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HARMONY

Holistic Approach for Providing Spatial & Transport Planning Tools and Evidence to Metropolitan and Regional Authorities to Lead a Sustainable Transition to a New Mobility Era

D9.4 HARMONY areas engagement activities – Second version

Submission date: 29/04/2022

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SUMMARY SHEET

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LIST OF ABBREVIATIONS

Abbreviation	Explanation
AV	Autonomous Vehicle
BEB	Battery electric bus
CAA	Civil Aviation Authority
CAV	Connected and Autonomous Vehicle
CDT	Comune Di Torino
DRT	Demand Responsive Transit
DoW	Document of Work
KPI	Key Performance Indicator
LUTI	Land use and transport interaction
MaaS	Mobility-as-a-Service
MS	Modelling Suite
OASA	Athens Urban Transport Organisation
OCC	Oxfordshire County Council

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OFS	Operational Freight Simulator
OMM	Oxfordshire Mobility Model
RAI	Rijwiel en Automobiel Industrie (Bicycle and Automotive Industry)
RTL	Return to Launch
SME	Small and medium size enterprises
SUMP	Sustainable Urban Mobility Plan
TFS	Tactical Freight Simulator
TUD	Technical University of Delft
UAM	Urban Air Mobility
UAV	Unmanned Aerial Vehicle
ZE	Zero Emissions

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EXECUTIVE SUMMARY

Aligned with the main goals of the project, HARMONY WP9 envisages and is efficiently organizing co-creation and demonstration activities. In this framework, task 9.1 (T9.1) specifically focuses on setting up the HARMONY case studies and managing cross-metropolitan activities. It covers all preparatory and necessary steps to set-up and coordinate the demonstrations, stakeholders' engagement activities, the primary and secondary data collection and the evaluation of the case studies.

In line with deliverable 9.1, which describes general guidelines for the setting up, operation, evaluation and knowledge exchange of the six HARMONY co-creation labs, as well as deliverable 9.3, which is the first version of the progress performed in tasks 9.2 until 9.7, with respect to the results of the engagement activities and demonstrations, the current deliverable 9.4 aims at presenting the further progress of these activities as well as at evaluating the results of the engagement activities and demonstrations, across with any potential political or governance barriers faced. This pertains to the activities carried out until the moment of the deliverable submission, considering that, due to several delays, as will be mentioned in the deliverable, some activities are still ongoing. All the co-creation labs contain a set of activities aiming at contributing to the further development of the innovative approaches to the mobility services on the local level, as well as to contribute to the HARMONY modelling activities. Next to it, three of the co-creation labs will carry out physical demonstrations too.

The main input for deliverable 9.4 relates to the case studies' set-up, management and cross-metropolitan activities and more specifically to changes in the objectives and scope of the co-creation lab and/or demonstration, activities carried out, barriers (in relation to the activities carried out), crucial success factors, the lessons learnt and key stakeholder engagement moments. A section on the selected KPIs for the evaluation of both the co-creation and the demonstration activities is also included. Additional input is provided by the results of one of the demonstrations which has been carried out. Lastly, a summary is included, focusing on the process evaluation and the impact of COVID-19 pandemic, as well as other external or internal factors, on the activities so far.

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1. Introduction

1.1 Aim of the project

Nowadays, new mobility services and technologies are presented as possible solutions to reduce greenhouse gas emissions and energy consumption in metropolitan areas. However, authorities face several challenges when it comes to harmoniously integrating these developments into spatial and transport plans to improve citizens' wellbeing and achieve environmental targets. Given rapid technological advances and the emergence of new mobility services, metropolitan authorities are often in need of expertise, knowledge and tools for multiscale spatial and transport planning.

In the view of this background, HARMONY's vision is to enable different city or regional authorities to lead a sustainable transition towards a low-carbon new mobility era. This will be guided by its harmonised spatial and multimodal transport planning tools, which comprehensively model the behavioural and operational dynamics of the changing transport sector as well as metropolitan areas' spatial organisation.

HARMONY has set ambitious targets for the co-creation of metropolitan scenarios, informing updated spatial and transport planning tools. Therefore, a strict and stable planned coordination is mandatory to ensure the quality of the results and findings of each area and, also, to allow comparisons across the six different geographic areas. The consortium's intention is to ensure the best experience of the implementation of the HARMONY concept in each area and its exchange, not only across the HARMONY metropolitan areas, but also across other EU and international areas.

1.2 Objectives of the deliverable

Within HARMONY, WP9 is responsible for ensuring that demonstration activities are efficiently organized, contributing to achieve the main goals of the project. Specific objectives of WP9 are:

- To develop the guidelines on setting up the co-creation labs, the stakeholder engagement activities and the demonstrations, to make sure that all the areas follow the same approaches and can be comparable;
- To organise the aforementioned activities and demonstrations, and assist in their operation;
- To organise cross-metropolitan activities for experience and knowledge exchange;
- To collect the secondary data and recruit participants for the primary data collection. To evaluate the engagement activities, the demonstrations and the barriers faced in each area.

In this framework, task 9.1 specifically focuses on setting up HARMONY case studies and cross-metropolitan activities. It covers all preparatory steps which are necessary to set-up and coordinate the demonstration as well as the stakeholders' engagement activities, the primary and secondary data collections/surveys, the demonstrations and the evaluations of the case studies. A strict and stable planned coordination is necessary to ensure the quality of the results and findings of each area and also to allow comparisons across the six different geographic areas. Task 9.1 also manages the knowledge and experience exchange across the HARMONY metropolitan areas but also across the HARMONY areas and other EU and international areas.

In line with the above, the main objective of the current report is to present and evaluate the results of the engagement activities and demonstrations, across with any potential political or governance barriers faced, as raised in the context of tasks 9.2 to 9.7. Other objectives relate to the factors that influenced the flow of the activities carried out by the six HARMONY metropolitan areas, such as impact of COVID-19 during the current year, delays in demonstrations due to technical or other reasons and internal re-organization issues. This deliverable is the continuation of deliverable 9.3, therefore it mainly presents the progress of the same topics that have been described in that first version, with some important additions that will be described in the next section.

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1.3 Structure of the deliverable

Deliverable 9.4 includes the following parts: First, a summary of the orchestration approach of the co-creation labs and demonstrations, as initially reported in D9.1, is presented. Second, the key performance indicators (KPIs) which have been formulated for the evaluation of the co-creation activities, as well as the ones related to the demonstrations, are presented. Following, the main part of the deliverable pertains to the case studies' set up, management and cross-metropolitan activities. More specifically, for each HARMONY metropolitan area, the following issues are discussed: (any) changes in the objectives and scope of the co-creation lab and/or demonstration, activities carried out, barriers (in relation to the activities carried out), crucial success factors, the lessons learnt, key stakeholder engagement moments and the adapted time planning. In addition, the progress in the demonstration activities of the cities with a pilot is presented. The deliverable is completed by the section on summary, including an overall evaluation of the processes and the demonstrations which have been carried out so far.

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2. Orchestration approach of the co-creation labs and demonstrations

In this chapter, we provide a summary of D9.1, adapted as presented more recently in D9.3, for the sake of completeness, related to the current state of the art of the HARMONY co-creation labs and what had to be orchestrated there. All of the HARMONY metropolitan areas will develop co-creation labs, varying in objectives and scope, depending on the area. Alongside modelling use cases, physical pilots with demonstrations are planned to take place in Rotterdam and Oxfordshire, while they have already taken place in Trikala. HARMONY co-creation labs in the above-mentioned areas as well as in Turin, Athens and Katowice will focus on stakeholder engagement activities necessary to fulfil their identified scope of activities.

2.1 Setting up the co-creation labs

The objectives and scope of each co-creation lab have been clearly defined and presented in D9.1, including information on the core co-creation lab team, the selection of an appropriate governance model and the preparation of the co-creation lab, identifying the potential demonstrations and activities to carry out, with an indicative planning.

Once the preliminary ideas were identified, team members needed to further develop them within a co-creation lab. Thus, per each of them, it is necessary to clarify on:

- Concrete objectives and ambitions;
- Expected results;
- External to co-creation lab stakeholders necessary to fulfil the demonstrations (who, why, what do we expect from them, their input and their benefit from the pilot);
- Planned co-creation strategies/sessions during demonstrations;
- Stakeholder engagement milestones (why, who, where, expected result);
- Demonstration location and test environment preparation (what is necessary to prepare there, who is involved, planning);
- Operational preparation for demonstrations (what is necessary, concrete actions, who is necessary for it);
- Potential risks, barriers and mitigation strategies;
- Potential facilitators;
- Baseline measurement (if any, based on the evaluation framework developed).

Analysis of the ecosystem defined by the above allows to identify early enough what are the potential risks and opportunities from the direct co-creation lab environment. It is also necessary to carry out the analysis of legal and ethical issues and mitigation measures that can be undertaken. It serves as a check whether the co-creation lab goals can be developed and achieved in real life without raising legislative, social, political or ethical issues.

The whole setting up phase was finalised with the development of the indicative planning for the co-creation lab. It should encompass both demonstrations carried out in the labs, as well as activities supporting them. This action plan documents key agreement points: objectives, scope, expected results to be achieved, operational and geographical scope of the lab, core co-creation lab team, concrete ideas for the demonstrations and activities to be carried out within the lab, risks and opportunities that were identified and which should be monitored throughout the whole lab process. The pre-selected demonstrations are documented via the process evaluation forms (see Annex for the template).

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In this deliverable, we focus on what has possibly changed with respect to the objectives and scope of each co-creation lab, the key activities that have been carried out so far, the barriers faced (in relation to the activities carried out), the crucial success factors and the lessons learnt during the first period of the operation of the co-creation lab, as well as the key stakeholder engagement moments.

2.2 Operation of the co-creation labs

The steps necessary to operate the co-creation lab, with some concrete steps to be performed, have been described in D9.1, specifically for each approach, regarding a) the operation of the physical demonstration (for Rotterdam, Oxfordshire and Trikala) and b) the operation of other activities of the co-creation lab. Stakeholder engagement processes are important in both cases and are at core to operation of any co-creation lab as well as an essential requirement for a successful co-creation process.

