a Trusting Environment	Create a safe and trusting environment by being polite, unbiased, open, and empathetic, which encourages honest and open participation.
Customise Settings for Participant Comfort	Choose settings for engagement activities that are familiar and comfortable for specific participant groups, such as elderly individuals.
Effectively Manage Group Dynamics	Develop strategies to manage group dynamics effectively, ensuring all voices are heard and dominant participants do not overshadow others.
Centralise Coordination Efforts	Consider centralising the coordination of engagement activities to improve efficiency and reduce the burden on partner organisations and associations.
Develop a Pool of Interested Participants	Establish and maintain a pool of citizens interested in mobility issues who can be repeatedly asked for their input in future research activities.
Collaborate with Local Organisations	Enhance cooperation with local associations, clubs, and community organisations to streamline engagement efforts and reduce duplicated requests.

The lessons learnt and recommendations outlined in this chapter provide a comprehensive guide to improving engagement strategies in future CCAM projects. These lessons learnt emphasise the importance of the role of moderators, who need to be sufficiently competent to ensure effective engagement and, at the same time, better direct research activities. Another important factor in social engagement in research projects is communication: information must be provided to the users involved in a clear, intuitive and direct manner, in order to build trust and foster honest feedback among participants. A focus on heterogeneous representation of participant ensures that a wide range of perspectives are taken into account, making the results more inclusive and reflective of real-world scenarios. The recommendation of flexibility in engagement and recruitment methods and customised settings allows for the different needs of various participant groups to be respected, thus enhancing the effectiveness of the engagement process. In addition, having centralised coordination helps to bring together a pool of interested participants and encourages the development of pragmatic approach to streamline activities and optimise resources and data

collected. Taken together, these lesson and recommendation highlight the critical role of thoughtful and adaptive engagement strategies in the development of socially inclusive and technically sound CCAM solutions. By integrating these lessons learned and recommendations, future CCAM projects can improve their engagement strategies, ensuring more inclusive, effective, and efficient research outcomes.

6. Conclusions

The SINFONICA project has made significant strides in advancing the field of Cooperative Connected and Automated Mobility (CCAM) by prioritising inclusive and participatory engagement strategies. Through the project's various activities, several key conclusions have been drawn that highlight the importance of social engagement and the effectiveness of the methodologies employed. SINFONICA has demonstrated the profound impact that well-planned and inclusive engagement strategies can have on the development of CCAM solutions. By prioritising the involvement of diverse stakeholder and user groups, and leveraging modern digital tools, the project has set a new standard for engagement in mobility research. These strategies not only enhance the relevance and acceptance of CCAM technologies, but also ensure that the solutions developed are equitable and responsive to the needs of all users.

This document aims to be a comprehensive report on the approaches and methodology chosen to structure the engagement strategy in SINFONICA, as well as on the activities implemented in order to best realise this strategy, with the objective of implementing an effective and consistent engagement of users, stakeholders and citizens in research activities. If positively implemented, a well-structured engagement strategy can foster a spillover from the different sectors involved in research projects, to bring the outcomes as close as possible to civil society and meet the societal needs. On the basis of these assumptions, the lessons and recommendations collected in this document provide a valuable framework for future research and innovation projects aiming to create more inclusive and effective mobility solutions.

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For more information

SINFONICA Project Coordinator

UNIMORE – University of Modena and Reggio Emilia

Via Giovanni Amendola, 2

42122 Reggio Emilia, IT

sinfonica@sinfonica.eu

www.sinfonica.eu

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