HARMONY

SPATIAL & TRANSPORT PLANNING FOR A NEW MOBILITY ERA

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

D1.2 Stakeholder requirements and scenarios for regional spatial and transport planning

Submission date: 16/01/2020

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SUMMARY SHEET

PROJECT

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Deliverable Leader:	**ENIDE**
Responsible Author(s):	**ENIDE**: Annarita Leserri, David Quesada
Responsible Co-Author(s):	**UCL**: Maria Kamargianni, Lampros Yfantis, Manos Chaniotakis, Melinda Matyas, Thomas Oléron Evans, Marteen Vanhoof, Mike Batty, Elena Gatti; **OCC**: George Economides, Sridhar Raman, Jason Taylor; **ARR**: Alexandre Charr ; **AIR** : Mark Biell, Dirk Schindler ; **OASA** : Nellie Tzivelou ; **NTUA** : Babis Magoutas, Efthimios Bothos, Gregoris Mentzas; **TOR** : Giuseppe Estivo, Gianfranco Todisco ; **GRIFF** : Phillip Johan Hofset Holand, Hans Petter Førde ; **TRT** : Angelo Martino, Francesca Fermi ; **UOW** : Panagiotis Georgakis ; **ETRIK :** Georgios Gorgogetas; **SIGN** : Michiel de Bok, Sebastiaan Thoen, Barry Zondag ; **TUD** : Michiel de Bok, Lori Tavasszy, Ioanna Kourounioti ; **TNO**: Tariq van Rooijen; Nina Nesterova; **AIM**: Tamara Djukic ; **UAEGEAN**: Ioanna Pagoni, Amalia Polydoropoulou; **GROT**: J.M.A. (Jos) Streng; Richard van der Wulp; **GZM :** Marcin Domański, Krzysztof Drewniok ; **MOBY :** Athina Tsirimpa ; **AUCM :** Andrea Marella ; **ENI** : Francesc Rosinés
Peer Review:	**TRT**: Francesca Fermi, Angelo Martino; **UCL**: Manos Chaniotakis, Lampros Yfanti; **RIAB:** Siamak Khorgami
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LIST OF ABBREVIATIONS

Abbreviation	Explanation
AV	Autonomous Vehicle
D	Deliverable
DC	Distribution Center
DEIC	Dissemination Exploitation Innovation Committee
EUG	End Users' Group
I2V	Communication infrastructure to vehicle
ITS-G5	Intelligent Transport Systems – G5
LoI	Letter of Interest
M	Month
MS	Model Suite
RIAB	Research and Innovation Advisory Board
S&T	Scientific and Technical
SUMP	Sustainable Urban Mobility Plan
T	Task
UAM	Urban Air Mobility
V2I	Communication vehicle to infrastructure
WP	Work Package

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Executive summary

The introduction of AV- and drone-related mobility services in SUMPs is expected to result in multiple impacts on European metropolitan areas. Although many challenges hinder the introduction of new AV- and drone-related mobility services, some solutions are also envisaged to address the economic, legal and societal consequences of their implementation in SUMPs.

The present deliverable D1.2 “Stakeholder requirements and scenarios for regional spatial and transport planning” reports on the methods used to organise HARMONY first cross-metropolitan workshop in M6 and the methods used to collect stakeholder requirements. It also presents and analyses the findings and the scenarios designed during the workshop.

The document aims at guiding S&T WPs within HARMONY and at advancing the identification of challenges and opportunities in terms of regional and transport planning, multimodality and integration of traditional and new mobility services at the European level. Additionally, this deliverable will represent a useful reference tool to organise stakeholder engagement activities within HARMONY and beyond.

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1. Introduction

1.1 Aim of the project

HARMONY's vision is to develop a new generation of harmonised spatial and multimodal transport planning tools which comprehensively model the dynamics of the changing transport sector and spatial organisation, enabling metropolitan area authorities to lead the transition to a low carbon new mobility era in a sustainable manner.

HARMONY envisages providing a new generation of integrated tools, which comprehensively model new forms of mobility for freight and people, and their business dynamics in metropolitan areas. The HARMONY model suite (MS) integrates: 1. Strategic models (land-use, economic growth), 2. Tactical models (people/freight activities), and 3. Operational models (multimodal land- and air-network) allowing for multi-scale spatial and transport planning. This approach is necessary, because strategic decisions, affect the tactical and operational and vice versa; for example, the construction of transit hubs or the introduction of Mobility-as-a-Service (MaaS) schemes (strategic decisions) may affect residential/firm location choice or vehicle ownership decisions of households/firms (strategic) and their mode choice decisions for everyday mobility (tactical), which in turn affect transport network traffic flows (operational) requiring the re-design of transport networks (once again strategic). Thus, a feedback loop is required for these three levels of decisions so that authorities can understand if policies are economically viable, while also contribute to meeting COP22 targets, social equality and wellbeing. HARMONY goes beyond simply designing this model suite. Stakeholders are actively engaged in co-creation labs to understand their needs in terms of integration of traditional and new transport modes, as well as regional spatial and transport planning feeding the development of the HARMONY MS' functionalities. New mobility technologies and concepts [such as electric autonomous vehicles (AVs) and drones] are demonstrated and integrated with the traditional transport modes to derive the real-world challenges, social acceptance and policy requirements. HARMONY uses the results of the MS and the co-creation labs to offer a complete solution including recommendations for a new generation of SUMPs (Sustainable Urban Mobility Plans) ready to tackle the challenges of the new mobility era and regional planning. In addition, urban and regional multi-stakeholder partnerships, business models and cases required for attracting investments and for a sustainable transport system are proposed. HARMONY's outputs act as an enabler of the innovation process and its introduction in harmony with the needs and requirements of agglomerations.

