D 7.4

Exploitation plans - First update

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ABBREVIATIONS AND ACRONYMS

Abbreviation	Meaning
C-ITS	Connected-Intelligent Transport System
CAV	Connected and Autonomous Vehicle
CCAM	Cooperative, connected and automated mobility
GLOSA	Green Light Optimal Speed Advisory
KER	Key Exploitable Result
KPI	Key Performance Indicator
LL	Living Lab
OBU	On-Board Units
RSU	Road Side Units
WP	Work Package

1 EXECUTIVE SUMMARY

This deliverable presents the ex-ante / in-itinere exploitation strategy and the initiatives carried out in the first half of the IN2CCAM project's life cycle, a ground-breaking initiative aiming to advance the deployment of Connected Cooperative and Automated Mobility systems across Europe. This first set of conducted actions and their related analysis will set the basis for the final exploitation update in which a comparison between ex-ante, in-itinere and ex-post results will be developed to reach the ultimate goal of the exploitation task.

Exploitation, indeed, is meant as a strategy to make concrete use of the project results aiming at creating social, economic, and environmental benefits. It involves transforming research outcomes into practical applications, innovations, or policy recommendations that can be implemented, shared, and scaled to address societal needs. The main scope of the exploitation is to evolve the IN2CCAM project's results into a solution beyond the lifecycle of the project. To achieve this goal, several activities will be carried in every phase of the project. Each of these tasks, whether ex ante, in-itinere or ex-post, will serve to engage external stakeholder and to make concrete use of the experimentation outcomes.

The first steps of the exploitation strategy consisted in conducting an expected outcomes analysis, to concrete understand all the cities' participating expectation, concerns and hopes related to project results. Furthermore, the survey also served to lay the foundation for the next steps, which was to conduct an analysis of the market context. The main topics of this analysis were indeed identified in the most common answers highlighted from all Living Labs.

The final step was to conduct the first of the two scheduled exploitation workshops. These meetings aim at creating dialogue, collaboration and confrontation between cities. Also, in this case, the subjects laid the foundations on the expected outcomes survey.

2 INTRODUCTION

2.1 Project description

IN2CCAM (Enhancing Integration and Interoperability of the CCAM eco-system) is an Innovation Action funded by the European Commission's Horizon Europe 2021-2027 Programme that aims to accelerate the implementation and uptake of innovative CCAM (Connected Cooperative and Automated Mobility) technologies and systems for passengers and goods.

The goal is to provide benefits to all citizens by implementing a full integration of CCAM services in the transport system. The main expected positive impacts for society are: i) safety; ii) environment; iii) inclusiveness. To fulfil these objectives, IN2CCAM relies on the implementation and integration of enhanced physical, digital, and operational infrastructures to enrich CCAM services and enhance safety and traffic efficiency in 4 lead Living Labs (LL's), namely Tampere (Finland), Trikala (Greece), Turin (Italy) and Vigo (Spain); two follower LL's (i.e., Bari (Italy) and Quadrilátero (Portugal)) will also be assisting the design and validation processes with novel approaches and data assessed using simulation tests.

Within IN2CCAM, Work Package (WP) 7 aims to disseminate and communicate the project objectives, technology and results to industry stakeholders, public authorities, the scientific community and end-users. A particular focus will be finding ways to engage the new generation in the project and its goals. The dissemination and communications efforts will support the technical work to widely promote the innovation aspect of IN2CCAM and EU activities in this area as well as to pave the way for the commercial exploitation of the solutions developed and validated within the project. Within WP7, Task 7.4 "Citizens, user engagement and exploitation" will provide the consortium with a framework to effectively exploit the knowledge, methodologies, and solutions to be developed and tested, beyond the project lifetime. Exploitation is intended both as progress of the overall European research community and as commercialisation of new products, services, and solutions.

2.2 Purpose of the deliverable

This deliverable outlines the strategic approach for exploiting the project's outcomes, focusing on understanding the current market potential, addressing the needs of the involved stakeholders, and the expected outcomes of the six cities regarding the resources needed, potential risks and barriers and actions required to exploit them beyond the project lifetime.

Furthermore, this document will catalogue the technologies and solutions developed within the project, assessing their expected impact and the factors that could influence or hinder their exploitation, including individual motivations and technology acceptance.

This Deliverable sets its basis on the European Commission definition of exploitation: “The use of results in developing, creating and marketing or improving a product or process, or in creating and providing a service in standardisation activities or shaping a policy. Exploitation focuses on the actual use of the results, translating research concepts into concrete solutions that have a positive impact on the public's quality of life.” Hence, scope of this Deliverable is to lead the project consortium to not only reach sites’ results, but also to look forward to profit upon these results to achieve social and economic impacts. In the applied exploitation methodology, before involving external stakeholders, it is considered to be pivotal to have an exchange of expectation and practices among lead & follower LLs.

2.3 Intended audience

This deliverable aims at providing the strategy concepts to multiple actors of the project’s value chain. Initially, the consortium's contributions ranging from actions to insights and feedback played a pivotal role in shaping our strategic direction. Hence, the lead and follower LL municipalities will take advantage of the strategy here defined to exploit the results and to conduct the improvement in the awareness of the testing. Lastly, the external stakeholders and market actors that may be interested in the Key Exploitable Results (KERs) defined and the actions foreseen in order to join the IN2CCAM community.

2.4 Structure of the deliverable and its relationship with other work packages

This deliverable integrates insights from multiple work packages (WPs), specifically drawing on Task 1.2: “Technical coordination and innovation management”, Task 2.1: “Social aspects and a priori users’ concerns, needs and expectations”, Task 2.2: “Requirements of communication, road infrastructure, safety and interoperability of the CCAM ecosystem” and Task 2.3 “Existing governance models of the traffic management system” helped in the identification of how the innovations developed in the project framework will be managed; also, helped in the first definition of the KER’s and in the definition of the key points to investigate on during the survey/workshops.

This deliverable is structured upon the basis that will be outlined in the Applied Methodology chapter: this core part will initially define the base around which the exploitation actions will be scheduled, in the ex-ante Expected Outcomes Survey. Subsequently, the core part of the methodology will be the analysis of the market context of the Connected-Intelligent Transport Systems (C-ITS) identified in the survey and from the inputs deriving from other WPs and Tasks. In the conclusion of this first update of the exploitation, a first out of two online exploitation workshops has been conducted to openly discuss and to create a collaborative dialogue between cities representatives.

3 APPLIED METHODOLOGY FOR EXPLOITATION

The methodology defined will first aim at developing an exploitation strategy to define the framework and to outline the required actions to drive market adoption and further utilisation of the project results. In the first 18 months, it is structured around three main steps:

- Conducting an ex-ante Expected Outcome Survey.
- Analysing the current market status, based upon the fragments of interest deriving from the survey.
- To start a dialogue between the cities' representatives in the first of the two online workshops.

In the second project period, the methodology will also follow the subsequent actions:

- To identify key stakeholders, both public and private, to be considered or liaise with, defining their roles and potential benefits. TTS will
- To identify a set of potential risks and blockers to be considered for adoption of the proposed solutions.

The main scope of the exploitation is to evolve the IN2CCAM project's results into a solution beyond the lifecycle of the project. To achieve this goal, in-itinere and ex-ante activities' results will be adopted as a starting point to engage stakeholders and to start an empathic change in the governance and business models. The market analysis, for example, will be conducted upon the most specific topics that will emerge from the expected outcomes survey. The market results will be shown as an opportunity for exploitation. The social awareness event, namely ideas generation workshops, are an ongoing process that lead/follower LLs are scheduling throughout the second period of the project. The Task 7.4 will analyse the events results to define an ex-post exploitation strategy, to assess replicability; the aim is the exploit these outcomes to evolve them through time.

Another key aspect that the methodology will consider is the efficiency of communication and dissemination, to increase the public awareness about the project deliverables and results and to provide the participants with accurate and reliable information.

To boost the above-mentioned aspect, a key point will be to identify and categorise the possible exploiter into target groups. The identification of target users is crucial to successful exploitation. Following the identification of target users, the consortium will need to keep them successfully engaged in order to keep them informed and interested in the project developments.

To better exploit the project results, three main indicators were identified that are formally called Key Exploitable Results (KERs). A KER is an identified main interesting result, which

has been selected and prioritized due to its high potential to be “exploited”, meaning to make use and derive benefits and act as an important input to policy, further research or education. Identification of the key exploitable results also aids the Replicability and future Business plans/model’s identification (European Commission - Horizon Results Platform).