2.3 Evaluation of the co-creation labs

The evaluation is a necessary step to draw conclusions on the experiences of the co-creation labs and their activities, as well as lessons learnt from them. In task 9.8 of HARMONY project, evaluation of the validation area activities takes place. To enable a proper evaluation and comparison across the labs, it is necessary to establish concrete procedures and processes according to which the evaluation processes will be organized during the HARMONY duration. The character of activities performed within HARMONY co-creation labs suggests two types of evaluation processes. For each of the co-creation labs a process evaluation is applied, that allows to reflect on the experiences of the co-creation lab and get the lessons learnt from their processes. Next to it, Rotterdam, Trikala and Oxfordshire are developing a set of KPIs in order to evaluate the results of the physical demonstration. The specific KPIs are introduced and described in the following chapter, for both the co-creation and the demonstration activities. Evaluation of the co-creation lab includes three key steps:

- Development of the evaluation framework;
- Data collection processes;
- Data collection analysis.

The key objective of the HARMONY task 9.8 is to conduct evaluation of the six co-creation labs. Looking at the character of activities performed, within each co-creation lab, the evaluation framework, as has been presented in deliverable 9.1, consists of two main pillars: (1) Periodical progress evaluation of the co-creation lab, and (2) Evaluation of the physical demonstrations.

Periodic progress evaluation has been established for all the co-creation labs, in the form of the open questions form (see Annex), reflecting on:

- Progress on the objectives and expected results of the co-creation lab;
- Activities carried out during the established period;
- Barriers and facilitators encountered during this period;
- Key stakeholder engagement moments;
- Activities planned for the next progress report period.

Objectives and expected results from the co-creation labs, as well as concrete activities that are planned to be carried out in order to achieve those, are the starting point of the progress evaluation. At the end of the project, it will be assessed, whether these objectives and results were achieved and what was the process, facilitating factors and barriers that led to it or not. Chapter 5 of the current deliverable

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assesses the overall progress so far on these topics for each co-creation lab, as well as one of the demonstrations.

Evaluation of the physical demonstrations (2) will be performed according to the set of the co-creation performance indicators developed on the level of each individual demonstration. Indicators to evaluate the results of the physical demonstrations include, for example:

- Performance, including process and impact-related, indicators;
- Public acceptance and adoption indicators;
- Business model and technological readiness of solutions indicators.

Data collection processes differ in form and timing for either physical demonstration or other activities carried out within each co-creation lab. For the overall co-creation lab activities, approximately every six months the process evaluation form is being sent to and collected from the HARMONY co-creation labs core partners. Regularity of the data collection from the physical demonstration depends on the specific demonstration case and can take the form of interviews, on-site counting's, automated data collection, etc. It is also possible that physical demonstration evaluation might require baseline measurements data collection, in order to be able to compare business as usual situation, with the situation after the introduction of the innovative solution.

Data analysis is performed throughout the co-creation lab in order to make sure that the lessons learnt from each evaluation period are well integrated into the future development of the lab.

Specifically ,for the physical demonstration, findings will be assessed in order to compare the before and after situations. Based on the suggested evaluation framework, the following assessments are considered as useful to perform:

- Of the co-creation indicators to evaluate the efficiency of the solution/ technology compared to the co-creation lab goals;
- Of the adoption indicators to evaluate users' feedback and public acceptance of the innovative solution/ technology;
- Of the business model and technological maturity of the solution/ technology.

2.4 Knowledge exchange

As mentioned in D9.1, several activities and physical demonstrations are running in parallel within co-creation labs. Therefore, the operation of the co-creation lab needs to consider how the knowledge from individual activities, within individual co-creation lab, is combined and transferred to other project co-creation labs, as well as how the knowledge generated in the different co-creation labs will be exchanged beyond the HARMONY project. The main objective of the knowledge and experience exchange is to liaise with different stakeholder groups and to ensure interoperability of the project results with other innovative solutions in the field of sustainable transport and mobility. The knowledge and experience exchange activities are closely linked to WP10 Dissemination, Exploitation and Innovation Management, more specifically to T10.1 communication and dissemination activities and 10.3 Engagement activities and collaborations. Detailed and concrete approach to the envisaged knowledge exchange strategies and activities within HARMONY is therefore described in the corresponding to these tasks' deliverables. In summary, in relation to the knowledge exchange, HARMONY commits to:

- Avoiding duplication of work with other projects and platforms, especially within the CIVITAS network, aiming mostly to align our evaluation related work with the other CIVITAS projects, in order to exchange knowledge and experience;
- Aligning with other activities in order to integrate HARMONY in the wider field of sustainable regional mobility and spatial and transport planning;

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- Allowing others to build on HARMONY results.

With respect to the abovementioned points, a number of CIVITAS special sessions have been organized, where HARMONY has participated and presented the evaluation framework, as well as the activities carried out so far in terms of evaluation.

Regarding internal communication, knowledge and experience exchange among the different cities, regular WP9 meetings are being organized, with all the six HARMONY areas and the partners involved in co-creation and demonstration activities, being present. In parallel one-to-one meetings are also organized between WP9 leader and each of the cities, i.e. the tasks 9.2 to 9.7 leaders. In addition to that, the periodic process evaluation report (see Annex for the template) is being regularly filled in by the areas in order to provide their updates and make an archive of those.

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3. Introduction of KPIs for the evaluation

In this section, the identification and definition of KPIs to be measured for the evaluation of the co-creation (section 3.1) and demonstration (section 3.2) activities of the cities is presented. Several sub-categories have been further determined, which include enough indicators, able to serve the purpose of task 9.8. The list presented is non-exhaustive, as we tried to limit the number of KPIs to a feasible amount for evaluation, while ensuring that nonimportant information will not be included.

3.1 Co-creation KPIs

As presented in Table 1, the co-creation KPIs are further separated into the following categories: context, involvement and process indicators. The latter ones are related to main events taking place. The exact KPIs to be measured in every category are presented and described in the table. It should be noted that this is a non-exhaustive list of KPIs that can be potentially measured for evaluation of co-creation activities, but focus has been put on the most relevant ones, which would still offer adequate information.

Table 1 Co-creation KPIs

Sub-category	KPI	Description	Measurement
Context indicators	Objectives	Objectives met/ changed	Descriptive
	Expected results	(Expected) Results achieved	Descriptive
	Record of communications	Conversations, discussions, interviews, negotiations and agreements	Descriptive
	General barriers	Barriers in the process of the co-creation lab	Descriptive
	General facilitators	Facilitators in the process of the co-creation lab	Descriptive
Involvement indicators	Number of stakeholders	Number of stakeholders contacted/ involved	Quantitative
	Users involved	Users involved for execution of operations or process (including for example subcontractors)	Descriptive
	Users involved	Users involved for planning of operations	Descriptive
	Other stakeholders	Other stakeholders to involve	Descriptive
	Other relevant developments	Other relevant developments that help to scope the lab	Quantitative
	Type of stakeholders involved	knowledge institutes, citizens, civil society organisations, policy makers, industries	Descriptive

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	Total number of events	Total number of major events carried out	Quantitative
	Key stakeholder moments	Events such as workshops with the different stakeholders involved	Quantitative
	Number of surveys	Number of surveys conducted	Quantitative
	Number of interviews	Number of interviews conducted	Quantitative
Process indicators (per event)	Type of event	Description of the type of event	Descriptive
	Purpose	Type of service, policy, other	Descriptive
	Duration	Duration of the event	Quantitative
	Delays	What is the delay and the reason of it	Quantitative
	Type of co-creation process	Co-initiation, creation of data/knowledge, design, implementation	Descriptive
	Number of stakeholders	Number of stakeholders involved in the session	Quantitative
	Type of stakeholders involved	1. Knowledge institutions; 2. Citizens, civil society organisations; 3. Policy makers; 4. Industries (including sub-categories; mobility policy makers, type of industries, etc.)	Descriptive
	Objectives event	1. Gaining more effectiveness; 2. Gaining more efficiency; 3. Gaining customer satisfaction; 4. Increasing citizens involvement; 5. Other, namely	Descriptive
	Outcome	1. A new initiative; 2. Better shared or new knowledge; 3. A new product; 4. A new service; 5. New or better policy; 6. Other.	Descriptive

3.2 Demonstration KPIs

Table 2 presents the demonstration KPIs, split in the following sub-categories: performance indicators (split further into process and impact ones), public acceptance and adoption, as well as business model and technological readiness indicators. First, it should be mentioned that this list focuses on drone demonstrations and KPIs have already been measured in one of the cities and will be presented in a following chapter. It should be further noted that this is a non-exhaustive list of KPIs that can be potentially measured during a drone demonstration, while it might still not be possible to obtain all of the ones in the table below, either due to lack of data collected or because no validity on the results would be guaranteed, e.g., because results come from a short-term pilot instead of a long term or larger scale one.

