



EIT Urban Mobility Knowledge base of innovative solutions in urban mobility and living labs:

Final Report

EIT Urban Mobility - Mobility for more liveable urban spaces

EIT Urban Mobility

Breda, the Netherlands | 12 April 2021

eiturbanmobility.eu

Funded by the
European Union



Except where otherwise noted, this document is published under a Creative Commons Attribution-NonCommercial 4.0 International license, (CC BY-NC 4.0).

This document is published under a CC BY-NC 4.0 license which means you can s copy and redistribute the material in any medium or format; and you can remix, transform, and build upon the material for any purpose except using this document for commercial purposes.

Under the following terms: Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

NonCommercial — You may not use the material for commercial purposes.

No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.



		Date
Deliverable No.	DEL02	
Deliverable title	EIT Urban Mobility Knowledge base of innovative solutions in urban mobility and living labs: Final Report	
Deliverable date	12 February 21	
Deliverable type	Report	
Dissemination level	Public	
Written by	Nina Nesterova (BUas), Ekaterina Uzunova (BUas); Patrick van Egmond (LuxMobility)	
Checked by	Jordi Juan Casas (EIT Urban Mobility)	
Approved by	Florinda Boschetti (EIT Urban Mobility)	12 April 2021
Status	Final version	

Document information

Additional author(s) and contributing partner(s)

Name	Organisation
Ekaterina Uzunova	Breda University of Applied Sciences
Patrick van Egmond	LuxMobility

Document change log

Name	Date	Comments
Nina Nesterova (BUAs)	7 December 2020	Preparation of draft 1
Patrick van Egmond (LuxMobility)	28 December 2020	First revision
Nina Nesterova (BUAs)	29 December 2020	Preparation of draft 2
Jordi Casas and Florinda Boschetti (EIT Urban Mobility)	6 January 2021	Second revision
Nina Nesterova (BUAs) and Patrick van Egmond (LuxMobility)	21 January 2021	Preparation of draft 3
Jordi Casas and Florinda Boschetti (EIT Urban Mobility)	29 January 2021	Third revision
Nina Nesterova (BUAs) and Patrick van Egmond (LuxMobility)	1 February 2021	Preparation of final version
Nina Nesterova (BUAs) and Patrick van Egmond (LuxMobility)	12 February 2021	Submission of final version

Document distribution log

Name	Organisation	Distributed to
Maria Alonso Biagio Ciuffo Andromachi Mourtzouchou	Joint Research Centre (JRC)	30.03.2021

Publishable executive summary

Scope of the study

Since 2006, the concept of the living lab (LL) is recognized by the European Commission as a key tool for open innovation. In line with the EC Sustainable and Smart mobility strategy for Europe Urban Mobility Living Labs are a recognised vehicle to assure a real shift from the existing paradigm of incremental change to fundamental transformation of the present urban mobility system. Living labs will enable cities, research, and industry to have a real involvement and commitment of the citizens and therewith guarantee the success of the European Green Deal.

Recognizing the strategic and operational importance of the living lab approach as an instrument for mobility solutions innovation and upscaling, the aim of this study was to provide the EIT Urban Mobility with an understanding of the scope of the mobility living labs movement in Europe, the shapes and forms of these labs, as well as their added value for the mobility transition. In a second step it was asked to assist the EIT in shaping the ideas on a possible programmatic activity.

The aim of this public report is to provide to the wider transport community an understanding of the potential of successfully ran Living Labs and their essential contribution to the much-needed fundamental transformation of the present Urban Mobility system.

For this, the study we analysed:

1. The existing mobility living labs in innovation projects included in the EIT Urban Mobility Business Plan 2020;
2. The existing European networks and other mobility-related living labs in the Pan-European region. This inventory completes the above by extending the map to new regions, including an overview of living labs in transport, logistics and automotive in European research and innovation projects;
3. The key learnings from existing mobility living labs in Europe.

Next to an inventory of the mobility living labs in Europe through initial desk research and an online survey, we performed a dedicated set of interviews, organized 2 collaborative workshops with the EIT KIC Urban Mobility Management and recognized living lab experts. Based on those works next to this public report, a strategic advice, a living lab toolbox and a dynamic geo-referenced map of EU urban mobility living labs was produced.



Data collection

The 12 existing mobility living labs presently included in the innovation projects supported by the EIT Urban Mobility Business Plan 2020 have been analysed. 4 of them belong to EIT Urban Mobility Innovation Hub (IH) South, 2 – to IH West, 1 – to IH East, and 5 – to IH Central. These 12 mobility labs are spread across the countries of Italy, Spain, Germany, Turkey, Bulgaria, Greece, the Netherlands, Denmark, Sweden, France and Israel. In addition to these mobility living labs, the EIT Urban Mobility partners are also active in already established living labs within their local ecosystems: IH North partners are part of 7 already established living labs; IH South partners are part of 4 living labs; IH West – of 3; and IH Central – of 4.

An internet-based desk research and the online survey resulted in the identification of 201 initiatives containing living labs, test beds and other initiatives containing living lab elements but not labelled presently as such. Out of those, Spain represents the highest number of initiatives – 25, followed by the Netherlands – 22, and Germany – 18. These labs also vary per main topic they focus on 118 are mobility-focused, 23 are automotive, 22 logistics, 13 urban development, 7 smart cities, and 18 others. Out of the total 201 initiatives, 65 are external entries received through the online survey. An expert check has been performed on these external entries based on their correspondence to the core living lab criteria: real-life environment to run experiment; triple or quadruple helix stakeholder's involvement; co-creation and end-users' engagement. Following and expert check of all identified UM living lab initiatives, 47 urban mobility living labs were selected for a more in-depth analysis.

The in-depth analysis focused on the following topics: origin, duration, main topics addressed, key owners and stakeholders involved, relation to policy initiatives, real-life environment characteristics, co-creation and end-user involvement, operational structure, business models, activities facilitated by the LLs, key challenges, areas of support needed, interest in an organized network of the mobility LLs, and the added value perceived of such a network.

In addition, to generate more in-depth insights about the living lab initiatives at Europe level, 14 interviews were conducted with representatives and experts from universities, research centres, and EU institutions involved in the operation of living labs active in the field of urban mobility. These interviews were complemented by two internal interactive workshops that took place in October and November 2020.

A multitude of urban mobility living labs

The living labs movement in Europe dates to 2006, when it was first mentioned in the Helsinki Manifesto (November 2006 Finnish EU Presidency). Since then, living labs have spread over Europe in various waves, first focusing on new ICT tools but later also extending to other fields, such as sustainable energy, healthcare, safety, and mobility. Nowadays, we read about the living labs in the newspapers, networks of living labs are being created, and European projects organize their activities within the living labs set-up.

Living lab experiments usually take place in an uncontrolled real-life setting, in the daily environment of their end-users, which can have a scale of a house, a street, a neighbourhood, but also of a city or a travel corridor. This "research in the wild" approach allows to take the variety of the outside situations into account.

The multi-method approach often practiced by living labs allows the involvement of multidisciplinary competences, encouraging an unprecedented combination of skills, competences, people, equipment, companies, settings, etc., and thus, the development of "out of the box" innovations.

When initiated by the public authorities (e.g., local/regional/national governments) living labs often strive for the inclusion of industry (e.g., start-ups, SMEs, etc.), academia (e.g., universities and research institutes) and civil society (i.e., citizens) within one innovation ecosystem. The added value of such quadruple helix cooperation model is a shift from an expert-driven innovation towards and user-centric innovation.

Next to this, living labs are also about continuation, upscaling, and synergies:

- Continuation: living labs provide an opportunity to go through the improvement cycles for the product/service and to continue the existing achievements, instead of re-inventing the wheel.
- Upscaling: living labs provide an opportunity to adjust the product/service to local circumstances, cultural differences, and regulations.
- Synergy: as living labs provide an ecosystem to multiple innovation testing, they serve as an excellent platform to share knowledge between these experiments on the achievements, barriers, and facilitators.

The present inventory and mapping illustrated that operational set up, local urban mobility strategies as well as the goals of the main key stakeholders lead in practice to a large variety of urban mobility living labs in Europe. In order to be able to provide a strategic advice on how to best approach the different Living Lab initiatives the following classification proved functional:

- **Project based living lab experiments** (classification related to the governance model): single living lab experiments organised in the framework of European or /project funded living labs. Those are usually 2- 4 year externally funded initiatives, created with an objective to co-create innovative products/services within a quadruple helix stakeholder setting; they are investigating the possibilities of the living lab approach and are not focused on the self-sustainability of the own living lab business model.
- **Fixed location living labs** (classification related to the facilities used to carry out experiments): mixed funded initiatives, offering a real-life setting experiment location to mobility stakeholders and connected to it added value services, like: special equipment; network of stakeholders; facilitation of the administration or regularly permits for the experiment; facilitating co-creation processes and end-user involvement.
- **Not-fixed location living labs** (classification related to the facilities used to carry out experiments): mixed funded initiatives, bringing together public authority, knowledge, industry, and end-user organisation at one dialogue table, developing experiments in different fit for purpose in real-life settings within a neighbourhood, city or region. The added value of these living labs is generated via the synergy between different projects; knowledge accumulation and transfer, facilitation of the administrative and regulatory permits for the experiments, facilitation of the co-creation processes and of the end-user involvement.

Despite the large differences in nature between the urban mobility living labs the overall functioning of a living lab is often based on an initial memorandum of understanding or public private and/or public-public (research) partnership agreements.

Following are different operational agreements to assure the management and operational activities, such as for example:

- a formal cooperation agreement between several founding partners (e.g., industry/location owner/research) supported by a public authority;
- a project-based agreement between a national (mobility) agency (or any other affiliated organisation) and a public authority to establish and run living labs (for a specific project duration) ;
- A mandate of the public authority to university (or any other key stakeholder) to operates a national/regional/local living lab;
- EU/ National research programme and project agreements to organise Living labs project experiments.

There is usually a set of criteria for the admission of projects within the living labs. Possible criteria are:

- Experiments are open for the living lab community members, for which, a user agreement is signed.
- Proposals should fit the themes and vision of the living lab.
- TRL level: some accept innovations higher than a certain TRL level.
- Responding to the conditions expressed within a call of interest.
- Size of the companies (start-ups, SMEs, no size requirement).
- Value in terms of scientific/business/market opportunity.
- The application potential on the market.
- The relevance to local policy priorities.
- Relevance to what the local site can offer.
- Feasibility in terms of costs and competences.

Depending on the living lab nature, some are open for the external parties, offering fixed-term collaboration agreements while others only allow experimentation by their partner organisations, making from it an added value competence for their business model.

The Inventory and analysis have illustrated that numerous EU and national financed urban mobility projects contain elements of the living lab approach and/or implemented within an established Living Lab. Noteworthy are the 80 CIVITAS Living Lab cities demonstrations as well as the 12 projects involving living labs or their elements in the framework of the EIT Urban Mobility Business Plan 2020. The 47 living labs analysed more in depth are largely focusing their activities on the topic of mobility (29), next to automation and logistics.

Urban mobility living labs concretely contribute to a successful achievement of the goals laid down in the EU Sustainable and Smart Mobility Strategy, the Green Deal, and the upcoming updated Urban Mobility Package. Despite the recognised importance of the urban mobility living labs it was also found that they face several challenges and would need additional support from the EIT KIC Urban Mobility to fully achieve their objectives and impacts. The following key challenges were identified:

- Assure the long-term financial sustainability of the living lab as well as resources for an upscaling of the successfully tested LL innovations;
- Ensure an efficient upscaling of the product/ service;

- Ensure knowledge transfer between different projects carried within the LL;
- Ensure active end user involvement in each phase of the innovation development: ideation, co-creation, and validation;
- Ensure active citizens engagement in the activities necessary to successfully develop, upscale and deploy innovation;
- Reach a common understanding of the goals of the different stakeholders involved in individual projects of the living lab.

Specifically, the first five challenges seem opportune for the EIT KIC Urban Mobility to play a role and assist the EU urban mobility labs by:

- Enabling a successful financial sustainability of the living labs and providing access to (new) financing for the creation of wider social and green impacts;
- Enabling a more efficient upscaling of living lab products and tested mobility services and knowledge transfer;
- Enabling a higher levels of end-user involvement and citizens engagement.

List of abbreviations

ADAS	Advanced Driver Assistance Systems
AMS Institute	Amsterdam Institute for Advanced Metropolitan Solutions
AR	Augmented Reality
BUas	Breda University of Applied Sciences
C-ITS	Cooperative Intelligent Transport Systems
CAVs	Connected and Automated Vehicles
CERTH	Centre for Research and Technology-Hellas
CIVITAS	An acronym of City-VITALity-Sustainability
DGPS	Differential Global Positioning System
DOLL	Danish Outdoor Lighting Lab
DTU	Technical University of Denmark (Danish: Danmarks Tekniske Universitet)
EARPA	European Automotive Research Partners Association
EC	European Commission
EIT	European Institute of Innovation and Technology
EIT UM	EIT Urban Mobility
ELTIS	European Local Transport Information Service
ENoLL	European Network of Living Labs
EU	European Union
FGC	Catalan Government Railways (Catalan: Ferrocarrils de la Generalitat de Catalunya)
ICT	Information and Communications Technology
IH	Innovation Hub
IoT	Internet of Things
ISA	Intelligent Speed Assistant
IT	Information Technology
JRC	Joint Research Centre
KIC	Knowledge and Innovation Community
KTH	KTH Royal Institute of Technology (Swedish: Kungliga Tekniska högskolan)
LL	Living Lab
MIT	Massachusetts Institute of Technology
MR	Mixed Reality
MUE	Mobile Urban Elements
N/A	Not applicable, not available
NFF	The Automotive Research Centre Niedersachsen (German: Niedersächsisches Forschungszentrum Fahrzeugtechnik)
NGO	Non-governmental organization
NMS	New Mobility Services
NVH	Noise, Vibration, and Harshness
PPP	Public–private partnership
PV	Photovoltaic

R&D	Research and Development
RIS	Regional Innovation Scheme
SME	Small and Medium-sized Enterprise
SULP	Sustainable Urban Logistic Plan
SUMP	Sustainable Urban Mobility Plan
TRELAB	Transport Research Lab
TRL	Technology Readiness Levels
TU	Technical University
UK	United Kingdom
UML	Urban Mobility Laboratory
UPC	Polytechnic University of Catalonia (Catalan: Universitat Politècnica de Catalunya)
V2X	Vehicle-to-everything
VR	Virtual Reality
3D	Three-dimensional
5G	The 5th generation mobile network

Contents

1	The EIT Urban Mobility assignment.....	14
2	Urban mobility living labs: setting the scene	20
2.1	Urban mobility living labs movement in Europe.....	20
2.2	Living labs in the context of the other urban mobility initiatives	22
2.3	Categorisation of the living labs.....	24
2.4	The scene of the European urban mobility living labs	26
3	Inventory within EIT Urban Mobility partnership.....	29
4	Looking beyond the EIT Urban Mobility partnership.....	36
4.1	Urban mobility living lab characteristics: quadruple helix stakeholders	46
4.2	Urban mobility living lab characteristics: real-life environment.....	55
4.3	Urban mobility living lab characteristics: co-creation and the end user engagement	64
5	Operation and management of the urban mobility living labs.....	71
5.1	Operational structure and business models of the living labs	71
5.2	Added value of the living labs for the urban mobility ecosystem.....	84
5.3	Areas of support for the further development of the urban mobility living labs	88
6	Learning and recommendations.....	98
7	References.....	102
8	Acknowledgement	105



1 The EIT Urban Mobility assignment

Initiative of the European Institute of Innovation and Technology (EIT), the EIT Urban Mobility was established to become a leading organisation in accelerating the transition towards more sustainable urban mobility and liveable cities. The organisation is at the forefront of integrating education, research, and business by bringing together cities and their citizens, students and researchers, practitioners and experts, business developers and entrepreneurs.

Mobility issues are complex to solve as there are usually many stakeholders with different objectives and stakes involved and no single problem-owner. As stated in the EIT Urban Mobility Strategic Agenda (2020), “today’s model of urban mobility is not sustainable and requires immediate change”. Enabled by technological developments as well as political and societal pressure, many solutions, products, and services are being tested and developed to make urban mobility more sustainable. Since 2006, the concept of the living lab (LL) is recognized by the European Commission as a key tool for open innovation. Living Labs provide an opportunity for the real-life testing of products and services to accompany the mobility transition. They bring together different stakeholders and enable the involvement of the end-user in co-creation activities for the achievement of long-term sustainable solutions.

Recognizing the strategic and operational importance of the living lab approach as an instrument for mobility solutions innovation and upscaling, EIT Urban Mobility aims:

- To understand the scope of the mobility living labs movement in Europe, the shapes and forms of these labs, their added value for the mobility transition, and the barriers and opportunities they are facing.
- To shape the definition of living labs as a programmatic activity and/or a European network.

As recognised urban mobility experts, LuxMobility (Luxembourg) and Breda University of Applied Sciences (the Netherlands) were engaged ¹to provide the EIT Urban Mobility with an inventory and categorization of the living labs active in Europe in the field of urban mobility. Based on the analysis of best practices and organisation of the internal workshops, they support the EIT Urban Mobility in getting a better understanding and the definition of a dedicated living lab strategy that allows to scale new mobility solutions in cooperation with all living lab stakeholders.

This final report presents the public results of the activities carried out as part of the assignment.

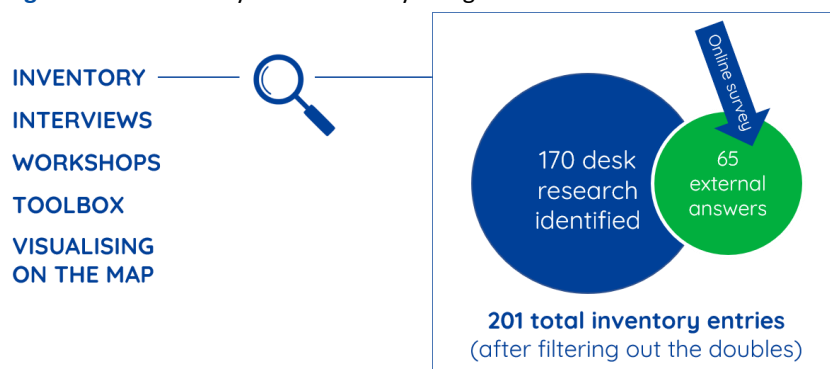
¹ EIT UM Living Labs/Advisory services to set up a knowledge base of innovative solutions in urban mobility and living labs (07/08/2020 – 31/12/2020)

The approach to this project included an inventory of the mobility living labs in Europe (initial desk research and an online survey), a dedicated set of interviews, 2 collaborative workshops, creation of a living lab capacity building toolbox and a geo-referenced map of urban mobility living labs. This approach was developed to support three main objectives of the study:

- **Objective 1.** To take stock of the existing mobility living labs in innovation projects included in the EIT Urban Mobility Business Plan 2020, through already available sources, as well as surveys of core and project partner organisations of EIT Urban Mobility. This inventory shall aim to provide information on the type of existing living labs across the partnership and the coverage in each of the five Innovation Hubs and Regional Innovation Scheme (RIS) countries;
- **Objective 2.** To involve existing European networks, collect and map other mobility-related living labs in the Pan-European region. This inventory shall complete the above by extending the map to new regions, including an overview of living labs in transport, logistics and automotive (e-mobility) in European research and innovation projects;
- **Objective 3.** To collect learnings from the analyses of living labs and set up a toolbox of best practice and results for cities to support them in the development and scaling of new mobility solutions.

Inventory of the mobility living labs.

Figure 1. Inventory of the mobility living labs.



The project participants performed an internet-based desk research with the goal of identifying the urban mobility living labs active in Europe. In order to identify the living labs for each Member State a research was done in the own language using the following keywords:

Keywords search:		
mobility living lab	logistics living laboratory	automotive testbed
mobility living laboratory	logistics testbed	urban living lab
mobility testbed	logistics field lab	urban living laboratory
mobility field lab	automotive living lab	urban testbed
logistics living lab	automotive living laboratory	urban field lab

This internet-based search has resulted in the identification of 170 initiatives including living labs, test beds and other initiatives containing living lab elements but not labelled presently as such. The online mappinion survey was developed to collect standardized information about these initiatives, with the objective to identify the mobility living labs and get a structured insight into their main characteristics and operational parameters.