In the frame of the IN2CCAM project, the identified KERs are:

- Impact to society acceptance
- Technological Innovativeness
- Potential to influence policy making.

The above three main topics are strictly related to the implementation of the Connected and Autonomous Vehicle (CAVs) in every day’s life.

The aim of the workshops is to identify the commercialisation potential of the project results, considering also European and global market trends. The market potential will be evaluated during the whole project duration.

TTS will use its contacts to promote the project’s activities and results both within their memberships and vis-à-vis external stakeholders with the goal of unifying the ecosystem around CCAM services to attain seamless sustainable mobility. By creating synergies with other EC-funded projects, advising local authorities and participating/chairing European and National working groups on the CCAM topic, the association will ensure that the project’s results and tools for the integration of CCAM technology in fleet management and traffic management systems are available to a wide audience for deployment opportunities.

3.1 Expected outcomes survey

Under Task 7.4, Citizens, user engagement and exploitation, a comprehensive survey consisting of 13 questions was administered to the lead and follower LLs. The aim was to collect forecasts and expected outcomes over the project experimentations and results. This survey was based on the expected outcomes from the project Grant Agreement and from the results of the Task 2.3 survey over the existing governance model for traffic management.

The purpose of this survey was to provide an ex-ante depiction of the city expectation that will prelude the market context analysis of the CCAM services.

3.1.1 Question 1: What type of outcome are you expecting for your city?

The initial question sought to categorize the types of outcomes the cities anticipated, distinguishing between various expected results:

- To implement new services/technologies
- To improve already implemented services/technologies
- To start new mobility processes
- To improve already existing mobility processes
- To enhance the current governance model with Organisational Method
- Consulting services for already existing governance models.

All six lead/follower LLs agreed to the implementation of new services/technologies. At the time of the survey, no cities were expecting to exploit project results or external stakeholder participation process to foster already existing CCAM governance models.

The following picture depicts the results of the first question:

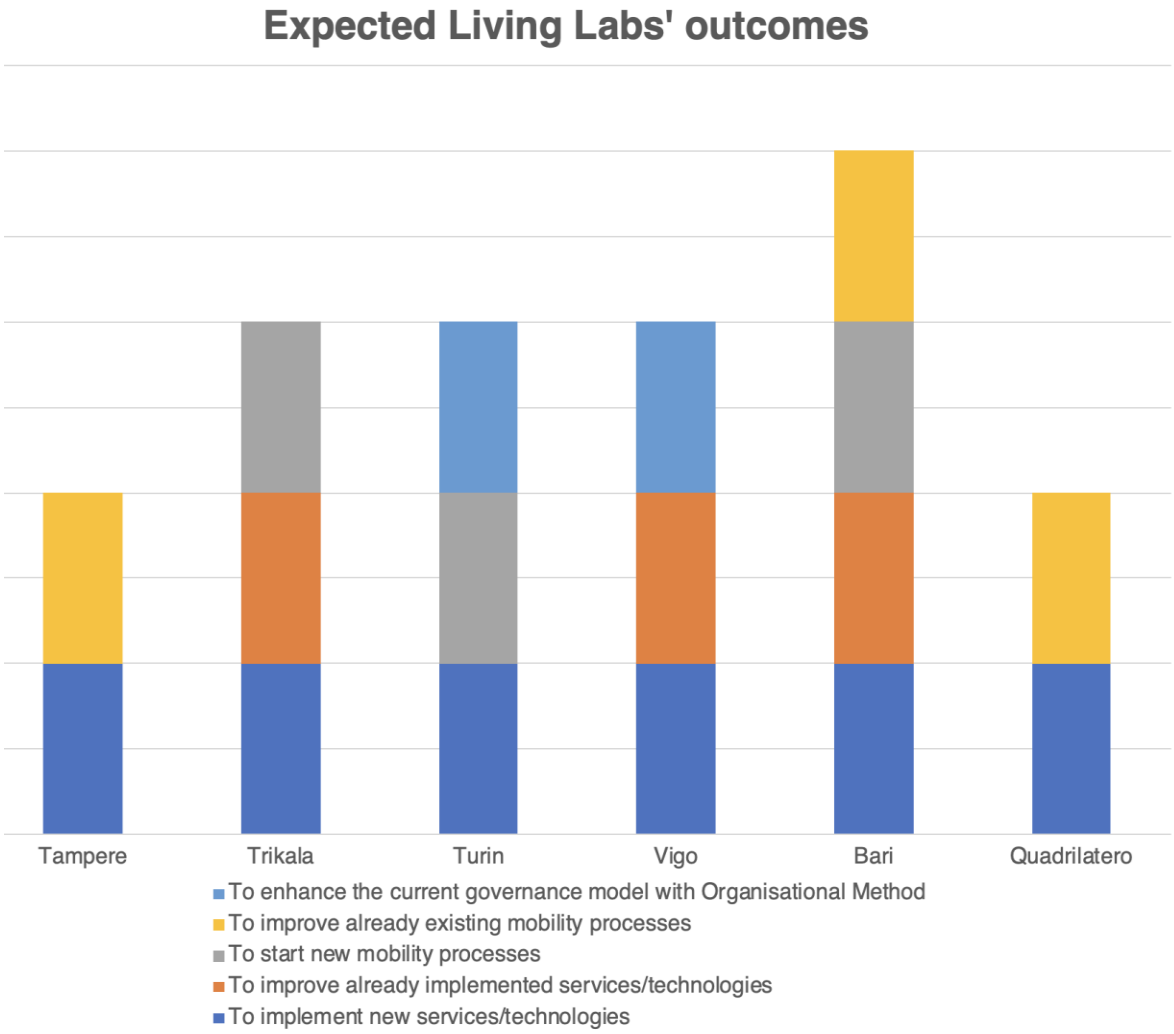

Figure 01: Expected Living Labs' outcomes

3.1.2 Question 2: With regard to the previous selected choices, please, describe in short details your selection

To have a clearer vision of the previously selected type of outcome, a deepest analysis of the answer was further provided with a second, opened-answer, question to all cities:

Tampere: aims at implementing last-first mile feeder traffic for local public transport using autonomous vehicles; simultaneously, the development of digital services to support autonomous vehicles.

Trikala: foresees three new services/technologies implementations: a traffic-based green wave via the Trikala traffic management system; a Green Light Optimized Speed Advisory (GLOSA) system for the AVs, and the development of a vulnerable road user detection-and-warning-to-the-approaching-AVs system. Moreover, the LL aims at improving already implemented services/technologies introducing a journey planner which should include

autonomous vehicles, demand-responsive solutions, and local bus services. Lastly, regarding the start of new mobility processes: two CAVs (6-seat mini vans) will be offering autonomous and demand-responsive services on a specific route.

Turin: expects that testing activities of CAVs will allow the city to prepare new services and test new CCAM technologies. The road tests should allow the municipality to implement new mobility models within the framework of already existing ones. Also, the testing may work as a proving ground, in the innovative regulation process, for those normative aspects not compliant with CCAM requirements.

Vigo: looks at fostering the already existing possibility of deploying small autonomous shuttle service, provided by the SUMP. The project expected outcomes are related at supporting the city in its decision process in the deployment of the service or it's abortion; regarding the improvement of already implemented services/technologies, Vigo's C-ITS platform provides cooperative services to citizens and fleets. IN2CCAM will improve this service adapting its services to be used by autonomous connected vehicles. Lastly, the enhancement of the organisational method will address the management strategies to allow a smooth coexistence of autonomous vehicles and human drivers in the city roads.

Bari: expects the implementation of new services for the transportation of goods and people providing a more efficient, effective, and sustainable logistic system.

Quadrilátero: aims at optimizing urban space, reducing congestion, and improving the quality of urban areas through the implementation of new services/technologies and the improvement of existing mobility processes. By simulating different deployment scenarios for CCAM vehicles and providing usable digital tools for urban planning and traffic management, the lab seeks to enhance efficiency, reduce pollution, and provide valuable data to decision-makers. This collaborative approach fosters innovation, cooperation, and research for sustainable and liveable urban environments.

3.1.3 Question 3: Based on the IN2CCAM project Grant Agreement (101076791) expected impacts, which one do you believe will be more relevant to your city?