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Table 2 Demonstration KPIs

Sub-category	KPI	Description	Measurement
Performance indicators	***Process***		
	Lessons learnt	Lessons learnt while setting up the demonstration	Descriptive
	Facilitators/ Drivers/ Success factors	Facilitators, drivers and success factors while setting up the demonstration	Descriptive
	Deviation from expected results	Possible deviations from the expected results	Descriptive
	Risks and barriers	Risks and barriers while setting up the demonstration	Descriptive
	Mitigation strategies	Possible mitigation strategies taken	Descriptive
	Deployment plan	Deployment plan of the demonstration	Descriptive
	Technical feasibility	Technical feasibility of the demonstration	Descriptive
	Economic feasibility	Economic feasibility of the demonstration	Descriptive
	Legal feasibility	Legal feasibility of the demonstration	Descriptive
	Operational feasibility	Operational feasibility of the demonstration	Descriptive
	Workshops for user instruction	Number of workshops to provide instructions to the user	Quantitative
	Workshops organized to set up the demos	Number of workshops with stakeholders to set up the pilots	Quantitative
	Data requirements	Data needed for performing the demo	Descriptive
	External data sources used for the drone demo	To measure what and how many external data sources was required for the vehicles to operate in the real-world environment	Descriptive
	Number of infrastructure/sensors that the drone interacted with	Number of infrastructure and which infrastructure the drone interacted with	Quantitative
	Communication data security	Communication throughput including data security number of treated messages per time; Number per time unit; Collection method: self- assessment from solution provider	Descriptive
	Privacy protection	Is privacy ensured according to law/ GDPR, i.e., no info about localization and real-time speed transmitted to the cloud?	Descriptive
	Impact		

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	Number of flights	Number of flights performed for the whole demonstrations	Quantitative
	(total) Duration	Total time tested	Quantitative
	Average flight duration	Average time per flight	Quantitative
	Number of errors	Number of errors during the testing phase	Quantitative
	Time for error fixing	Time required to fix an error during the demo	Quantitative
	Average speed	Average speed during the flight/ trip	Quantitative
	Speed variation	Standard deviation of speeds	Quantitative
	Stops	Number of stops per flight	Quantitative
	Total distance per flight	Total distance travelled per flight	Quantitative
	Freight kilometres	Ratio of the distance with cargo onboard	Quantitative
	Number of cargo transported	Average number of units of cargo transported per ride	Quantitative
	Weight and size of cargo transported	Maximum size and weight that can be delivered	Quantitative
	Energy consumption	Total energy consumption	Quantitative
	Pollutant emissions/ Air quality	Air quality' is the healthiness and safety of the atmosphere which can be described by the level of pollutants in the air. The main air pollutants considered are Sulphur dioxide (SO2), Nitrogen dioxide (NO2) and Particulate matter (PM2.5 and PM10)	Descriptive
	Noise level	The indicator 'Noise level' is used to capture the outdoor sound level caused by human activities, including transport.	Quantitative
	Accuracy	altitude, position	Quantitative
	Max video transmission distance	Max video transmission distance in meters	Quantitative
	Maximum wind resistance	Maximum wind resistance in Km/h	Quantitative
	Communication	Communication (all types) in Ghz	Quantitative
	Identification	Identification	Descriptive
	Failure mode	Failure mode	Descriptive
	Security/ cyber security	Security/ cyber security	Descriptive

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	Real time capability	Real time capability	Descriptive
	Object classification	Object classification	Descriptive
	Interoperability	Interoperability (with manned aviation and other stakeholders)	Descriptive
	Detection	Detection	Descriptive
Public acceptance and adoption indicators	Adoption willingness	Ratio of number of customers relative to the total number of people/companies that were invited to adopt the solution.	Descriptive
	Adoption rate	Adoption rate	Quantitative
	Perceived usefulness	Perceived usefulness	Descriptive
	Political acceptance	Political acceptance	Descriptive
	Drone operator satisfaction	Satisfaction – 7-point Likert scale	Quantitative
	Customer / Recipient satisfaction	Satisfaction – 7-point Likert scale	Quantitative
	Feeling of safety of the recipient/ Risk perception	expressed on a Likert scale, e.g., 1–7, very dangerous – very safe	Quantitative
Business model and Technological readiness of solutions indicators	Number of use cases	Number of use cases tested	Quantitative
	Business models	Business models developed	Quantitative
	Total costs	Total costs for the demonstration, including the purchase costs of the vehicle and the digital infrastructure	Quantitative
	Capital costs	Capital costs	Quantitative
	Cost of purchased Drone	Cost of purchased Drone (market price, monetary value)	Quantitative
	Operational and maintenance costs	Operational and maintenance costs	Quantitative
	Usability evaluation	survey, behaviour observations, other relevant methods	

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4. Case studies' set-up, management and cross-metropolitan activities

4.1 Rotterdam

4.1.1 The Rotterdam co-creation lab

In order to support (and promote) the further integration of the automated vehicles (AVs) into the local mobility system, the municipality of Rotterdam needs to have a clear picture of the potential effects and impacts from the AVs integration: e.g., in terms of the economic growth, jobs market, impact on the total vehicles within city borders, infrastructure and urban space requirements, impact on the IT and public communication systems capacity. The objective of the Rotterdam co-creation lab is to understand the potential impacts emerging from the integration of AVs into the local mobility system, specifically the urban freight transport component. This has been planned to be done through 1) the Harmony modelling activities (application of the tactical freight simulator to the city logistics system of Rotterdam and identification of the impact of the AVs on the Rotterdam city transport network) and 2) physical pilots with AVs.

4.1.2 Changes in the objectives and scope of the activities

There have been no particular changes in the objectives and the scope of the co-creation lab per se for Rotterdam, however, these can no longer be met via the physical pilots with AVs. First, due to COVID-19, it had not been possible to have the physical pilot finished before the modelling had started. Next to that, very recently, the partner responsible for the development of the AVs for the demonstration, ARRIVAL, has withdrawn from the project. Therefore, it is expected that it will be difficult to have a demonstration with AVs that can contribute to the goals of the co-creation lab. However, additional time has been available to collect and analyse data from stakeholders which can be applied to improve the modelling activities, while an alternative plan for a physical pilot has been set up, details for which are provided in section 5.1.

4.1.3 Activities carried out

Below are some of the main activities carried out:

- Work on gathering primary data for the Tactical Freight Simulator has been continued. In close partnership with TU Delft, the TFS is continuously under development.
- Actions on GPS devices, questionnaires and serious gaming to receive additional data have started.
- Questionnaires for SMEs (specifically those using delivery vans) are expected to be sent out beginning of April 2022. Results are expected at the second half of April. A couple of questions have been added which help to improve the TFS input.
- Results from recent surveys by Evofenedex (branch organisation of transporters) and RAI association (branch organisation of vehicle importers and dealers) regarding the transition to zero-emissions (ZE) freight transport have been made available.
- Rotterdam puts big efforts in close cooperation with the industry to make sure that the implementation of the ZE zone in 2025 will go as smoothly as possible.
- Regarding modelling of use cases, preparations have been made for the OFS use cases.

Further, an important workshop and a consultation meeting have taken place as part of the Rotterdam co-creation lab activities, details of which are presented in Table 3.

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Table 3 Main co-creation events Rotterdam

Process indicators (per event)	Type of event	**Event 1: Co-creation workshop**	**Event 2: Mobilizing and analysing the Ecostars database**
	Purpose	1. To inform stakeholders on the city's draft policy for charging infrastructure, specifically the heavy duty charging for logistics 2. To get feedback from the stakeholders 3. Demonstrating how the city uses the simulation tool for policy development. 4. To call upon the stakeholders to set up/ participate in initiatives to gain experience with (joint) use and exploitation of heavy-duty charging facilities	Calibration and validation of the simulator input describing the behaviour of the logistical agents.
	Delays	no delays	no delays
	Type of co-creation process	Creation of data/knowledge	Creation of data/knowledge
	Number of stakeholders involved in the session	20	more than 120
	Type of stakeholders involved	Traffic modellers, LSPs-TSPs, grid operator, charging service providers, transport authority, financial service provider	Companies in various logistic segments, model developers, municipality
	Objectives event	Increasing stakeholders involvement; Gaining more effectiveness	To use the consultations to stimulate the individual companies; Gaining more effectiveness; Increasing stakeholders involvement
	Outcome	1. Stakeholders have been informed by the presentation of the draft policy document 2. Feedback received and processed in final version (established Q4-2021); English version available 3. Presentation of a heatmap (computed with the HARMONY-TFS), indicating transport energy demand at depots, destinations and en route. 4. Stakeholders have not taken initiatives yet.	Due to involvement in HARMONY, the relevant information from the available reports (the number of which is still growing) was extracted and was made it available to TUD for analysis and processing. Data from companies in ECOSTARS database on vehicle fleet size and usage have been made available.

4.1.4 Barriers in relation to the activities carried out

COVID-19 has caused many delays also in the co-creation lab of Rotterdam, while a further barrier were the delays occurring from the partner ARRIVAL which would provide the vehicle to be used for the AV demonstration. Eventually, as mentioned before, this partner has withdrawn from the project, hence bringing up a bigger barrier in the process. This means the effort of Rotterdam to support the pilot will need to be done in a shorter timeframe than earlier planned, due to the timeframe of the project, while having to look for an alternative demonstration plan. Details on this issue are provided in section 5.1.

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4.1.5 Crucial success factors and lessons learnt

The city of Rotterdam is trying to stay in close contact with the relevant organisations of the proposed alternative pilot and other activities of the project. There is an effort to ensure that the colleagues are ready when the new proposed plan is approved so as to start immediately with carrying it out.

4.1.6 Key stakeholder engagement moments

Several meetings and activities have taken place. For the ZE zone, there have also been discussions over the goals and means. Specifically, the following moments are the most interesting ones, some of which have been described in more detail in section 4.1.3:

- A co-creation workshop, organized by the municipality of Rotterdam, aiming at informing stakeholders on the city's draft policy for charging infrastructure, getting feedback, demonstrating how the city uses the simulation tool for policy development and calling upon the stakeholders to set up initiatives to gain experience with (joint) use and exploitation of heavy-duty charging facilities.
- The development of (domestic) waste transport module for the TFS, for which five different stakeholders were engaged. In view of the anticipated growth in space and transport capacity resulting from the city's policy on circularity (Zero Waste by 2040), it was considered relevant to take first a step of integrating this component of city logistics in the simulation tool. Legally, domestic waste collection is a public responsibility, while private parties provide waste collection services for the rest of the city. The first step in development of a waste transport module for the TFS will be finalized by a MSc student in the beginning of April 2022. Future use cases may comprise the determination of efficiency gain through combined collection of domestic and non-domestic waste and the spatial and logistic impact of circular economy on waste collection and re-use process.
- Cooperation with knowledge partner Hogeschool Rotterdam in development and application of simulators, in an action to promote the application of the TFS and OFS.
- Mobilizing and analysing the Ecostars database, with companies in various logistic segments, model developers and the municipality participating in a discussion on the calibration and validation of the simulator input describing the behaviour of the logistical agents.
- Rotterdam has attended the "LEAD Futureshop: Hyperconnected city" of the EU-project LEAD in Delft-The Hague, in March 2022. During the event, cargo bicycle carrier Cycloon has expressed their willingness to share operational data for validation of the use case.

4.1.7 Adapted time planning

The demonstration with AVs in Rotterdam was initially delayed by one year to the summer of 2021, but the current situation, with the partner ARRIVAL having withdrawn from the project, has led to additional delays. The new foreseen moment for an alternative demonstration is now summer 2022.