1.2 Purpose of document

The objective of WP1 "HARMONY conceptual framework" is to review latest practice in spatial and transport planning, project appraisal techniques and KPIs and works with stakeholders to understand requirements for planning and decision-making. These findings are be used to build the conceptual HARMONY MS architecture and the underlying software framework components guiding the development of the S&T WPs. Specifically, WP1:

- provide an update on the relevant state-of-the-art in spatial and transport planning approaches;
- review transport technologies and services that are currently available or will be available up to 2050;
- review the latest developments in project appraisal and the KPIs authorities and industry use to identify the gaps in terms of multimodality, regional planning, new mobility technologies and services;
- work with stakeholders to identify their requirements in terms of spatial and transport planning and integration of traditional and new mobility services;
- prepare the use-case scenarios that guide the development of the HARMONY MS;
- define the conceptual modelling frameworks, the reference architecture and the software framework components of the HARMONY MS that guide the technical developments from WP2 to WP7.

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As part of this WP1, T1.3 “Specification of stakeholder needs” works with targeted stakeholders (public authorities, transport and freight operators, mobility-related companies, infrastructure, construction/real estate and investment companies, etc.) to identify requirements, barriers and opportunities in terms of regional and transport planning, multimodality and integration of traditional and new mobility services. Data collected from the first cross-metropolitan workshop is be analysed and further discussed in personal interviews and questionnaires with key stakeholders from the public and private sector of each HARMONY pilot. The stakeholders’ requirements feeds the design of T1.4 and form the first round of scenarios that will be simulated using the HARMONY MS (WP2), and the first round of SUMP revision requirements.

On the one hand, deliverable D1.2 “Stakeholder requirements and scenarios for regional spatial and transport planning” reports on the methods used to organise the workshop in Rotterdam in M6 and to collect stakeholders’ feedback. On the other hand, it presents and analyses the findings and the scenarios designed during the workshop. Therefore, D1.2 purpose is twofold:

- Showcase the methods used to organise and disseminate the workshop; serving as a useful reference tool for the whole HARMONY consortium for future events and contributing to the exchange of best practices among European projects and beyond;
- Elaborate on stakeholder requirements and scenarios for regional spatial and transport planning will guide S&T WPs and inform data collection towards the development of the HARMONY MS. Equally, they will allow other similar projects and initiatives to build on HARMONY results, especially within the CIVITAS network.

D1.2 will also feed D1.4 (to be delivered in M36) to include the analysis of the on-line questionnaires and polls and their design approaches, that will be set up throughout the project to update the stakeholders’ requirements.

1.3 Intended audience

This document is intended to address mobility stakeholders, practitioners and decisions makers who need to be aware of advances/challenges/areas of impact etcetera. These directly result from stakeholders participating in the workshop. Moreover, it serves as a useful resource for people organizing similar activities in transportation and mobility areas.

In addition, as a preliminary step for T1.4, this document is particularly useful to S&T partners involved in the modelling of HARMONY MS conceptual architecture, and especially to UCL as main author of D1.3 “The HARMONY MS conceptual architecture”.

1.4 Structure of the document

This document consists of six main sections. After a brief introduction in Section 1, the organisation of the first HARMONY cross-metropolitan workshop will be outlined in section 2 and will lead to a more detailed description of the event in Section 3. Consequently, the first findings regarding stakeholders’ requirements and scenarios will be presented in Section 4. Finally, the document will provide some useful guidelines for improvement in Section 5 as a reference point for the whole consortium and for other European projects. Some final remarks in section 6 will conclude the document.

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2. Organisation of the first cross-metropolitan workshop

HARMONY organised a cross-metropolitan workshop in Rotterdam in early November 2019 (M6) to engage key stakeholders and elicit their spatial and transport planning requirements regarding new forms of mobility and spatial design. A cross-metropolitan approach was adopted to collect a wide range of requirements from areas with different demographic, economic growth and travel needs characteristics. These requirements will then feed the design of HARMONY MS and the revision of SUMPs. However, stakeholder requirements will be continuously monitored until M30, should any further input and scenario emerge after the first collection activities.

The next section relates to the categorization of the participants and their engagement and the activities held after the workshop. For a detailed description of the organisation activities of the workshop, please refer to **Error! Reference source not found.**

2.1 Participants

2.1.1 Invitation

HARMONY first cross-metropolitan workshop was open to all, meaning that anyone interested in the event could attend it. The targeted audience included:

- Public authorities, Governmental bodies, municipalities, cross metropolitan and regional authorities;
- Public and private transport operators;
- Freight operators;
- Mobility-related companies;
- Transport services integrators and MaaS;
- Technology providers;
- Data providers
- Infrastructure operators;
- Construction/real estate and investment companies;
- Local and national public bodies for major development in the health and education sector;
- Associations and lobbies.

Given the global scope of the workshop, efforts have been placed to attract stakeholders around Europe. In addition to this, local networks have been activated for inviting closest entities in Belgium and the Netherlands areas. Therefore, HARMONY partners mobilised their own network by sending invitations to relevant third parties. The invitation included a brief explanation of the objectives of HARMONY as well as sufficiently attractive arguments to ensure a high participation rate, e.g. potential commercial development, networking at an international level, sharing know-how and best practices, etc. Then, they kept record of the invited connections and of their feedback on the invitation list on SharePoint.

The invitation process was supported by an invitation template and an invitation list, as described in Section 2.1.3.

2.1.2 Registration

The whole registration process was managed through Eventbrite. Though many communication and dissemination channels were exploited to spread the visibility of the event, participants could only register through Eventbrite. For each order received, both the attendee and the organiser received an email by Eventbrite confirming the registration and providing a QR code for checking in at the venue.

The workshop was attended by 43 people out of 51 registrations.

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2.1.3 Engagement

An engagement campaign spanned throughout the lifetime of the workshop, starting approximately one month before and ending a couple of weeks after the event. The website and social media have been constantly updated in order to ensure the widest visibility to the workshop. All partners committed to share and retweet HARMONY posts on their LinkedIn and Twitter corporate and personal profiles. During the event, ENIDE distributed some leaflets to partners and attendees to further spreading HARMONY objectives and solutions. After the workshop, ENIDE produced a web article, a newsletter and a press release about the workshop to make it known through all possible channels.