To further analyse the expectations, the survey then posed the focus on the expected impacts related to those addressed by the Project Pathways in the project Grant Agreement. Moreover, these impacts will be assessed by reaching dedicated Key Performance Indicators (KPI). Respectively, these are:

1. Concepts of fleet and traffic management in the CCAM eco-system enabling optimised systems for the mobility of people and goods that consider the balance between societal and individual user needs. **KPI**: Increase by 50% in acceptance of mobility of people and goods by the society about CCAM referring to the three physical, digital and operational infrastructures point views.
2. Advanced simulation models and tools that enable and help assessing new traffic management strategies CCAM. **KPI**: number of journal publications, participation to conferences, workshops, events
3. Intermodal interfaces and interoperability between traffic management systems considering integration beyond road transport in the overall multimodal transport system providing seamless mobility services. **KPI**: the increasing of the 30% of exchanged messages between the implemented interfaces.
4. Optimised mobility network load balancing approaches through advanced traffic management guidance and information loops that can reach individual users as well as operational traffic management actors. **KPI**: performance measures for traffic monitor- ing and detection evaluated both by the LL demonstration on the field and on the simulation.
5. Effective cooperation and governance models for operating CCAM services as part of real-life fleet and traffic management systems developed and tested. **KPI**: new developed cooperation and governance and business models for operating CCAM according to the experience of lead and follower LLs.
6. Accelerating the implementation of innovative CCAM technologies and systems for passengers and goods. **KPI**: Improve connectivity, quality of services measured by trans-mission delays. Improve secure and trustworthy interaction between CCAV and road users, infrastructure, and platform.
7. Further developing a multimodal transport system through sustainable and smart long-haul and urban freight transport and logistics, upgraded and resilient physical and digital infra-structures for smarter vehicles and operations, for optimised system-wide network efficiency. **KPI**: Emission reduction and traffic congestion reduction.
8. Decreasing the number of transport accidents, incidents and fatalities and increase the resilience of transport systems. **KPI**: Comparison between the traffic offences performed by CCAV compared with standard vehicles, failure rates. Agreed safety standards for highly automated driving systems to operate on public roads.
9. Improved synergies between public and private investment plans to advance vehicle and infrastructure technologies. **KPI**: Agreement among the LLs and obtained synergy between public and private.

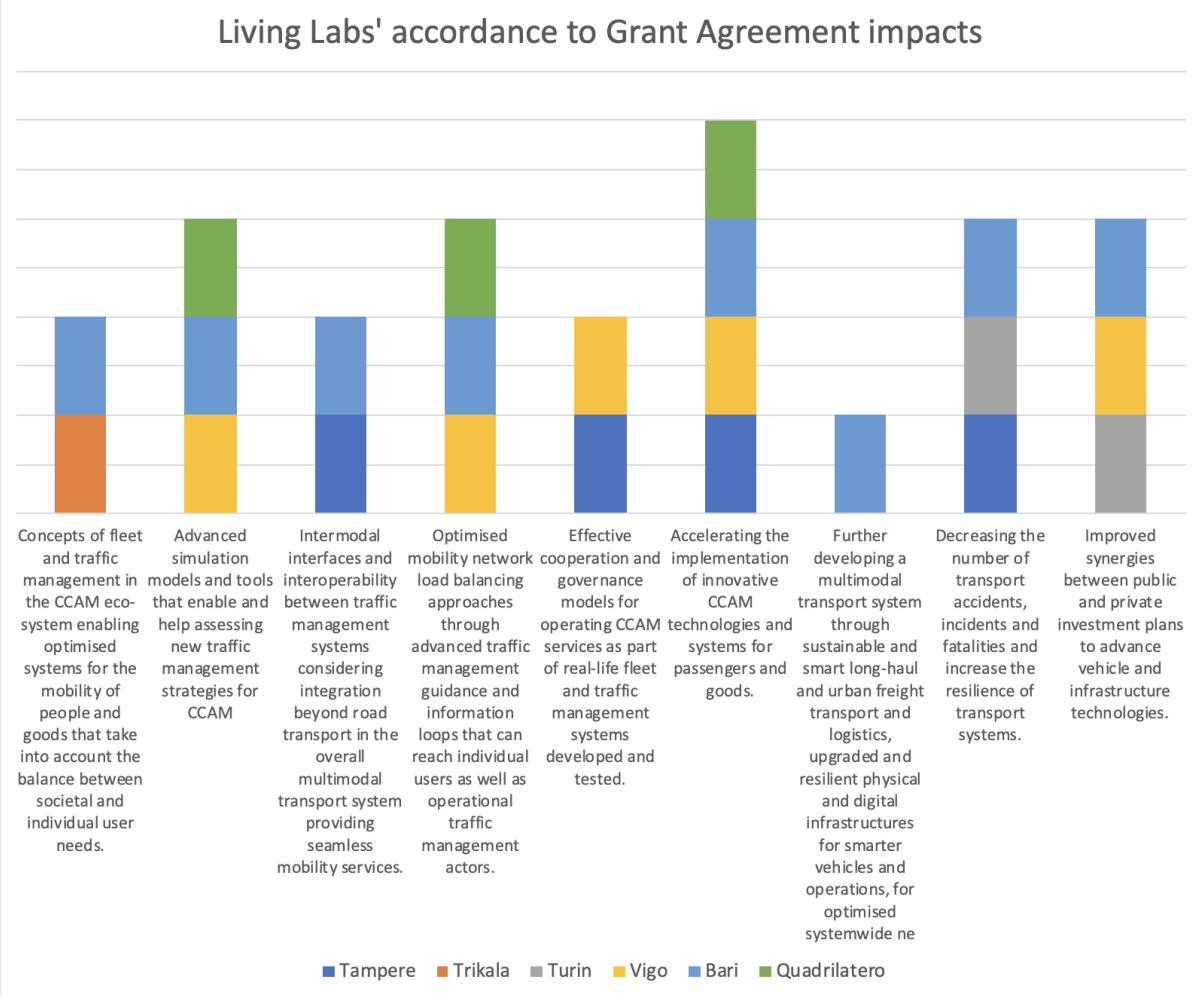

Figure 02: Living Labs' accordance to Grant Agreement impacts

"Accelerating the implementation of innovative CCAM technologies and systems for passengers and goods" is the most selected impact, with four out of six cities selecting it. Impact number 2, 4, 8 and 9 received the same number of votes, in which a synergy between the expectation of Vigo, Bari and Quadrilatero can already be seen. Only Bari voted the impact number 7, "Further developing a multimodal transport system through sustainable and smart long-haul and urban freight transport and logistics, upgraded and resilient physical and digital infra- structures for smarter vehicles and operations, for optimised system-wide network efficiency." showing their interest in the development of the CCAM also in the logistic sector.

From the following question, onwards, the survey started the investigation on what outcomes do the cities expect about several topics concerning the efficiency or risks that CCAM could bring to the cities.

3.1.4 Question 4: What outcomes do you expect will benefit traffic efficiency and the quality of transport and how?

The fourth question asked which outcome will enhance traffic efficiency and the quality of transport and how.

Tampere is the only city that expects outcomes about safety and, as it was already expressed in the task 2.3 survey, about weather condition: the municipality forecasts that real-time traffic information and information on road conditions will improve safety and service quality.

Trikala states that traffic-based green wave could benefit traffic efficiency by adjusting signal timings according to the level of traffic (either based on historic data or in real-time); also, the implementation of GLOSA can enhance traffic fluidity and fuel consumption economy; lastly, a user-friendly journey planner app that will incorporate autonomous on-demand services and local bus services could highly improve transport quality and accessibility.

Turin foresees that the testing activities of an autonomous vehicle would allow the creation of a new information and routing service, which could also be beneficial for non-autonomous vehicles; the main outcome expected is traffic efficiency, with these new services aimed at lowering the city traffic by containing congestion phenomena, especially during peak periods.

Vigo expects results to demonstrate that coordination among CCAM fleets and traffic management improves traffic efficiency through the reduction of trip times and emissions as a consequence of a better traffic load balancing and the reduction of stop/start and hard acceleration/braking events.

Bari believes that the implementation of new technologies will enable existing ones to improve their impact, referring to the quality of transport and city traffic management.

Quadrilátero expresses three different outcomes: the first one focuses on the reduced traffic congestion, which could be improved by the introduction of CAVs. Moreover, the city will optimize the traffic flows based on real-time data calculations. Additionally, this implementation is expected to reduce the bottlenecks on the roads and to reroute vehicles and distribute traffic more evenly across different routes. About parking management, the follower city expects that access to information about available parking spaces can help drivers find parking spots quickly, reducing the time spent searching for parking and the consequent traffic congestion. The second main impact is related to the environment: the optimized traffic flow and reduced congestion, will lower emissions and decrease air pollution contributing to a cleaner and healthier urban environment. Hence, also the decision-making process for a more sustainable and liveable urban environment will benefit directly from the quality of data collected.