4.2 Oxfordshire

4.2.1 The Oxfordshire co-creation lab

The Harmony Oxfordshire co-creation lab aims to contribute to the demonstration of urban air mobility solutions in UK and use Harmony modelling activities to further contribute to the development of the regional spatial and transport planning strategies. The major expected results of the Harmony co-creation lab are:

- To integrate Harmony project recommendations on new urban air mobility technologies into the regional spatial and transport planning strategies.

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- To carry out drone demonstration and evaluate the feasibility and viability of this urban mobility solution.
- Possibly, to carry out autonomous vehicle demonstration and to evaluate the feasibility and viability of this urban mobility solution.

Other co-creation lab activities contain either activities supporting the demonstration (e.g., air traffic management controller), either are connected to the development of Harmony modelling suit (MS) and are still being shaped in the project.

4.2.2 Changes in the objectives and scope of the activities

There are no changes in the objectives and scope of the Oxfordshire co-creation lab to be reported. However, there have been some major changes in the demonstration plans which are reported in section 5.2, due to the same reason as for the case of Rotterdam, since the partner developing the vehicles has withdrawn from the project.

4.2.3 Barriers in relation to the activities carried out

In the short term, one of the biggest barriers is the short time window to identify a new AV/van operator. This operator would need to integrate with the drone trials being conducted at Milton Park as planned.

Another barrier faced is that the data collection for travel diaries has not been started as the sampling strategy requirement for the companies was too complicated.

4.2.4 Crucial success factors and lessons learnt

Several success factors have been identified during the Oxfordshire co-creation activities and these are listed below.

- Convergence of region's long-term urban mobility plans with objectives of the project.
- Comprehensive internal mobility model (OMM) being linked with HARMONY MS to help identify gaps and shape use cases.
- Ease of transition to new drone operator was possible due to quick project management and existing relations.
- Pre-existing regulatory approval for drone operator.
- Synergies with demonstration location partner through other projects, which are running in parallel, has enabled a seamless flow of information.

Similarly, some lessons learnt have been identified:

- Involve internal stakeholders at early stages of modelling design, as it helped benchmark existing use cases, models as well as provide input to modelling partners for future enhancements.
- Be aware of challenges of cutting-edge technology, as partners might not be able to provide them within the require time period.
- Balance requirements from modellers with market reality, with respect to data collection.
- Prepare backup plan for every partner in the project so that any last-minute unforeseen change can be better managed.

4.2.5 Activities carried out

One of the main activities carried out has been the re-procurement to find survey companies to conduct the Travel Demand Surveys (using MOBY app) as the initial round of tendering did not provide Oxfordshire with any interested responses. Beginning of April 2022, a company has eventually been

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identified and the contract has been signed. There has also been an internal testing of the travel demand survey application to provide feedback to app developers, via on-boarding sessions with MOBY.

Further, two important workshops have taken place during the Oxfordshire co-creation lab activities, details of which are presented in Table 4.

Table 4 Main co-creation events Oxfordshire

Process indicators (per event)	Type of event	**Event 1: Workshop**	**Event 2: Workshop**
	Purpose	Explain the capabilities of the HARMONY MS and understand how it can work together with existing internal models. Help to identify gaps in models being built within the County Council that could potentially be filled by HARMONY.	Internal planners at OCC interested in understanding more about the LUTI model being developed by UCL CASA. Detailed demonstration of the model and provision of clarity to the planners on potential use cases was given.
	Duration	2 hours	2 hours
	Delays	No delays	No delays
	Type of co-creation process	Co-initiation	Creation of data/ knowledge, design
	Number of stakeholders involved in the session	15	10
	Type of stakeholders involved	Local transport planners, policy makers at Oxfordshire County Council	Transport planners, HARMONY modellers
	Objectives event	To explain the HARMONY modelling suite and its capabilities.	Increasing stakeholders engagement and understanding
	Outcome	• 2050 forecasting is very important • WebTAG compliance status • Active Travel what-if scenarios are essential • Can the planners get details of the algorithms used, especially on carbon emissions? • Version controlling of models, network is needed Due diligence of model must be internal	History of LUTI model: • Technology challenges in scaling up the model • Discussion on Interfaces • Dis-aggregation Consistency between models

4.2.6 Key stakeholder engagement moments

These are some of the key stakeholder engagement moments that have taken place:

- Extensive discussions with CAA on regulatory approval application process. These were held to set up a feedback pipeline between demo partners and CAA.
- Discussions with OCC transport model users. These were held to understand HARMONY model architecture better and provide feedback on use cases and requirements.

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- Multiple discussions with modelling partners on data sharing, data licensing and third-party data integration.
- Collaboration with OCC Procurement team to set up the public tender for finding survey companies to conduct Travel Demand Surveys (using MOBY app).
- Multiple discussions on use cases for UAV trials.
- Multiple discussions on use cases for CAV and UAV trials.
- On-boarding discussions with new drone operator.
- Managed site visit for drone operator at Milton Park to identify landing spots and flight paths for the trials.
- Coordinating drone partners to set up timelines for the trials as well as pre-demonstration work integration.

4.2.7 Adapted time planning

The demonstration with automated vehicles in Oxfordshire was initially delayed by one year to the summer of 2021, but the current situation, with the partner developing the vehicle having withdrawn from the project, has led to additional delays. The new foreseen moment for the Oxfordshire demonstration is now Q3 of 2022. In the upcoming period, also help will be provided to travel survey partners to identify potential survey management companies through the internal procurement setup. UAV trial timelines will also be finalized, while a workshop to facilitate integration between different transport management control centres will be set up, as this has been postponed due to new drone operator.

4.3 Trikala

4.3.1 The Trikala co-creation lab

The Trikala co-creation lab is focusing on a pilot with drones within HARMONY. The aim of the co-creation lab is to foster co-creation, social embracement and public acceptance for such a new mobility concept. The local pharmaceutical warehouses and the pharmacies are crucial stakeholders in the project that shape the core community of the co-creation lab. In this direction, the demonstration is co-created between them along with the technical team and the Municipality of Trikala. In particular, the Medical Association of Trikala and the Medical Association of Greece have provided requirements for the design of the demonstration. Along with the Medical Association of Trikala, the geographical routes served by drones have been planned. The demonstration has been shaped through their input and, thus, the process is characterized as bottom-up rather than a technical top-down procedure. It should be highlighted that for the safe and successful implementation, different stakeholders and authorities that have never worked together in the past, had to collaborate. In that context, co-creation lab was the only methodological tool to be used in order to have tangible results.

4.3.2 Changes in the objectives and scope of the activities

Engagement processes, continuous bilateral contacts and consultations with several stakeholders (in particular the National Union of Pharmacists and Union of Pharmacists in Trikala, as well as specific pharmacists) have taken place. The goal was to promote and boost (i) the pharmacists' acceptance in transferring medicines served using urban air mobility (UAM) services and (ii) the pharmacists' agreement on which villages should be served using drones. In addition, their input has been collected regarding the number of urgent cases per day that could be served by drones.

The objective and scope of the activities is to provide improved mobility systems and services to older and vulnerable groups that live in rural areas. By using UAM Systems and Services and going to the 3rd dimension, freight transportation could be improved in a very efficient way in the city of Trikala. UAM could be useful for the bypass of some routes for medical supply delivery for urgent cases. This use-

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case could later on be extended to similar fields that are time-critical. Handling the transferring of crucial goods (such as medicines) by air, decreases the delivery time, since no traffic congestion is confronted in the third dimension and the route is optimized to a straight line if possible. Cost is reduced since the delivery is conducted by electric self-piloted drones.

It should be noted that there is a new short-term objective added to the objectives agenda, which is the aim to provide a COVID-19 response in the mobility sector in order to create societal confidence in shared services and healthcare. By using autonomous drones with remote operation from a support Control Room, everyone is kept safe, ensuring social distancing. This is currently important in order to quickly face the COVID-19 crisis and any other crisis that could emerge in the future and transform the everyday life of elderly population to a much safer and convenient landscape. Concluding, UAM is a safer, greener, smarter, cheaper and faster solution that will replace the traditional freight mobility regime.

4.3.3 Activities carried out

The main activities within the Trikala co-creation lab are two events related to the start of the drones' demonstrations, which took place the last months, in three different locations in Trikala area. The purpose has been to launch the demonstration and start an initial dialogue with the local ecosystem on UAM. Two events took place for the first two series of flights, while there was no big event planned for the third demonstration. More details are provided in Table 5.

Table 5 Main co-creation events Trikala

Process indicators (per event)	Type of event	**Event 1: Demonstration**	**Event 2: Demonstration**
	Purpose	Start of demonstrations: Launch the demonstration and start an initial dialogue with the local ecosystem on UAM	Start of demonstrations: Launch the demonstration and continue the initial dialogue with the local ecosystem on UAM
	Duration	1 day	1 day
	Delays	no	no
	Type of co-creation process	Events for implementation	Events for implementation
	Number of stakeholders involved in the session	11 (Citizens, Hellenic Civil Aviation Authority, UCL, MobyX, University of Aegean, Union of Pharmacists in Trikala, Pharmacists (individuals), e-Trikala, Municipality of Trikala, Depot of Pharmacists, Drone Provider)	7 (Citizens, Union of Pharmacists in Trikala, Pharmacists (individuals), e-Trikala, Municipality of Trikala, Depot of Pharmacists, Ministry of Digital Governance, Drone provider)
	Type of stakeholders involved	1. Knowledge institutions; 2. Citizens; 3. Policy makers; 4.	1. Citizens; 2. Policy makers; 4. Industries (drone provider and pharmacists)

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		Industries (drone provider and pharmacists)	
	Objectives event	4. Increasing citizens involvement; 5. Increasing stakeholders engagement and understanding	4. Increasing citizens involvement; 5. Increasing stakeholders engagement and understanding
	Outcome	A new service (UAM service)	A new service (UAM service)

4.3.4 Barriers in relation to the activities carried out

The general lockdown has been an essential barrier given that trips between different regions are not allowed and physical meetings with stakeholders were not allowed. This has been a bottleneck for our potential operator and drone provider as well as for engagement activities. Physical meetings and workshops have taken place virtually.