The survey was sent to 170 identified initiatives as well as disseminated via external city, industry, and university networks active in the field of urban mobility. As a result of the initial desk research and through the online mappinion survey, a more in-depth look was taken at each living lab set-up, needs, operational and organisational processes. Presently, the EIT Urban Mobility living lab database includes 201 initiatives including living labs, test beds and other initiatives containing living lab elements but not labelled presently as such.

Semi-structured interviews.

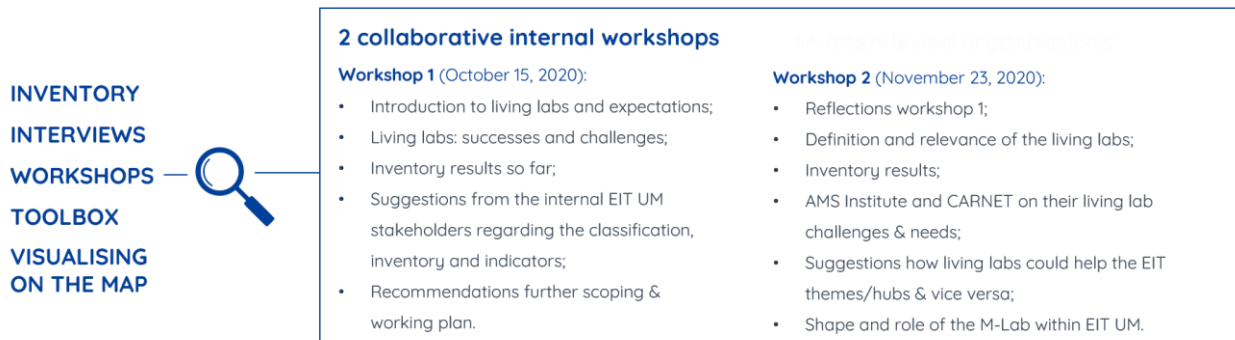
Figure 2. Interviewed organizations.



With the purpose of generating more in-depth insights about the different living lab initiatives in Europe, 14 interviews were conducted with representatives from universities, research centres, and EU institutions involved in the operation of living labs active in the field of urban mobility. The interviews in particular focused on the living lab governance and management; business models and the added value of the living labs within the urban mobility ecosystem.

Collaborative internal workshops.

Figure 3. Activities during the collaborative internal workshops.



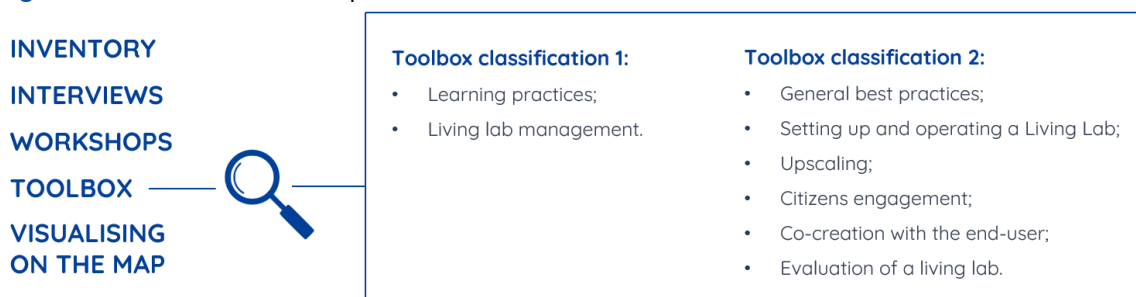
Two internal interactive workshops took place within the project duration. Workshop 1 had the objective to present the results of the desk research on mobility living labs to the internal EIT UM stakeholders and to gather their opinion on the further working methodology and potential added value of the living labs to the organisation. Workshop 2 had the objective to share the inventory results with a larger internal audience and to receive the first-hand opinion of the living labs “owners” on the challenges and facilitators of the living lab process.

The workshops have indicated that knowledge sharing about the mobility living labs is needed, showcasing what works and not, in terms of best practices and learning cases; to form a clear view on the tasks and ownership and business models of the living labs. For the EIT UM, it is interesting to understand how they can provide efficient support to mobility living labs and vice versa, how existing living labs can support different types of activities and goals of EIT and its members.

Toolbox.

In the frame a Living lab toolbox was created to allow the EIT KIC Urban Mobility to collect and share both living lab learning practises and Living lab management tools. With learning practices are meant Living lab initiatives that can function as an inspiration for other living labs. Living lab management tools will be a collection of best practices, ideas on how to set up and operate a living lab, how to upscale, allow for citizens engagement, co-create with the end user and evaluate on impacts.

Figure 4. The classification options of the Toolbox.



Therewith the living lab toolbox will be a catalogue of diverse tools and best practices which aims to assist cities and other relevant stakeholders to create and/or enhance their own urban mobility living lab. Links to relevant sites and tools are included. An easy to use back-office will allow the EIT Urban Mobility management to manage the Living lab toolbox over time, update links, and add new urban mobility living lab tools.

Visualising on the map.

A EIT Urban Mobility Living Lab Map has been created and filled with an initial list of approximately 200 identified European living labs. This allows to easy identify past and present living lab initiatives in the different EU member states. Newly identified living labs can be easily added, as well as updated / new information of the already mapped living labs.

Figure 5. Mapped out the inventory entries.



For each of the mapped living lab a standardised set of information was collected as presented in

INVENTORY
INTERVIEWS
WORKSHOPS
TOOLBOX
VISUALISING
ON THE MAP



Mapped inventory entries showing:

- Living lab name;
- Website;
- Start year;
- End year;
- Main focus area;
- Main owner of the living lab;
- Impact area of products/services;
- Whether it is a continuation of a previous initiative;
- Funding mechanisms;
- Main activities facilitated by the living lab.



2 Urban mobility living labs: setting the scene

2.1 Urban mobility living labs movement in Europe

The newly presented EC Sustainable and Smart mobility strategy for Europe states that “we must shift the existing paradigm of incremental change to fundamental transformation” with an objective of putting the European transport “firmly on the right track for a sustainable and smart future” (COM (2020) 789 final). The European Green Deal recognizes that “the involvement and commitment of the public and of all stakeholders is crucial to the success of the European Green Deal” (COM(2019)640 final). It states that “recent political events show that game-changing policies only work if citizens are fully involved in designing them” and that “citizens are and should remain a driving force of the transition”. Moreover, “a new pact is needed to bring together citizens in all their diversity, with national, regional, local authorities, civil society and industry working closely with the EU’s institutions and consultative bodies” (COM(2019)640 final).

On the local level, living labs do offer this opportunity to address transition challenges in close cooperation between the mentioned stakeholders and actively involving the end-users in the ideation, co-creation and validation of the necessary for the transition products and services. The living labs movement in Europe dates to 2006, when it was first mentioned in the Helsinki Manifesto (November 2006 Finnish EU Presidency), pointing at living labs as a first step towards “a new European R&D and Innovation System, entailing a major paradigm shift for the whole innovation process” (European Commission, 2020). However, the concept of the living lab can be traced back to 1980s, evolving from the implementation of long-term field experiments (1980s – 1990s), to lab infrastructures aimed at testing in settings recreating real-life conditions (1990s – 2000s), towards an innovation approach based on end-user co-creation and experimentation in real-life contexts (2000s – 2010s) (Schuurman & Protic, 2018).

Since then, living labs have spread over Europe in various waves, first focusing on new ICT tools but later also extending to other fields, such as sustainable energy, healthcare, safety, and mobility. Nowadays, we read about the living labs in the newspapers, networks of living labs are being created, and European projects organize their activities within the living labs set-up. The number of the living labs within different domains is steadily growing; for example, since its formation in 2006, the European Network of the Living Labs (ENoLL) - the international Living Labs in Europe and worldwide – has labelled 460+ living labs, marking in 2019 its 13th wave of application for the living labs. ENoLL acts as a best practice exchange, learning and support platform, providing its members with targeted

advice and support in co-creation, user engagement, test and experimentation. The European Commission initiative CIVITAS recognizes its cities as living labs, accounting up to now for more than 80 Living Lab cities Europe-wide. The European projects are being organised around the living labs concept, aiming to achieve the impact that goes beyond the official project duration (e.g., CITYLAB Horizon 2020 project; LEAD Horizon 2020 project; CIVITAS Destinations; CIVITAS Inclusion, etc). Since 2019 the European Commission Joint Research Centre has opened its research centres in Ispra (Italy) and Petten (the Netherlands) to host mobility and energy related living labs. More and more national/regional/local urban mobility programmes are organized following the living lab concept (e.g., SUMMALab and CILOLAB in the Netherlands; Smart Mobility Living lab in the UK; Mobility Laboratory Upper Austria, etc.).

The European Network of Living labs (ENoLL) defines living labs as "*user-centred, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real life communities and settings.*" (ENoLL, n.d.). Following this definition, the key elements of a living lab are: (uncontrolled) real-life setting; co-creation and active end-user involvement; triple/quadruple helix stakeholder participation and a multi-method approach (Zavratnik et al., 2019; Nesterova et al., 2018; Robles et al., 2015; & Schuurman, 2015).

Within living labs, the experiments usually take place in an *uncontrolled real-life setting*, in the daily environment of their end-users, which can have a scale of a house, a street, a neighborhood, but also of a city or a travel corridor. This "research in the wild" approach allows to take the variety of the outside situations into account.

- *Co-creation and end-user involvement* relate to a cooperative process where the involved stakeholders, and particularly the end-users, can influence the experimentation from its ideation phase. Co-creation aims at aligning the objectives of the parties involved and enhancing the participation of the end-users in the development of the final products and services, as a result - increasing their acceptance of the developed innovation and, thus, the chances of their uptake.
- *Quadruple helix stakeholder involvement* means engagement of the representatives from public authorities (e.g., local/regional/national governments), industry (e.g., start-ups, SMEs, etc.), academia (e.g., universities and research institutes) and civil society (i.e., citizens) within one innovation ecosystem. The added value of the quadruple helix cooperation model next to the triple helix (cooperation between public authorities, industry, and academia) is a shift from an expert-driven innovation towards and user-centric innovation.
- *Multi-method approach* allows the involvement of multidisciplinary competences, encouraging an unprecedented combination of skills, competences, people, equipment, companies, settings, etc., and, thus, the development of "out of the box" innovations.

Next to this, living labs are also about continuation, upscaling, and synergies:

- *Continuation*: living labs provide an opportunity to go through the improvement cycles for the product/service and to continue the existing achievements, instead of re-inventing the wheel.
- *Upscaling*: living labs provide an opportunity to adjust the product/service to local circumstances, cultural differences, and regulations.
- *Synergy*: as living labs provide an ecosystem to multiple innovation testing, they serve as an excellent platform to share knowledge between these experiments on the achievements, barriers, and facilitators.

2.2 Living labs in the context of the other urban mobility initiatives

Despite the clarity of the official ENoLL living lab definition, the EIT Urban mobility living labs inventory and dialogue with stakeholders have shown that in practice a common mobility living labs “language” is still missing across Europe. Living labs are being referred to as a method; a context; an ecosystem; an easy testing concept for new solutions. Commonly, the term “living lab” is used for summarizing a variety of local experimental projects/project settings with participatory nature and there is not yet a clear, established boundary between them and concepts such as testbeds, regular pilots, and demonstration activities.

Testbeds are often associated with a controlled environment and are closely linked to the usage of special equipment (Engels, Wentland and Pfothauer, 2019; Habibipour, 2018; Edgar & Manz, 2017; & Sarjanen, 2010). Engels, Wentland and Pfothauer (2019) define testbeds as "controlled experimental spaces that facilitate a kind of performance or hypothesis testing under presumably realistic conditions". Often, the environment where products/services are tested has been specifically built and structured for the specific type of innovation testing purposes. Thus, the risks associated with real-life experimentation environments (e.g., a street, a district, etc.) used in living labs, could be avoided in the controlled testbed settings which bear a resemblance to science laboratories (Sarjanen, 2010). The involvement of quadruple helix stakeholders and end-users is wishful but not a hard requirement for a testbed operation.

Compared to regular pilots and demonstrations, living lab experiments pay more attention to continuation and upscaling. They incorporate the elements necessary for the sustainable business models of innovation and have a long-term vision in mind while setting up concrete experiments. Standalone pilots or demonstrations often have short-term goals, illustrating technical feasibility of the innovation and focusing on the validation of the solution/technology with an end-user or technology provider.

Table 1. Living labs in the context of other initiatives.

Criteria	Living labs	Testbeds	Demonstrations
<i>Key offer</i>	Multi-stakeholder ecosystem/test environment for the co-creation and validation of the product/service with an end user.	Access to physical facilities, capabilities and services required for the development, testing and upscaling of new products and services (usually in industrial environments).	Linear and predetermined experiment development, focusing mainly on testing a new product or service in an operational environment.
<i>Real-life environment</i>	Fixed and not-fixed locations, uncontrolled	Fixed location, controlled	Project specific
<i>Special equipment</i>	Project specific	Hard requirement	Project specific
<i>Goals</i>	Medium to long-term	Short to medium-term	Short to medium-term
<i>Uncertainty</i>	High	Limited	Little
<i>Citizens engagement</i>	Requirement	Project specific	Project specific
<i>Multi-stakeholder approach</i>	Hard requirement	Project specific	Project specific
<i>Co-creation with the end-users</i>	Ideation/co-design/validation/evaluation	Validation/evaluation	Validation/evaluation

Table 1 summarizes some general characteristics of the living labs, testbeds and stand-alone pilots/demonstrations. In practice, there is no sharp qualification criteria for those and the boundaries between the initiatives can fluctuate depending on the final goal and stakeholders involved. To sum up, the living labs approach differs from other innovation approaches, as it is “no longer only about the technical aspects of innovation, but also about the user, business models, acceptance and policy” (Maas et al., 2017).

It goes beyond the development of demos, pilots, experiments, and testbeds by changing the emphasis from the product/service as an isolated object to the process of integrating it into the daily environment of its end-user. It allows the creation of experimentation environments that are sufficiently connected with real-world stakeholders and their business models.

2.3 Categorisation of the living labs

Several approaches for the urban mobility living labs categorisation are possible, depending on the leading criteria laid down in the analysis. For example, laying in foundation the nature of the owner and focus of the activities, Schuurman et al (2016) identify:

- Research Living Labs focusing on performing research on different aspects of the innovation process.
- Corporate Living Labs that focus on having a physical place where they invite other stakeholder (e.g., citizens) to co-create innovations with them.
- Organizational Living Lab where the members of an organization co-creatively develop innovations, and
- Intermediary Living Labs in which different partners are invited to collaboratively innovate in a neutral arena.

Depending on the ambition and the goals of the living labs, two main other living lab types can be distinguished (Neef, Verweij, Gugerell, & Moen, 2017):

- The product-oriented living labs, focusing on the development of a new concrete innovative object, service, process, etc. These living labs are organized around the learning process for the specific product (service, process, etc.) and are usually driven by private stakeholders. They benefit most from the co-creation process with actual end-users of the innovation in development.
- The urban transition living labs, focusing on achieving specific area sustainability by means of innovation. They are usually initiated by public authorities or knowledge institutes and focus on aligning all stakeholders' interests and develop and test several solutions in parallel, all contributing to one major goal.

The categorisations presented above has not been used further in this study due to the fact that it does not match with the objectives of the assignment and the scope of the study. The inventory and mapping of the urban mobility living labs in Europe illustrated that operational and ecosystem conditions as well as key stakeholder goals lead in practice to the variety of the above-mentioned categories combinations. Three following categories of these mixed-nature urban mobility living labs were leading throughout the performed inventory:

- **Project based living lab experiments (classification related to the governance model):** single living lab experiments organised in the framework of European or /project funded living labs. Those are usually 2- 4 year externally funded initiatives, created with an objective to co-create innovative products/services within a quadruple helix stakeholder setting; they are

investigating the possibilities of the living lab approach and are not focused on the self-sustainability of the own living lab business model.

- **Fixed location living labs** (*classification related to the facilities used to carry out experiments*): mixed funded initiatives, offering a real-life setting experiment location to mobility stakeholders and connected to it added value services, like: special equipment; network of stakeholders; facilitation of the administration or regularly permits for the experiment; facilitating co-creation processes and end-user involvement.
- **Not-fixed location living labs** (*classification related to the facilities used to carry out experiments*): mixed funded initiatives, bringing together public authority, knowledge, industry, and end-user organisation at one dialogue table, developing experiments in different fit for purpose in real-life settings within a neighbourhood, city or region. The added value of these living labs is generated via the synergy between different projects, knowledge accumulation and transfer, facilitation of the administrative and regulatory permits for the experiments, facilitation of the co-creation processes and of the end-user involvement.

Next to it, the project also made a classification of the urban mobility living labs, based on the functional elements, as presented in **table 2**.

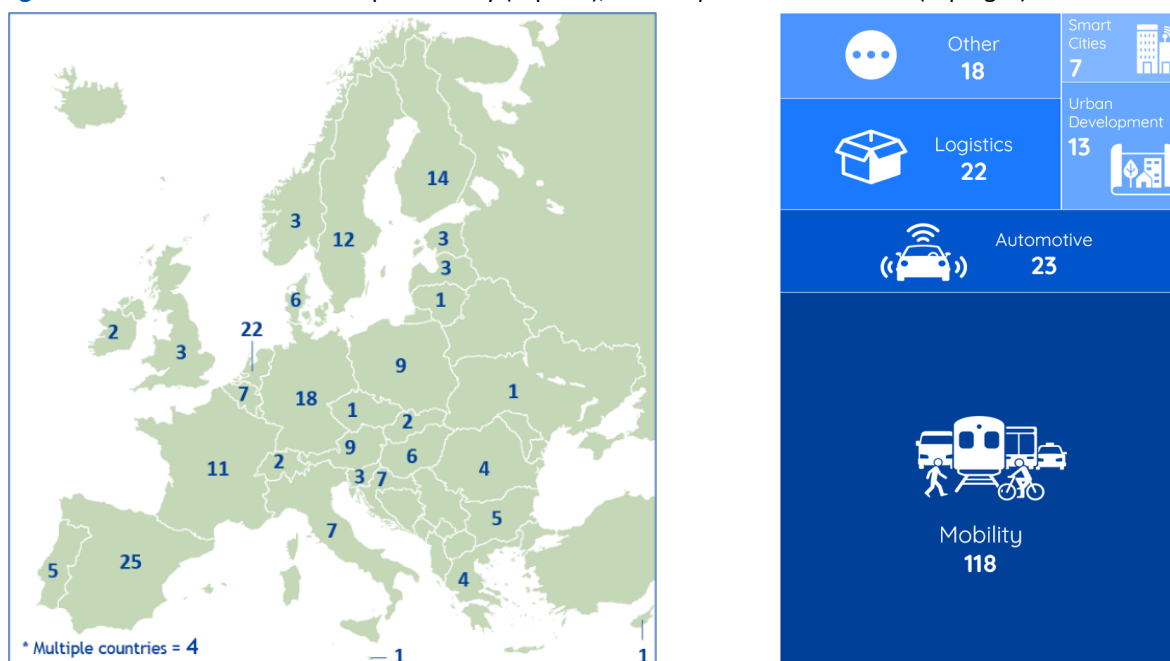
Table 2. Classification for the urban mobility living labs.

Criteria	Classifications
Key living lab focus	Mobility; logistics; automation; urban development; ...
Leading stakeholder	University; research; industry; public authority; civic organization;
Field of interest	Alternative fuels; cycling; drones; freight transport; ...

2.4 The scene of the European urban mobility living labs

The desk research and the externally filled in online survey entries collected within this assignment, have resulted in a database of 201 initiatives including living labs, test beds and other initiatives containing living lab elements but not labelled presently as such. The map below shows these initiatives per country of operation: Spain represents the highest number of initiatives – 25, followed by the Netherlands – 22, and Germany – 18. The most active cities in Spain are Madrid (5), Barcelona (4) and Malaga (4). The most active ones in the Netherlands are Amsterdam (4), The Hague (4), Helmond (2) and Delft (2). In Germany these are: Hamburg (3), Aachen (2), Munich (2), Bremen (2) and Stuttgart (2). The Nordic countries Denmark, Norway, Sweden and Finland are also well-represented with a total of 35 initiatives. Within these countries, the most active cities are: Gothenburg (6), Copenhagen (5), Helsinki (4), Malmö (4) and Oslo (3). Out of the 201 initiatives: 109 are still active, 75 are not active and for 17 it is unclear whether they are active or not.