Furthermore, ENIDE contacted CIVITAS communication team and managed some cross-publications on their social media and website. The news and information related to the workshop were also published on the ELTIS website (www.eltis.org) to enlarge the possible audience. Not only did the promoting of HARMONY cross-metropolitan workshop on CIVITAS communication channels allowed to further spread the word about the event, but it also enforced the cooperation link among the two European projects.

Finally, a poster session was organised during the workshop in Rotterdam. Each metropolitan area elaborated on a template poster prepared by ENIDE to convey some information regarding sustainable mobility in their region, namely the background of their area, the transport modes currently available and the HARMONY co-creation lab in the region. The aim of this activity was at least threefold:

- It allowed authorities from cities and metropolitan areas to reflect and increase their awareness on the situation of mobility and on the HARMONY co-creation approach in their regions. It also allowed them to cooperate and to have a clearer idea of the background of the other regions involved in the project through its visual summary.
- It allowed to engage participants during the workshop by fostering informal discussion during coffee and lunch breaks. Additionally, some posters intendedly left some blank space for participants to leave their feedback.
- It produced new communication and dissemination material that could be used by cities and metropolitan areas authorities to showcase HARMONY in future international events and conferences throughout Europe.

2.2 Follow-up

The communication and dissemination activities related to the workshop continued even after the event:

- HARMONY website and social media have been updated to provide a short report of the event and the link to the public presentations given during the workshop. This will enable the spreading of the workshop contents even among interested people unable to attend in Rotterdam;
- A follow-up mail was sent to all attendees to link to presentation given during the workshop. This will be useful to recap the workshop contents and to reopen a communication channel with participants interested in keeping abreast with HARMONY developments. The follow-up mail also included a link to an online anonymous survey to collect feedback on the participants' experience of the workshop;
- A press release was sent to HARMONY partners to further share with their connections in the local press in their regions. It is expected that the press involvement could help reach out for key stakeholders for future HARMONY engagement activities;
- The first newsletter due in M6 included a report of the workshop in order to raise awareness around HARMONY activities and to increase the project visibility;
- The present deliverable D1.2 will provide a very detailed public report of the workshop and its results, namely stakeholder requirements and scenarios for regional spatial and transport planning. As a public deliverable, D1.2 will be uploaded on HARMONY website and shared on HARMONY social media. D1.2 is due in M7.

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3. The cross-metropolitan workshop

HARMONY cross-metropolitan workshop in Rotterdam in November 2019 (M6) engaged key stakeholders and elicited their spatial and transport planning requirements regarding new forms of mobility and spatial design. A cross-metropolitan approach was adopted to enable the collection of a wide range of requirements from areas with different demographic, economic growth and travel needs characteristics. These requirements will then feed the design of HARMONY MS and the revision of SUMPs. However, stakeholder requirements will be continuously monitored until M30, should any further input and scenario emerge after the first collection activities.

As detailed in the agenda available in Annex II, the workshop revolved around two main sessions, namely AVs and UAM. Each of them was internally split into a presentation, a round table and a panel discussion.

3.1 Presentations

Due to the diversity of the audience, a preliminary sharing of fundamental definitions and concepts about AVs and UAM was essential in order to empower the audience to actively take part in the following discussions. Therefore, presentations in session 1 and 2 - “Autonomous Vehicles for Passenger and Freight mobility” and “Urban Air Mobility for Passenger and Freight mobility” respectively – were based on an overview of HARMONY D1.1 “Review of new forms of mobility, freight distribution and their business models; gaps identification in KPIs and SUMPs”. Presentations were held by UAEGEAN and TUD respectively that covered some primary aspect such as service types, technological elements, business models, etc.

In both sessions, some technical presentations followed by AV and UAV stakeholders – ARRIVAL, AIRBUS and GRIFF. The purpose of this technical contribution was to provide a state-of-the-art overview of the technology progress made so far and their current and potential application in real-life scenarios. In summary:

- Presentation of outputs/insights on AVs by Dr. Ioanna Pagoni, University of the Aegean in which definitions, state of the art and challenges on the subject were reviewed;
- Technical presentation by Mr. Alexandre Charr, Project Manager at ARRIVAL, showcasing their strategy concerning vehicles.
- Mr. Jos Streng, Transport Planner at the Urban Development City of Rotterdam presented some challenges that Rotterdam faces that AVs could help to solve.
- Phillip Holand, GRIFF Aviation introduced some of the pros, cons and challenges related to UAV, also about the approach of GRIFF on the matter.
- AIRBUS representant Mark Biell presented the vision of the company for 2028 towards UAS Traffic Management, proposing a traffic management system to deliver a save low level air traffic based on the existing ATM/ATC approach aligned to aviation standards and international Rules

Afterwards, the point of view of cities and metropolitan areas was given by GROT, who focused on mobility challenges in the area and on expected solutions deriving from implementing disruptive passenger and freight mobility services.

Finally, four round tables addressing the different scenarios were presented, and attendees were given the opportunity to contribute to the discussion.

3.2 Round tables

After the introductory presentations, discussion was channelled into four round tables to further investigate different technology-centred aspects defining future scenarios, areas of impact, implementation challenges and future policies and regulations. Four moderators for each session – AVs and UAM respectively – were mobilised among the HARMONY S&T partners and led four groups of approximately ten participants per session, focusing on specific scenarios. Attendees were

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pre-allocated to a round table based on their expertise and total number of participants; not registered ones chose freely.

The selection of scenarios to be discussed during each round table was based on previous findings from T1.1 and T1.2. During each round table, the moderator ensured the addressing of some crucial questions to better define the scenario:

- Impact of the scenario on the overall transport system;
- Challenges connected to the implementation of the scenario;
- Potential solutions for the sustainable implementation of the scenario;
- Performance indicators to evaluate the implementation of the scenario.