This has further contributed to low participation in stakeholder engagement activities/co-creation labs and surveys as well as a multi-phased authorisation process by the Civil Aviation Authority. The risk is owned by the co-creation lab coordinator in the city of Trikala, in our case e-Trikala. The capacity to engage stakeholders in this context is under question. E-Trikala has strong networks with stakeholders that will be used to maximise participation in workshops and ensure the right stakeholders attend. Letters of support have been gathered before the start of the project and several steps have been already initiated.

4.3.5 Crucial success factors and lessons learnt

The importance of co-creation is a lesson learnt itself. The knowledge that can be shared until this point is the initial integration of Urban Air Mobility solutions and services into the transport planning framework. Another lesson learnt has been the process of building public acceptance in the field of urban air mobility, correlating with the medical sector.

In addition, the public engagement with the citizens and stakeholders, which is the only way to develop and implement a UAM project, given the multitude of stakeholders that take part, has been a success factor so far, despite the complexity of the process.

4.3.6 Key stakeholder engagement moments

The key stakeholder engagement moments for the city of Trikala took place during the drone demonstrations, the preparation and the launching of them.

Further activities are being planned for the upcoming period which are the following:

- Qualitative interviews will take place with stakeholders and citizens.
- Quantitative data deriving that will derive from online surveys. This data collection processes will be conducted before and after the pilot demonstration, so that comparisons are able to be made.

4.3.7 Adapted time planning

The demonstration with drones in Trikala was initially delayed by one year to the summer of 2021, but the COVID-19 situation led to an additional delay. Eventually the demonstrations took place in Q4 of 2021.

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4.4 Turin

4.4.1 The Turin co-creation lab

The Turin municipality pursues the goal of rebalancing the demand for transport between collective and individual, in order to reduce congestion and improve the accessibility to the various urban functions. The SUMP of the Turin municipality in 2010 has been designed to embrace this vision, that is likely to be continued in the new SUMP, covering the whole metropolitan area, which is currently under definition and planned to be presented in 2021.

The Turin pilot goals within the HARMONY project are focused on the territorial impacts generated by the new public transport infrastructure (such as the new metro line) and the new MaaS mobility paradigm on the Turin Urban Functional Area, with particular reference to its integration with the Metropolitan Railway System (known as SFM).

Furthermore, the HARMONY MS could be used to simulate some of the specific strategies and scenarios of the new SUMP of the Metropolitan City of Turin. In this sense, the engagement of stakeholders is in progress and the topics mentioned above would be integrated by the outcome of the co-creation labs. The upcoming co-creation labs will focus on two main aspects: on the one hand, analysing the Turin mobility in the wider context of the city's emerging trends and vision for the future, on the other hand, exploring the potential opportunities offered by the MaaS mobility paradigm from various points of view.

4.4.2 Changes in the objectives and scope of the activities

Currently, there are no huge deviations from objectives and scope to be reported. The postponement of passenger survey nevertheless caused some delay in some of the co-creation activities originally planned.

4.4.3 Activities carried out

- In Torino, on 17th of December 2020, a co-creation workshop with about 30 participants took place online. With all AUCM colleagues, a fun and engaging presentation with Mentimeter application was created. Interesting suggestions to implement Turin traffic model were acquired.
- Before summer 2021, involvement into two different dissemination activities during Next Generation Mobility event are to be reported:
    - Into Mobility as A Service session, a brief introduction about Harmony project and Turin study case activities was presented.
    - With UrbanLab colleagues, a web on-air session with other mobility experts was organized to speak about shared mobility and Harmony Turin study case.
- Definition of the use cases for the HARMONY MS application for Turin has been completed.
- CDT together with TRT prepared the tender for recruiting individuals (passengers), which was published officially in July 2021 and closed at beginning of September 2021.
- TRT tested the App and supported MOBY for improvements. A pilot with 30 users was launched at end of November. Then, feedback and analysis were performed to improve and prepare for the second and main part of the survey.
- In February 2022, the survey has been launched in two batches of about 235 participants. The planning was revised and delayed by two weeks due to a new COVID-19 wave (original plan was to perform it in January 2022).
- Passenger survey with MOBY App (sample managed by IPSOS company) has been completed at the end of February 2022. Data analysis is ongoing since mid-March.

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  - Recruiting about 580 valid participants (verifying at least 4 days, filling at least two SP questionnaires).
- Passenger survey with MOBY App open for voluntary participation, launched on March 14th, 2022 (ongoing, planned until April 10th, 2022).
  - 113 download of the App, 61 users tracking at least 1 day.
  - 28 users verifying at least 1 day, 16 users verifying at least 4 days.
  - 19 users filling at least 2 SP questionnaires (in addition to the intro questionnaire).
- Data collection/ elaboration to support modelling applications (Demographic forecasting model, agent-based model, VISUM network model and use cases).
- Synergies with other on-going projects in Turin, related to transport topics of HARMONY (Buoni mobilità – MaaS, CIVITAS Handshake).
- Co-creation activities, i.e. a workshop on survey results and Harmony application in Turin, to be re-scheduled after the end of the survey and analysis of data.

Below, in Table 6, some more details are provided for the workshop mentioned as part of the Turin co-creation lab, as well as for the Urban Lab on Air, a broadcasted event with media coverage.

Table 6 Main co-creation events Turin

Process indicators (per event)	Type of event	**Event 1: Turin co-creation lab (Dec 2020)**	**Event 2: Urban Lab on Air (May 2021)**
	Purpose	workshop	media coverage (broadcasted)
	Duration	2 hours	1 hour 20 minutes
	Delays	delayed due to COVID	-
	Type of co-creation process	creation of data/knowledge, design	Creation of data/ knowledge
	Number of stakeholders involved in the session	20+	50
	Type of stakeholders involved	Knowledge institutions, policy makers	general public
	Objectives event	description of HARMONY MS and Turin case study, explore topics for use cases	Increasing citizens involvement, discuss mobility topics explored in HARMONY
	Outcome	Better shared or new knowledge; New or better policy for the modelling suite	Better shared or new knowledge; New or better policy for the modelling suite

4.4.4 Barriers in relation to the activities carried out

On data collection and access to models, the main barriers are that there is no direct access to traffic data and software license, moreover the partners have to sign different official agreements. Next to that, COVID-19 emergences have slowed down some meetings and approval of some agreements between partners, as well as have caused some issues for the survey, which had to be re-scheduled.

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4.4.5 Crucial success factors and lessons learnt

A success factor of the project is the possibility to exchange knowledge and lessons learnt with the other HARMONY metropolitan areas, with reference to co-creation labs and stakeholder engagement. In addition, the case study is taking benefit of finding synergies and sharing information with other research projects that are currently exploring new mobility services in Turin. These projects are the BIPforMaaS, MaaS vouchers, Smart Mobility (Smarter Italy).

The main lesson learnt is that COVID-19 pandemic has reduced the possibility of stakeholders' engagement and many people were often unavailable due to job retention period. Business contacts and public participated events, that are typical situations where sharing opinions and ideas is possible, have been strictly limited and this has affected the activities related to co-creation labs.

4.4.6 Key stakeholder engagement moments

Co-creation activities have taken place in order to define the use cases for the HARMONY MS application for Turin. In the second half of March, a passenger survey with MOBYapp open for voluntary participation (on-going), to collect additional data will be launched. Subsequently, co-creation activities, which were originally planned at the end of 2021, will be re-scheduled after the end of the survey and analysis of data (to present results). In the meantime, potential synergies with other on-going projects in Turin on MaaS and Autonomous vehicles is being explored.

4.4.7 Adapted time planning

The travel surveys with the MOBY app for primary data collection in Turin was initially postponed to Spring 2021, but the COVID-19 situation led to an additional delay. The new moment for this data collection is now Q1 of 2022. Specifically, in the second half of March, a passenger survey with MOBYapp, open for voluntary participation (on-going), to collect additional data has been launched. Co-creation activities originally planned at the end of 2021 will be re-scheduled after the end of the survey and analysis of data (to present results). Data collection/elaboration for Turin modelling applications will proceed and support will be provided for the definition of KPI for modelling. Potential synergies with other on-going projects in Turin on MaaS and Autonomous vehicles will also be explored in the coming period.

4.5 Athens

4.5.1 The Athens co-creation lab

The general objectives of the 1st Athens co-creation lab can be briefly summarized in: (a) the provision of input for the strategic, tactical and operational-level transportation planning of the greater Attica region, and (b) the assessment of the impact of various sustainable urban mobility solutions and services on the Athens metropolitan network. However, since the transportation services that were proposed through the questionnaires are innovative and have never been applied to Athens before, the most relatable objective was to gain some insight into the standpoint of the stakeholders on those services, along with the expression of some of their problems, needs and preferences.

The main expected results from the Athens co-creation lab were: (a) to understand the stakeholders' problems, needs and points of view on different transportation-related issues, (b) to allow the stakeholders to express their proposals and preferences with respect to those issues, and (c) to possibly implement some of the stakeholders' proposals in the scenarios that will be examined as part of the project.

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4.5.2 Changes in the objectives and scope of the activities

No changes are to be reported with respect to the scope and objectives of the second Athens co-creation lab. As far as its scheduling is concerned, the lab was initially planned to take place in late 2021. However, after a meeting with UAegean in October 2021, it was proposed that the lab would better be postponed until autumn 2022. The proposal was based on the grounds of the completion of all models (strategic, operational, tactical) as well as the MS platform until the second quarter of 2022, enabling us in this way to provide the stakeholders with more information on the topics discussed and some tangible results from the testing of the scenarios over the Attica region, so that the discussion over the topics of concern will be more fruitful. On that basis, OASA has agreed and plans to organize the lab in autumn 2022.

4.5.3 Activities carried out

First, the Athens transportation model has been successfully updated in its supply- and demand-related parameters in order to be ready for use during the HARMONY scenario application. Second, OASA has had several meetings (both internal and with project partners and WP teams) in order to finalize the respective scenarios. In this regard, OASA provided the WP4 team with all the data needed for the construction of the strategic-level models (Athens LUTI and regional economy models) and has asked the Hellenic Statistical Authority to provide the data needed for the construction of the Athens synthetic population model. As for the operational-level models, OASA has also been involved in discussions with partners that contribute to a scenario application and has implemented the scenarios of interest in the Athens transportation model, with modifications and adjustments taking place as needed. Eventually, the analyses for the three operational level use cases have been completed. Further analyses with respect to the micro-mobility scenario are under consideration.