Figure 6. Number of initiatives per country (top left); Main topics of the activities (top right)



(Source: EIT Urban Mobility survey, 2020, single-choice question)

The desk research has focused on the identification of the mobility related initiatives, both active and non-active. According to the ELTIS glossary, mobility is defined as “the potential for movement and the ability to get from one place to another using one or more modes of transport to meet daily needs” (www.eltis.org/glossary/mobility). 118 initiatives, 87 of which label themselves as living labs, have mobility as the main topic, with public transport; information systems; road and traffic

management systems and cycling being the most common fields of experiments carried out. The countries hosting the most mobility living labs are the Netherlands (13), Germany (12) and Spain (9).

Table 3. Cities with most identified urban mobility living labs.

Number	City	Total from 87 mobility living labs	From which active	Total from 118 mobility initiatives	Total from 201 total initiatives	EIT Urban Mobility Innovation Hub
1	Amsterdam	3	2	3	4	IH West
1	Antwerp	3	2	3	3	IH West
2	Aachen	2	1	2	2	IH Central
2	Barcelona	2	2	3	4	IH South
2	Copenhagen	2	1	3	5	IH North
2	Delft	2	1	2	2	IH West
2	Gothenburg	2	0	5	6	IH North
2	Graz	2	1	2	3	IH Central
2	Hamburg	2	1	2	3	IH North
2	Helsinki	2	1	3	5	IH North
2	Ljubljana	2	1	2	3	IH Central
2	Munich	2	1	2	2	IH Central
2	Stuttgart	2	1	2	2	IH Central
2	Vienna	2	2	2	3	IH Central

The desk research also encompassed other types of initiatives related to the mobility innovation ecosystem:

- 23 automotive-focused initiatives were identified, of which 18 are listed as test beds, looking into the topics of advanced driver assistance systems (ADAS), connected and automated vehicles (CAVs), electric road vehicles, road vehicle design and manufacturing, etc. Between those regions of Catalonia and Lower Saxony have 2 initiatives each, with each other city/region only operating one (within those identified).
- 22 logistics - focused initiative, of which 21 are the living labs, working on the topics of freight transport. The leading cities here are The Hague (3), Malmö (2), Rome (2) and Oslo (2).

- 13 urban development initiatives, supporting experiments within an area development and design, Waste, Circular economy, Spatial cognition, etc. There is no leading city within initiatives identified.
- 7 (3%) of the initiatives are focused on Smart Cities meaning that they focus(ed) on solving issues related to topics, such as IoT, Open data, Smart lighting, etc. There is no leading city within initiatives identified.

The database of 201 initiatives including living labs, test beds and other initiatives containing living lab elements but not labelled as such, includes desk research entries by the assignment team, as well as 65 survey replies. Within these 65 replies, 42 identify themselves as “living labs”, 15 as “testbeds”, 5 as “initiatives containing the living lab elements but not labelled as such” and 3 other responses. However, as discussed in section 2.1, there is still a variety of interpretations of what a living lab is within different stakeholders of the urban mobility ecosystem.

Therefore, the 65 external records were checked based on their correspondence to the core living lab criteria: real-life environment to run experiment; triple or quadruple helix stakeholder’s involvement; co-creation and end-users’ engagement. Multi-method approach was not included in the assessment criteria as it was not considered feasible to properly assess it within the chosen methodology. The expert check of the 65 external initiatives resulted in the identification of 47 urban mobility living labs for which information about key characteristics, governance structure, business models, barriers of operation is contained within a survey. Chapters 4 and 5 of this report are focused on the analysis of these living labs.

3 Inventory within EIT Urban Mobility partnership

Objective 1. To take stock of the existing mobility living labs in innovation projects included in the EIT Urban Mobility Business Plan 2020, through already available sources, as well as surveys of core and project partner organisations of EIT Urban Mobility. This inventory shall aim to provide information on the type of existing living labs across the partnership and the coverage in each of the five Innovation Hubs and Regional Innovation Scheme (RIS) countries.

EIT Urban Mobility partners are developing several projects involving living labs or their elements in the framework of the Business Plan 2020. Likewise, there are several established living labs that EIT Urban mobility partners are members. Based on an initial inventory and number have been picked up and integrated within the analysis. The overview per innovation hub is presented in **table 4**.

Table 4. EIT Urban Mobility Business Plan 2020: projects involving living labs.

Project name and website	Project lead	Cities involved	Description
EIT Urban Mobility Innovation Hub SOUTH:			
FURNISH: Fast Urban Responses for New Inclusive Spaces and Habitat www.furnish.tech	UPC Technology Center	Milan	This proposal aims to merge the challenge of having more public spaces through 'tactical urbanism', which can reconfigure a street expanding the space for pedestrians and leisure, with local digital manufacturing, through the quick and effective deployment of urban elements in a neighbourhood. FURNISH propose a series of Mobile Urban Elements (MUE) designed to be temporarily installed.
Inclusiv_eBike https://inclusivebike.eu/en	Tecnia	Bilbao and Bergamo	InclusiveBike aims to develop and demonstrate a new concept of rickshaw e-bikes capable to promote safety and comfort by extending inclusiveness to vulnerable people that have seen their mobility and physical activity strongly reduced due to COVID risk associated to transport.
OSCAR: an Off-Street parking floating CAR-sharing service www.eiturbanmobility.eu/projects/off-street-parking-floating-carsharing-service	SEAT	Barcelona and Hamburg	This project will develop and pilot test a one-way station-based carsharing service with existing off-street parking and real customers. The service will be initially tested in one city and will consider scalability to other European cities based on the results of the first trial. Recommendations will be provided to cities interested in new urban mobility services complementing the existing transportation alternatives.
CO-APS: Crowdsourced Obtention and Analytics of Data About the Crowding of Public Spaces for the Benefit of Public Transport and Mobility in Cities www.coaps.eu	Technical University of Catalonia	Istanbul, Sofia, Barcelona and Karditsa	CO-APS aims to develop a mobile application that helps reduce the spread of COVID-19 by managing density in public transport and public spaces.

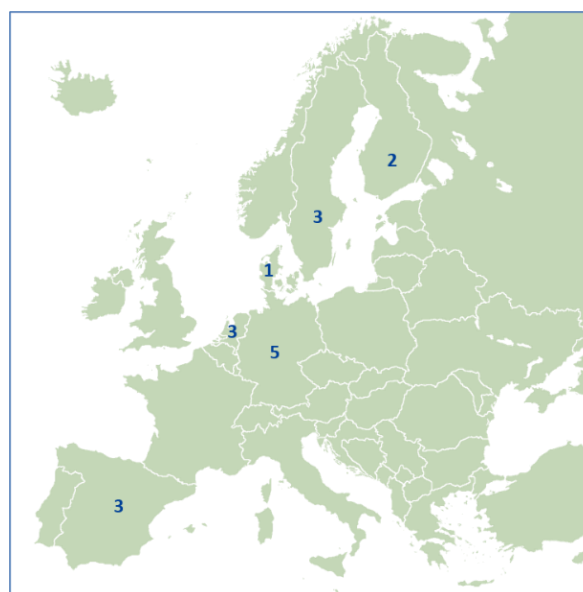
Project name and website	Project lead	Cities involved	Description
EIT Urban Mobility Innovation Hub WEST:			
CityFlows: Decision-support system for pro-active crowd management of crowded urban spaces www.cityflows-project.eu	Stichting Amsterdam Institute for Advanced Metropolitan Solutions	Amsterdam, Barcelona and Milan	Impact assessment of a cloud-based crowd management decision-support system featuring four living labs at crowded pedestrian locations Amsterdam, Milan and Barcelona.
ZEUS: Zero Emission off-peak Urban deliveries	Colruyt Group	Barcelona, Munich and Stockholm	A concept for silent and emission free city deliveries providing a more liveable, cleaner and safer urban environment. ZEUS will demonstrate what researches and tests showed: It will be more efficient and eco-friendly to shift deliveries to off-peak hours.
EIT Urban Mobility Innovation Hub EAST:			
CALL4SMS: Citizen Aimed Living Lab for Smart Mobility Solutions www.call4sms.eu	ZONE Cluster	Helmond, Munich and Milan	The objective of the CALL4SMS project is to design and develop a common methodology and platform for the urban environment testing of connected and automated smart mobility solutions. The platform helps to compare the performance in different environments of the European Union. The other unique value proposition is to involve citizen participation in the testing to create user-centric solutions.
EIT Urban Mobility Innovation Hub CENTRAL:			
USP: UrbanSmartPark www.urbansmartpark.com	TU Braunschweig, NFF	Hamburg and Helmond	The project UrbanSmartPark focusses on the development and pilot demonstration of automated vehicles that simplify driverless on-street inner-city parking and provide a broad range of possibilities for parking-related services.
CLEAR: City LiveAbility by Redesign www.streetexperiments.com	City of Milan	Amsterdam, Milan and Munich	Within CLEAR, real-life transition experiments are launched in urban streets, taking advantage of the commitment of selected cities.
MOBY: Living lab e-micromobility www.eiturbanmobility.eu/projects/living-lab-e-micromobility	Fraunhofer Society for the Advancement of Applied Research	Munich, Copenhagen and Tel Aviv	In the MOBY project conditions for e-micromobile usage concerning regulatory, planning, safety, legal- and financial aspects have been analysed. Several outputs and publications were created within the work-packages of the project.
SMUD: Shared micro depots for urban pickup and delivery www.eiturbanmobility.eu/projects/shared-micro-depots-for-urban-pickup-and-delivery	Fraunhofer Society for the Advancement of Applied Research	Helmond	Provides a publicly acceptable solution and raise awareness for Shared Micro depots for Urban pickup and Delivery for the benefit of urban residents.
SafeCONNECT: Safely Connected: Sustainable Common Accessibility of Lively Downtowns for Healthy People www.fondazionepolitecnico.it/en/initiatives/visionary-cities/safely-connected	Politecnico di Milano	Saint Germain-En-Laye	Safely Connected collaboratively develops and tests the relaunch of local economy and urban life, with the pedestrianisation of the city-centres and the strengthening of the community sense as vectors of urban resilience. A series of flexible physical and digital tools will be developed in this frame, allowing the safe resumption of economy and urban life and generating a shift in favour of sustainable modes of travel.

These projects are under development at this moment and their results will be available in the course of 2021. As said next to the EIT Urban Mobility (co-) financed projects, EIT Urban Mobility partners are part of the already established living labs within their local ecosystems. The overview of the cities where these living labs are located is presented in **table 5**.

Table 5. Living labs in the EIT Urban Mobility cities.

EIT Urban Mobility Innovation Hub NORTH:	
Greater Copenhagen	1
Helsinki	2
Stockholm	3
Hamburg	1
EIT Urban Mobility Innovation Hub SOUTH:	
Thessaloniki	1
Barcelona	2
Catalonia	1
EIT Urban Mobility Innovation Hub WEST:	
Helmond	2
Amsterdam	1
EIT Urban Mobility Innovation Hub CENTRAL:	
Kaiserslautern	1
Saarbrücken	1
Stuttgart	1
Munich	1

Figure 7. Countries where EIT Urban Mobility members are part of the urban mobility living lab.



The following tables present a short overview of the already established living labs that EIT Urban Mobility partners are part of.

Table 6. Living labs of which EIT Urban Mobility Innovation Hub North partners are part of.

Name	City	Key offer	Living lab owner	Stakeholders involved	Real-life setting
EIT Urban Mobility Innovation Hub NORTH:					
DOLL Living Lab www.doll-livinglab.com	Glostrup/ Greater Copenhagen (Denmark)	Europe's leading living lab for intelligent outdoor lighting and Smart City-technologies.	Albertslund municipal, DTU and Gate 21	University, Research entity, National public authority, Regional public authority Municipality, Industry Consulting company Citizens engagement entity and End users	Fixed site: industrial commercial area located in the Greater Copenhagen district of Glostrup
Jätkäsaari Mobility Lab www.mobilitylab.helsinki.fi	Helsinki (Finland)	Assisting companies and researchers in testing and developing smart and digital mobility solutions on the streets of Helsinki, with real users.	Public authority	Municipality and Citizens engagement entity	Fixed site: Jätkäsaari-Ruoholahti district located near central Helsinki
Smart Kalasatama www.fiksukalasatama.fi/en/	Helsinki (Finland)	Urban Living Lab for speeding up smart city development in Helsinki.	Public authority	Municipality, Industry and End users	Fixed site: Kalasatama, a district on the eastern edge of the city centre of Helsinki
Test Site Stockholm www.itrl.kth.se/research/completed-projects-a/test-site-stockholm-1.917801	Stockholm (Sweden)	Testing and demonstration of sustainable mobility in Stockholm.	Research entity	University, Research entity, National public authority, Municipality, Industry, Consulting company and End users	No fixed site: testing in Stockholm
Mistra SAMS Living Lab 2 www.itrl.kth.se/research/ongoingprojects/mistra-sams-living-lab-2-1.917927	Stockholm (Sweden)	Mistra SAMS aims to understand how a professional work environment closer to home, combined with new mobility services, can operate in practice.	University	Research entity, Municipality, Industry and End users	Fixed site: a work hub in Tullinge Centrum, Botkyrka municipality
Senseable Stockholm Lab www.senseablestockholm.org	Stockholm (Sweden)	Using Stockholm and its residents as a test bed to address the challenges facing a growing city with the help of AI and big data.	MIT, KTH and the City of Stockholm	University, Municipality, Industry and End users	No fixed site - testing in Stockholm
HomePORT www.homeport.hamburg	Hamburg (Germany)	Offering conditions for testing autonomous robots and vehicles in the port area.	Public authority	University, Regional public authority and Industry	Fixed sites - parking spaces and a water test area at the Hafen

Table 7. Living labs of which EIT Urban Mobility Innovation Hub South partners are part of.

Name	City	Key offer	Living lab owner	Stakeholders involved	Real-life setting
EIT Urban Mobility Innovation Hub SOUTH:					
Thessaloniki Smart mobility Living Lab www.smartmlab.imet.gr	Thessaloniki (Greece)	The entire city of Thessaloniki is a platform for testing technological and innovative solutions for mobility, cooperative and autonomous vehicles.	Research entity	University, Research entity, Regional public authority, Industry, Municipality and Transport operators	No fixed site - testing in different parts of the city
Barcelona Robot Lab Dataset www.iri.upc.edu/research/webprojects/pau/datasets/BRL	Barcelona (Spain)	Data intended for use in mobile robotics and computer vision research. The area surveyed in this dataset covers 10000 m ² of the UPC Nord Campus.	University	University, Research entity, Industry and End users	Fixed site – UPC Nord Campus
FGC Intermodal Sustainable Mobility www.5gbarcelona.org/news/barcelona-is-to-have-one-of-the-worlds-first-5g-railway-laboratories	Barcelona (Spain)	Stretches of indoor railway equipped with 5G technology for testing new 5G applications in a real environment.	Public-private partnership	Research entity, Regional public authority and Industry	Fixed site – Tunnel between Plaça Espanya and Europa Fira
Catalonia Living Lab www.catalonialivinglab.com	Catalonia (Spain)	Public - private framework for the development and testing of connected and automated vehicle technologies.	Public-private partnership	Research entity, Regional public authority, Municipality, Industry and Transport operator	No fixed site - testing in different parts of the region

Table 8. Living labs of which EIT Urban Mobility Innovation Hub West partners are part of.

Name	City	Key offer	Living lab owner	Stakeholders involved	Real-life setting
EIT Urban Mobility Innovation Hub WEST:					
Brainport Smart District www.brainportsmartdistrict.nl/en	Helmond (Netherlands)	A smart city residential and working district for the development and testing of new products, services and systems.	Public authority	University, Regional public authority, Municipality, Industry and End users	Fixed site - smart city district in the city of Helmond
DRIVEN - Helmond Smart Mobility Living Lab www.drivenbyhelmond.nl	Helmond (Netherlands)	A Living Lab for smart mobility solutions. The N270 road in Helmond and the A270 motorway act as test roads for C-ITS applications and automated driving tests.	Public authority	Regional public authority, Municipality, Industry and EU network	Fixed sites – N270 main road and A270 motorway
Marineterrein Amsterdam Living Lab www.living-lab.nl	Amsterdam (Netherlands)	A real-life testing area for ideas that help accelerate the development of sustainable, future-proof cities.	Bureau Marineterrein Amsterdam	Research entity, National public authority, Municipality, Industry and End users	Fixed site - a publicly accessible, privately governed site in the heart of Amsterdam

Table 9. Living labs of which EIT Urban Mobility Innovation Hub Central partners are part of.

Name	City	Key offer	Living lab owner	Stakeholders involved	Real-life setting
EIT Urban Mobility Innovation Hub CENTRAL:					
EnStadt: Pfaff www.pfaff-reallabor.de	Kaiserslautern (Germany)	A real-life lab on the former factory premises of a sewing machine factory for the implementation of a climate-neutral residential, commercial, and technology district.	Public private partnership	University, Research entity, Municipality, Industry and End users	Fixed site - the former factory premises of the Pfaff sewing machine factory in Kaiserslautern
Advanced Driver Assistance Systems (ADAS) Living Lab www.dfki.de/en/web/technologies-applications/living-labs/advanced-driver-assistance-systems-living-lab	Saarbrücken (Germany)	Located at a university campus, the aim of ADAS Lab is to foster research, development, and demonstration of interactive in-vehicle systems and novel mobility concepts.	N/A	University, Research entity and Industry	Fixed site - located at Saarland University campus
Electric vehicle fleet with charging infrastructure www.iao.fraunhofer.de/en/labs-equipment/electric-vehicle-fleet-with-charging-infrastructure.html	Stuttgart (Germany)	To study questions that electromobility presents, Fraunhofer IAO operates an extensive fleet of electric vehicles and the necessary charging infrastructure	Industry	University and Industry	No fixed site
Embedded Software Lab www.germadigitaltechnologies.de/community/embedded-software-lab	Munich (Germany)	A lab for testing new technologies for applications such as automotive networks, wireless-based networking of vehicles (Car2X), etc.	Industry	Industry	Fixed site - the lab is equipped with various tools, prototyping platforms and other equipment

The initial analysis of the established living labs that EIT KIC Urban Mobility partners are members of, show that there is a representative mix of living labs in terms of governance model. Whereas the EIT KIC Urban mobility co-financed projects with living lab elements seem to be in the majority led by research institutions, within for the moment non EIT co-financed living labs there is a mix of organizational models in which either the city (or dedicated entity), research or industry has the living lab lead. All of the living labs have strong connections to the local (and sometimes national) transport and urban mobility policy priorities.

Most of the Living Labs are in fixed locations: *Smart Kalasatama* and *Jätkäsaari Mobility Lab* (two districts of Helsinki; (Forum Virium is a partner); *DOLL Living Lab* (an industrial park in the outskirts of Copenhagen: Gate 21 is a partner); *Marineterrein Amsterdam Living Lab* (a small island: AMS Institute is a partner) and *UPC Nord Campus* (university campus: CARNET is a partner). When running the Living lab tests on private ground, even if they are publicly accessible, prove to make it easier to obtain the necessary authorizations. *Senseable Stockholm Lab* (KTH Royal Institute of Technology is a partner) and *Thessaloniki Smart Mobility Living Lab* (CERTH is a partner) are not-fixed location living labs, defining the whole city territory as their living lab test environment.

All the living labs that EIT KIC Urban Mobility members are taking part in, have a multi-stakeholder approach adopted. Both university/ research as well as the (local) authorities are highly involved in all living lab activities and organization. The involvement of industry partners (and/or start-ups) and citizens (or groups of end-users) is done on a project-basis. The level of the citizens involvement and co-creation with an end user depend much on the respective living lab project.

The living lab offers a portfolio of services: such large-scale testing and showcase opportunity within in an urban area; facilitating an engagement with active groups of end-users; add on innovation and matchmaking; allow for testing and validation; assistance in terms of decision-making support, skills development, project development and profiling and internationalization. Some Living Labs are also starting to offer agile piloting and agile project management services.