3.1.5 Question 5: What outcomes do you foresee will bolster the policy and regulatory actions changes and how?

One of the key points in the definition process of the exploitation strategy is to investigate how and if the impacts resulting from the introduction of CAVs may change or strengthen of regulatory policies. Hence, the survey asked directly to the cities if it is foreseen that this new technology introduction could bring improvements in the current governance framework.

Tampere expects that fact-based decision making will be enabled deriving from demonstrations results.

Trikala extends the expectation, not only to the Greek scenario, but to the enrichment of the entire EU regulatory framework thanks to the CAVs pilots.

Turin municipality believes, although securing compliance with traffic ruling will be pivotal with new mobility paradigm, there will be a growing enhancement of the road control regulatory framework, as the number of CAVs circulating will increase.

Vigo answers that the desirable management strategies could allow a smooth coexistence in a safe, efficient and eco-friendly way between autonomous and human drivers. This process may pave the ground to a regulatory framework which includes CAVs.

Bari expresses its enthusiasm about the start of new mobility process, which could be the reason to bolster policy and regulatory actions aimed at regulating new aspects connected to the implementation of new services.

Quadrilátero highlights the bolstering outcome related to the policy and regulatory actions, deriving from each of the simulation scenarios developed in IN2CCAM and demonstrated in Guimarães. About Traffic Congestion Analysis: to visualise the extent of traffic congestion in the city, will be used parameters such as the density, vehicles per kilometre, and occupancy of the edge, expressed as a percentage. These metrics offer valuable insights into the level of congestion experienced on various roads and where it needs to be decreased. Regarding Speed Study: to perform an analysis of the traffic speed within the city. With the maximum speed limit assigned to each road segment, it becomes possible to gauge congestion levels on specific roads by examining the average speed of vehicles travelling along them and its impact on/from traffic congestion. Lastly, focusing on Environmental Impact: three crucial key performance indicators are provided, that enable the visualisation of vehicle emissions during simulations, such as CO2, PM, and NOx, as well as the total emissions, emissions normalised by time and road length and even emissions per vehicle. These visualisations serve not only to analyse CO2, PM, and NOx emissions but also to assess carbon monoxide, hydrocarbons,

fuel and electricity consumption, which provide useful indicators on the pollution caused by traffic and the policy actions to be performed to reduce those.

3.1.6 Question 6: What outcomes do you expect will enhance the CCAM awareness and how?

Another core aspect of the exploitation is to increase or to create social acceptance, since no behavioural changes could happen if the citizens reject the idea behind the technology.
The sixth question, indeed, aimed at highlighting what already emerged from the results of the Task 2.3: how the cities foresee the project results will enhance the CCAM awareness and how:

Tampere: answers that results from demonstrations will enable fact-based decision making.

Trikala: allocates a social acceptance increase with reliable, safe, and comfortable journeys in the CAVs.

Turin believes that population will be aware of the functionalities and potential use of CAVs because of public testing in real traffic situations, improving the perception of the mobility advantages associated with the use of autonomous vehicles.

Vigo thinks that outcomes could raise awareness of CAVs at City Authority Level and Mobility Management. The difficulties foreseen are to involve users in tests and experiment CCAM services may have a lower impact in CAVs awareness within general public and citizens, due to low level of technological knowledge.

Bari municipality expects that the introduction of CAVs will grant access to new services to the population, which will improve their life and work.

Quadrilátero gives a detailed description of the user awareness expected increase: the outcomes of the simulation tools and models will be exploited in Ubiwhere's Urban Intelligent Platform, a technological platform which offers information on various domains, from urban mobility and energy efficiency to air quality, always having as its main objective the support to the decision for the sustainability, which is already implemented in Guimarães and demonstrated in the city's Integrated Operation Centre. This centre provides the municipality of Guimarães with innovative tools for the collaborative management of occurrences and events, constituting itself as an operational coordination centre. By demonstrating the Urban Intelligent Platform's innovative features developed within IN2CCAM and the simulation of reserved routes for CCAM, the city can assess the evaluation of several KPIs and the impact of such an implementation by designating a scenic area exclusively for autonomous vehicles, restricting access to other types of vehicles. By showcasing this reserved route, the scenario demonstrates the potential of autonomous vehicle integration in enhancing specific areas or

routes and increase the awareness of the community who visits and participates in the city's Integrated Operation Centre.

3.1.7 Question 7: Do you expect that cybersecurity risks and existing regulatory acts could worsen the project outcomes when facing CCAM and CAVs implementation, in your city?

The survey explores the present forecasts related to cybersecurity risks and existing regulatory acts that could worsen the project outcomes when facing CCAM and CAVs implementation. The reason behind this question finds its thesis in the Survey on existing governance model for traffic management, shared by TTS Italia within the context of Task 2.3. Notably, low levels of cybersecurity prevention and mitigation can be considered as a barrier in the CAVs implementation process, since a CAV is susceptible to various cyberattacks, including, but not limited to, ransomware and vehicle theft, akin to any other networked apparatus. Only one lead and one follower LLs currently fear that risks related to cybersecurity aspects could harshen the project outcomes, respectively Tampere, which believes that new security measures will have to be developed and implemented for CCAM systems; and Bari which expects that cybersecurity issues will be the biggest risk during CAV's implementation.

3.1.8 Question 8: Do you foresee any criticalities that could worsen the expected outcomes, in your city?

At the time of the survey, no business-related problems are foreseen by any of the six cities.

3.1.9 Question 9: Are you planning to collaborate with other LL to achieve joint results, even on non-primary outcomes for your city?

In conclusion, cities were asked about their willingness and planning to collaborate with other lead/follower LLs to achieve joint results, even in the non-primary outcomes scenario. Five, out of six cities answered positively, showing current interest in planning and co-working with the other lead/follower LLs. Trikala highlighted the potential collaboration with Tampere on the development of GLOSA, which is confirmed by the Finnish city which aims at sharing experiences. The LL of Vigo foresees opportunities for exploring synergies with Quadrilátero due to geographical proximity and good relationship.

Particularly interesting collaboration emerged from the two follower cities, Quadrilátero and Bari: Guimarães and the city of Bari are collaborating to exchange knowledge and experiences. Guimarães aims to learn from Bari's successful outcomes in CCAM technologies and traffic management, by adapting Bari's best practices to the Portuguese city reality, Quadrilátero seeks to enhance traffic efficiency, lower the pollution, and to create a more

liveable urban environment. The partnership could foster innovation, cooperation, and research for sustainable development.

At the time of drawing the results for this deliverable, Turin was not foreseeing any collaboration in the present scenario.

3.1.10 Lessons learned

The expected outcomes survey showed great enthusiasm and participation by all six cities. The survey aimed at specific focal points to investigate upon, including improving traffic efficiency, social awareness and improving regulatory actions related to CCAM.

About the improving of traffic efficiency, the main expected impacts foreseen are:

- Real-time traffic information and information on road conditions will improve safety and service quality.
- Adjusting signal timings according to the level of traffic and the implementation of GLOSA can enhance traffic fluidity and fuel consumption economy.
- Testing activities of an autonomous vehicle would allow the creation of a new information and routing service, which could also be beneficial for non-autonomous vehicles.
- The CAVs implementation is expected to reduce the bottlenecks on the roads and to reroute vehicles and distribute traffic more evenly across different routes.
- Access to information about available parking spaces can help drivers find parking spots quickly, reducing the time spent searching for parking and the consequent traffic congestion.

The second focal point was the governance/regulatory process. The LLs expressed the following expectations:

- Fact-based decision making will be enabled deriving from demonstrations results.
- There will be a growing enhancement of the road control regulatory framework, as the number of CAVs circulating will increase.
- Defining the correct management strategies during the project, could allow a smooth coexistence in a safe, efficient, and eco-friendly way between autonomous and human drivers. This process may pave the ground to a regulatory framework which includes CAVs.
- Also, that the start of new mobility process, which could be the reason to bolster policy and regulatory actions aimed at regulating new aspects connected to the implementation of new services.

Regarding the social acceptance, cities highlighted the following benefits:

- Project results will increase social awareness of CAVs.