The questions included in the template should be used as follows:

- How do the stakeholders think the scenarios will affect the transport system;
- What elements need to be considered and what obstacles will be faced upon scenario implementation;
- How policies, regulations, planning, governances, etc can steer the implementation in a sustainable way;
- What indicators are needed to evaluate the implementation for different areas of impact.

An example of the template guiding the moderator is provided in Annex IV.

Notes taken by the moderators during each round table are thoroughly analysed in the following Section 4 and will help inform future interviews with key stakeholders in the public and private sector.

3.3 Panel discussions

The discussion developed during the four round tables resulted in two panel sessions, one for AVs and one for drones respectively. Each moderator wrapped-up the key points addressed during the round table and joined a wider conversation with other moderators and workshop participants.

Panel discussions were moderated by Dr Siamak Khorgami, a member of the HARMONY RIAB. He identified some insights and concluded with some key take away points and to build future research on. Given their nature, they have been included as **Error! Reference source not found.**

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4. Stakeholders' requirements and scenarios

Co-creation and end-user involvement are essential for the process of innovation development. This implies a cooperative process where all stakeholders can influence the solutions. HARMONY adopted the co-creation approach to address the implementation scenarios related to AVs and UAM. The goal is to align potentially conflicting objectives, identify room for cooperative engagement and, consequently, boost the uptake of HARMONY solutions.

After describing the scenarios tackled during the workshop, this chapter will outline the outcomes of the round tables and panel discussions related to AVs and UAM respectively. More specifically, these outcomes will address:

- The impact of the scenario on the overall transport system;
- The challenges connected to the implementation of the scenario;
- Potential solutions for the sustainable implementation of the scenario;
- Performance indicators to evaluate the implementation of the scenario.

This structure was the same for both AVs and UAM, therefore it will be repeated in the following description of technology-based outcomes.

It is important to highlight that this is a first approach on the definition based on the assumptions, projections and personal opinions expressed during the workshop. During the progress of the project it is expected additional verification and tuning of these definitions.

4.1 Potential scenarios

The selection of scenarios discussed during each round table was based on previous findings from T1.1 and T1.2. S&T partners identified a list of potential scenarios during the preliminary preparation of the workshop and then submitted them for a wider discussion with the workshop attendees. The cross-metropolitan approach adopted for their development consisted in the collection of a wide range of requirements from geographical areas with different demographic, economic and travel needs characteristics.

A detailed description of each scenario discussed during the workshop is provided in Table 1 below.

Table 1 – Scenarios for AVs and UAM

Topic	Scenario	Description
AVs for passenger transport	Privately owned AVs	Households replace their private conventionally-fuelled vehicles with AVs; assumption of different penetration rates.
	Door-to-door autonomous e-hailing service	App-based mobility services where the fleet is fully composed by AVs.
	Fixed on-demand responsive autonomous shuttle service	Automated passenger minibuses offering transit rides between variable locations with varying schedules or fixed stations with varying schedules.
	Carsharing services with AVs	Station-based or free-floating AVs which can be hired in the same notion as with carsharing/car-clubs.
	Bus fleets replacement with AVs	Replacement of conventionally fuelled bus fleets with fully electric AVs.

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	First- and last-mile to mass transit with AVs	Automated passenger shuttles/vans/minibuses offering door-to-station and station-to-door rides.
	Integrated multimodal/intermodal services - MaaS	MaaS providers offering all or combination of the above services via a single app where riders plan and access all services seamlessly.
AVs for freight transport	Dedicated autonomous urban distribution services	Use of autonomous vans in restricted car-free areas.
	Delivery bots	Delivery bots for specific deliveries in local small-scale areas.
	Autonomous trucks and truck platooning	Use of platooning and automated trucks in specific transport corridors (i.e. connection between cities).
	Autonomous trucks	Autonomous trucks services connecting terminals with DCs.
Drones for passenger transport	On-demand point to point urban coverage	On-demand point-to-point non-stop air taxi service from one destination to another. Fluctuating medium to high demand between the destination
	Scheduled airport shuttles	Scheduled operations with fixed flight plans and pre-booked flights, flights schedules are adjusted to arrival and departure times of airport. Landing sites are close to gates and terminals.
	Intercity flights	Interregional flights connecting cities that are too close to be connected by regional flights.
Drones for freight transport	Express delivery services	Drone delivery service for dedicated high value deliveries inside urban areas.
	Port delivery services	Drone delivery service to ships in the Port of Rotterdam.
	Express delivery in remote areas	Drone delivery services connecting cities with rural areas .

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4.2 AV-based outcomes

4.2.1 AVs impact on the overall mobility

As an initial baseline, the use of AVs has been explored in two main categories, 1. Passenger services including privately-owned, shared and on-demand services, public transport services and integrated concepts; 2. Freight services.

Depending on the implementation scenarios, two tangential evolutions are discussed, concerning the impact on the overall transport system:

- AVs contributing to an increased use of car-based mobility services (for example in carsharing service, app-based mobility services and private AVs). Discussions were directed towards the idea that, given its tailored offer, multimodality and collective transport means (Public Transport) share will decrease. This could lead to increased congestions, travelled miles and emissions.

- On the opposite situation, the introduction of AVs as part of the public transport system could increase its attractiveness, by extending the offer with AV-based mobility solutions, such as AV shuttles for first- and last- mile, integration to public transport, automated bus fleets and automated multimodal services. This could be highly useful to enlarge the accessibility of public transport to passengers with reduced mobility. In addition, using AVs as part of the public transport services should lead to reduce the cost of public transport overall with more targeted solutions to some specific needs (such as isolated or disseminated areas, difficult orography, etc).

In this view, the role of specific policies seems to be a key factor for the successful of AVs in the ecosystem.