Following this initial analysis with in the EIT KIC Urban Mobility the study enlarged its analysis to a wider set of EU Living lab related initiatives.

4 Looking beyond the EIT Urban Mobility partnership

Objective 2. *To involve existing European networks, collect and map other mobility-related living labs in the Pan-European region. This inventory shall complete the above by extending the map to new regions, including an overview of living labs in transport, logistics and automotive (e-mobility) in European research and innovation projects.*

A database of 201 initiatives including living labs, test beds and other initiatives containing living lab elements but not labelled as such was collected via desk research and an external online survey, facilitated by several European networks of research, city and industry partners. Online survey was filled in by external partners for the 65 initiatives, providing more detailed and first-hand information on the key elements of the urban mobility initiatives characteristics, governance structure, business models, barriers of operation. Expert conformity check to the key living labs criteria has identified that 47 out of these 65 initiatives are corresponding to the core living lab criteria: real-life environment to run experiment; triple or quadruple helix stakeholder's involvement; co-creation and end-users' engagement. The location of these living labs is presented in a map and further detailed per EIT Urban Mobility Hub in tables.

Some of these living labs appear in both Chapter 3 and Chapter 4 discussed living labs. Additionally, in-depth semi-structured interviews were carried out with 14 urban mobility stakeholders, involved in management and operation of the urban mobility living labs in Europe, further providing details and opinions on the added value, relevance, and importance of the living labs for the urban mobility ecosystems. Chapter 4 provides analysis of the 47 urban mobility living labs complemented with the insights of the interviews. First and overview for all 47 living labs is presented, followed up with a detailed information per EIT Urban mobility Innovation hub.

As with the 201 total entries, Spain is represented by the highest number among the 47 identified living labs – 6 (13%), followed by the Netherlands with 5 entries (11%). France, Germany, Austria and Sweden each have 4 living labs identified,

The cities in Spain hosting living labs are Barcelona with 2, and Malaga, Madrid, Sevilla, Alcobendas and Terrassa with 1 each. In the Netherlands, the most active is the Province of North Brabant with 3 living labs, then the cities of Helmond and The Hague with 1 living lab each. The 4 living labs in France are located in Lille, Lyon, Grand Est region and Paris. Germany has 2 living labs located in Hamburg, 1 in Munich and 1 in Schorndorf. Sweden has 2 living labs in Stockholm, 1 in Gothenburg

and 1 in Lund. Zooming into the main topic of the living labs, more than half of them focus on the development of mobility services/products/activities – 29 (62%).

Figure 8. Number of initiatives per country (top left); Main topics of the living labs (top right); Start and end year of the living lab (bottom).

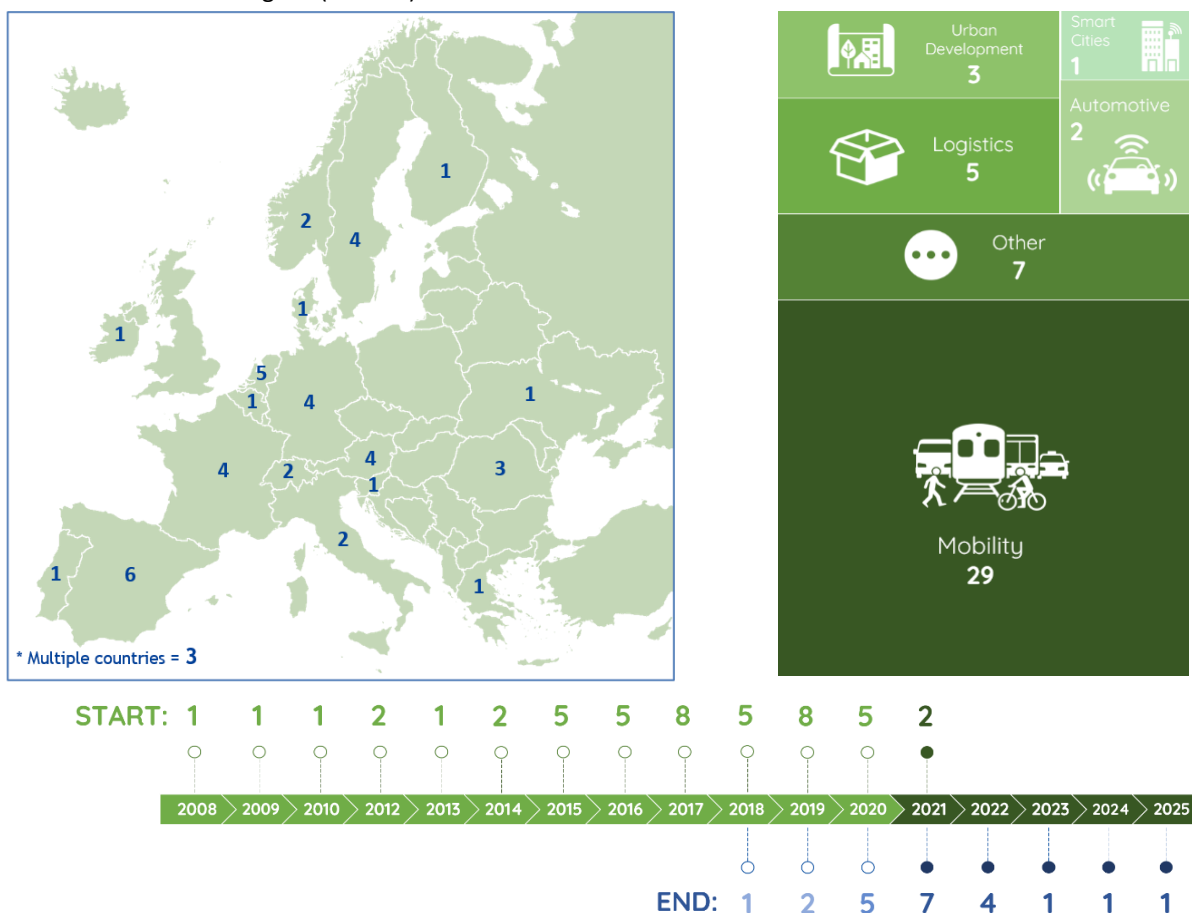


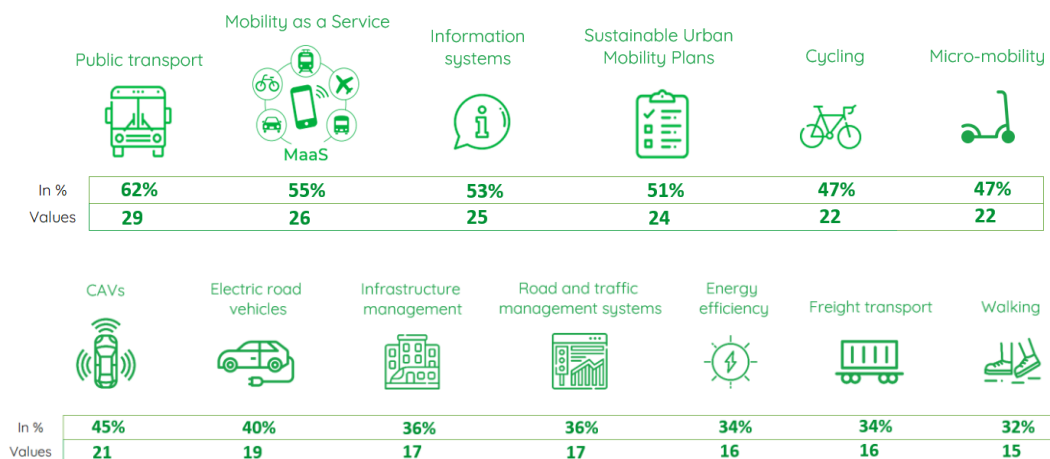
Figure 8 also illustrates that after the year 2015 there is a growing number of the urban mobility living labs initiated, with 2017 and 2019 being the years with the most living labs started. From the active living labs for which the end year is known, most of the labs have ended in 2020 or will end in 2021. However, 10 from 47 urban mobility living labs have indicated that they do not have an end year set for the lab, and 15 have not placed an answer at all. The average duration of the 8 non-active living labs is 4 years. The average duration of the 14 active labs (ending in or after 2021) which have indicated their end year is 4.5 years.

More than half of the 47 initiatives have (or had) products/services/activities focused on Public Transport – 29 (62%), closely followed by the Mobility as a Service - 26 (55%) as fields of interests



supported. Information systems and Sustainable Urban Mobility Plans with 25 (53%) and 24 (51%) labs and Cycling and Micro-mobility both supported by 22 (47%) are the next most common fields of the living labs experiments.

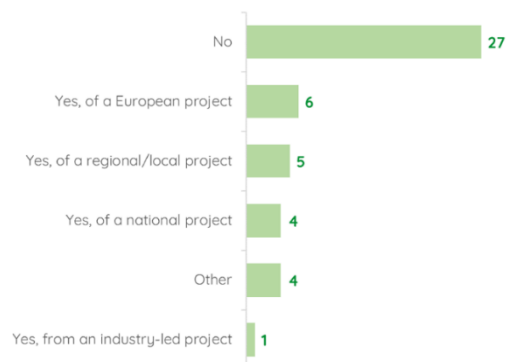
Figure 9. Fields of interest supported by the living labs.



(Source: EIT Urban Mobility survey, 2020, multiple-choice question)

Out of the 47 living labs, 27 (57%) have been created as a living lab from the start, 6 (13%) have in the origin a European project, 5 (11%) are a continuation of a regional/local project, 4 (8.5%) – of a national project, and only 1 (2%) – of an industry-led project. Living labs that answered “Other” state to be a continuation of a combination of European/national/regional/local projects and initiatives.

Figure 10. Urban mobility living lab origin.



(Source: EIT Urban Mobility survey, 2020, single-choice question)

“Sometimes, it starts with the location. For example, at the Marineterrein, we have a location that wants to become a future-proof district. This location opens itself to experimentation.” (AMS Institute, interview, 2020)

“We have a good background story – starting from a European project that was linked to the local ambitions to have participatory planning in place... I think that our strength now is based on the experience we gained back then.” (TRELAB, interview, 2020)

Within 47 living labs, 8 are living lab experiments, that are/were conducted in the framework of the European projects: CIVITAS Eccentric (Munich), CIVITAS Eccentric (Stockholm), CIVITAS PORTIS (Constanta), CITYLAB (Oslo), LEAD (Lyon), Interreg Alpine Space e-SMART (Piedmont, Veneto and Lombardy regions; Whole country of Slovenia; Grand Est region; Munich; Klagenfurt), CIVITAS SUNRISE (Southend-On-Sea; Thessaloniki; Bremen; Jerusalem; Budapest; Malmö) and INCLUSION (Cairngorms National Park; Flanders region; Rhein-Sieg region; Budapest; Florence; Barcelona). Some of them have originated from the start, others from another EU or national/regional project.

Next to it, several living labs state to have their origin from the European projects: CILOLAB in the Netherlands and Logistics Living Lab of Rome from the CITYLAB project; the labs in Constanta and Antwerp from the CIVITAS PORTIS project; a lab in Stockholm from H2020 projects; a lab in Terrassa from an EIT Health. Having EU project at its origin does not per se mean that the living lab at this moment benefits from the EU funding, but it builds up on the knowledge and experience received from the previous EU trajectory.

5 individual responses per living lab experiment (CIVITAS Eccentric (Munich), CIVITAS Eccentric (Stockholm), CIVITAS PORTIS (Constanta), CITYLAB (Oslo) and LEAD (Lyon)), were received, identifying concrete characteristics of those living labs experiences. As these responses are site-specific, they are further taken up in the EIT Innovation Hub - split. For 3 out of the 8 EU Project based living lab experiments the survey was filled in on the overall project level: Interreg Alpine Space e-SMART, CIVITAS SUNRISE and INCLUSION. These answers are used in Chapter 5 for the

evaluation of the barriers and opportunities but are not taken up in site-specific EIT Urban Mobility Innovation Hub tables.

From the 47, 12 living labs fall under the EIT Regional Innovation Scheme (RIS). The RIS countries living labs are located in are Italy (Piedmont, Veneto and Lombardy regions, Ispra, Rome and Florence), Slovenia (Ljubljana), Romania (Cluj-Napoca and Constanta), Ukraine (Rivne), Portugal (Matosinhos), Greece (Thessaloniki) and Hungary (Budapest). 9 out of the 12 RIS countries living labs are currently active. Within further analysis, they are split under the respective EIT KIC Urban Mobility Innovation Hub areas.



Table 10. EIT Urban Mobility Innovation Hub North living labs: origin, duration and main topics.

EIT Urban Mobility Innovation Hub NORTH:							
City or region	Number of living labs	Active or not active	Origin	Start year	End year	Number of active projects	Projects finalised during the last 5 years
Greater Copenhagen	1	1 active	LL from start	2014	No end year set	N/A	N/A
Gothenburg	1	1 active	N/A	2015	N/A	25	75
Hamburg	2	1 active	LL from start	2020	No end year set	N/A	N/A
		1 active	LL from start	2020	2021	10	N/A
Helsinki	1	1 active	From various projects	2019	2021	15	20
Lund	1	1 active	LL from start	2019	2022	N/A	N/A
Oslo	2	1 active	LL from start	2018	N/A	N/A	N/A
		1 not active	LL from start	2015	2018	N/A	N/A
Stockholm	2	1 active	N/A	2016	N/A	15	10
		1 not active	From EU project	2015	2020	N/A	2

Rank	Main topics
1	Public transport (8)
2	Information systems (7) Micro-mobility (7) Mobility as a Service (7)
3	Freight transport (6) Road and traffic management systems (6) Sustainable Urban Mobility Plans (6)
4	Connected and automated vehicles (5) Energy efficiency (5) Infrastructure management (5) Safety systems (5)
5	Advanced driver assistance systems (4) Cycling (4) Drones (4) Electric road vehicles (4)

Within EIT Urban Mobility Innovation Hub North, 8 living labs are active at this moment. The average duration of the labs for which the start and end year is known is 4 years.

2 of the 10 labs are project-based living lab experiments organized in a framework of the European projects: CITYLAB (Oslo) and CIVITAS Eccentric (Stockholm).

8 of the 10 living labs run experiments related to Public Transport. Next to that, 7 labs are active in the fields of Information systems, Mobility as a Service and Micro-mobility.

The 10 labs originate from:

- 1 is from a European project.
- 6 labs are built as living labs from the start.
- The living lab in Helsinki is a continuation of various projects over the years.
- The initiative in Gothenburg is a Strategic Innovation Program with living lab elements.
- The living lab in Stockholm is a collaboration arena inaugurated in a triple-helix constellation.

Table 11. EIT Urban Mobility Innovation Hub South living labs: origin, duration and main topics.

EIT Urban Mobility Innovation Hub SOUTH:							
City or region	Number of living labs	Active or not active	Origin	Start year	End year	Number of active projects	Projects finalised during the last 5 years
Alcobendas	1	1 active	LL from start	2020	N/A	N/A	N/A
Barcelona	2	1 active	LL from start	N/A	No end year set	25	50
		1 active	Regional/ local project	2014	N/A	2	2
Madrid	1	1 active	Regional/ local project	2017	N/A	6	30
Malaga	1	1 active	National project	2021	2021	2	1
Matosinhos	1	1 active	LL from start	2018	2022	4	15
Sevilla	1	1 active	Regional/ local project	2017	N/A	6	30
Terrassa	1	1 active	EU project	2018	2022	2	N/A
Thessaloniki	1	1 active	From various projects	2012	No end year set	3	6

Rank	Main topics
1	Connected and automated vehicles (7) Information systems (7)
2	Micro-mobility (5) Mobility as a Service (5) Sustainable Urban Mobility Plans (5) Public transport (5)
3	Electric road vehicles (4) Energy efficiency (4) Road and traffic management systems (4)
4	Cycling (3) Infrastructure management (3)
5	Advanced driver assistance systems (2) Dynamic Road Space management (2) Emissions control systems (2) Safety systems (2) Walking (2)

Within EIT Urban Mobility Innovation Hub South, all 9 living labs are active at this moment. The average duration of the labs for which the start and end year is known is 4 years.

7 of the 9 living labs are active in the fields of Connected and automated vehicles and Information systems. Next to that, 5 labs are active in the fields of Sustainable Urban Mobility Plans, Public transport, Micro-mobility and Mobility as a Service.

Among the 9 labs:

- 1 belongs to an EIT KIC Health project.
- 3 are built as living labs from the start.
- 4 are a continuation of a national/ regional/ local project.
- The living lab in Thessaloniki is built from various European, national, and regional projects.

Table 12. EIT Urban Mobility Innovation Hub West living labs: origin, duration and main topics.

EIT Urban Mobility Innovation Hub WEST:							
City or region	Number of living labs	Active or not active	Origin	Start year	End year	Number of active projects	Projects finalised during the last 5 years
Antwerp	1	1 active	EU project	2015	No end year set	20	60
Grand Est region	1	1 active	Regional/local project	2008	No end year set	N/A	N/A
Helmond	1	1 active	LL from start	2017	N/A	N/A	N/A
Lille	1	1 active	LL from start	2015	2024	6	2
Limerick	1	1 active	LL from start	2010	No end year set	0	2
Lyon	1	1 active	LL from start	2021	2023	1	N/A
Paris	1	N/A	LL from start	2012	N/A	16	50
Province of North Brabant	3	1 active	National project	2009	N/A	N/A	N/A
		1 active	LL from start	2019	2021	2	1
		1 not active	EU project	2017	2019	N/A	N/A
The Hague	1	1 active	National project	2019	2022	15	N/A

Rank	Main topics
1	Cycling (7)
2	Electric road vehicles (5)
3	Infrastructure management (4) Micro-mobility (4) Sustainable Urban Mobility Plans (4)
4	Energy efficiency (3) Information systems (3) Walking (3)
5	Advanced driver assistance systems (2) Connected and automated vehicles (2) Freight transport (2) Life cycle analysis (2) Public transport Mobility as a Service (2) Road and traffic management systems (2) Public transport (2)

Within EIT Urban Mobility Innovation Hub West, 9 living labs are active at this moment. The average duration of the labs for which the start and the end year is known is 4.5 years.

2 of the 11 labs are project-based living lab experiments organized in a framework of the European projects: LEAD (Lyon) and CIVITAS PORTIS (Antwerp).

7 living labs run experiments related to Cycling. Next to that, 5 labs are active in the field of Electric road vehicles.

Among the 11 labs:

- 2 originate from European projects: the lab in Antwerp and a lab in the Province of North Brabant for which the EU projects are unknown.
- 6 of the labs are created as living labs from the start.
- 3 are a continuation of a national/ regional/ local project.

Table 13. EIT Urban Mobility Innovation Hub East living labs: origin, duration and main topics.

EIT Urban Mobility Innovation Hub EAST:							
City or region	Number of living labs	Active or not active	Origin	Start year	End year	Number of active projects	Projects finalised during the last 5 years
Cluj-Napoca	1	1 active	LL from start	2018	No end year set	3	N/A
Constanta	1	1 not active	EU project	2016	2020	N/A	N/A
Rivne	1	1 not active	Regional/ local project	2019	2020	N/A	N/A
No fixed location digital platform	1	1 active	LL from start	2019	N/A	N/A	N/A

Rank	Main topics
1	Public transport (4)
2	Information systems (3) Infrastructure management (3) Mobility as a Service (3) Sustainable Urban Mobility Plans (3) Walking (3)
3	Cycling (2) Road & traffic management systems (2)
4	Advanced driver assistance systems (1) Alternative fuels (1) Connected and automated vehicles (1) Energy efficiency (1) Micro-mobility (1)

Within EIT Urban Mobility Innovation Hub East, 2 living labs are active at this moment. The average duration of the labs for which the start and end year is known is 3 years.

1 of the 4 labs is a project-based living lab experiment organized in a framework of the European project CIVITAS PORTIS (Constanta).

All 4 living labs run experiments related to Public Transport. Next to that, 3 labs are active in the fields of Information systems, Infrastructure management, Mobility as a Service, Sustainable Urban Mobility Plans and Walking.