- Testing on public roads will sensitise over the CAVs.
- Project outcomes will make fact-decision making process smoother.
- Showcasing the results in reserved areas for testing, will emphasise on the potential benefits that CAVs bring to traffic management.

5 cities are willing to share experience and to collaborate to achieve joint results. Among the shareable experiences:

- Collaboration on the development of GLOSA.
- Learning from other sites' successful outcomes in the deployment of CCAM technologies and traffic management.
- Adaptation of other cities' best practices for reducing pollution.
- Achieving results from sharing policy recommendations.

Only one Lead and one Follower LLs currently fear that risks related to cybersecurity aspects could harshen the project outcomes; respectively that new security measures will have to be developed and implemented for CCAM systems and that cybersecurity issues will be the biggest risk during CAV's implementation.

No business entanglements are foreseen by any of the six cities. Nonetheless, some difficulties are foreseen to involve users in tests and experiment.

3.2 Market context analysis

This second section of the methodology will explore and analyse the current fragments of interest market status, considered to be pivotal for a complete exploitation.

The overall analysis investigates and emphasises on the GLOSA: the latter, attracted particular attention as a use case of particular interest that emerged from the expected outcomes survey conducted earlier, to which the six cities responded. Therefore, the attention is placed on Traffic Management Systems and Road Side Units, which are integral and fundamental components for the development of the above-mentioned use case.

At present, governments regulators are making the necessary efforts to improve transportation by addressing critical issues such as traffic accidents, congestion, and transportation costs. Given the rapid growth of the automotive industry, various sensor technologies are being applied to make driving more comfortable, luxurious, and safe. A major impetus for investment growth is new and emerging technologies, most notably autonomous driving, which is expected to bring significant changes to markets. With advances in artificial intelligence and Internet of Things and increasing dependence, demand for cars is no longer limited to electric vehicles.
However, it is not only investment on the part of governments that boosts the sector's growth; it is also impositions and restrictions that stimulate car manufacturers to produce vehicles with basic safety systems for users. The growth of the automotive industry, coupled with government initiatives to adopt advanced technologies, will open new revenues for the global CCAM market over the forecast period.

3.2.1 Green Light Optimal Speed Advisory (GLOSA)

This section highlights the possible market exploitation of the GLOSA, as the cities indicated it as the highest interesting and promising enhancing use cases during the expected outcome survey as the most-generating interest use cases among all six cities.

GLOSA provides vehicle drivers with advice on optimal speed when approaching a controlled intersection equipped with traffic lights. Based on information about the phases and timing of traffic lights, it is possible to offer drivers of vehicles or vehicle controls a speed change warning when approaching and exiting a signposted intersection. The service aims to create a greener and more energy-efficient driving experience for vehicle drivers by providing speed advice, traffic light information and countdown to green/red, with the goal of reducing energy consumption and the number of stops. Based on the recommended speed, the driver can adjust the vehicle speed within the set limit. The main purpose of the system is to optimise traffic efficiency; by reducing unnecessary acceleration and deceleration, traffic flow is

optimised and emissions and fuel consumption are reduced (Miller, N. A., Biedka, M., Gibson, G., Kirsch, F., Hill, N., White, B., Uddin, K., 2016)

In the context of EU-project results, regarding to the socio-economic analysis of the benefits of GLOSA, the following analysis is based on a study that TTS Italia conducted as part of the European project CEF C-Roads Italy 2. The study analyses the benefits derived from the deployment of GLOSA use case in real traffic condition within the city of Turin and Trento, where traffic lights are equipped with traffic Road Side Units (RSU) that enable Vehicle-to-Infrastructure communication. Typical daily traffic flows affecting the test routes, extrapolated from a series of traffic sensors along the network, are also shown.

The main economic benefit that emerges from the analysis derives from the impacts on traffic efficiency; this impact is usually calculated through the macro-indicator total travel time, expressed as the change in hours compared to the peak hour, more precisely through the net change in total travel time between the baseline and the operational scenario. Travel time savings is by far the most important benefit in the cost-benefit analysis, although it is strongly influenced by the specific value of time (€/h) attributed to it.

The market adoption scenarios were simulated by means of a cost-benefit analysis, whereby the corresponding Net Present Values of the annual discounted costs and benefits and the CBR were calculated. In both cities, the application of the method showed that the investment in GLOSA is not cost-effective for any of the adoption scenarios when considering all system costs, including the On-Board Units (OBU). Furthermore, by removing the purchase costs of the OBUs from the analysis, the future deployment scenarios evaluated all become operational, starting in 2025, when vehicle penetration (MP) and infrastructure adoption are at 50% and 35% respectively.

It should be remembered that although the GLOSA provides initial indications of when the investment becomes economically viable, the methodology adopted also entails a number of limitations, such as: Impact assessment - the benefits costs analysis relied on impact key performance indicators values obtained through a simulated exercise, through which the average delay was simulated based on the market penetration rate, but without considering the contributory effects of gradual infrastructure-related adoption levels (Ciccarelli, Valletta, 2023).

3.2.2 Traffic Management Systems

It is estimated that the global traffic management systems market will amount to about $26.72 billion by 2023; while, for the long-range forecast, it is expected to expand at a Compound

Annual Growth Rate of about 12% during the forecast period, exceeding $74.09 billion by 2033 (FutureMarketsInsights, 2023).

These numbers fit in a scenario where the traffic management systems market accounts for about 85 percent of the global ITS market. This exponential growth is expected due mainly to the continued development of new technologies for traffic control and management control panels; however, there are other key factors that will grow the market, such as the introduction of intermodal mobility systems and platforms (most notably Mobility as a Service, MaaS), the increasing penetration of ITS systems in traffic management, both in the public and private sectors, and in the logistics sector.

As mentioned earlier, regional, national, and international authorities have mandated or are mandating ratifications and/or introductions of road safety laws because of the ever-increasing number of accidents and deaths on the roads. An example of this is the work that, for example, Italy is carrying out with the ratification of the Decree-Law on Road Safety, which includes an update precisely on traffic flow management and control systems.
The introduction of these systems has become a necessity because of the failure to reduce accidents through regulations and systems put in place to date; actions that have failed to decrease the number of deaths and injuries on the roads.

Cities are becoming smart, and smart mobility is a key component in achieving the increase of safety and the lowering of the accidents/fatalities. In the current scenario, the use of ITS and AI-managed systems looks to be one of the most promising ways in which smart cities can improve the daily commute of citizens while increasing sustainability. However, in most cities, lack of safe and quality transit, road safety problems, overloaded road network, poor traffic management, parking problems, theft, and poor road conditions are still the main problems.

To solve these problems, authorities are investing in intelligent traffic management solutions, such as electronic toll management systems, adaptive traffic control systems, video-based automatic traffic counter and classifier, red light infraction detection, and integrated command and control centre, and most of all, RSU.

3.2.3 Road Side Units

The following is a specific analysis of RSUs as a key component for the deployment of self-driving cars and GLOSA.

An RSU is a transport infrastructure communication device that is part of a C-ITS transport environment. The goal of this environment is to reduce the number of deaths and injuries on

the roads, improve mobility and reduce the environmental impact of transport systems. Commonly known as the Connected Vehicle environment, it includes both human-driven and CAVs. The expressions Vehicle-to-Infrastructure and Vehicle-to-Vehicle are used to reflect message exchanges within the Connected Vehicle environment. The vision of this technology has expanded to include all types of travellers, including pedestrians, cyclists, multi-modal travellers, and other vulnerable road users, and is referred to as Vehicle-to-Everything technology and communications. Traveller services are delivered through OBUs installed in vehicles or mobile units used for other modes of transport.

The various problems associated with transport infrastructure hinder the adoption of self-driving vehicles and other related technologies such as Vehicle-to-Everything, which also hold back the adoption of on-road units. Many developing countries lack the integrated transport system plans and infrastructure needed to adopt the latest connected technologies. Obstacles to integrating intelligent transport systems into the existing infrastructure include, among others, coordination with various stakeholders, keeping up with technology, integration with existing systems and budgetary constraints; finally, privacy and data security concerns are another factor hindering market expansion. RSUs may include physical hardware, radio systems and software servers (AASHTO, ITE, NEMA, 2021).

The market for RSUs, for connected vehicles will be approximately USD 535.3 million in 2022 and is expected to reach a value of USD 16,517.9 million by 2032, at a Compound Annual Growth Rate of 40.8% (DataHorizzonResearch, 2022)

The main growth impetus for this specific sector of the CCAM-related universe comes from the increasing technological advancement of smart cities and road infrastructure contributes to the market growth. The increasing adoption of advanced technologies in the automotive sector offers growth opportunities for the major market players. According to Automotive World estimates, there will be more than 2 billion cars globally by 2050 (Automotive World, 2013).