Table 7 Main co-creation events Athens

Process indicators (per event)	Type of event	**Event 1: Athens's 1st co-creation lab**
	Purpose	The purpose of the lab was to investigate the standpoint of various stakeholders on various innovative transportation services on the Athens network as well as record some of their problems, needs, preferences and recommendations with respect to transportation issues in general and the scenarios examined.
	Duration	The lab took place in a virtual form. Invitations to the stakeholders and the filling out of questionnaires by them was conducted from April 2020 till mid May 2020. Analysis of the findings took place from June to July 2020.
	Delays	No delays are to be reported with respect to the Athens 1st co-creation lab. However, due to the coronavirus pandemic and the restrictions imposed, the lab had to take place in a virtual form.
	Type of co-creation process	Due to the coronavirus pandemic, the co-creation lab was held in a virtual manner. The scope was to gain some general insight on innovative transportation services that had never been applied to Athens (nor to Greece) before.

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	Number of stakeholders involved in the session	On the basis of the four types of questionnaires prepared (four scenarios examined) the number of stakeholders that replied are: 19 (Demand Responsive Transit (DRT)), 4 (Battery Electric Buses (BEBs)), 5 (Micro-mobility), 7 (Autonomous Vehicles (AVs)). All questionnaires had a common Introduction section to them, which was filled out separately. The total number of Introduction questionnaires that were returned was 14.
	Type of stakeholders involved	As already listed above: municipalities, the police, the Ministry of Transport and DEDDIE, OASA also contacted academics, other transport organizations (AMETRO, STASY, TRAINOSE, ATTIKES DIADROMES), consultants and citizens.
	Objectives event	The general objectives of the 1st Athens co-creation lab can be briefly summarized in: (a) the provision of input for the strategic-, tactical-, and operational-level transportation planning of the greater Attica region, and (b) the assessment of the impact of various sustainable urban mobility solutions and services on the Athens metropolitan network. However, since the transportation services that were proposed through the questionnaires are innovative and have never been applied to Athens before, the most relatable objective was to gain some insight into the standpoint of the stakeholders on those services, along with the expression of some of their problems, needs and preferences.
	Outcome	The main expected results from the Athens co-creation lab were: (a) to understand the stakeholders' problems, needs and points of view on different transportation-related issues, (b) to allow the stakeholders to express their proposals and preferences with respect to those issues, and (c) to possibly implement some of the stakeholders' proposals in the scenarios that will be examined as part of the project.

4.5.4 Barriers in relation to the activities carried out

The coronavirus outbreak has been a major impediment in the planning and organization of the 1st Athens co-creation lab. In addition, most stakeholders appeared to be hesitant in replying, with the municipalities were the ones most difficult to engage. The organizations that were most willing to participate were those that would not be directly involved in the implementation of the scenarios examined. Moreover, certain types of questions (open questions, questions regarding the collaboration with other entities) were not answered.

The coronavirus pandemic and the restrictions imposed have affected the organization of the second Athens co-creation lab, which, as explained earlier, will eventually be held in autumn 2022. Some other problems experienced regard the gathering of the data needed for the construction of the Athens synthetic population model. These may be attributed to: (a) the more aggregated data types that the Hellenic Statistical Authority is able to provide as opposed to the very disaggregated data types that the synthetic population model needs, and (b) the delay of the Hellenic Statistical Authority to quickly process the data asked for due to the 2021 population census taking place between the months November 2021 and February 2022. Acknowledging the difficulties arising in this respect, OASA has already forwarded to the WP4 team the type of data (templates) that is available and lies closer to the actual data asked for in order for the WP4 team to investigate the feasibility of building a model. In parallel, OASA began the necessary actions to receive the data from the Hellenic Statistical Authority. As of now, OASA has signed the necessary contract with the Hellenic Statistical Authority and is waiting to receive the data, which will then be forwarded to the WP4 team.

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4.5.5 Crucial success factors and lessons learnt

The electrification of public transport is in direct relationship with one of the scenarios that were examined during the lab and acts in favour of it with the provision of real planning data that can be assessed by the stakeholders.

OASA has participated in many meetings regarding various aspects of the scenarios that are to be investigated for Athens, the HARMONY project and the MS platform, contributing to a vivid exchange of opinions with all the involved WP members. This has resulted in a closer collaboration with all team members, in the transfer of knowledge and expertise between the partners and in stronger interpersonal relationships, all of which will undoubtedly contribute to the successful completion of the HARMONY project and to possible pursuit of further collaborations between the partners in the future.

The impact of exogenous agents (covid-19 pandemic) is clear in the case of the organization of the second Athens co-creation lab, with the lab eventually planned to take place in autumn 2022. However, despite the scheduling fluctuations, the lab is expected to provide valuable results since, at that time, the stakeholders will have the chance to be provided with some tangible results from the testing of the scenarios and give their feedback on that basis. In addition, stronger collaboration with other project partners has proved to be valuable in the case of the scenario formulation and application for Athens and it is expected to be a crucial success factor in the final outcome.

4.5.6 Key stakeholder engagement moments

During the reporting period, OASA has had several meetings with stakeholders involved in the electrification of public transport, a breakthrough initiative of high importance that is going to be realized in Athens over the upcoming months. In this case, OASA cooperates with a wide range of public and private entities that play a key role in the planning of the operation and the actual implementation of the new means of transport (municipalities, ministries, the European Investment Bank etc.). OASA has also active participation in the conduction of the municipalities' SUMPs and the specification of the mobility measures that are proposed as part of them.

Due to the coronavirus pandemic, the first co-creation lab was held in a virtual manner. The questionnaires were first prepared by OASA and sent by email to the stakeholders. The stakeholders then had the chance to contact the Organization and ask questions about the questionnaires and, when filled out, send the questionnaires back to OASA for the processing of the results.

4.5.7 Adapted time planning

The time planning of the activities in Athens is also affected by the COVID-19 outbreak. The next Athens co-creation lab will be postponed to autumn instead of spring 2022. In the upcoming period, OASA awaits to see how the formulation of the HARMONY MS platform will be realized in the case of Athens and the added value that will come as a result of that in the levels of strategic and operational planning. No major further delays are expected at the moment.

4.6 Katowice

4.6.1 The Katowice co-creation lab

The main objective of the Katowice (GZM) co-creation lab is to a have citizen-driven approach to the process of SUMP creation, with a focus on the social acceptance of Urban Air Mobility use cases. Next to it, within the co-creation lab, the opportunities of transport modelling software for the public transport network planning, are being investigated. In line with this, expected results from the co-creation lab are:

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- Created SUMP reflects the needs of citizens in terms of the problems and challenges addressed and solutions proposed;
- There is a clear picture on the mobility patterns within and between different districts of the GZM agglomeration (urban, rural, intercity);
- Knowledge about transport modelling software and its potential application for GZM is produced;
- Transport modelling software is tested with input data from GZM, and concrete user experience results are available;
- HARMONY MS is tested by GZM.

There is no physical demonstration planned within GZM co-creation lab, but a set of concrete activities will be performed, as described in DoW:

- To engage and work with stakeholders and citizens to investigate their requirements in terms of spatial and transport planning and new mobility services (WP1, WP9);
- To transfer results from the HARMONY MS application to assist the authority to plan for the metropolitan-wide transport, introduce new forms of mobility and update their SUMP (WP8).

4.6.2 Changes in the objectives and scope of the activities

As mentioned in D9.3, the topic and the scope of the co-creation lab in Katowice had to be reinvented to align to its SUMP process. Specifically, topics of social acceptance research have been narrowed to Urban Air Mobility. Since then, work is continued within GZM's co-creation lab objectives under T9.7 to solicit stakeholder feedback on preferences for types of drone operations.

4.6.3 Activities carried out

The main activities related to the GZM co-creation lab pertain to a general preparation and investigation phase that will lead to a proper design of it, aligned with the overall scope of the project and the objectives of the SUMP of the city. In addition, the co-creation lab has conducted activities in the last six months related to the Drone Deliveries Game survey.

So far, the specific objectives of the co-creation lab and the definition of the framework are being explored in collaboration with UCL and discussed during online workshops with several stakeholders. On this basis, a survey for planning and testing citizens participation phase of SUMP, including topics related to new technologies and new mobility, is also being created.

The main activity carried out in GZM was the workshop titled “Flying taxis? Drones as a component of modern urban mobility”, details for which are provided in Table 8. This workshop took place in Poland, in December 2020, together with UCL.

Table 8 Main co-creation events Katowice

Process indicators (per event)	Type of event	**Event 1: Co-creation workshop**
	Purpose	Bring together stakeholders in the Urban Air Mobility sector to update them on the region’s efforts to promote the safety implementation of drones. Capture stakeholders’ ideas regarding drones in use cases. Understand who are the involved actors, what are the preconditions and the implementation flow. Identify additional requirements outside the functional requirements the system is expected to perform.

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	Delays	No delays
	Type of co-creation process	Creation of data/ knowledge
	Number of stakeholders involved in the session	29
	Type of stakeholders involved	Stakeholders from NGOs in the field of mobility, representatives of national and local governments, crisis management services, the R&D and academia, financing institutions, representatives of the drone industry
	Objectives event	Top 3 issues selected to be discussed: Drone missions as support for rescue missions; Transport of medicines / medical samples; Transport of documents between municipal offices and passenger transport
	Outcome	List of opportunities and threats for every one of the abovementioned issues discussed.

4.6.4 Barriers in relation to the activities carried out

A barrier that has been identified in the process of developing a co-creation lab is that there is not enough support and knowledge on how to initiate it. The area of interests in initial plans has been too wide which hinders the procedures. Further, there have been internal changes with resource management in GZM, which required rethinking of goals of the co-creation lab. It was also hard to start with any activities since leadership was changed inside GZM and there was no plan for activities previously. Further, there have been some technical issues for workshops, related to translation and the need for a better tool for online workshops.