Among the 4 labs:

- 1 belongs to the European project: CIVITAS PORTIS (Constanta).
- The 2 other living labs in Romania are created as living labs from the start.
- The living lab in Rivne (Ukraine) is a continuation of a regional/local project.

Table 14. EIT Urban Mobility Innovation Hub Central living labs: origin, duration and main topics.

EIT Urban Mobility Innovation Hub CENTRAL:							
City or region	Number of living labs	Active or not active	Origin	Start year	End year	Number of active projects	Projects finalised during the last 5 years
Geneva	2	1 active	LL from start	2019	No end year set	9	N/A
		1 active	LL from start	2013	N/A	3	15
Graz	2	1 active	LL from start	2017	2021	21	7
		1 active	LL from start	2020	No end year set	1	1
Ispra	1	1 active	LL from start	2019	No end year set	N/A	N/A
Ljubljana	1	1 active	Industry-led project	2018	N/A	2	30+
Munich	1	1 not active	Regional/local project	2016	2020	12	5
Rome	1	1 active	EU project	2016	N/A	N/A	N/A
Schorndorf	1	1 not active	LL from start	2016	2019	N/A	N/A
Sierre	1	1 active	LL from start	2019	No end year set	9	N/A
Steyr	1	1 active	LL from start	2017	2021	N/A	N/A
Vienna	1	1 active	National project	2017	2025	25	10

Rank	Main topics
1	Mobility as a Service (8)
2	Public transport (7)
3	Connected and automated vehicles (6) Electric road vehicles (6) Freight transport (6)
4	Advanced driver assistance systems (4) Cycling (4) Information systems (4) Micro-mobility (4) Sustainable Urban Mobility Plans (4)
5	Energy efficiency (3) Road and traffic management systems (3) Safety systems (3) Walking (3)

Within EIT Urban Mobility Innovation Hub Central, 10 out of 12 living labs are active at this moment. The average duration of the labs for which the start and end year is known is more than 5 years.

1 of the 11 labs is a project-based living lab experiment organized in a framework of the European project: CIVITAS Eccentric (Munich).

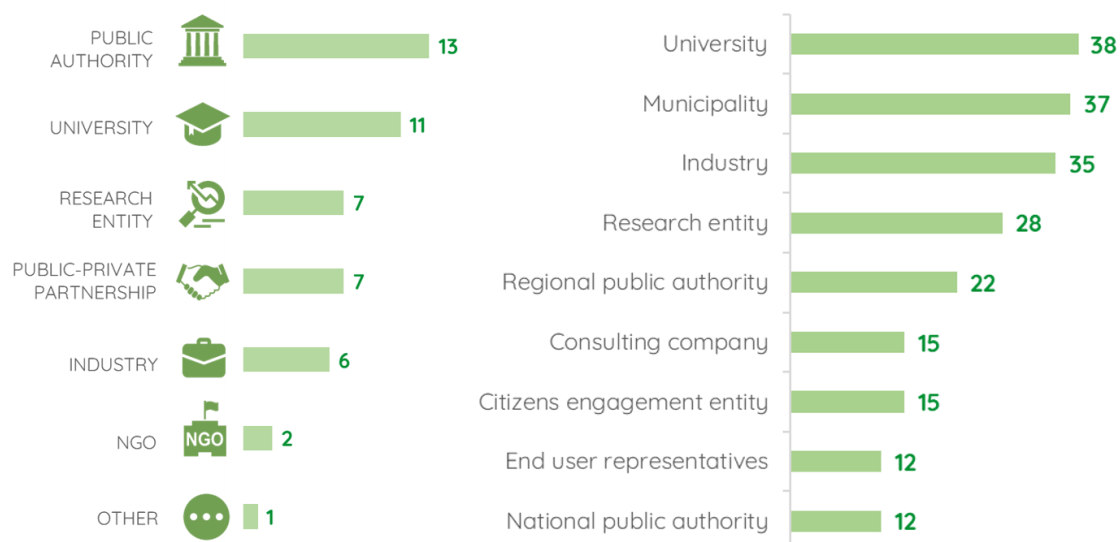
8 living labs run experiments related to Mobility as a Service. Next to that, 7 labs are active in the field of Public transport.

Among the 12 labs:

- 1 originates from a European project: CITYLAB (Rome).
- 8 labs are built as living labs from the start.
- 2 originate from a national/regional/local project.
- 1 originates from an industry-led project.

4.1 Urban mobility living lab characteristics: quadruple helix stakeholders

Figure 11. Main owner of the living lab (left); Stakeholders participation in 47 living labs (right).



(Source: EIT Urban Mobility survey, 2020, single-choice question (left); multiple – choice question (right))

Within 47 living labs, for 13 (28%) public authority is a main living lab owner. Universities are the second most common living lab owners - 11 (23%), followed by the 7 (15%) living labs owned by public private partnerships, and the 7 (15%) research entity-led. Subsequent are the 6 (13%) industry-led living labs and the 2 (4%) NGO-led. It often occurs that the official living lab owner (especially in the case of the public authority) delegates daily management and operation of the living lab with a university, a research entity, or another type of institution (e.g., a foundation, a national transport agency, etc.).

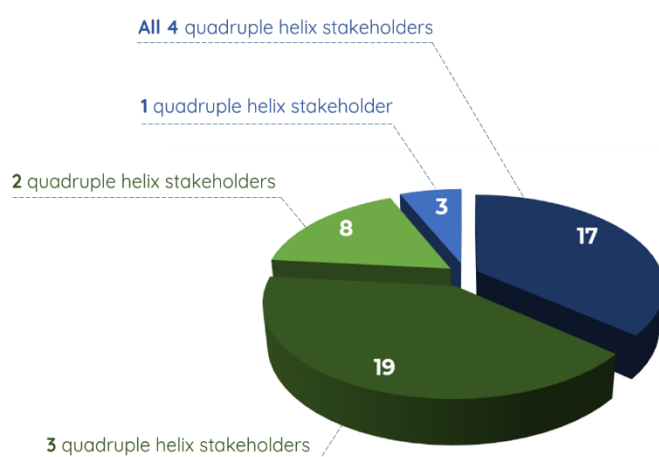
“...the living lab owner is the City of Rome through the Department of Transport, supported by Roma Servizi per la Mobilità (the mobility agency), and managed by TRELAB. We (university) are acting as a living lab manager.” (TRELAB, interview, 2020)

University, municipalities, and industry partners closely follow each other as the most frequent mobility living lab partners: 38 (81%) out of the 47 living labs have university as a stakeholder involved in the living lab structure; 37 (79%) involve municipality and 35 (74%) involve industry. The least involved ones are end-user representatives and national public authority, present in only 12

(26%) of the 47 living labs each. 6 of the labs also have mentioned "Other" to this multiple-choice question, indicating that they include 'Transport Association (Public Transport)', 'Retailers', and 'NGOs' in their structure.

Involvement of quadruple stakeholders in the living lab operation is one of the main distinctive characteristics of the living lab ecosystem, bringing added value to its participants. 19 (40%) of the 47 living labs involve in their organizational structure 3 quadruple helix stakeholders, while 17 (36%) involve all 4 quadruple helix stakeholders. 8 (17%) out of 47 living labs involve 2 out of 4 quadruple helix stakeholders and 3 (6%) living labs involve only 1.

Figure 12. Quadruple helix stakeholder involvement in the living labs.



"It is hard to run the living lab if you do not have all partners on board from the quadruple or triple helix. The city or the region has access to the areas, housing, and people. You need the research, of course, and the companies to do some activities, it could be start-ups, as well. To get the most benefit out of it, it is better to have the triple or quadruple helix approach." (KTH, interview, 2020)

(Source: EIT Urban Mobility survey, 2020, single-choice question)

Involvement of all the quadruple stakeholders' representatives in the official living lab structure is not an objective as such: depending on the living lab goal and format, some stakeholders can be more important to have within a structured long term dialogue structure, than others.

"...the less stakeholders, the simpler the lab becomes. I would do it with the KISS principle – keep it as simple as possible. Look at who you really need, starting from city, research and industry collaborations" (AMS Institute, interview, 2020)

For example, category of the "end user" varies depending of the main living lab topic, type of experiments supported by the living lab and its general objective: transport operators and retailers are regular end users of the city logistics living labs; citizens are of the mobility living labs supporting

experiments where citizens are the end users of the developed products and services; public authorities of the mobility living labs where local, regional or national transition processes are supported. End users are often not necessarily an official partner of the living lab structure but are invited to participate in a project-specific activity.

“The end users of the lab are the municipalities and the companies (from a lab perspective). If we need citizen involvement, that will happen on a project level within the framework of what each project can offer.” (Gate 21, interview, 2020)

The inventory has illustrated that there could be various motivations for the creation of an urban mobility living lab. For example, urban mobility living lab can start from:

- A European/national/regional/local project, building up on the successful cooperation of triple/quadruple helix stakeholders.
- The specific needs/problem of the location (e.g., street, neighbourhood, city area, etc.).
- The ambition of the specific location to become future proof/innovative/sustainable.
- The ambition of public authority/industry partners to bring closer research, industry, policy and citizen’s needs.
- The need to bring the developed innovations to the next TRLs and accelerate their market uptake.
- The topic of combined interests of city, researchers, industry, and citizens.
- The policy agenda, city vision or SUMP, integrating the creation of a living lab in its priority actions.
- Etc.

More than half of the urban mobility living labs respond to the priorities stated within a local transport/mobility/urban strategy – 25 (53%). 7 of these 25 labs are owned by a public authority, and 6 – by a research entity. This is closely followed by the 24 (51%) labs which are research-driven initiatives, responding to the local research priorities (with universities and research institutions being an owner of 14 out of the 24 living labs). 17 (36%) out of the 47 living labs respond to the priorities stated within SUMPs (universities and public authorities together are key owners of these living labs). 11 (23%) of the 47 living labs are industry-driven initiatives, responding to the commercial priorities (5 of them are industry-owned and 3 are led by a public authority.) Finally, 4 (8.5%) of the 47 respond to the priorities stated within SULPs.

“There was an argument that there is a gap in the chain of innovation – between applied science and the market, there was a missing link for the companies to engage more directly in the market. By establishing a living lab, we had some unique opportunities for the companies to help support their journey further into the market with these new technological developments.” (Gate 21, interview, 2020)

“The Austrian Mobility Lab initiative was founded because it was seen that many findings of the research performed in mobility never gets into practice. It is often called the ‘innovation failure’, but it is a ‘transformation failure’ - transforming the results with real-life application. We have a big RTI-programme in Austria called “Mobility of the Future”. There, a high percentage of the research never got into practice, so we thought we need accompanying measures and support structures to merge the research world and the desired world in mobility.” (AustriaTech, interview, 2020)

“In the Barcelona living lab (CityFlows project), the problem that grows there came from the citizens. They discuss together with the city to focus on the influence crowds have on the touristic areas. That is why the focus of the Barcelona living lab is to find solutions which benefit these citizens and give them a big stake in the course of the project development, to ask them what they want to see happening” (AMS Institute interview, 2020)

“...the city strategy states explicitly that Helsinki uses the city as a platform for testing of services. We are implementing projects for that need. Companies have the needs too and this is one justification for the activities, however, it is a policy-led strategy, as it comes from the city strategy.” (Forum Virium, interview, 2020)

“Tom Kuipers: For example, in the Barcelona living lab, the problem that grows there came from the citizens. They discuss together with the city to focus on the influence crowds have on the touristic areas. That is why the focus of the Barcelona living lab is to find solutions which benefit these citizens and give them a big stake in the course of the project development, to ask them what they want to see happening.

Table 15. EIT Urban Mobility Innovation Hub North living labs: relation to policy and quadruple helix.

EIT Urban Mobility Innovation Hub NORTH:							
City or region	Origin	Key living lab owner	Relation to policy initiative				
			SUMP	SULP	Local transport/ mobility/ urban strategy	Industry- driven	Research- driven
Greater Copenhagen	LL from start	Public private partnership				X	X
Gothenburg	N/A	Public authority	X	X	X	X	X
Hamburg	LL from start	Public authority				X	X
	LL from start	Public transport company	X	X	X	X	X
Helsinki	From various projects	Public authority	X				
Lund	LL from start	Public private partnership	N/A				
Oslo	LL from the start	Public private partnership				X	
	LL from start	Research entity			X	X	
Stockholm	N/A	Public authority			X	X	X
	EU project	Public authority	X	X	X		

Quadruple helix	Key living lab owner	Not present stakeholder
All 4	Public private partnership	N/A
	Public authority	
	Public authority	
All 3	Public authority	Citizens/end users
	Public transport company	Citizens/end users
	Public private partnership	Citizens/end users
	Research entity	Citizens/end users
	Public authority	Citizens/end users
2	Public authority	<ul style="list-style-type: none"> Industry Academia
	Public private partnership	<ul style="list-style-type: none"> Citizens/end users Academia

Within EIT Urban Mobility Innovation Hub North, 5 of the living labs are led by a public authority, 3 by a public private partnership (PPP), 1 by a research entity, 1 by a public transport company.

Industry priorities are most common among all 10 living labs, with 7 from them being industry driven. Local transport/ mobility/ urban strategy and research driven priorities are second most relevant, being present in 5 living labs each.

2 of all 10 living labs respond to all 5 priorities, they are both public authorities driven. 1 responds solely to the priorities stated within a SUMP; and 1 living lab is industry-driven only.

3 out of the 10 living labs involve all 4 quadruple helix stakeholders in their official living lab structure, from which 2 have public authority as a main living lab owner. All 5 living labs that involve 3 of the 4 quadruple helix stakeholders do not have citizens/end users as an official stakeholder part of the lab. Academia is a stakeholder which is not present in 2 of the living labs involving only 2 quadruple helix stakeholders in the structure.

Table 16. EIT Urban Mobility Innovation Hub South living labs: relation to policy and quadruple helix.

EIT Urban Mobility Innovation Hub SOUTH:							
City or region	Origin	Key living lab owner	Relation to policy initiative				
			SUMP	SULP	Local transport/ mobility/ urban strategy	Industry- driven	Research- driven
Alcobendas	LL from start	Public partnership private	X				
Barcelona	LL from start	University	X		X		X
	Regional/local project	University					X
Madrid	Regional/local project	Non-profit organization	X		X		
Malaga	National project	Industry			X	X	
Matosinhos	LL from start	Public partnership private	X		X		
Sevilla	Regional/local project	Non-profit organization	X		X		
Terrassa	EU project	University			N/A		
Thessaloniki	From various projects	Research entity			X		X

Quadruple helix	Key living lab owner	Not present stakeholder
All 4	Non-profit organization	N/A
	Non-profit organization	
All 3	Public partnership private	Citizens/end users
	University	Citizens/end users
	Industry	Citizens/end users
	Public partnership private	Citizens/end users
	Research entity	Citizens/end users
2	University	<ul style="list-style-type: none"> Public authority Citizens/end users
1	University	<ul style="list-style-type: none"> Public authority Citizens/end users Industry

Within the EIT Urban Mobility Innovation Hub South, 3 of the 9 living labs are led by a university, 2 by a public private partnership (PPP), 2 by a non-profit organization.

6 out of the 9 living labs are responding to the priorities stated within a local transport/mobility/urban strategy. Next, 5 living labs respond to the priorities stated within a SUMP; 1 is purely industry-driven and 1 – research-driven.

There are no living labs responding to all 5 or 4 priorities and only 1 living lab responding to three of them.

The 2 living labs owned by a non-profit organization are the only ones which involve all 4 quadruple helix stakeholders in their official structure. 5 living labs that involve 3 out of the 4 quadruple helix stakeholders do not have citizens/end users as an official stakeholder part of the living lab. Along with the citizens/end users, public authority is a stakeholder that is not involved in 3 other living labs.

Table 17. EIT Urban Mobility Innovation Hub West living labs: relation to policy and quadruple helix.

EIT Urban Mobility Innovation Hub WEST:							
City or region	Origin	Key living lab owner	Relation to policy initiative				
			SUMP	SULP	Local transport/ mobility/ urban strategy	Industry- driven	Research- driven
Antwerp	EU project	Public authority	X				
Grand Est region	Regional/ local project	University	X		X		X
Helmond	LL from start	Public authority			X		
Lille	LL from start	University	X		X		X
Limerick	LL from start	University					X
Lyon	LL from start	Public private partnership			X		
Paris	LL from start	University	X				
Province of North Brabant	National project	Industry				X	
	LL from start	Public private partnership			X		
	EU project	Public authority					X
The Hague	National project	Research entity			X		X

Quadruple helix	Key living lab owner	Not present stakeholder
All 4	Public authority	N/A
	University	
	Public authority	
All 3	Public private partnership	Citizens/end users
	Public private partnership	Citizens/end users
	Research entity	Citizens/end users
2	University	<ul style="list-style-type: none"> • Citizens/end users • Industry
	University	<ul style="list-style-type: none"> • Citizens/end users • Industry
	University	<ul style="list-style-type: none"> • Public authority • Citizens/end users
	Public authority	<ul style="list-style-type: none"> • Citizens/end users • Industry
1	Industry	<ul style="list-style-type: none"> • Citizens/end users • Public authority • Academia

Within the EIT Urban Mobility Hub West, 4 out of 11 living labs are led by a university, 3 by a public authority, 2 by a public private partnership (PPP), 1 by a research entity, and 1 by industry.

6 of the 11 living labs respond to the priorities stated within a local transport/mobility/urban strategy; 5 living labs are research-driven, 4 respond to the priorities stated within a SUMP, and 1 is solely industry-driven.

There are no living labs responding to all 5 or 4 priorities and 2 living labs responding to three of them.

3 living labs involve all 4 quadruple helix stakeholders, from which 2 are led by a public authority, and 1 – by a university. Citizens/end users are not official stakeholders of all labs that involve 3, 2 or 1 quadruple helix stakeholders.

Table 18. EIT Urban Mobility Innovation Hub East living labs: relation to policy and quadruple helix.

EIT Urban Mobility Innovation Hub EAST:							
City or region	Origin	Key living lab owner	Relation to policy initiative				
			SUMP	SULP	Local transport/ mobility/ urban strategy	Industry- driven	Research- driven
Cluj-Napoca	LL from start	Industry				X	X
Constanta	EU project	Public authority	X				
Rivne	Regional/local project	University	X		X		X
No fixed location digital platform	LL from start	NGO	N/A				

Quadruple helix	Key living lab owner	Not present stakeholder
All 4	Industry	N/A
All 3	Public authority	Industry
	University	Industry
	NGO	Industry

Within EIT Urban mobility Innovation Hub East, 1 of the labs is led by industry, 1 by a public authority, 1 by a university, and 1 by an NGO.

2 of the labs respond to the priorities stated within a SUMP and 2 are research driven.

There are no living labs responding to all 5 or 4 priorities and only 1 living lab is responding to three of them.

The industry-led living lab involves all 4 quadruple helix stakeholders, while all 3 living labs that involve 3 quadruple helix stakeholders do not have industry as an official stakeholder.

Table 19. EIT Urban Mobility Innovation Hub Central living labs: relation to policy and quadruple helix.

EIT Urban Mobility Innovation Hub CENTRAL:						
City or region	Origin	Key living lab owner	Relation to policy initiative			
			SUMP	SULP	Local transport/ mobility/ urban strategy	Industry- driven
Geneva	LL from start	Research entity				X
	LL from start	University				X
Graz	LL from start	Public authority			X	
	LL from start	Research entity			X	X
Ispra	LL from start	Public authority			X	X
Ljubljana	Industry-led project	Industry				X
Munich	Regional/ local project	Public authority			X	
Rome	EU project	University	X	X		
Schorndorf	LL from start	Research entity			X	X
Sierre	LL from start	Research entity				X
Steyr	LL from start	Research entity			X	X
Vienna	National project	University			X	X

Quadruple helix	Key living lab owner	Not present stakeholder
All 4	Research entity	N/A
	University	
	Public authority	
	Public authority	
	University	
	Research entity	
All 3	Research entity	Citizens/end users
	Public authority	Citizens/end users
	University	Public authority
2	Research entity	<ul style="list-style-type: none"> •Citizens/end users • Public authority
1	Industry	<ul style="list-style-type: none"> •Citizens/end users • Public authority • Academia

Within EIT Urban mobility Innovation Hub Central, 5 of the 12 living labs are led by a research entity, 3 by a public authority, 3 by a university, and 1 by industry.