Hence, with a large number of cars, traffic congestion will be of great concern. RSUs could contribute to solving traffic congestion problems.

3.3 Exploitation Workshop

Exploitation workshops have two functions: first, to make partners familiar with what exploitation is; and second, to collect data. The structure and content of the workshop is explained at the beginning, and all necessary data is discussed and collected from project partners during the workshop. The aim of the workshops is to gather views from all the partners of the consortium and boost their commitment to actively drive both individual exploitation activities and participate in joint exploitation of project results.

Although it was indicated as mandatory, only 4 out of 6 cities participated in the online workshop. Quadrilátero and Turin who were tackled by last minute hitches, provided their answer in a remote way.

The agenda of the first exploitation workshop is presented in Table 1:

Table 1: Exploitation Workshop Agenda

Time	Activity	Organisation
10.00-10.05	Welcome	TTS Italia
10.05-10.10	Roundtable of the participants	All
10.10-10.40	Business models discussion	CEA
10.40-10.50	Introduction, definition of the exploitation and definition of the KERs	TTS Italia
10.50-11.50	Gathering of partner's views to how they expect to exploit results from their own test sites and how they expect to share results and knowledge	TTS Italia + All
11.50-12.00	Conclusion	TTS Italia

The first 30 minutes, led by CEA, explored the business models and plans identified or foreseen by the cities. This time slot was organised to create a link between Task 7.4 and Task 6.3 - Co-design of CCAM business & operating models.

Subsequently, the core part of the workshop was completely addressed around the forecasted exploitation of the results. Three main questions, deriving from the identified KERs were asked to all cities:

- **Social Exploitation**: How is your city planning to take advantage of the project results, to increase the social awareness of the CCAM?
- **Technological Exploitation**: Which results (data/technologies/services/etc.) do you foresee to be valuable and applicable in other Living Labs, and what would they need to have to use those?
- **Governance Exploitation**: Which path and action are you planning to follow, after gathering the experimentation results, to change your current governance model about the CCAM?

Due to uncertainties emerged in the frame of the third question, a fourth, sub question was asked to the attendees, about the collaborative exploitation:

- **Collaborative Exploitation**: Are you planning to exploit the other cities' experimentation results or planning to cooperate to change your current policy framework, regarding the CCAM? Or to start a new one?

3.3.1 Question 1: How is your city planning to take advantage of the project results, to increase the social awareness of the CCAM?

The aim of the first question was to investigate upon the foreseen actions for the social awareness and social acceptance deriving from, for example, a communication campaign following the test sites works.

Tampere: Single Phase and Timing Information use case that will run in the city of Tampere, will perhaps provide useful results within some years. While the second use case, Public Transport Vehicle Crossing for AVs, that is already in use, shows that the application is very useful. Hence, the kind of application that will be used in the future for the safety drivers and bus drivers may work along with the social acceptance. And the Tampere's remote operator centre, that who resides in VTT, will involve the citizens into better service, both for this project and the future projects.

Trikala: social awareness is foreseen to be raised thanks to all those solutions that are planned for the LL. Firstly, it is planned an awareness event in June. This opportunity, like the demonstrations of the autonomous services that are going to be offered in the city, will allow the local community of business to raise familiarity with the concept of autonomous driving; not only in a market/business view, but also for everyday use. The project results are, hence, foreseen as a first-hand experience of general public with the true potential of an autonomous vehicle. Furthermore, this will be an opportunity for a first understanding, considering all the limitations within the experimentation. Moreover, it is a possible interconnection with the use

of a mobile application to book the rides and travel from point A to point B; meaning that the results could lead also to an increased familiarity with a mass application combined with public transportation.

Turin: Turin Municipality has been involved, and currently participate, in initiatives focused on CCAM, such as the ToMove project, which has been just launched by the city with a group of local partners and aimed to create a stable experimentation platform on the topic of autonomous, connected, and cooperative driving. The Municipality will accompany and observe the IN2CCAM project field trial, supporting dissemination, information and involvement of users and stakeholders' communities. The City's idea is to use both Turin and the other IN2CCAM LL field experimentation to promote a widespread knowledge and social acceptance of the new mobility from the user's point of view. In this perspective, the Turin LL will be an opportunity for the Turin City to involve research and business stakeholders, but also end users, to promote the new technologies development in the local.

Vigo: although the demonstration focuses on technical feasibility, the city is also planning social exploitation that will address more the logistics sector than the public transport. In this perspective, the application should be some kind of complementary public transport service for citizens with special mobility needs that could cover streets with a high slope. This complementary public service could extend the current public transport service, which is covering trips and routes, which are maybe not viable or profitable with traditional buses, or the traditional means of transport, and also can cover trips that due to the geography or the streets topology has a difficult access for vehicles. Hence, it could be a complementary public transport for this kind of rural areas, which has a lower accessibility. In addition, the advantage is to cover these areas and these services with a clean mobility service, because those vehicles should be electric, and the number of people transported with special needs are relatively low, but the emissions per passenger would be zero. Like the other LL, Vigo is planning his own ideas generation workshop, in which external stakeholders are invited, along with the mobility agency and also the road authority; the main idea is to face the need to be feasible according to legislation in terms of homologation of the vehicles and so on.

Bari: due to its nature of being a follower city, it won't have on the field an implementation or demonstrations. The city will mostly work on simulation and so on. So, the social impact is not as evident as it could be in the Lead LL. Nonetheless, the follower city will work in strict contact with the municipality, since it has keen interest in the CCAM ecosystems. During the same week of the Workshop, it was scheduled a meeting with the municipality and local stakeholders, in which the city will present the results of the project and get the feedback from their interest and their implementations.

Quadrilátero: the second follower city showed more interest and focus on the increase of political/executive exploitation than the social awareness, which is not considered pivotal at the time of the Workshop.

3.3.2 Question 2: Which results (data/technologies/services/etc.) do you foresee to be valuable and applicable in other Living Labs, and what would they need to have to use those?

The second question aimed at investigating the confrontation between the cities and the expectation of a possible collaboration in a technological exchange way.

Tampere: as the city developed the application for the public transport vehicle crossing for AVs, it is expected that the technological exploitation would be simple; moreover, these useful applications can be shared with other cities. For the AV detected event, the question is seen as a little bit tricky because of its nature of being highly tied into a vehicle that is traveling over the road surface. This is not excluding the idea of some components to be reused in other sites. And Signal Phase and Timing Information cluster is highly dependent on the current traffic light provider in the city. This resolves into a more difficult implementation, imagining the actual setup in other cities.

Trikala: the believes is that most of the use cases and their functionality that are being developed could be valuable and applicable in other living labs too. Obviously, the easier one would be just the MaaS application, which it can be easily used in different places in different regions, assuming that there is an autonomous service to be offered. Likewise, additional information about the public transport is going to be required, as sure as those aspects come in standardized formats. Hence, it's something that other cities can easily apply. In terms of the functionalities like GLOSA, those are not region specific and something that cannot be provided in other countries in Europe; nonetheless, those notably require a certain amount of infrastructure that needs to be in place and enough technology and some requirements about the implementation of the functionalities.

Turin: In Turin Living Lab will be experimented a "dynamic re-routing" service to evaluate the impact of different CCAVs penetration rates on traffic management. These evaluations will be performed using a combination of real and simulated data.
Using short-range technologies, real vehicles will send messages to the RSUs installed in the field. The first valuable outcome is represented by the implementation of a module for collecting these messages, which are then saved on a Digital Twin. Moreover, another accomplishment will be the usage of a traffic microsimulator, integrated with the LINKS's CAM Simulator software to generate simulated Cooperative Awareness Messages. In the Digital Twin - representing the LL Testing Area - will be gathered vehicles' data (both real and simulated), used to share with other parties as well as produce feedback to the vehicles themselves (e.g., the result of the dynamic rerouting service).
About traffic simulations, the following results could be valuable and usable in other LLs:

- Impact assessment of different market penetration rates of connected vehicles on the effectiveness of the dynamic re-routing strategies.

- Estimation of the optimal rate of connected vehicles needed to improve the re-routing strategies, in order to reduce road congestion.