Another barrier related to the area of Katowice is the direct outreach to potential study participants. By making the survey available, inter alia, in the social media of GZM and direct mailing to a base of over 400 stakeholders, including institutional partners of GZM for further dissemination, 199 responses from users with a Polish IP address were acquired by the beginning of March 2022. Further, there was a barrier with respect to the technical difficulties in implementing the survey with the support of a professional opinion polling company. It took four months to carry out the procedures related to the implementation of the survey, as well as the integration of IT tools in order to provide results in line with the expected amounts regarding age, gender, place of residence. Work on the implementation of the survey could only be carried out with a second contractor.

Lastly, due to COVID-19, there was limited interest of stakeholders from the group of local government authorities and municipal services in participation in additional activities i.e., the workshops.

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4.6.5 Crucial success factors and lessons learnt

A crucial success factor for GZM has been the continuous knowledge and experience exchange with the rest of the HARMONY areas, especially the ones dealing with UAM. The support of UCL, the lead partner in the preparation of the content and research tools, has been essential to successfully carry out the task. Regarding the potential to increase the reach of the survey, a crucial success factor was its availability in different languages. Further, GZM partners and survey respondents appreciated the interesting, non-standard formula of the survey with respect to choosing the more acceptable option of drone use on the basis of various variables presented in two parallel pictures. Another benefit of the added value of the study is its universal character and the topicality of the issues. The online format allows for wide dissemination.

An important lesson learnt is that strong support from scientific partners is needed to start anything. UCL offers great support in the process of developing a co-creation lab/workshop. With respect to the survey, the complexity that characterizes it, gives an indication that the desired results, on the preferences for drone operators, based on a variety of specified criteria, become difficult to be obtained. Further, several challenges have been identified, such as reaching respondents directly when conducting an online survey. Also, the challenge of conducting an online survey in cooperation with a professional subcontractor on the tool provided is to integrate the tool, as well as to consider the substantive and technical comments of subcontractors. Additionally, when pricing the services ordered on a ready research platform, many challenges arise related to checking the subcontractor's actual technical readiness to conduct the survey.

Regarding the workshop, applying a formula well suited to the subject matter made it possible to achieve the intended effects of the co-creation lab, i.e., analysis of opportunities and threats for various types of drone services in cities from the point of view of various stakeholder groups, including NGOs, local governments, crisis management services, and scientific communities. Further, the following can be noted:

- Positive effect of joint mobility and drone Metropolis teams working together on the project. Access to both drone and mobility groups of interest.
- Attaching the obligatory questionnaire to the recruitment form achieved the expected result. This not only allowed to analyse the expectations of various social groups regarding the use of drones in urban space, but also allowed to increase the participants' identification with the discussed subject matter, strengthened the involvement of the workshop participants in its work.
- Due to the high level of specialization and knowledge in various areas on the part of the participants, it is worth considering working in workshop groups only for 1 use case. Thanks to this solution and the increasing dynamics of the group's work, it is possible to achieve the desired results in the form of comprehensive scenarios.

4.6.6 Key stakeholder engagement moments

Some of the needs to explore social acceptance have been met during general research of mobility habits in the SUMP process. In addition, several deep interviews were performed during the European Mobility Week, including discussions about new and future mobility. Several meetings of Council for New Mobility and three workshops with citizens as a part of SUMP meeting have taken place. In addition, strong cooperation is continued between UCL and GZM in developing and translating the survey content into Polish (until July 2021). The direct distribution of the survey by the GZM to over 400 stakeholders - partners of the GZM followed, until October 2021. Finally, public procurement and cooperation with UCL and 2 companies in turn to integrate the tools until March 2022 has been completed.

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4.6.7 Adapted time planning

The HARMONY activities in Katowice (GZM) are currently not affected by the COVID-19 outbreak. No major further delays are expected at the moment. In terms of upcoming activities, a hybrid workshop is being planned on the topic of 'Conditions for drones in cities', as well as further co-creation activities, involving Harmony and ASSURED-UAM, aiming at cooperation between the two projects.

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5. Physical demonstrations activities

5.1 Rotterdam

5.1.1 The freight AV demonstration

The original plan for Rotterdam was to perform AV pilots in Delft and Rotterdam, in The Netherlands, using three level 4 electric autonomous vans, provided by ARRIVAL. Due to the partner withdrawing from the project, the pilot could no longer continue as planned. However, a plan B has been prepared in order to make up for the delays so far, while also maintaining the purpose of the demonstration and achieving the goals and objectives, as these had been formulated in the beginning of the project.

The new planning involves 'Rosie' (Robot On SIte Erasmus), a delivery robot, used for last mile logistics. In collaboration with partners such as SPAR university and the Erasmus University Rotterdam (EUR), the feasibility of self-driving delivery robots for food delivery on the campus site was investigated. Since December 1st 2021, delivery robot Rosie has started delivering SPAR University products to campus visitors, students, and employees. This takes place in a closed campus environment, in a private fenced off test facility. Before the start of the pilot, learning questions have been defined by the various partners and these are answered, as far as possible, in collaboration with, among others, research institutes. These learning questions concern technical, operational, economic, legal and social questions on the closed campus. However, the academic research performed during the pilot is mainly focused on the interaction between the robot and the environment, and not directly on city logistics. Furthermore, The Netherlands have no practical experience with the use of delivery robots on public roads. Based on the 'learning by doing' attitude, the plan is to tackle the issues jointly by conducting tests with the city of Rotterdam and other stakeholders on a test site and the public road.

Via this pilot, some questions interesting and relevant for the objectives of Harmony, to be answered, are:

1. How can automation of city logistics contribute to the goals of the city of Rotterdam with respect to policy goals?
2. What will the future of city logistics in Rotterdam look like with the introduction of self-driving robots? What will be the city's role in this respect?
3. Can the pilot contribute to new insights in the city logistics traffic models?
4. What should be the role of the city with a possible introduction of self-driving logistic robots?

However, it has to be noted that this plan is yet to be approved in order to proceed, thus the situation regarding the Rotterdam pilot is still uncertain.

5.2 Oxfordshire

In Oxfordshire, one demonstration was being planned, combining freight and passenger transport (CAV) with drones (UAV). The changes that had to be made in this demonstration plan are to be reported in the next section.

5.2.1 The drones and AV demonstration

Oxfordshire has transitioned to a new drone operator (RUAS) due to GRIFF facing difficulties to conduct the operations in UK. RUAS is a UK-based drone operator and has already approval from the CAA to conduct trials. GRIFF will still provide the heavy lifting drone, but RUAS will handle the operations as well as the small drones.

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An initial meeting with RUAS has already taken place, aiming at discussing the types of drones, the use cases to be tested and the various challenges based on weight of drones as well. The most important takeaways from the most recent meetings with all partners are:

- Discussion on landing spots and flight routes.
- Types of payload.
- On-site at Milton Park needs to be done early in 2022 to identify details.

Regarding the freight and passenger transport, some major changes had to be made. The partner ARRIVAL has withdrawn from the project; thus, no AVs will be provided by them for demonstration purposes. Several alternatives for another AV or even replacement with conventional vans were being considered. Eventually, it has been decided that an electric van will replace the AV, while the original plan to have a combined freight van and UAV demonstration remains the same. However, no passenger transport demonstration will be performed, due to time constraints because of the delays so far. The current dates planned now are the 19th until 21st of August 2022, including a rehearsal on the 20th before the actual demonstration on 21st. an internal meeting to finalize the electric van usage and the charging infrastructure for both the drones and the electric vans is currently being planned.

5.3 Trikala

5.3.1 The drones demonstration

The drone's demonstration in the city of Trikala involved a preliminary case study focusing on a pharmacy shop that delivers medicines to elderly houses through drones. Eventually, an adapted case study has been formulated, due to legislation restrictions, focusing on a pharmacy logistic centre that delivers medicines to pharmacy stores through drones. Afterwards, each pharmacy store can deliver the medicines to elderly groups through ground mobility modes.

In total, pilot drone flights have been conducted in three peri-urban areas of the city of Trikala, in Greece. Eight (8) flights have been conducted to each one of the destinations. The landing took place in the pharmacy area of Leptokaria, in the football area of Mikro Kefalovriso and in the football area of Mikro Kefalovriso.

During the flights, several data was collected and impact assessment results, in the form of various KPIs, are presented here. During the whole pilot, 24 flights were performed, a total distance of 170km was covered, while the total duration of the flights was 632 min (10.5h), on an average speed of 10m/s.

Table 9 Process KPIs for the drone demonstration in the city of Trikala

KPIs	**Leptokaria**	**Megalo Kefalovriso**	**Mikro Kefalovriso**
Process			
Lessons learnt	value of co-creation, safety challenges in urban areas and public areas, traffic models needed, cybersecurity		
Facilitators/ Drivers/ Success factors	Structured co-creation process		
Deviation from expected results		land and take-off in village's outskirts	

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Risks and barriers	approach Urban Environment, Municipality and user/stakeholders acceptance, absence of technological equipment and investment, lacking U-space monitoring tools and methods		
Mitigation strategies	Evacuation, work with local and national authorities		
Deployment plan	N/A	N/A	N/A
Technical feasibility	N/A	N/A	N/A
Economic feasibility	yes	yes	yes
Legal feasibility	N/A	N/A	N/A
Operational feasibility	N/A	N/A	N/A
Workshops for user instruction	Yes	Yes	Yes
Workshops organized to set up the demos	N/A	N/A	N/A
Data requirements	Yes	Yes	Yes
External data sources used for the drone demo	N/A	N/A	N/A
Number of infrastructure/sensors that the drone interacted with	0	0	0
Communication data security	Yes	Yes	Yes
Privacy protection	Yes	Yes	Yes

The value of co-creation has been pointed out for a successful process in setting up and carrying out such a demonstration. Also, safety challenges in urban and public areas, the need for traffic models and cybersecurity have been identified and highlighted as lessons learnt. Moreover, a structured co-creation process is indicated as a success factor. Regarding risks and barriers in the process, the following have been noted: approach in an Urban Environment, acceptance from the municipality and user/stakeholders, the absence of technological equipment and investment and lacking U-space monitoring tools and methods.

Moving from process to impacts, Table 10 presents several performance-related indicators for the impact assessment of the drone demonstration. In the same table, indicators related to public acceptance and adoption, as well as business model and technological readiness of solutions, are also presented and have been filled in, to the extent possible.