9 of all 12 labs have research-driven priorities. Next, 7 respond to the priorities stated within a local transport/ mobility/ urban strategy.

There are no living labs responding to all 5 or 4 priorities with largest majority of labs responding to the research and local transport policy priorities combined.

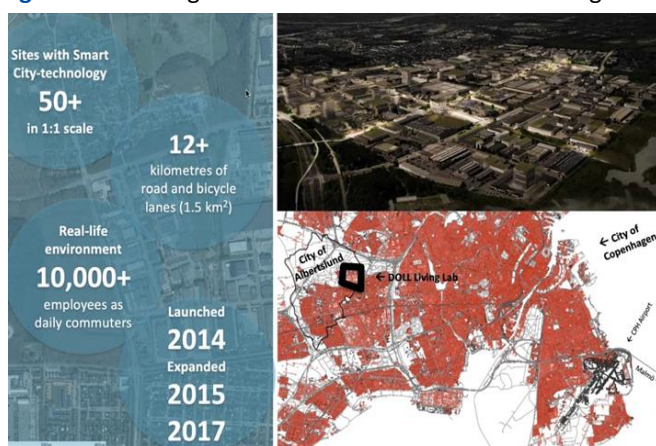
7 of all 12 living labs involve all 4 quadruple helix stakeholders. 5 of them are led by a research entity and university combined and 2 – by a public authority. Citizens/end users are not official stakeholders of 2 of the 3 living labs involving 3 quadruple helix stakeholders. Citizens/end users and Public authority are missing stakeholders of the 2 living labs that involve only 2 or 1 quadruple helix stakeholders.

4.2 Urban mobility living lab characteristics: real-life environment

The inventory of the urban mobility living labs put forward two types of real-life settings of the urban mobility living labs:

Living labs with a fixed location: single- or mixed-funded initiatives where experiments are run in a pre-designated for a living lab experiments area. Depending on the format and objective of the living lab, this area offers to the participant a set of advantages to run experiments: e.g., facilitation of regulation; facilitation of the end-users/citizens engagement; opportunities for networking and product/service development with a new partner; specific equipment; data measurement, evaluation and analysis capacities.

Figure 13. Living lab with a fixed location: DOLL Living Lab.



(Source: Gate 21, interview, 2020)

“We have a physical area where we have a big concentration of cases which we develop together with an ecosystem of industry and knowledge partners. It is mainly an industrial commercial area where people work. About 10,000 employees are commuting in and out of this area daily. In the outskirts of the area, we have a housing area, recreational areas, and a major infrastructural corridor.” (Gate 21, interview, 2020)

Figure 14. Living lab with a fixed location: ISPRA Living Lab.

“The JRC defined a strategy for 2030, and the objective within this strategy is to transform the sites of the JRC into sites which are efficient, smart, open and sustainable. Living labs are a key part of this strategy. The idea is to make the premises of the JRC test beds and demonstrators of advanced technologies and citizen engagement. We focus on the innovations, the technological solutions that will be developed and how they can be tested in real life conditions with citizens” (JRC ISPRA, interview 2020)

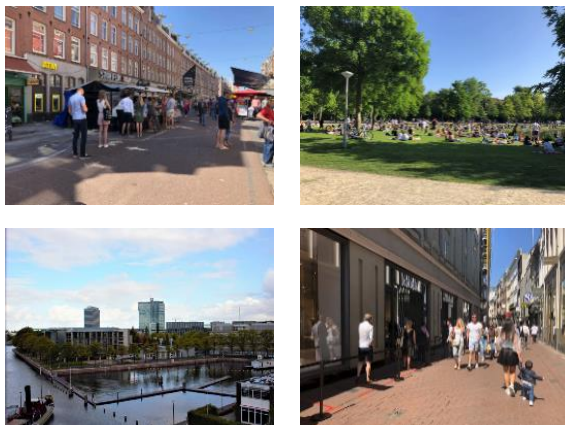
167 ha – Largest site of the JRC
around 2250 people present on site every day (+ ca. 200 visitors/day) with real daily needs
230 buildings (of which 80 heated/staffed)
36 km of roads
213 000 m² managed space
Italian law applied under JRC responsibility



(Source: JRC, interview, 2020)

Project based living lab experiments: single living lab experiments organised in the framework of European or /project funded living labs. Those are usually 2- 4 year externally funded initiatives, created with an objective to co-create innovative products/services within a quadruple helix stakeholder setting; they are investigating the possibilities of the living lab approach and are not focused on the self-sustainability of the own living lab business model.

Figure 15. CityFlows: project-based living lab experiments.



“In the Amsterdam case, the CityFlows project was based on a process we started in 2015 with a crowd-monitoring system. For me, this is a great example of a living lab that can spread across the city. That is also a good characteristic of the living lab - that it can be spread throughout the city. For me, it does not necessarily need to be contained in one area only. Then, you can also see that the range of stakeholder’s changes although you are working on the same topic. Each area might require a different approach and a different set of tools that you use.”

(AMS Institute, interview, 2020)

(Source: <https://cityflows-project.eu/covid-19-living-lab/>)

Figure 16. CIVITAS Destinations: project-based living lab experiments.

“We got the project approved four years ago and since then we have been able to implement pilot projects in a number of areas, related to sustainable mobility, but also to island and tourist destinations.”
(University of Malta, interview, 2020)

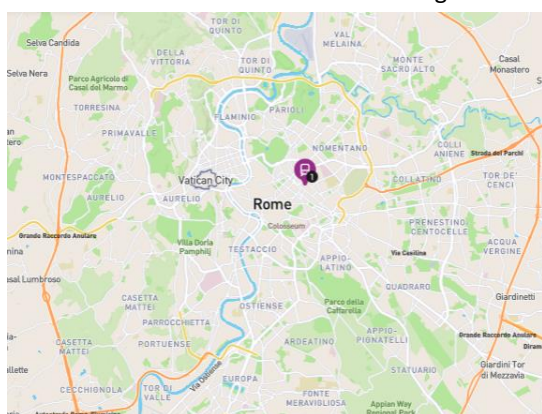


(Source: https://civitas.eu/sites/default/files/civitas_destinations_-_final_brochure.pdf)



Not-fixed location living labs: mixed funded initiatives, bringing together public authority, knowledge, industry, and end-user organisation at one dialogue table, developing experiments in different fit for purpose in real-life settings within a neighbourhood, city, or region. The added value of these living labs is generated via the synergy between different projects, knowledge accumulation and transfer, facilitation of the administrative and regulatory permits for the experiments, facilitation of the co-creation processes and of the end-user involvement.

Figure 17. TRELAB: not-fixed location living lab.



(Source: <https://www.rome.net/map>)

“We would like to do pilots from A to Z – to experience everything, and decide whether we do it, and whether we need a policy change. We would like to see through a pilot, discuss in theory, do it in practice, get the knowledge, and act based upon that.”
(TRELAB, interview, 2020)

Figure 18. The Thessaloniki Smart Mobility living lab: not-fixed location living lab.



(Source: <https://smartmlab.imet.gr/index.php>)

“The Thessaloniki Smart Mobility Living Lab is a living lab based on an ecosystem approach for improving and supporting mobility in the area of Thessaloniki. Also, to gain from the knowledge and the results, to distribute this knowledge, methods and tools which are developed to other cities.”
(CERTH, interview, 2020)

Experiments of all sizes are being run within the urban mobility living labs: street (53%), city (51%) and neighbourhood (47%) are indicated as the most frequent locations of the living lab experiments, followed by city centre (28%), hub (21%), region (19%) and multiple cities (19%). As other possible locations of the living lab experiment, the following were mentioned: university campus areas and large company-owned areas that use their premises for running mobility living lab experiments.

Figure 19. Location of experiments within living labs (left); Combinations for size/scope of geographical locations (right)



Legend:

- - typical size/scope of geographical locations
- - expected impact

(Source: EIT Urban Mobility survey, 2020, multiple-choice questions)

While streets, neighbourhoods, and cities, as well as their combinations are the most recurring locations of the living lab experiments. 72% of the living labs aim at the level of the city and 51% at the regional level within an upscale potential for their products/services developed. Zooming into the roll out potential, some are also looking into the upscaling of their products/services into other sectors and to other types of end-users. From 47 living labs, 32 run experiments on public roads/space. 22 declare to use specific research equipment and 18 – a laboratory environment. Examples of these equipment are: diverse types of sensors (e.g., for air quality monitoring); cameras (e.g., thermal cameras); VR/AR/MR; simulators (e.g., driving simulators and 3D simulators); electric vehicles and e-bikes; dummy road users and others.

“We are applying this dual approach because in some cases we will make use of our laboratories (controlled conditions), for example, when we want to understand the emissions of the vehicles. Then, when we go for the interaction with citizens, we make use of the real environment and the real conditions. That would be both uncontrolled and controlled conditions.” (JRC, interview, 2020)

Table 20. EIT Urban Mobility Innovation Hub North living labs: real-life environment.

EIT Urban Mobility Innovation Hub NORTH:				
City or region	Key living lab owner	Real-life environment	Location of experiment(s)	Research equipment used for testing
Greater Copenhagen	Public private partnership	Fixed location living lab	Industrial commercial area located in the Greater Copenhagen district of Glostrup	N/A
Gothenburg	Public authority	Not-fixed location living lab	Experimentation on different geographical scales	E.g., AstaZero www.astazero.com
Hamburg	Public authority	Fixed location living lab	Parking spaces and a water test area at Hafen	N/A
	Public transport company	Not-fixed location living lab	Testing in real-life in and around Hamburg	N/A
Helsinki	Public authority	Fixed location living lab	Jätkäsaari-Ruoholahti district (residential area with a terminal for passenger ferries) located near central Helsinki	N/A
Lund	Public private partnership	Fixed location living lab	A kilometre-long electric road is implemented and tested on a road section at Getingevägen in Lund	N/A
Oslo	Public private partnership	Fixed location living lab	Forskningsparken - Oslo Science Park	N/A
	Research entity	Fixed location living lab	Økern shopping mall in Oslo	N/A
Stockholm	Public authority	Fixed location living lab	Co-creation arena in Kista Science City	N/A
	Public authority	Not-fixed location living lab	Experimentation spread across several districts (e.g., Årsta, Stockholm City Centre, Västberga, etc.)	N/A

Rank	Typical geo scope of locations	Expected impact area
1	Street (7)	Region (7)
2	Neighbourhood (5)	Street (6) Neighbourhood (6) City (6)
3	City (4) Hub (4)	Multiple cities (4)
4	City center (3) Suburb (3)	Country (3)
5	Region (2) Business Park (2) Rural village (2)	N/A

Within EIT Urban Mobility Innovation Hub North, 7 out of the 10 living labs have/had fixed locations to run experiments, from which 6 are still active. For 3 of them the main owner is a public authority and for 3 is public private partnership. 3 living labs are a not-fixed location living labs, from which 2 are still active.

All of the not-fixed location living labs are run by public authorities (including one led by a public transport company). Only 1 of all 10 living labs has mentioned the usage of special equipment for testing.

Street and neighbourhood are the two most common sizes of the geographical areas to run experiment within these living labs. Region is the most frequent expected impact area of the tested solutions.

Table 21. EIT Urban Mobility Innovation Hub South living labs: real-life environment.

EIT Urban Mobility Innovation Hub SOUTH:				
City or region	Key living lab owner	Real-life environment	Location of experiment(s)	Research equipment used for testing
Alcobendas	Public private partnership	Not-fixed location living lab	Testing of new products and services within the municipality	N/A
Barcelona	University	Not-fixed location living lab	Experimentation in different parts of the municipality	Simulation lab
	University	Fixed location living lab	Campus living lab	Electronic and IT devices
Madrid	Non-profit organization	Not-fixed location living lab	Experimentation on different geographical scales	N/A
Malaga	Industry	Fixed location living lab	Testing on a fixed route in real traffic conditions	DGPS, Lidars, V2X, Cameras
Matosinhos	Public private partnership	Fixed location living lab	Located in a central area of the city surrounding the City Hall	Prototypes, proof-of-concept, sensors, apps, etc.
Sevilla	Non-profit organization	Not-fixed location living lab	Experimentation on different geographical scales	N/A
Terrassa	University	Fixed location living lab	A safe and controlled environment; a vision and mobility laboratory in the city of Terrassa	Computer program, recording programs, camera, eye tracker, glare meter, simulator glasses, etc.
Thessaloniki	Research entity	Not-fixed location living lab	Experimentation in different parts of the city	IoT sensors

Rank	Typical geo scope of locations	Expected impact area
1	Neighbourhood (6)	City (6)
2	City (5)	Region (3) Neighbourhood (3) Multiple cities (3)
3	Street (4) City center (4)	Street (2) Country (3)
4	Corridor (2)	N/A
5	Region (1) Multiple cities (1)	N/A

Within EIT Urban Mobility Innovation Hub South 5 of all 9 active living labs are not-fixed location living labs, 2 of them are run by a non-profit organization, 1 by a public private partnership (PPP), 1 by a university and 1 by a research entity. There are 4 fixed location living labs, from which university is an owner of 2.

5 out of 9 living labs have mentioned the usage of specific research equipment for testing.

Neighbourhood followed by city are the two most common sizes of the geographical areas to run experiment within these living labs. City is the most frequent expected impact area of the tested solutions.

Table 22. EIT Urban Mobility Innovation Hub West living labs: real-life environment.

EIT Urban Mobility Innovation Hub WEST:				
City or region	Key living lab owner	Real-life environment	Location of experiment(s)	Research equipment used for testing
Antwerp	Public authority	Not-fixed location living lab	Antwerp area and around it	N/A
Grand region Est	University	Not-fixed location living lab	N/A	Simulation in 3D, immersive environments, eye tracking, air quality monitoring, etc
Helmond	Public authority	Fixed location living lab	Smart city district in the city of Helmond	N/A
Lille	University	Fixed location living lab	Campus of University of Lille	Charging stations with PV panels; Instrumented e-bike, segway, el. vehicles
Limerick	University	Not-fixed location living lab	Co-designing with communities in neighbourhoods, villages, city districts	N/A
Lyon	Public private partnership	Fixed location living lab	Confluence district	N/A
Paris	University	Not-fixed location living lab	Indoor testing (e.g., an apartment, static driving simulator, etc.)	Vicon mobility tracking Eye tracking Virtual reality headsets
Province of North Brabant	Industry	Fixed location living lab	Test site located on the A270 and N270 roads; indoor laboratory testing available as well	Communication & localization equipment; Carlabs; Dummy road-users).
	Public private partnership	Fixed location living lab	Fast cycle route between Tilburg and Breda	E-bike equipped with ISA
	Public authority	Fixed location living lab	Fast cycle route between Tilburg and Waalwijk	Thermo-cameras; traffic recording cameras
The Hague	Research entity	Not-fixed location living lab	A variety of experiments in different cities in the Netherlands	N/A

Rank	Typical geo scope of locations	Expected impact area
1	Street (5)	City (8)
2	Neighbourhood (4)	Region (6)
3	City (3) Multiple cities (3)	Neighbourhood (5) Multiple cities (5) Street (5)
4	Corridor (2)	Country (4)
5	City center (1) Region (1) Hub (1) Business Park (1)	N/A

Within EIT Urban Mobility Innovation Hub West, 6 out of the 11 living labs have/had fixed locations to run experiments (1 is non active up to date).

From those 2 have/had public authority as a main owner and 2 a public private partnership. 4 out of the 11 living labs are not-fixed location living labs, from which the main owner of 3 is a university. 6 of all 11 living labs have mentioned they use special research equipment for testing.

Street and neighbourhood are the two most common sizes of the geographical areas to run experiment within these living labs. City is the most frequent expected impact area of the tested solutions.

Table 23. EIT Urban Mobility Innovation Hub East living labs: real-life environment.

EIT Urban Mobility Innovation Hub EAST:				
City or region	Key living lab owner	Real-life environment	Location of experiment(s)	Research equipment used for testing
Cluj-Napoca	Industry	Not-fixed location living lab	Local and regional coverage	N/A
Constanta	Public authority	Not-fixed location living lab	Testing in the city centre of Constanta and port area	Environment data collection equipment
Rivne	University	Not-fixed location living lab	N/A	N/A
No fixed location digital platform	NGO	Not-fixed location living lab	N/A	N/A

Rank	Typical geo scope of locations	Expected impact area
1	City (4)	City (4)
2	Street (2) Multiple cities (2) City center (2) Hub (2)	Region (3)
3	Region (1)	Street (2)
4	N/A	Multiple cities (1)
5	N/A	N/A

Within EIT Urban Mobility Innovation Hub East, all 4 living labs are not-fixed location living labs; 2 of them are still being active. Only 1 living lab has mentioned to use special research equipment for testing.

City is the most common size of the geographical area to run experiments within these living labs.

City is also the most frequent expected impact area of the tested solutions.

Table 24. EIT Urban Mobility Innovation Hub Central living labs: real-life environment.

EIT Urban Mobility Innovation Hub CENTRAL:				
City or region	Key living lab owner	Real-life environment	Location of experiment(s)	Research equipment used for testing
Geneva	Research entity	Not-fixed location living lab	N/A	N/A
	University	Not-fixed location living lab	N/A	N/A
Graz	Public authority	Not-fixed location living lab	Focus on the region of Graz	N/A
	Research entity	Not-fixed location living lab	N/A	Automated Drive Demonstrator, Driving Simulator, different research and NVH test equipment
Ispra	Public authority	Fixed location living lab	JRC Ispra premises	E.g., Real-Driving Emissions equipment
Ljubljana	Industry	Fixed location living lab	Shopping, business, and entertainment center (BTC City Ljubljana)	N/A
Munich	Public authority	Fixed location living lab	Testing in area Domagkpark and the neighbouring Parkstadt Schwabing	N/A
Rome	University	Not-fixed location living lab	Testing in Rome	N/A
Schorndorf	Research entity	Fixed location living lab	On-demand bus replaced two regular bus routes in Schorndorf	N/A
Sierre	Research entity	Not-fixed location living lab	N/A	N/A
Steyr	Research entity	Not-fixed location living lab	Regional focus	N/A
Vienna	University	Fixed location living lab	A city district in Vienna - Seestadt Aspern	Human sensors, VR/AR/MR, games, design counting infrastructure

Rank	Typical geo scope of locations	Expected impact area
1	Street (7)	City (8)
2	City (6)	Multiple cities (7)
3	Neighbourhood (5)	Street (5)
4	Hub (3) Business Park (3) Suburb (3)	Neighbourhood (4) Country (4)
5	City center (2) Region (2) Rural village (2)	Region (3)

Within EIT Urban Mobility Innovation Hub Central, 7 out of the 12 living labs are not-fixed location living labs. Research entity is a key living labs owner for 4 of them. Of all 5 fixed location living labs, 2 are run by a public authority.

3 of all 12 living labs have mentioned they use a special equipment for solutions testing.

Street and city are the two most common sizes of the geographical areas to run experiments within these living labs. City is the most frequent expected impact area of the tested solutions.

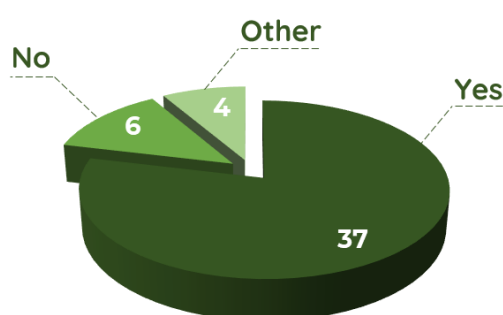
4.3 Urban mobility living lab characteristics: co-creation and the end user engagement

Co-creation of the living lab products/services/activities with an end-user is another core feature of the living lab, as highlighted in the living lab definition. End-users are the stakeholders whose needs are being addressed/solved by the products/services developed within the living labs. They may vary per developed project/product/activity within a lab and could be, for example, transport companies; citizens; public authorities; mobility operators; retailers; etc.