To reapply on another city, the method used to achieve these results for the city of Turin, would be necessary to implement an appropriately calibrated traffic microsimulation model and it is recommended the usage of RSU to collect data from connected vehicles (such as G5-enabled Volkswagens) and eventually activate one or more real CAVs.
In the framework of Turin city, the CCAM ecosystem further developed within the IN2CCAM project will be the basis upon which to synergically build-up the technological architecture for the ToMove project (again involving LINKS Foundation, 5T and the Municipality). In that perspective, IN2CCAM is paving the way to a more and more robust, cooperative, and functional data-exchange concept between mobility actors in Turin in a roadmap towards the activation of production-grade services to the road community.
Finally, the experience achieved with the developed traffic management strategies is believed to provide useful insights to the application of similar strategies to connected human-driven vehicles in the urban traffic.

Vigo: according to the Trikala point of view, that most of the use cases are replicable and usable in other cities. However, what is pivotal is the communication among CAVs and the traffic management systems; even more within the fleets in a Vehicle-to-Vehicle system. This will be mandatory for a smooth coexistence of those autonomous vehicles and not autonomous vehicles. Meaning that the ecosystems to be created (and the rules for coordinating actions, for example the GLOSA) is one where the autonomous vehicle can see the traffic light status or traffic light priority, or else where the traffic management is able of balancing the load of the roads, providing a better route to autonomous fleets. It will be most probably interesting and replicable for other cities. Notably, these services will need at least a state-of-the-art competitive ITS platform with competitive ITS services, also available for human drivers, but specifically for autonomous driving. And these autonomous vehicles will need to integrate this communication in their systems and in their decision algorithms and so on.

Bari: due to its nature of follower LL, lacking experimentation, the city of Bari took the opportunity to remind that in task 1.2, which deals with the innovation management plan, it is built up a catalogue of innovation results, which are called innovation tools. Results, in this perspective, could be called innovation tools for all the LLs. By the way, the Innovation Tool Catalogue considers the conditions of scalability and transferability of the Innovation Tools of the different LLs, which are elements potentially useful in view of exploitation.

Quadrilátero: Ubiwhere is preparing for introducing the innovative results from IN2CCAM as exciting new features into its Urban Platform solution. This integration will enrich the platform with advanced functionalities for simulating CCAM vehicles and analysing their impact on traffic flow and potential congestion in urban and peri-urban areas. This exploitation strategy will incorporate cutting-edge simulation capabilities for CCAM vehicles and other urban

mobility scenarios into the platform. These new features will facilitate a nuanced analysis of traffic flow and the potential for congestion in urban and peri-urban areas, enhancing the platform's utility in urban planning and mobility management.

3.3.3 Question 3: Which path and action are you planning to follow, after gathering the experimentation results, to change your current governance model about the CCAM?

The third question was about governance and policy changes, highlighting to path and action that the cities are planning to promote after gathering the experimentation results to change their current governance model about the CCAM.

Tampere: at the time of this first exploitation workshop, the LL of Tampere had no information to share about the creation of changing of a governance model regarding the CCAM.

Trikala: the current scenario shows that there is not so much assurance with the current governance yet, because most of those concepts are prototyped and there are research ideas in application. What is to be considered is the involvement of external stakeholders, which sometimes makes governance difficult, time consuming and more complicated, because there are different technical providers, different infrastructure providers, and the needs of local authorities. It appears, hence, that it's difficult to coordinate all the several stakeholders to make progress, maintain the agreement and quickly get decisions. The city believes that it's still early in the project lifecycle to have complete guidance and ideas on governance.

Turin: The governance models promoted and tested in IN2CCAM will be analysed and discussed/validated within the ToMove promoting committee (made up by the Municipality of Turin, 5T, GTT, Turin University, Polytechnic University of Turin, LINKS Foundation, Piemonte Innova Foundation), also involving the liaison committee with other local PAs, thus extending the perimeter to the Piedmont Region, Metropolitan City and Regional Mobility Agency.
Furthermore, the new governance models will be discussed and analysed within the financing body of the MaaS for Italy initiative, i.e. the Department for Digital Transformation of the Italian Presidency of the Council of Ministers, the Ministry for Infrastructure and Transport, and with other cities involved (primarily the Municipality of Milan), with which Turin City will share the experiences in the field of CCAM.
The evolution of the market and governance models related to CCAM and Future Mobility may also be a matter of comparison, discussion, and models transferability in the framework of the CTE-Next project, the "Houses of Italian Emerging Technologies", an initiative financed by the Ministry for Enterprise and Made in Italy. In fact, Turin is one of the main CTE-Next "houses" and one of its activity pillars is the promotion of innovative solutions for Smart Roads, enabled by Emerging Technologies (e.g. AI, 5G, blockchain, etc.), so it will therefore be possible to scale-up the debate to the national level.

Vigo: in Vigo there is not an ongoing governance model regarding the CCAM. Nonetheless, the question of how to address a CCAM breaks in urban scenarios, especially in those that are the most complex in small cities like Vigo. So, if not a governance model, there is a floating idea regarding the accord to what it is expected to be demonstrated in IN2CCAM, the coordination of actions and the connectivity among grids and infrastructure; this path will be a key point. The municipality, at present, finds it preferable to have autonomous vehicles driving isolated and not connected to other entities such as traffic management or other users, despite the connection. These city's worries explain why Vigo LL invited the national authority in traffic, DGT, to the stakeholders' workshop: to have a deeper analysis of what is the idea of a common framework of legislation in Spain, at least at national level. And in the homologation of connected automated vehicles to stipulate in the country, connectivity will be required. And how they plan to address this kind of complex scenarios in cities and at which level of responsibility will have the local authorities, the city local authorities' responsibility and the capability of legislate or write a normative to stipulation such as parking level or whatever that are responsibility of the city, if they will have competences in autonomous vehicle regulation in their territory.

Bari: like the previous question, due to lacking experimentations, the status is quite different from the Leading LLs. Nonetheless, the city is testing on the simulation plan an innovative distribution system for the last mile delivery of goods, based on autonomous vehicles. In this case, the municipality is interested in considering autonomous vehicles for the logistics of the last mile.

Quadrilátero: the Portuguese city believes that could be very interesting to work in the governance field; thus, it is foreseen that it could be beneficial, if the results of the project could sensitize the public executives of the region to the need for prioritization and the need to define, non-existent, CCAM governance models.

3.3.4 Question 4: Are you planning to exploit the other cities' experimentation results or planning to cooperate to change your current policy framework, regarding the CCAM? Or to start a new one?

As previously introduced, a fourth question is asked to the attendees, to enrich the governance question. More in details, it was investigated on how the cities are expecting to exploit other LLs' results and experimentations to deal with their own municipality to start a policy change. This question drives, hence, more in terms of collaboration and exploiting the other test sites results.

Tampere: regarding the import of results, it is not seen as an easy task because the implementation of the other LLs are specific to the development in the particular environment in which the experimentation is conducted. But vice versa, exporting the method, could be

very useful and interesting for receiving return feedback. About the possible collaboration, Tampere had some ideas to cooperated with the LL of Vigo.

Vigo: the embracing concept is right, at least for the evaluation purposes and KPIs. The Spanish proposal is to unify the results of GLOSA. This is due to numerous commonalities to be addressed in the shared evaluation among all LLs that will develop the GLOSA. Providing a common result and to demonstrate a common benefit resolve into demonstrating its replicability. Comparing the current public transport state of the art of Trikala and Tampere, they are equipped with small buses that could fit for the city of Vigo for some applications; hence, the city will pay attention to the results and to the demonstrations and it will be considered for a potential future implementation or deployment of such a kind of vehicles. The use cases of delivery with autonomous robots were considered in Vigo for a previous call, but there were found some issues with the local stakeholders. At the time, no interested partners were involved in an experiment. In terms of collaboration, however, if the city of Bari will now provide some results Vigo could rework that idea.

Trikala: the main idea of the city of Trikala is to think about the governance models and what information can be exploited from our current operations. It is expected that most of the experience will be towards the technical side of things, but this is going to be a demo video and the city is sure it's going to be useful information for us to learn through this process.

Turin: There is a strong commitment of the Turin Municipality in bringing together further projects or activities in the context of its path towards climate neutrality by 2030, being Turin is one of the 100 cities selected at European level as Climate Neutral Emission City. For this reason, the City has an high interest in all the activities related to the evaluation of the effects of autonomous and connected cooperative driving technologies on the reduction of the environmental impacts of urban mobility.
Finally, the City of Turin promotes several Cooperation Activities at both European and global scales, and then can promote the transferability of CCAM experimentations results within international networks such as ENOLL, 6G-IA, EIT Urban Mobility, Eurocities, etc.