Concerning economic impact, due to automatization there might be effects related to increased expenses. Additionally, introduction of AVs might also entails some consequences in terms of employment. It is worth mentioning that this societal concern emerged in all discussed scenarios, either passenger services or freight AVs. Other AV-related costs concern their implementation and the infrastructure they require for they thorough set-up and running. Besides, these costs could be partly covered by the reorganization of public investments following a decreased share of public transport and public infrastructure.

To address all these phenomena, public authorities are required to develop new policies to manage land use and AVs interactions with other users (e.g. pedestrians, cyclists, other vehicles, etc.) and to ensure safety and quality of mobility services.

4.2.2 Challenges to AVs implementation

Some specific challenges will emerge due to the introduction of AVs in passenger transport and freight movement. First, their operating costs are expected to be comparatively higher than traditional mobility services, thus entailing an issue of equity and accessibility for all lower income groups. Another main challenge is considered to be the lack or insufficiency of dedicated regulations and standardizations comprehensive of AVs for passenger and freight mobility that allow, among other things, the current coexistence of different business models according to different service providers, competing with one another for clients. Furthermore, a major issue of the AVs implementation is the transition period in which traditional vehicles and AVs – or, better said, different SAE levels of AVs - will coexist, raising questions about the management of mixed traffic and the optimization of available technology and infrastructure. It goes without saying, the coexistence period will affect the users' acceptance and satisfaction, as well as AVs-related stakeholders' engagement, all of which are strictly related not only to the quality of mobility services, but also to their education and training to the service itself. Moreover, AVs imply remarkable legislative issues, including safety,

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security, cybersecurity, privacy issues and data management. Lastly, AVs will require the supply of energy and specific materials on an increased scale than today.

4.2.3 Solutions for a sustainable AVs implementation

One of the HARMONY's goal is to ensure a sustainable transition towards a new mobility era. Therefore, a pivotal discussion encouraged to build on sustainable development goals to focus on potential solutions to the previously identified challenges in order to enable the economic, social and environmental sustainability of AVs implementation.

A potential solution emerged in all scenarios, be they related to private and public passenger mobility and freight movement, is the optimization of the infrastructure, also including the communication between vehicles and infrastructure (V2I and I2V), such as ITS-G5. Also, a thorough regulation encompassing the service conditions and operations (energy consumption, fuel used, etc.), pricing policies and privacy issues is fundamental for ensuring a fair competition among all service providers. Additionally, campaign for public engagement is deemed necessary to enhance users' acceptance, as well as subsidies for AVs vulnerable users and for SME implementing AVs for freight movement. Finally, public authorities are expected to cooperate with private stakeholders to guarantee an efficient multimodality and integration of mobility services with an increased and enhanced offer of public transport, as well as to adapt the land use plans and to allow further research and pilots like HARMONY's ones.

4.2.4 Indicators to evaluate AVs implementation

Within the HARMONY project, the development of the modelling suite will allow the estimation of several outputs, providing quantifiable evidence and KPIs for the metropolitan areas. The KPIs are expected to quantify the impacts of planning scenarios related to several topics, e.g. on public space, transport deserts and poverty, accessibility, traffic congestion, energy demand, air quality, noise etc. for several time-horizons from the base year up to the year 2050.

D1.1 provided an example of the KPIs which could be estimated with the HARMONY MS. Among other things, the cross-metropolitan workshop aimed at identifying suitable indicators to evaluate the AVs implementation for different areas of impact, thus comparing the preliminary analysis provided in D1.1 with the input received by relevant stakeholders during the workshop.

The following Table 2 shows the KPI envisaged by D1.1 and their integration following the cross-metropolitan workshop.

Table 2 – Indicative AV-related KPI that could be estimated in HARMONY MS

	Land-use & transport infrastructure	Environment	Regional economy	Inclusive communities
D1.1	Change in inter/intraregional transport infrastructure capacity	Noise levels (e.g. people exposed to high noise levels)	Change in population density	Transport affordability/poverty
	Mode sharing infrastructure/public space	Carbon intensity (CO2, NOX emissions)	% change in number of VAT registered business	Transit accessibility
	Increase of risk mitigation measures (resilience)	VMT per mode	Investments attracted in EUR	Measures of wellbeing

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Workshop	Total travelled time	Occupancy per mode	GDP per region	Willingness to use AVs
	mode choice - intermodal trips		Entrepreneurial diversity	Willingness to share AVs
	Delays			Safety
	Congestion location		Employment rates	
	Coverage of service			Technology accessibility
	Communication network capacity			

A more detailed picture of the indicators will be available once the design of the modelling suite is completed.

4.3 UAM-based outcomes

4.3.1 UAM impact on the overall mobility

Both passenger and freight UAM-related scenarios discussed during the round tables highlighted a clear impact of UAM at least on land use, infrastructure needed for their implementation and design of the drone itself according to different purposes (drone dimension, materials, business models etc.).

The issue of congestion raised more questions, especially regarding the potential role of drones in redirecting road and rail traffic to air one. More specifically, it is not clear whether drones will be able to reduce traditional traffic congestions or whether they would only add another level of air traffic. In both cases, drones are expected to produce a remarkable impact on liveability in cities in general and on air quality in particular. For example, drones applied to freight movement are understood to reduce pollutions, provided that they are fuelled by clean energy.

Another consideration applying to freight movement by drone is that they will allow a wider accessibility of goods in remote areas, such as mountainous and maritime ones. Additionally, whereas the reduced travel time, the enhanced emergency services and the improved communication channels could impact positively on drone acceptance, the elevated access and maintenance costs question their equity, not to mention safety and security concerns hindering users' satisfaction.

4.3.2 Challenges to the implementation of drones

Similarly to AVs, drones present safety and (cyber)security concerns entailing legal, liability and privacy issues both in their implementation for passenger and freight transport. Also, infrastructure represents a challenge inasmuch as new one is needed and current one requires management and optimization. The lack of thorough regulation – which has been highlighted among AVs challenges as well – represent a major issue as viable market and routes need to be identified and certification for production need to be produced.