Co-creation refers to the involvement of the end-users and other relevant stakeholders in all the stages of the product/service/activity development. Depending on the objective and the TRL of the innovation, the end-users could be involved in the ideation, co-design, validation/ testing and evaluation of the product/service/activity. Co-creation secures the following benefits:

- Developed product/service integrates first-hand opinion and requirements of the end-users, therefore has a better fit for purpose characteristics and benefit of the higher acceptance rate and roll out perspectives.
- Product/service developers gain access to the end-user data and feedback which further accelerates the innovations` uptake and acceptance.
- Stakeholders could go through the innovation iteration cycles earlier in the product/service development process.

Figure 20. Do you usually co-create the products/services/transition processes with the end-users?



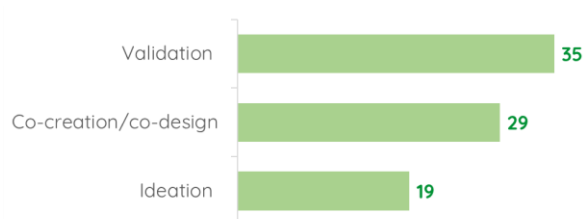
“We try to incorporate the end users in the testing phase by interviewing them, surveying them, observing how they are using the test environment. We have a more complex situation where we involve the whole community”
(CARNET, interview, 2020)

(Source: EIT Urban Mobility survey, 2020, single-choice question)

37 (79%) of the 47 living labs co-create products/services/transition processes with the end-user while 6 (13%) do not do it. The “Other” 4 answers reflect that living labs often include multiple partners and multiple projects/activities, for which the need and extend of the end user involvement differs.

The earlier the end-user is involved in the product/service development process, the more added value its participation can bring to the final output. 19 (40%) of the living labs involve the end-user in ideation, 29 (62%) in co-creation, and the largest majority - 35 (74%) in validation. 12 (25.5%) of the 47 labs declare to involve the end-user in the three stages of the co-creation process: ideation, co-creation and validation.

Figure 21. At which stage of the project development is the end-user involved the most?

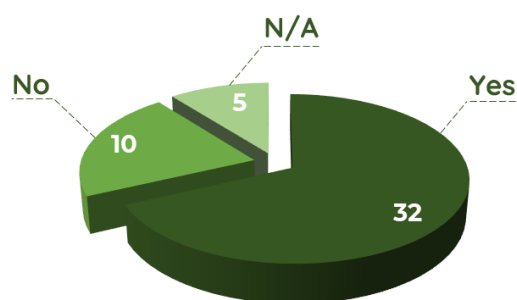


“I think, had there been a better engagement with the stakeholders before the project, then the planning and implementation would have been smoother. In living lab proposals and projects, early engagement is important.”
(University of Malta, interview, 2020)

(Source: EIT Urban Mobility survey, 2020, multiple-choice question)

Citizens are the largest category of the urban mobility products/services end- users. 32 (68%) of the 47 living labs carry out citizen engagement activities, 10 (21%) do not and 5 (11%) have not given an answer to this question.

Figure 22. Do you carry out citizen engagement activities in support of products/service/transition process development or upscale?



“It is common that especially start-ups ask for test users. They need help to be introduced with residents and end-users in general. A number of our own experts take care of the contact with residents. We have local events, we communicate via a webpage, we are present on social media, we do workshops. It is the project staff that does this.”
(Forum Virium, interview, 2020)

(Source: EIT Urban Mobility survey, 2020, single-choice question)

Table 25. EIT Urban Mobility Innovation Hub North living labs: co-creation and the end user engagement.

EIT Urban Mobility Innovation Hub NORTH:						
City or region	Key living lab owner	Labs which involve end-users	Labs that have citizen engagement initiatives	Involvement in co-creation stages		
				Ideation	Co-creation/ co-design	Validation/ Evaluation
Greater Copenhagen	Public private partnership	It is very different for the 50 partners	Yes	x	x	x
Gothenburg	Public authority	Yes	Yes	N/A		
Hamburg	Public authority	Yes	Yes	x	x	x
	Public transport company	Yes	Yes			x
Helsinki	Public authority	Yes	Yes			x
Lund	Public private partnership	No	Yes		x	x
Oslo	Public private partnership	Yes	N/A	x		x
	Research entity	Yes	No	x	x	x
Stockholm	Public authority	Some have been but more could be done, particularly in early phases	Yes		x	x
	Public authority	Yes	Yes		x	x

Co-creation stages	Key living lab owner	Not present stage
All 3	Public private partnership	N/A
	Public authority	
	Research entity	
2	Public private partnership	• Ideation
	Public private partnership	• Co-creation
	Public authority	• Ideation
	Public authority	• Ideation
1	Public transport company	• Ideation • Co-creation
	Public authority	• Ideation • Co-creation

Within EIT Urban Mobility Innovation Hub North, all 10 living labs state to involve end users or citizens in their initiatives.

Only 3 living labs from 9 indicate to involve the end users in all the stages of the co-creation process.

Testing/ evaluation is present in 9 from 10 responding living labs; co-design in 6 and ideation in 4 living labs.

Table 26. EIT Urban Mobility Innovation Hub South living labs: co-creation and the end user engagement.

EIT Urban Mobility Innovation Hub SOUTH:						
City or region	Key living lab owner	Labs which involve end-users	Labs that have citizen engagement initiatives	Involvement in co-creation stages		
				Ideation	Co-creation/ co-design	Validation/ Evaluation
Alcobendas	Public private partnership	Yes	N/A	N/A		
Barcelona	University	Yes	No	x	x	
	University	Yes	Yes	x	x	X
Marid	Non-profit organization	Yes	No	x	x	X
Malaga	Industry	Yes	Yes	x		X
Matosinhos	Public private partnership	Yes	Yes		x	X
Sevilla	Non-profit organization	Yes	No	x	x	X
Terrassa	University	Yes	Yes		x	X
Thessaloniki	Research entity	Yes	Yes			X

Co-creation stages	Key living lab owner	Not present stage
All 3	University	N/A
	Non-profit organization	
	Non-profit organization	
2	University	• Validation
	Industry	• Co-creation
	Public private partnership	• Ideation
	University	• Ideation
1	Research entity	• Ideation • Co-creation

Within EIT Urban Mobility Innovation Hub South, all 9 living labs state to involve end users in their initiatives and 5 involve citizens.

3 living labs from 8 indicate to involve the end users in all stages of the co-creation process. From those, non-profit organization is the main owner of 2 living labs.

Testing/evaluation with an end user is performed within 7 from the 8 responded living labs; co-design in 6 and ideation in 5 living labs.

Table 27. EIT Urban Mobility Innovation Hub West living labs: co-creation and the end user engagement.

EIT Urban Mobility Innovation Hub WEST:						
City or region	Key living lab owner	Labs which involve end-users	Labs that have citizen engagement initiatives	Involvement in co-creation stages		
				Ideation	Co-creation/co-design	Validation/Evaluation
Antwerp	Public authority	Yes	Yes			x
Grand Est region	University	Yes	Yes	x	x	x
Helmond	Public authority	Yes	N/A	N/A		
Lille	University	Some with municipality/region	Yes		x	
Limerick	University	Yes	Yes	x	x	
Lyon	Public private partnership	No	No			x
Paris	University	Yes	No		x	x
Province of North Brabant	Industry	No	No			x
	Public private partnership	No	Yes			x
	Public authority	Yes	N/A			x
The Hague	Research entity	Yes	No			x

Co-creation stages	Key living lab owner	Not present stage
All 3	University	N/A
2	University	• Validation
	University	• Ideation
1	Public authority	• Ideation • Co-creation
	University	• Ideation • Validation
	Public private partnership	• Ideation • Co-creation
	Industry	• Ideation • Co-creation
	Public private partnership	• Ideation • Co-creation
	Public authority	• Ideation • Co-creation
	Research entity	• Ideation • Co-creation

Within EIT Urban Mobility Innovation Hub West, 9 of all 11 living labs state to involve end users or citizens in their initiatives.

Only one living lab from 10 indicates to involve the end users in all stages of the co-creation process.

End users are involved in testing/evaluation within 8 living labs; in co-design in 4 living labs and in ideation only in 2 living labs.

Table 28. EIT Urban Mobility Innovation Hub East living labs: co-creation and the end user engagement.

EIT Urban Mobility Innovation Hub EAST:						
City or region	Key living lab owner	Labs which involve end-users	Labs that have citizen engagement initiatives	Involvement in co-creation stages		
				Ideation	Co-creation/ co-design	Validation/ Evaluation
Cluj-Napoca	Industry	Yes	Yes	x	x	x
Constanta	Public authority	Yes	Yes	N/A		
Rivne	University	Yes	Yes		x	x
No fixed location digital platform	NGO	Yes	Yes	x	x	

Co-creation stages	Key living lab owner	Not present stage
All 3	Industry	N/A
2	University	• Ideation
	NGO	• Validation

Within EIT Urban Mobility Innovation Hub East, all 4 living labs state to involve both end users and citizens in their initiatives.

Only one living lab from 3 involves the end users in all stages of the co-creation process. Industry is the main owner of this living lab. End users are involved in validation/ evaluation in 2 from the responding living labs; in co-design in 3 and in ideation in 2 living labs.

Two living labs where NGOs are the main owner do not perform testing and evaluation of the products/ solutions.

Table 29. EIT Urban Mobility Innovation Hub Central living labs: co-creation and the end user engagement.

EIT Urban Mobility Innovation Hub CENTRAL:						
City or region	Key living lab owner	Labs which involve end-users	Labs that have citizen engagement initiatives	Involvement in co-creation stages		
				Ideation	Co-creation/ co-design	Validation/ Evaluation
Geneva	Research entity	Yes	Yes	x	x	x
	University	No	Yes			x
Graz	Public authority	Yes	Yes			x
	Research entity	No	Yes	x	x	x
Ispra	Public authority	Yes	N/A		N/A	
Ljubljana	Industry	Yes	Yes	x	x	x
Munich	Public authority	Yes	Yes		x	x
Rome	University	Yes	No		x	
Schorndorf	Research entity	Yes	Yes		x	x
Sierre	Research entity	Yes	Yes	x	x	x
Steyr	Research entity	Yes	Yes	x	x	x
Vienna	University	Yes	Yes	x	x	

Co-creation stages	Key living lab owner	Not present stage
All 3	Research entity	N/A
	Research entity	
	Industry	
	Research entity	
	Research entity	
2	Public authority	• Ideation
	Research entity	• Ideation
	University	• Validation
1	University	• Ideation • Co-creation
	Public authority	• Ideation • Co-creation
	University	• Ideation • Validation

Within EIT Urban Mobility Innovation Hub Central, all 12 living labs state to involve end users or citizens in their initiatives.

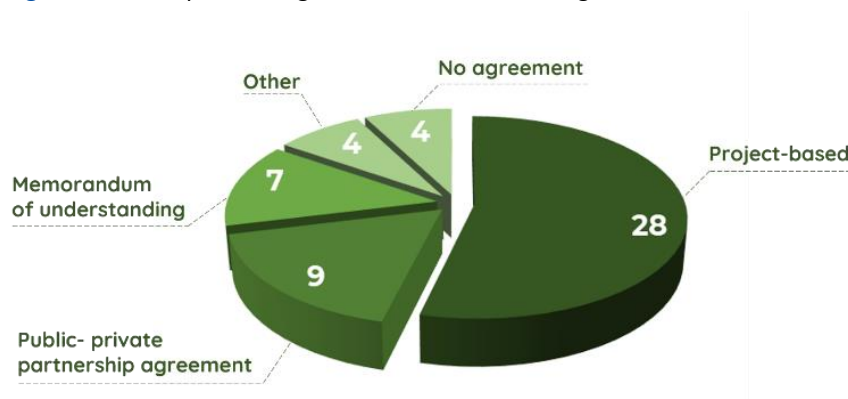
5 living labs from 11 indicate to involve the end users in all stages of the co-creation process. Research entity is a main owner for 4 out of them.

Testing/evaluation and co-creation are present in 9 from the responding living labs; and ideation in 6 living labs.

5 Operation and management of the urban mobility living labs

5.1 Operational structure and business models of the living labs

Figure 23. Cooperation agreement behind the living labs establishment.



(Source: EIT Urban Mobility survey, 2020, multiple-choice question)

28 (60%) out of 47 living labs are established on the project base. 9 (19%) living labs have a public private partnership agreement in their foundation, followed by 6 (13%) living labs that signed a memorandum of understanding between the founding partners. For 4 (8.5%) living labs there is no formal act of establishment and another 4 have mentioned 'Other' in their answer option. There are also combinations of cooperation agreements:

- Memorandum of understanding and Project based agreements are combined within 2 labs;
- Project based and Public private partnership agreements are combined within 5 labs.

There are different operational agreements behind the formal governance model of the living labs:

- Living labs project experiments conducted in the framework of EU or any other project, have a formal EU project/any other-based agreement and operate according to the responsibilities agreed there.
- A national mobility agency (or any other affiliated organisation) has a project-based agreement with a public authority to establish and run living labs (for a specific project duration);

- A university (or any other key stakeholder) by mandate of the public authority operates a national/regional/local living lab, acting as an executive power of those.
- A formal cooperation agreement between several founding partners (e.g., industry/location owner/research) supported by a public authority, where one of the parties operates the living lab on a daily basis.

“Marineterrein is operated by Bureau Marineterrein Amsterdam. They operate the terrain for the city of Amsterdam and the Ministry of Defence. We rent a building there and we have a cooperation agreement with Bureau Marineterrein to jointly develop the space as a living lab. There are two founding partners here. The other partners join in the coordination, but they are not founding partners. It is a joint venture structure, formalised with a cooperation agreement.” (AMS Institute, interview, 2020)

The interviewed living labs indicated that at least 1 full-time person is required for the daily management and operation of the living lab, with more of them having 2 full-time persons employed, some even having up to 5. Next to this, other people supporting the activities of the living lab are involved on the on-demand basis.

“For the core project planning and coordination of the Mobility Lab, we have 2 full-time persons - 1 from FV and 1 from the city. Then we have 2 other persons. So, in total 3-4 people, but that’s coordination only. We then have many externally-funded projects that are linked to our Mobility Lab and they are the under the umbrella of the LL – 6-10 individual projects and pilots that have their own funding but have been built in the entity of the lab (depends how you define a project or a pilot).” (Forum Virium, interview, 2020)

The number of projects supported depends on the type of the living lab: e.g., EU project-based living lab experiments usually focus on one individual project per participant city. Fixed location living labs and/or, for example, research driven living labs, have other initial objectives and a larger number of projects per year (on average 10).

Number of projects run within the 47 living labs. illustrates that 15 living labs have between 1-10 projects finalised during the last five years; 4 labs have between 11-20 projects and 7 - more than 20 projects finalised during the last 5 years. 16 living labs currently support between 1-10 projects. The duration of the projects is quite flexible, starting from the 1-2-month pilots and going up to 2-year activities. Out of the 47 labs, 17 labs have not mentioned how many on-going projects they have, and 21 labs have not mentioned the number of projects finalized during the last five years.

Table 30. Number of projects run within the 47 living labs.

Number of projects supported per year	Number of living labs with finalised projects during the last 5 years	Number of living labs with on-going projects
Between 1 and 10	15	16
Between 11 and 20	4	7
20+	7	4

(Source: EIT Urban Mobility survey, 2020, single-choice question)

Within the living lab a designated group of people discuss which projects could fit the rules of the locations/living lab, the priorities, and the goals, and select the experiments to be admitted. There is usually a set of criteria for the admission of projects within the living labs. Possible criteria are:

- Experiments are open for the living lab community members, for which, a user agreement is signed.
- Proposals should fit the themes and vision of the living lab.
- TRL level: some accept innovations higher than a certain TRL level.
- Responding to the conditions expressed within a call of interest.
- Size of the companies (start-ups, SMEs, no size requirement).
- Value in terms of scientific/business/market opportunity.
- The application potential on the market.
- The relevance to local policy priorities.
- Relevance to what the local site can offer.
- Feasibility in terms of costs and competences.

Depending on the living lab nature, some are open for the external parties, offering fixed-term collaboration agreements while others only allow experimentation by their partner organisations, making from it an added value competence for their business model. Living lab participants get a contract to perform the experiments at the living lab location: a permit to operate/experiment. Living labs are used for the testing innovations of all TRL levels, with each living lab individually deciding which TRL levels they are focusing on.

“Yes, there are criteria. We are redefining them right now. For many of these experiments, they have to pay us for the user agreement. We have decided that we will be open in particular for experimentation by community members, those who are already on the terrain. There are 60 organizations on the terrain, all very innovative. Also, the proposals should fit the themes and the vision of the terrain itself, they should lead to scalable project for Amsterdam. We are not there for TRL 1-5, we are higher on the TRL.”

(AMS Institute, interview, 2020)

“... a living lab should be in a position to respond to questions of implementation of all the TRL levels. We have the proof-of-concept - we have an idea coming from hackathons, for example, or from a project. That proof-of-concept is low TRL, you increase it in this context, and then the stakeholders of the living lab continue to increase the TRL of this service/solution... The whole range of TRLs should be the focus of a living lab, because if you don't have this, you exclude some partners and you may never have business models that make sense.”

(CERTH, interview, 2020)

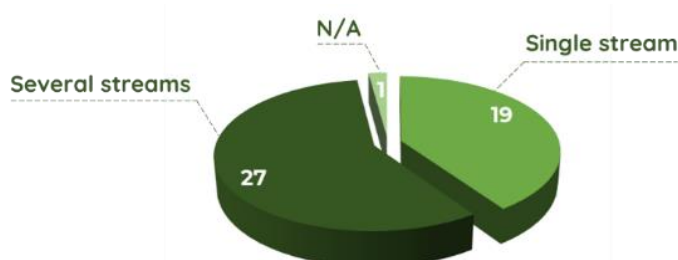
Project admission criteria can be changed with the evolution of the living lab. In the setting up and establishment phase, more projects might be accepted to raise awareness about the living lab's added value and efficiency. Once a certain maturity level and critical mass of partners/projects is achieved, more selection criteria come into play.

Majority of the interviewed living labs have an experience with a one-time participation projects and cases with iterative innovation development (when innovation is tested, user feedback is collected; innovation is improved and tested again) remain random. Going through the product/service innovation cycles for one product/service or having returning projects can be one of the key living lab features. As interviewed living labs note, that can be one of the indicators of the living lab maturity.

“Now we have been running the lab since 2014, and where I find that the lab has been particularly successful is that we have a high retention rate – meaning that the partners who were involved from the very beginning, are still active in the lab. What happens over the years is that they come back and upgrade, or they make reinstalments, or make new cases with partners where they experiment with new combinations. That is also a part of our contract, our collaboration agreement, that we agree on that while they are active in the lab, we need them to revisit the solutions and upgrade when they have new versions/models to offer. That is not happening in practice all the time, but that is what we committed to each other to do if we want to create a maximum level of value for one another.”
(Gate 21, interview, 2020)

Zooming into the business models of the living labs, from 47 living labs, 19 (40%) use single stream of financing. From those 19, 7 are EU-funded projects, while others are most commonly nationally, university- or industry-funded initiatives. From those 27 that are using several streams, the most frequent combinations are: industry and EU funding (37%); national and industry funding (41%); local and EU funding (52%).

Figure 24. Funding streams of the living labs.



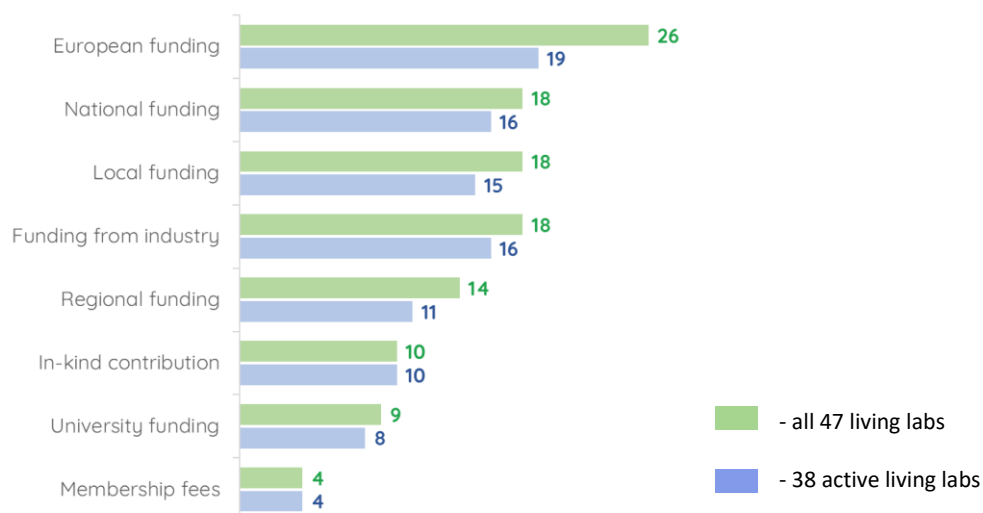
(Source: EIT Urban Mobility survey, 2020, single-choice question)

“To start building directly a large living lab, you need to consider the amount of resources allocated for that, which might be hard. Then, it is easier to run the approach where you have one party responsible for setting up the overall strategy of how to use this area/living lab you want to create. Based on that strategy, you try to fit in a number of different projects to utilize that according to the strategy. That was the easiest way we were able to set up the Test Site Stockholm. You always need to have something to anchor it on - what is the core of that living lab.