Quadrilátero: benchmarking could be a powerful tool for Quadrilátero. Indeed, there was a participation in the Task 4.1 monthly meeting on the same day of the workshop and what emerged is that it would be great for the follower city if it could show-case the demonstrations that the implementing cities will do during this year.

3.3.5 Lessons learned

The first workshop was a productive meeting in which LLs representatives had the opportunity to have a dialogue and to know/understand other cities' strategies upon the

possible exploitation of the experimentations results. The outcomes of the workshop will be here summarised.

About the actions for the exploitation of the results for increasing the social awareness and social acceptance, LLs expressed the following points:

- Remote operator centre will involve the citizens into better service, both for this project and the future projects.
- Social awareness is foreseen to be raised thanks to all those solutions that are planned for the LL, making the local community to raise familiarity with the concept of autonomous driving; not only in a market/business view, but also for everyday use.
- To take advantage of the project results by promoting a widespread knowledge and social acceptance of the new mobility from the user's point of view.
- The complementary public service could extend the current public transport service, especially for rural areas, which has a lower accessibility.

About the exploitation of the technological results between LLs in a possible collaboration, the answers were related to:

- Some for the public transport vehicle crossing for AVs are already developed, making the technological exploitation simple to be shared.
- Most of the use cases are replicable and usable in other cities. The easier one would be the MaaS application, which it can be easily used in different places in different regions, assuming that there is an autonomous service to be offered.
- It is pivotal to foster the communication among CAVs and the traffic management systems.
- To incorporate cutting-edge simulation capabilities for CCAM vehicles and other urban mobility scenarios into platforms that will facilitate a nuanced analysis of traffic flow and the potential for congestion in urban and peri-urban areas, enhancing the platform's utility in urban planning and mobility management.
- The experience achieved with the developed traffic management strategies will provide useful insights to the application of similar strategies to connected human-driven vehicles in the urban traffic.

The third and fourth question were related to governance models changes and collaboration between LLs. Although the common idea is that it's still early in the project lifecycle to have complete guidance and ideas on governance changes, the question of how to address a CCAM breaks in urban scenarios. The LLs highlighed the following points:

- The current scenario shows that there is not so much assurance with the current governance yet, because most of those concepts are prototyped and there are research ideas in application.

- It is pivotal to involve external stakeholders although it appears difficult to coordinate all the several stakeholders to make progress, maintain the agreement and quickly get decisions.
- New governance models will be discussed and analysed within the national financing body, so it will therefore be possible to scale-up the debate to the national level.
- Some municipalities find it preferable to have autonomous vehicles driving isolated and not connected to other entities such as traffic management or other users, despite the connection.
- Despite the difference between LLs and their experimentation, exporting the method could be very useful and interesting for receiving return feedback.
- Providing a common result and to demonstrate a common benefit resolve into demonstrating its replicability.
- Benchmarking could be a powerful tool for the collaboration between LLs.

4 CONCLUSION

This deliverable aimed at setting the basis for the exploitation strategy that will promote the IN2CCAM's results into concrete solution beyond the project life cycle.

The expected outcomes survey brought positive ex-ante expectation and results, showing enthusiasm and will to collaborate between all LLs. Although risks and barrier are foreseen in different aspects, especially in cybersecurity, both lead and follower LLs have expressed their enthusiasm related to the experimentation and exploitation of the results.

Conducting thorough market analysis was considered pivotal to identify potential applications and commercialization opportunities for project results. Understanding the market landscape, customer needs, and competitive advantages is expected to allow the project's consortium to tailor their exploitation strategy and develop business models that maximize the commercial potential of their innovations and to grow the interest among potential external stakeholder.

The first exploitation workshop was conducted in an initial phase and, although it was scheduled at month 18, this was an ex-ante workshop since no experimentation started yet. The main idea is that there will be more information and collaboration inputs in the second workshop, that will be held at month 36, at the end of the project, from which will derive the final considerations and the final design of an exploitation strategy. Also, there will be a confrontation between the results of the first and the second workshop, in terms of giving the best portrait of how the behavioural change, social awareness, the governance and policy framework changed during the project lifespan.

As previously introduced, this document will serve as a touchstone for a second update with input from other tasks and WPs:

- The Catalogue of Innovation Tools, that will be continuously updated throughout the project life-cycle.
- Results of the Ideas Generation Workshops, conducted within the framework of Task 6.2.
- Results of the experiments in Lead LL, within WP4.
- Results of the awareness events, under Task 7.3.
- Steady growth of the stakeholder register, under Task 6.1.

At the end of the project, therefore, this initial strategy will be the basis from which the final strategy will be outlined.

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ANNEX 1: EXPECTED OUTCOMES SURVEY QUESTIONS

IN2CCAM Task 7.4 Expected outcome survey

IN2CCAM (Grant Agreement 101076791) is a Horizon Europe project aiming to hasten the adoption of cutting-edge technology accelerating the adoption of Connected, Cooperative and Automated Mobility (CCAM) for seamless traffic management across Europe.

As part of the Task 7.4, Citizens, user engagement and exploitation, to better identify the Key Exploitable Results, we are kindly asking you to answer this short questionnaire, which is addressed to lead and follower LLs. The municipalities of the six cities are requested to fulfil the following short survey, that aims at covering the IN2CCAM's expected outcomes, to efficiently address the challenge of making the most out of produced outcomes.

- Which lead or follower LL do you represent?
  - Tampere
  - Trikala
  - Turin
  - Vigo
  - Bari
  - Quadrilátero

- What type of outcome are you expecting for your city?
  - To implement new services/technologies.
  - To improve already implemented services/technologies.
  - To start new mobility processes.
  - To improve already existing mobility processes.
  - To enhance the current governance model with Organisational Method.
  - Consulting services for already existing governance models.
  - Other
- With regard to the previous selected choices, please, describe in short details your selection.
- Based on the IN2CCAM project Grant Agreement (101076791) expected impacts, which one do you believe will be more relevant to your city?
  - Concepts of fleet and traffic management in the CCAM eco-system enabling optimised systems for the mobility of people and goods that take into account the balance between societal and individual user needs. Intermodal interfaces and interoperability between traffic management systems considering integration beyond road transport in

the overall multimodal transport system providing seamless mobility services. Advanced simulation models and tools that enable and help assessing new traffic management strategies for CCAM.
    - Optimised mobility network load balancing approaches through advanced traffic management guidance and information loops that can reach individual users as well as operational traffic management actors.
    - Effective cooperation and governance models for operating CCAM services as part of real-life fleet and traffic management systems developed and tested.
    - Accelerating the implementation of innovative CCAM technologies and systems for passengers and goods. Further developing a multimodal transport system through sustainable and smart long-haul and urban freight transport and logistics, upgraded and resilient physical and digital infrastructures for smarter vehicles and operations, for optimised systemwide network efficiency.
    - Decreasing the number of transport accidents, incidents and fatalities and increase the resilience of transport systems.
    - Improved synergies between public and private investment plans to advance vehicle and infrastructure technologies.
- What outcomes do you expect will benefit traffic efficiency and the quality of transport and how?
- What outcomes do you foresee will bolster the policy and regulatory actions changes and how?
- What outcomes do you expect will enhance the CCAM awareness and how?
- Do you expect that cybersecurity risks and existing regulatory acts could worsen the project outcomes when facing CCAM and CAVs implementation, in your city?
    - Yes
    - No
    - If yes, please specify how:
- Do you foresee any criticalities that could worsen the expected outcomes, in your city?
    - Yes
    - No
    - If yes, please specify how:
- Are you planning to collaborate with other LL to achieve joint results, even on non-primary outcomes for your city?
    - Yes
    - No
    - If yes, please specify how:

ANNEX 2: EXPLOITATION WORKSHOP QUESTIONS

- Social Exploitation: How is your city planning to take advantage of the project results, to increase the social awareness of the CCAM?

- Technological Exploitation: Which results (data/technologies/services/etc.) do you foresee to be valuable and applicable in other Living Labs, and what would they need to have to use those?

- Governance Exploitation (1/2): Which path and action are you planning to follow, after gathering the experimentation results, to change your current governance model about the CCAM?

- Governance Exploitation (2/2): Are you planning to exploit the other cities' experimentation results or planning to cooperate to change your current policy framework, regarding the CCAM? Or to start a new one.