The responsible for this regulation could be an *ad hoc* national or regional authority also in charge of air traffic management. The strive for a quality service is in fact essential for encouraging trust, acceptance and adoption among users, despite the high entry cost of drones. Besides, the engagement of all involved stakeholders needs to be boosted to ensure more equity and control and ultimately help feed the demand of UAM.

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4.3.3 Solutions for a sustainable implementation of drones

One of the main solutions emerged during the workshop is the elaboration of thorough regulations providing a reliable framework for responsibility and liability issues, as well as a selection of safe corridors for drone movement. Regulations should also include technical aspects for drone manufacturing, such as identification mechanisms, drone registrations and geofencing techniques to adjust their trajectory. This solution is strictly connected to the creation of an air authority managing air traffic and specific corridors.

Nevertheless, all solutions by technical actors cannot overlook the importance of stakeholder engagement, especially through engagement campaigns and co-creation labs with public transport operators and with the wider public.

Generally speaking, drone deliveries in remote areas are foreseen as more viable and beneficial as passenger and freight drone transport in urban areas, where their use could potentially become unnecessary if current transport infrastructure and services provide an efficient alternative.

4.3.4 Indicators to evaluate the implementation of drones

Within the HARMONY project, the development of the modelling suite will allow the estimation of several outputs, providing quantifiable evidence and KPIs for the metropolitan areas. The KPIs are expected to quantify the impacts of planning scenarios related to several topics, e.g. on public space, transport deserts and poverty, accessibility, traffic congestion, energy demand, air quality, noise etc. for several time-horizons from the base year up to the year 2050.

D1.1 provided an example of the KPIs which could be estimated with the HARMONY MS. Among other things, the cross-metropolitan workshop aimed at identifying suitable indicators to evaluate the implementation of drones for different areas of impact, thus comparing the preliminary analysis provided in D1.1 with the input received by relevant stakeholders during the workshop.

The following Table 2 shows the KPI envisaged by D1.1 and their integration following the cross-metropolitan workshop.

Table 3 – Indicative drone-related KPI that could be estimated in HARMONY MS

	Land-use & infrastructure	Environment	Regional economy	Inclusive communities
D1.1	Change in inter/intraregional transport infrastructure capacity	Noise levels (e.g. people exposed to high noise levels)	Change in population density	Transport affordability/poverty
	Mode sharing infrastructure/public space	Carbon intensity (CO2, NOX emissions)	% change in number of VAT registered business	Transit accessibility
	Increase of risk mitigation measures (resilience)	VMT per mode	Investments attracted in EUR	Measures of wellbeing
Workshop	Measures of air traffic efficiency	Energy consumption	Employment rates	
	Measure of drone services demand			Technology accessibility

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	Congestions			Safety
	Technical KPIs from UAV (energy consumption, operating time, etc)			

A more detailed overview of the indicators will be available once the design of the modelling suite is completed.

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5. Lessons learned for improving co-creation activities

As mentioned above, D1.2 will be updated with D1.4 in M36 to take advantage of future opportunities to update the stakeholder requirements. However, a preliminary analysis of the aspects allowing improvement is necessary in order to fully exploit the potentiality of future co-creation activities. Following the first cross-metropolitan workshop and the first consortium meeting, at least two main elements have been identified that should be considered when planning future activities, namely attendance and quality of input.

5.1 Improving attendance

One of the main challenges during the workshop organisation was reaching interested stakeholders involved in spatial and transport planning in European metropolitan areas. The commitment of all HARMONY partners to inviting their personal connections could be supported by the extension of the invitation to those stakeholders expressing their interest in the project before it began (LoI). In addition, members of the End Users Group and the RIAB could be contacted to directly participate in input collecting activities and to indirectly extend the invitation to their network. The follow-up survey sent to the cross-metropolitan workshop participants could help identify the most successful outreach strategy and foster the most suitable stakeholder engagement channel according to users' preferences.

Another element worth strengthening is the explication of the HARMONY added value for metropolitan areas' authorities, in order to boost their participation. HARMONY solutions, especially provided by the introduction of new mobility technologies and services, should clearly match the mobility challenges in European metropolitan areas. On the other hand, this requires a previous step of internal awareness effort from cities and regions to identify their challenges and of willingness to welcome ground-breaking solutions. Participating in innovative projects such as HARMONY could improve in-house capabilities of local authorities through education on city modelling and data management. Cities should invest in tools in cooperation with other actors (such as research centres, consultancies, etc.) in views of generating revenues and developing even more skills internally. This could result in more revenues gained from charging other users of tools and data.

5.2 Improving requirements and scenarios

As the name suggest, the task of co-creating scenarios is a dynamic one, requiring the quality input of both HARMONY partners and external stakeholders to continuously adjust and update their requirements.

Therefore, an internal agreement within HARMONY on the input required from external partners is essential for them to decide not only whether to participate or not, but also to deepen and enhance the quality of their participation. Reaching an internal agreement in advance on the planned stakeholder engagement activity would also allow to share the collecting tools in advance, such as template, questionnaires and so on.

Furthermore, follow-up activities are pivotal to keep engaging involved stakeholders. For example, the follow-up survey proposed to the cross-metropolitan attendees could help focus on the scenarios that they considered most useful to their metropolitan area. Consequently, some local focus groups could be organised in each HARMONY metropolitan area focusing on more tailored needs. Finally, this follow-up survey could also inform the online polls and webinar envisaged in M20 to further engage targeted stakeholders.

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6. Conclusions

Stakeholder engagement activities, such as cross-metropolitan workshops, are of paramount importance to ensure the implementation of HARMONY co-creation approach. Their main purpose is to involve key stakeholders in the field of regional sustainable mobility in order to retrieve their requirements and inform HARMONY MS and solutions.