Table 10 Performance KPIs for the drone demonstration in the city of Trikala

Performance indicators	***Impact***	**Leptokaria**	**Megalo Kefalovriso**	**Mikro Kefalovriso**
	Number of flights	8	8	8

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	(total) Duration (in minutes)	177	210	245
	Average flight duration (in minutes)	22	26	30
	Number of errors during the testing phase	0	0	0
	Time for error fixing	0	0	0
	Average speed	10m/s	10m/s	10m/s
	Speed variation (St. dev. of speeds)	plus or minus 1m/s	plus or minus 1m/s	plus or minus 1m/s
	Stops	1	0	0
	Distance per flight	2,4km	5,8km	13km
	Total distance	19,2km	46,8km	104km
	Freight kilometres	19,2km	46,8km	104km
	Number of cargo transported	2	2	2
	Weight and size of cargo transported	100x15x50 (300g)	100x15x50 (300g)	100x15x50 (300g)
	Energy consumption	800Wh	900Wh	1100Wh
	Pollutant emissions/ Air quality	Air quality is satisfactory and air pollution poses little or no risk	Air quality is satisfactory and air pollution poses little or no risk	Air quality is satisfactory and air pollution poses little or no risk
	Noise level	40Db	40Db	40Db
	Accuracy	plus or minus 5m	plus or minus 5m	plus or minus 5m
	Max video transmission distance in meters	20000	20000	20000
	Maximum wind resistance in Km/h	50Kph	50Kph	50Kph
	Communication (all types)	2,4Ghz	2,4Ghz	2,4Ghz
	Identification	YES	YES	YES
	Failure mode	RTL, Parachute	RTL, Parachute	RTL, Parachute
	Security/ cyber security	YES	YES	YES
	Real time capability	YES	YES	YES
	Object classification	YES	YES	YES
	Interoperability (with manned aviation and other stakeholders)	YES	YES	YES

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	Detection	YES	YES	YES
Public acceptance and adoption indicators	Adoption willingness	To be measured		
	Adoption rate	5 to 10		
	Perceived usefulness	To be checked through online survey		
	Political acceptance	YES		
	Drone operator satisfaction	YES		
	Customer / Recipient satisfaction	YES		
	Feeling of safety of the recipient/ Risk perception	To be checked through online survey		
Business model and Technological readiness of solutions indicators	Number of use cases tested	3		
	Business models developed	1		
	Total costs	40k for renting equipment and demonstration field works		
	Usability evaluation	To be checked through online survey		

In order to perform a proper evaluation of impacts, more information, which will be collected via follow-up questionnaires needs to become available and a more extended evaluation. For example, usability cannot be fully assessed with the current data, while factors, such as the energy consumption, need to be compared to e.g., other drones in the market. Further, limitations in the types of analysis need to be considered, considering the different levels at which our evaluation can be carried out, i.e. the measure, the city or site, the project, etc. it has to be kept in mind that this particular demonstration has been implemented in a short period of time, in a low scale, i.e. few itineraries with limited cargo, therefore large-scale impacts cannot be extracted from the collected data as they would lack validity. Having noted that, the initial objective and scope of the activities, which has been to provide improved mobility systems and services to older and vulnerable groups that live in rural areas, should be kept in mind when assessing the pilot results. As has been mentioned, legislation restrictions did not allow for direct delivery to elderly people, thus, it can be claimed that this objective has been only partially met. By using UAM Systems and Services and going to the third dimension, freight transportation could be improved in a very efficient way, however the efficiency at the level of the whole city of Trikala is difficult to be measured considering the type of demonstration, therefore we can only refer to usefulness locally. It can be claimed that UAM could be useful for the bypass of some routes for medical supply delivery for urgent and time-critical cases. What can be further claimed is that handling the transferring of crucial goods (such as medicines) by air, decreases the delivery time, since no traffic congestion is confronted in the third dimension and the route is optimized to a straight line if possible. Air quality can be described by the level of pollutants in the air. The main air pollutants considered are Sulphur dioxide (SO2), Nitrogen dioxide (NO2) and Particulate matter (PM2.5 and PM10). Air quality seems to be satisfactory and air pollution poses little or no risk. The indicator 'Noise level' is used to capture the outdoor sound level caused by human activities, including transport. A safe or acceptable noise level for constant exposure is 68 dB or below, therefore we can claim that the 40dB measured during the demonstrations satisfy this threshold. Lastly, no errors were noted during the testing phase, hence no time for error fixing has been needed, which is a positive output. More extensive evaluation will be included as part of the final deliverable 9.5 of the project. It should be noted here that an indicated 'yes' in Table 10 implies that this KPI will be measured and evaluated.

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Regarding the upcoming planning of activities related to the demonstration, questionnaires will be conducted for user acceptance purposes, which will be distributed to elderly people and pharmacists (or focus groups), while also in-depth interviews with other stakeholders will be held. The survey will also provide quantitative data which can then be analysed and offer further results, with major interest on the public acceptance of drones as a new mobility service. UAegean, e-Trikala and MobyX are preparing the collection of data (questionnaires) that is going to be used for the evaluation.

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6. Summary of process and impact evaluation

Deliverable 9.4, as the second version of D9.3, outlined the most important events and activities which have been carried out so far, in the process of initialization, development and operation of the co-creation labs in the six different HARMONY areas, including key stakeholder engagement moments, barriers faced, as well as success factors and lessons learnt. Overall, what should be noted is that the COVID-19 pandemic has continued being one of the major barriers in the planning and organization of several activities of the HARMONY areas, especially during 2021. Issues related to stakeholder engagement have been raised, as well as changes to the planning of data collection activities have been made in order to make sure that the information collected is meaningful (as an example, during a lockdown period, the validity of travel-related data would definitely decrease).

Some of the co-creation labs are currently still in the process of setting up, identifying concrete activities they are going to carry out in order to achieve the expected results, as well as, where relevant, making necessary arrangements and further shaping the physical demonstrations. Others, such as the Athens co-creation lab, are already further in the process, with the first co-creation lab to be already successfully completed, even in a virtual form while the second one is being planned for later this year.

Stakeholder engagement processes are at the core of each co-creation lab and are of crucial importance to reach its results. Currently, every co-creation labs are continuously in the process of contacting stakeholders and reflecting on other to the core lab team stakeholders that they need to involve. In the upcoming period, they will further shape their co-creation and stakeholder engagement strategies, looking into how to increase potential efficiency of the whole process, collecting the feedback and integrating the views of the key stakeholders into their co-creation lab activities. Although the communication with many stakeholders has been hindered due to this year's circumstances, with COVID-19 pandemic having a strong impact on physical meetings, still many interviews have been held, surveys have been distributed successfully and participation in various events has been possible.

Regarding the physical demonstrations, there has been an essential barrier for the cities of Rotterdam and Oxfordshire, where it has not been possible to perform the AV pilots, as ARRIVAL, the partner developing the vehicle, has withdrawn from the project. However, both cities have been working on alternative plans for a demonstration activity, which would still satisfy the objectives of the co-creation lab, to the extent possible. In Trikala, the third city with a demonstration including drones, the flights have been successfully completed and relevant data for impact assessment have been collected. A complete evaluation of impacts will be presented in the final deliverable 9.5 when questionnaires on ex-post evaluation will also have been collected. Several benefits and weaknesses have already been identified though, while it must be noted that we need to be very considerate regarding interpretation of results, especially in a city-level, since the demonstration that took place is considered as a low scale and low impact one. But for the project, this pilot offers some first very interesting and promising results upon which some initial conclusions could be drawn regarding the introduction of a new mobility service such as drones.

Regarding barriers in the co-creation lab processes, the different HARMONY areas have indicated similar experiences. Several regulations limitations for AVs and drones' operations have been mentioned. Further, the difficulty in having physical meetings as well as the low participation in stakeholder engagement activities has been an important barrier. Lastly, several agreement processes for data access have taken longer than expected. As success factors, cities have mentioned the possibility to find synergies and share knowledge with other projects. The importance of collaborating with professional and experienced partners has been identified as well. With respect to lessons learnt, the cities recognized the importance of having contingency plans for the locations of the demonstrations but also the importance of identifying multiple partners from other projects as well that can provide complementary benefits. Further, the knowledge that can be shared via a co-creation lab and the process of public engagement with the citizens and stakeholders is proven to be the only way to develop and implement a demonstration activity. Lastly, a main lesson learnt is that a pandemic such as COVID-

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19 has a huge effect when it comes to stakeholders' engagement, due to job retention periods and also to general sharing of opinions which would normally take place in several physical meetings and events.

Each of the co-creation labs has developed an indicative planning for the upcoming months. Regular communication among the WP9 partners will remain a priority to cope with the second phase of the co-creation labs and demonstration activities processes as effectively as possible. Progress evaluation reports will continue being sent to each of the co-creation labs in order to verify where the co-creation lab is standing in the process of reaching its expected results and objectives, what are the activities that were carried out during the reporting period, what are the barriers encountered and which facilitators helped to achieve positive results. Next reporting period plans and follow-up of relevant milestones set before, in order to monitor and evaluate the progress of the co-creation labs, will also be requested. Another important upcoming step for the HARMONY areas is the final evaluation of both the co-creation as well as the demonstration activities taking place in each specific case.

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References

HARMONY D9.1 The HARMONY area's orchestration, engagement plan and data collection guidelines.

HARMONY D9.3 HARMONY areas engagement activities and demonstrations – First version

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Annex: Periodic process evaluation report template

City/ area:
Partner:
Name:
Date:
Reporting period:

Were there any **changes** in the objectives and scope of the **co-creation lab and/or demonstration**?	
Please describe the **activities** carried out during the reporting period:	
Which **barriers** (in relation to the activities carried out) have you experienced during this period?	
Please identify crucial **success factors** (if any) that helped you to achieve the results during this period:	
What were the **lessons learnt** during this period?	
Please **list** and **describe** the key stakeholder **engagement moments** that took place during this period (stakeholder groups, quantity, co-creation strategy, results achieved, etc):	
Please provide an indicative **planning** for the upcoming period of the project (3-6 months).	

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