As such, this deliverable D1.2 “Stakeholder requirements and scenarios for regional spatial and transport planning” reported on the methods used to organise HARMONY first cross-metropolitan workshop in M6 and the methods used to collect stakeholder requirements.

It also presented and analysed the findings and the scenarios designed during the workshop. The introduction of AV- and drone-related mobility services in SUMPs is expected to result in multiple impacts on European metropolitan areas. For example, the coexistence of different business models could entail some competition among private and public mobility service providers. These latter are also expected to redirect their public investments towards the optimization the existing mobility infrastructure and the creation of new one according to the emerging mobility needs. On the other hand, the whole society will be affected by the implementation of AVs and drones, especially in terms of share of public transport, unemployment, accessibility for more users with reduced capabilities and liveability in European metropolitan areas overall.

Quite expectably, many challenges hinder the introduction of new technology in mobility services, primarily related to their implementation costs and the lack of dedicated regulations. Additionally, safety and (cyber)security concerns, as well as uncertainties about legal issues of liability, play a remarkable role in the perception and acceptance of AVs and drones. However, some solutions are also envisaged, such as the cooperation among private and public service providers, the issuing of a thorough regulation and standardisation and the optimization of mobility infrastructures. Also, mobility stakeholder’s engagement is deemed necessary to widen the number and reach of research, pilots and co-creation activities such as HARMONY’s ones all over Europe.

Finally, the deliverable provided some useful guidelines to improve the organisation and management of co-creation activities within HARMONY and beyond.

The document aims at guiding S&T WPs within HARMONY and at advancing the identification of challenges and opportunities in terms of regional and transport planning, multimodality and integration of traditional and new mobility services at the European level.

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References

CIVITAS (2019), “Harmony cross-metropolitan workshop”, last retrieved online 21/11/2019, https://civitas.eu/event/harmony-cross-metropolitan-workshop

ELTIS (2019), “Harmony cross-metropolitan workshop”, last retrieved online 21/11/2019, https://www.eltis.org/participate/events/cross-metropolitan-workshop-frame-harmony-h2020-project-rotterdam-7-november-2019

HARMONY (2019), D1.1 *Review of new forms of mobility, freight distribution and their business models; gaps identification in KPIs and SUMPs*

HARMONY (2019), D10.2 *Communication kit*

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Annexes

Annex I: Invitation template

Dear **XXXXX**,

We are excited to invite you at the HARMONY Cross-Metropolitan Workshop, titled "Regional Spatial and Transport Planning for disruptive passenger and freight mobility services– Stakeholder Requirements". The workshop will take place in **Rotterdam,** the Netherlands, on **7th November 2019** at "MAASSILO / CME, Maashaven Zuidzijde 1–2 3081 AE ROTTERDAM" from 9:00 am to 5:00 pm.

HARMONY is a project funded under European Union's (EU) **Horizon 2020** framework for Research and Innovation. Our vision is to deliver a new generation of regional spatial and transport planning tools which will enable metropolitan area authorities to introduce new passenger and freight mobility services in a sustainable way. Our **main objectives** are:

- the co-creation of city- and user-centric spatial and transport planning policies for the sustainable introduction and application of new mobility services based on autonomous vehicle and drone technologies
- the development of a new generation of harmonised spatial and multimodal transport planning tools which comprehensively model the dynamics of the changing transport sector and spatial organisation
- and the provision of evidence-based policy and regulation recommendations for updating the Sustainable Urban Mobility Plans of the future.

The workshop aims to tackle and address **key topics and challenges** related to the emergence of new forms of **sustainable urban mobility** and in particular:

- Regional and urban spatial and transport planning policies for sustainably introducing autonomous and urban air mobility

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- Policy implementation challenges and requirements
- Identification of key criteria and performance indicators for policy impact evaluation

The workshop is designed to be very participative and interacting so be prepared to share your thoughts about these topics and many more! It will also be a valuable opportunity to meet relevant stakeholders and be part of a wide network of experts in the sector, including but not limited to CIVITAS initiative. A final agenda and more information will be published soon.

You can register here.

You can find more information about the HARMONY project and its activities online. You can further follows us on Twitter & LinkedIn.

Please feel free to email us if you have any questions.

The Harmony consortium

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Annex II: Agenda

HARMONY
SPATIAL & TRANSPORT PLANNING FOR A NEW MOBILITY ERA

Harmony cross-metropolitan workshop

Date	7th November 2019
Venue	MAASSILO / CME, Maashaven Zuidzijde 1–2 3081 AE ROTTERDAM

Time	Topic	Session type
09:30 - 10:00	Registration and coffee	
10:00 - 10:15	The HARMONY vision	presentation
SESSION 1		
10:15–10:45	Autonomous Vehicles for Passenger and Freight mobility	presentation
10:45-11:00	Coffee break	
11:00-11:45	AV use cases: opportunities and challenges	round table discussion
11:45-12:30	City specific insights for AV implementation	panel session
12:30 - 13:30	Lunch	
SESSION 2		
13:30–14:00	Drones for Passenger and Freight mobility	presentation
14:00-14:45	Drone use cases: opportunities and challenges	round table discussion
14:45-15:30	City specific insights for drone implementation	panel session
15:30–15:45	Closing remarks	presentation
15:45-16:30	Coffee and networking	

Photos and videos may be taken during this event, which may or may not include your recognizable image or a video. By participating in this event, you consent to being photographed or filmed and authorize the organizer to use the photographs or film in print, digital, video or web-based format for its promotional and archival purposes.

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Annex III: Informed consent form

Informed Consent Form (ICF) for HARMONY project funded by the Horizon 2020 research and innovation programme

This Informed Consent Form has two parts:

- Information Sheet
- Certificate of Consent

This document may contain words that you do not understand. Please send us an email with any questions you may have and we will respond to you as soon as possible before the interview. During the interview, you can also ask us to explain anything you may not fully understand.

You will be given a copy of the full Informed Consent Form.

Part I: Information Sheet

Dear Participant,

Thank you for your interest in the project.

Before you decide to participate, it is important for you to understand why the research is being done and what participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading.

Background

HARMONY is a Horizon 2020 funded project that aims to develop a new generation of harmonised spatial and multimodal transport planning tools which comprehensively model the dynamics of the changing transport sector and spatial organisation, enabling metropolitan area authorities to lead the transition to a low carbon new mobility era in a sustainable manner. The HARMONY model suite is designed to assess the multidimensional impacts of the new mobility concepts and technologies. The model suite integrates:

1. land-use models (strategic/long-term)
2. people and freight activity based models (tactical/mid-term)
3. multimodal network (operational/short-term) models allowing for vertical planning

For more information please visit our website: http://harmony-h2020.eu

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Type of Research

This research will involve your participation in two round tables that will take about one hour each. The purpose of this participation is to understand and learn your needs and concerns regarding the HARMONY project and the implementation of HARMONY model suite in your city.

Participant Selection

You are being invited to take part in these round tables because you and your organization are major actors in this field. We feel that your thoughts and opinions can be remarkable for us to explore the opportunities and challenges of an integrated model suite such as HARMONY. These include technological, financial, business and legal concerns.

Voluntary Participation

Your participation in round tables is entirely voluntary. You may refuse to answer any individual question or withdraw from the whole discussion at any time. You do not have to share any knowledge that you are not comfortable sharing.

Procedures

- During the workshop, round tables with focus in specific subjects will be organized; an active and free participation of the attendants will be encouraged.
- The different points of view, comments and suggestions will be tracked and summarized in several reports.
- These reports content will be made available through project deliverables and/or academic publication will be anonymized so that you cannot be identified, and care will be taken to ensure that other information that could identify yourself is not revealed.
- Any variation of the conditions above will only occur with your further explicit approval.

Risks

There are no disadvantages or risks of this research. However, if you would like to stop at any point you will be free to do so without giving a reason.

Benefits

Our researchers will send you a summary of the research findings after the completion of the data analysis. The results from this research will also be part of the HARMONY project and will likely be published in journal articles and conferences. You will be informed by our researchers about the published results. No participant will be identifiable in any report or publication.

Who to contact

If you have any questions, please contact: info@harmony-h2020.eu

If you have any complaints, please contact the Coordinator of the HARMONY project: Dr. Maria Kamargianni, m.kamargianni@ucl.ac.uk

Thank you for reading this information sheet and for considering taking part in this research.

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Part II: Certificate of Consent

Please complete this form after you have read the Information Sheet.

Thank you for considering taking part in this research. If you have any questions arising from the Information Sheet, please ask the researchers indicated in the Information Sheet before you decide whether to join. You will be given a copy of this Consent Form to keep and refer to at any time.

I confirm that I understand that by ticking/initialling each box below I am consenting to this element of the research. I understand that it will be assumed that unticked/uninitialled boxes means that I DO NOT consent to that part of the research. I understand that by not giving consent for any one element that I may be deemed ineligible for the study.

		Tick Box
1.	I confirm that I have read and understood the Information Sheet for the above study. I have had an opportunity to consider the information and what will be expected of me. I have also had the opportunity to ask questions which have been answered to my satisfaction and would like to take part in the interview.	
2.	I consent to participate in the study. I understand that my personal information *(name and email address)* will only be used for the purpose of setting up my participation in the workshop.	
3.	I understand that taking part in the study involves the participation in several round tables with focus in specific subjects where I will be encouraged to give my input in the form of your comments and suggestions. All this information will be reported and summarized in several reports.	
4.	I understand that all personal information will remain confidential. Anonymity is optional for this research. Please select from the following three options: (a) I agree for my real name and role/affiliation to be used in connection with any words I have said or information I have passed on. (b) I request that my comments are presented anonymously but give permission to connect my role/affiliation with my comments (but not the title of my position). (c) I request that my comments are presented anonymously with no mention of my role/affiliation.	
5.	I understand the direct/indirect benefits of participating.	
6.	I understand that the data will not be made available to any commercial organisations but is solely the responsibility of the researcher(s) undertaking this study.	

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7.	I understand that I will not benefit financially from this study or from any possible outcome it may result in in the future.	
8.	I agree that my anonymised research data may be used by others for future research.	
9.	I understand that the information I have submitted will be published as a report.	
10.	I consent to my interview being audio recorded and understand that the recordings will be stored anonymously, using password-protected software and will be used for training, quality control, audit and specific research purposes. *To note: If you do not want your participation recorded you can still take part in the study.*	
11.	I agree that photos and videos of myself, taken during this event, can be used intact or in part by the organizer, in print, digital, video or web-based format, for event promotional activities or other related endeavors, including their use on the HARMONY project's website or associated social media outlets.	
12.	I am aware of who I should contact if I wish to lodge a complaint.	

If you would like your contact details to be retained so that you can be contacted in the future by our researchers who would like to invite you to participate in follow up studies to this project, or in future studies of a similar nature, please tick the appropriate box below.

	Yes, I would be happy to be contacted in this way	
	No, I would not like to be contacted	

_____ _____

Name of participant Date Signature

_____ _____ _____

Researcher Date Signature

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Annex IV: Template for round table

1. What do you foresee as areas of impact?	Description: We are focused here on extracting their insights on how do they think the scenario will affect the transport system in terms of e.g. land use, policy, infrstracture, modal splits, user acceptance, network performance, congestion, level of service, accessibility, etc.	2. What major implementation challenges do you think will be faced?	Description: Or else what elements need to be considered and what obstacles will be faced upon scenario implementation?
3. How can we ensure sustainable scenario deployment?	Description: We are looking here at how policy, regulation, planning, governance, etc. can steer the implementation in a sustainable way		
4. What performance indicators are of interest on regional and metropolitan level?	Description: What indicators are needed to evaluate the implementation for different areas of impact?		

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