(KTH Royal Institute of Technology, interview, 2020)

55% of the 47 living labs receive European funding, followed by national and local funding, as well as funding by industry. Only 4 of all 47 living labs ask for membership fees. Other types of financing mentioned within the survey are: implementation of commercial projects, co-funding via participation in the open call for expression of interest and donor contributions.

Figure 25. Funding sources of the 47 living labs (left) and of the 38 active (right) living labs.



(Source: EIT Urban Mobility survey, 2020, multiple-choice question)

9 (69%) of the public authority-led labs have European funding as the most common key funding stream. This often goes in combination with local funding, to be exact – for 6 of the labs (46%). 8 (72%) of the 11 university-led labs have university funding as the most common key funding stream. For the labs led by a research entity, regional funding is the most common key funding stream – 5 (71%) out of the 7. For PPPs the local funding is case of 4 (57%) out of the 7 labs. Finally, 3 (50%) of the 6 industry-owned initiatives have European funding, closely followed by industry and national funding present 2 times each.

Table 31. Funding streams used by the living labs with different living lab owners.

Funding	Living lab owner					
	Public authority	University	Research entity	Public-private partnership	Industry	NGO
National	3	5	4	3	2	0
Regional	3	4	5	1	0	0
Local	7	4	1	4	0	1
European	9	5	4	3	3	1
Industry	3	5	4	3	2	1
University	0	8	1	0	0	0
Membership fees	2	0	0	0	0	1
In-kind contribution	2	5	2	0	0	1

There is not yet a single winning recipe for the business case behind the living lab. Interviewed living labs have shared experience of the following (not yet always fully self-sustainable) business models:

- **Project based living lab experiments:** for the project duration, financial sustainability of the living lab experiment is guaranteed by the European or national/regional/local project funding. After the end of the project, one of the business models below could be utilized, building up on the knowledge of setting up and operating the living lab received during the project. Usually, experiment is focused on experience of the development of one single product/service within living lab setting.
- **Fixed location living lab:** A 3- year (as an example) collaboration agreement for companies to run the projects at the living lab location. Companies pay a membership fee, per year/per use case tested within a living lab. In return, the living lab provides infrastructure and facilitates testing experiment (e.g., in terms of legal permits, engagement with an end user, connection to relevant parties, etc). Companies have a key and access code to the facilities and can have unlimited use of it for the specific use case, as part of the agreement.
- **Fixed location living lab:** living lab has several committed sponsors, each having an individual reason for the provision of this external funding for the living lab (e.g. interest in the sustainable area development; interest in the research results; interest in the possibility of the facilitated innovation testing; etc). Sponsors are (can) commit either financially, or in kind, or both. Some of them are not focusing on any commercial results, but have more socially – environmental goals, which are yet hard to monetize. Users that want to run experiments employ the lab for this, paying membership fee/usage fee and, if possible, contributing with a community service.

- **Not fixed location living lab:** fixed public funding agreement (3-7 years) between the organisation setting up and operating a living lab and public authority. The scope of the funding agreement is to establish the operation of the living lab by assigned organisation and to gradually have it transferred for the operation by the public authority. Next to the public authority funding, the lab receives contributions from externally funded pilots and projects in which it participates as a partner. Large scale experiments are financially self-sustainable. The possibility of co-financing exists for the smaller pilots. Some funding is reserved to support the development and maintenance of the necessary infrastructure.
- **Not fixed location living labs:** universities or research organisations are building the business model of their living labs around mixed funding streams from different projects (European, national, regional, or local) and, in some cases, membership fees and/or in-kind contribution from other stakeholders. These types of business models need to have a stable financing stream or a stable combination of those (e.g., EU or national/local; in-kind contribution) to be long-term sustainable.

From the interviewed, DOLL living lab says to have reached a financially sustainable business model.

“So, the DOLL Living Lab started as a project here in Gate21, but, gradually, we reached a point where we created our own business model. Today, we are no longer dependent on a single major funding or project, we are based on different income channels. One is partner fees; another is funding from a number of projects that is also contributing to the facility; and then, of course, the local city of Albertslund.” (Gate 21, interview, 2020)

Table 32. EIT Urban Mobility Innovation Hub North living labs: operational structure and business models.

EIT Urban Mobility Innovation Hub NORTH:					
City or region	Origin	Key living lab owner	Governance agreement	Single/multiple funding stream	Types of funding
Greater Copenhagen	LL from start	Public private partnership	<ul style="list-style-type: none"> •Memorandum of understanding • Project based • Payment 	Multiple	National, Regional, Local, European, Industry, Membership fees
Gothenburg	N/A	Public authority	<ul style="list-style-type: none"> •Memorandum of understanding • Project based 	Multiple	National, Regional, Industry, In-kind contribution
Hamburg	LL from start	Public authority	<ul style="list-style-type: none"> • Project based 	Multiple	Local, Membership fees
	LL from start	Public transport company	<ul style="list-style-type: none"> • Project based 	Single	National
Helsinki	From various projects	Public authority	<ul style="list-style-type: none"> • Project based 	Multiple	Regional, Local, European
Lund	LL from start	Public private partnership	<ul style="list-style-type: none"> • Project based 	Single	National
Oslo	LL from the start	Public private partnership	<ul style="list-style-type: none"> •Public private partnership agreement 	Single	Industry
	LL from start	Research entity	<ul style="list-style-type: none"> • Project based 	Single	European
Stockholm	N/A	Public authority	<ul style="list-style-type: none"> •Public private partnership agreement 	Multiple	Local, European, Industry, Membership fees, In-kind contribution
	EU project	Public authority	<ul style="list-style-type: none"> • Project based 	Multiple	Local, European, Industry

Rank	Most common funding combinations	Most common funding streams
1	European + Local (4)	Local (5) European (5) Industry (5)
2	European + Industry (3) Local + Industry (3) Local + Membership fees (3)	National (4)
3	National + Regional (2) National + Industry (2) Regional + Local (2) Regional + Industry (2) Regional + European (2) Industry + Membership fees (2) Industry + In-kind contribution (2) European + Membership fees (2)	Regional (3) Membership fees (3)

Within EIT Urban Mobility Innovation Hub North, 4 living labs have/had a single funding stream and 6 benefit(ed) from multiple funding streams.

Local, European and industry funding are the most frequently used funding streams used within the business models of these living labs.

Next to it, the combination of the European and local funding is the most frequent one in the case of mixed-funding business models.

Table 33. EIT Urban Mobility Innovation Hub South living labs: operational structure and business models.

EIT Urban Mobility Innovation Hub SOUTH:					
City or region	Origin	Key living lab owner	Governance agreement	Single/multiple funding stream	Types of funding
Alcobendas	LL from start	Public private partnership	•Memorandum of understanding	Multiple	Local, European
Barcelona	LL from start	University	• Project based •Public private partnership agreement	Multiple	Local, European, Industry, University, In-kind contribution
	Regional/local project	University	N/A	Single	University
Madrid	Regional/local project	Non-profit organization	• Project based	Multiple	Local, European, Industry, Membership fees, In-kind contribution
Malaga	National project	Industry	• Project based	Single	National
Matosinhos	LL from start	Public private partnership	• Project based	Multiple	National, Local, Industry
Sevilla	Regional/local project	Non-profit organization	• Project based	Multiple	Local, European, Industry, Membership fees, In-kind contribution
Terrassa	EU project	University	• Agreement between the University and the company	Multiple	Industry, University, In-kind contribution
Thessaloniki	From various projects	Research entity	•Memorandum of understanding	Multiple	Regional, European

Rank	Most common funding combinations	Most common funding streams
1	<p>European + Local (3)</p> <p>Local + Industry (3)</p> <p>Industry + In-kind contribution (3)</p>	<p>Local (4)</p> <p>European (4)</p> <p>Industry (4)</p>
2	<p>National + Local (2)</p> <p>National + Industry (2)</p> <p>Local + In-kind contribution (2)</p> <p>Industry + University (2)</p> <p>European + Industry (2)</p> <p>University + In-kind contribution (2)</p> <p>European + In-kind contribution (2)</p>	<p>National (3)</p> <p>University (3)</p> <p>In-kind contribution (3)</p>

Within EIT Urban Mobility Innovation Hub South, 2 living labs have a single funding stream and 7 benefit from multiple funding streams.

Local, European and industry funding are the most frequently used funding streams within the business models of these living labs.

The combinations of European and local funding, local and industry, and industry and in-kind contribution are the most frequent ones in the case of mixed-funding business models.

Table 34. EIT Urban Mobility Innovation Hub West living labs: operational structure and business models.

EIT Urban Mobility Innovation Hub WEST:					
City or region	Origin	Key living lab owner	Governance agreement	Single/multiple funding stream	Types of funding
Antwerp	EU project	Public authority	• Project based • Public private partnership agreement	Multiple	Local, European
Grand Est region	Regional/local project	University	• Project based • Public private partnership agreement	Multiple	National, Regional, Local, European, Industry, University, In-kind contribution
Helmond	LL from start	Public authority	• Foundation	N/A	N/A
Lille	LL from start	University	• Project based • Public private partnership agreement	Multiple	Regional, Local, University
Limerick	LL from start	University	• No agreement	Single	In-kind contribution
Lyon	LL from start	Public private partnership	• Project based	Single	European
Paris	LL from start	University	• Public private partnership agreement	Multiple	National, Regional, European, Industry
Province of North Brabant	National project	Industry	N/A	Multiple	European, Commercial projects
	LL from start	Public private partnership	• Public private partnership agreement	Multiple	Regional, Local, Industry
	EU project	Public authority	• Project based	Multiple	National, Regional, Local, European
The Hague	National project	Research entity	• Memorandum of understanding	Multiple	National, Industry, In-kind contribution

Rank	Most common funding combinations	Most common funding streams
1	Regional + Local (4)	European (6)
2	National + Regional (3) National + Industry (3) National + European (3) Regional + Industry (3) Regional + European (3) Local + European (3)	Local (5) Regional (5)
3	National + Local (2) National + In-kind contribution (2) Regional + University (2) Local + Industry (2) Local + University (2) Industry + European (2) Industry + In-kind contribution (2)	National (4) Industry (4)

Within EIT Urban Mobility Innovation Hub West, 2 living labs have a single funding stream and 8 benefit from multiple funding streams.

Overall European funding is a part of the business models for 6 living labs.

The combination of regional and local funding is the most frequent one in the case of mixed-funding business models.

Table 35. EIT Urban Mobility Innovation Hub East living labs: operational structure and business models.

EIT Urban Mobility Innovation Hub EAST:					
City or region	Origin	Key living lab owner	Governance agreement	Single/multiple funding stream	Types of funding
Cluj-Napoca	LL from start	Industry	<ul style="list-style-type: none"> Project based Public private partnership agreement 	Single	European
Constanta	EU project	Public authority	<ul style="list-style-type: none"> Project based 	Multiple	Local, European
Rivne	Regional/local project	University	<ul style="list-style-type: none"> Memorandum of understanding 	Single	University
No fixed location digital platform	LL from start	NGO	<ul style="list-style-type: none"> No agreement We are just partners on specific events. Because of the lack of financial support, we don't have a national partnership with all stakeholders. We are just developing the partnership when we have before an event. 	Single	All the funds for the events organised by us were from private donors.

Rank	Most common funding combinations	Most common funding streams
1	European + Local (1)	European (2)

Within EIT Urban Mobility Innovation Hub East, 3 living labs have a single funding stream and 1 benefit from multiple funding streams.

European funding is used in 2 out for 4 living labs. For the living lab with a mixed funding the mix of European and local funding is used.



Table 36. EIT Urban Mobility Innovation Hub Central living labs: operational structure and business models.

EIT Urban Mobility Innovation Hub CENTRAL:					
City or region	Origin	Key living lab owner	Governance agreement	Single/multiple funding stream	Types of funding
Geneva	LL from start	Research entity	• No agreement	Multiple	National, Regional, Local, European, Industry, University
	LL from start	University	• Project based	Multiple	National, Regional, Local, European, Industry, University
Graz	LL from start	Public authority	• Project based	Single	National
	LL from start	Research entity	• Project based	Multiple	National, Regional, European, Industry, In-kind contribution
Ispra	LL from start	Public authority	N/A	Single	European
Ljubljana	Industry-led project	Industry	• Project based	Single	Industry
Munich	Regional/ local project	Public authority	• Project based	Single	European
Rome	EU project	University	• Official establishment by the City of Rome	Multiple	European, University, In-kind contribution
Schorndorf	LL from start	Research entity	• Project based	Single	Regional
Sierre	LL from start	Research entity	• Project based	Multiple	National, Regional, Local, European, Industry, University
Steyr	LL from start	Research entity	• Project based	Multiple	National, Regional, Industry
Vienna	National project	University	• Project based	Single	National

Rank	Most common funding combinations	Most common funding streams
1	National + Regional (4) / National + Industry (4) / Regional + Industry (4)	National (6) European (6)
2	National + European (3) / Regional + European (3) / Industry + European (3) / University + European (3)	Regional (5) Industry (5)
3	National + Local (2) / National + University (2) / Regional + Local (2) / Regional + University (2) / Local + Industry (2) / Local + European (2) / Local + University (2) / Industry + University (2) / European + In-kind contribution (2)	University (3)

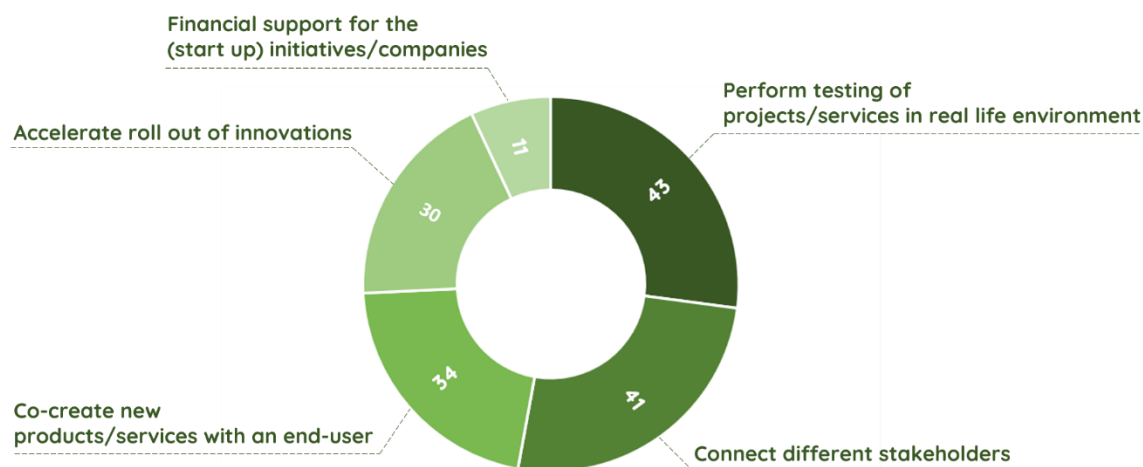
Within EIT Urban Mobility Innovation Hub Central, 6 living labs have a single funding stream and 6 benefit from multiple funding streams.

European and national funding are the most frequently used funding streams for the business models within these living labs.

The combinations of national and regional funding, national and industry, and regional and industry are the most frequent ones in the case of mixed-funding business models.

5.2 Added value of the living labs for the urban mobility ecosystem

Figure 26. Activities facilitated by the living labs.



(Source: EIT Urban Mobility survey, 2020, multiple-choice question)

Figure 26 presents the activities carried out by the 47 surveyed living labs. Testing of projects/services in a real-life environment is done by 43 (91%) of surveyed living labs, closely followed by connecting different stakeholders 41 (87%). 34 (72%) of the labs co-create new products and services with an end-user, and 30 (64%) accelerate the roll out of innovations.

Only 11 (23%) living labs see their role in financial support for the (start-up) initiatives/companies, e.g., providing funding for agile pilots through open calls published periodically. There is a slight difference between the different focus areas of the living labs, depending on the living lab “owner”. Testing of projects/services is a major focus activity for all the living lab owners: university, industry, public authority, research, and public private partnerships.

Connecting different stakeholders is a priority for: industry, public authority, research, and public private partnerships. Universities and public authorities are more focused on the co-creation of products and services with an end-user than other living lab owners. Public authorities are also looking into the acceleration of the innovation uptake. Financial support for the start-ups and other companies is mainly performed by industry and public authority owned living labs.

“...we play the role of the honest broker. We are an intermediary element between supply and demand. We are well-respected from both sides. We have no specific interest in whatever is performed, and we can bring everybody on the same table to discuss in a frank and clear way to find jointly acceptable solutions.”

(TRELAB, interview, 2020)

“I think the living lab approach was more effective because it has further engagement and potentially longer impact in terms of behavioural change, adoption of new technologies, innovation.”

(University Malta, interview 2020)

Living labs generate several types of added value to their customer organizations.

By structurally bringing all the stakeholders involved in the development of the mobility product, service, or policy at one table, living labs **enable the creation of a common perspective** on key issues and opportunities at hand. Living labs **facilitate an open dialogue** between all involved parties, aiming at a better understanding of other stakeholders` values, interests, challenges, and ideas. Higher policy coherence is then achieved using the bottom-up practical insights. Industry parties improve their innovation business cases through ideas and opportunities generated from working closely with a range of stakeholders.

“The UMLs offer the possibility to embed an approach to a product or service into real-life processes and street spaces. Support through the maze of regulations and permissions is given to ensure real life testing.”

(AMS Institute, interview, 2020)

“We have a very close collaboration with the local municipality which also means that if we need a mandate to do something different, we have quite a short time of reaction. Because of that very close collaboration, we can operate at a very agile level. That is, of course, within the framework of what the municipality can do.”

(Gate 21, interview, 2020)

More and more companies want to try out their technical solutions with real users in the real environment to understand the possible limitations of their technology. Living labs **provide this opportunity of testing** a mobility product, service, or policy **in a real-life environment**. They **facilitate**

and accelerate regulatory and administrative practical arrangements to run the experiments. Living labs have contacts within different departments of public authorities, infrastructure providers, research entities, etc., and can provide support and in-depth information about limitations, regulations, realities, and procedures of applying the permits.

“We have a lot of collaborations with residents and resident organizations (resident co-creator groups), so we can help with engaging end-users. We have many stakeholder contacts like shopping malls, resident organization, parking facilities, etc. This network we have built is quite a valuable asset.”

(Forum Virium, interview, 2020)

“We have control testing in the UPC with sensors, for example. There, the TRL can be high, but testing things in real life helps to show the interaction, the acceptance. The acceptance is something no one thought of 20 years ago.”

(CARNET, interview, 2020)

Integration of the end-users and other stakeholders in the development of the mobility product, service, or policy right from the start contributes to the acceptance of the solution in a later stage. Living labs have [access to these competences and networks](#) that are not regular to all the traditional mobility stakeholders. Living labs [enable co-creation with end-users](#) and, where necessary, [citizen engagement processes](#), further raising the trust in the developed innovation and its acceptance.

Telling a story about the mobility product, service, or policy, they [bring forward prospective cases](#), [increasing visibility](#), [speeding up the time to the market](#) and raising awareness on the topics at hand.

“It is favourable if the pilots already have ideas, but we help to find the right people and parties. We facilitate networking, collaborations and new partnerships.”

(Forum Virium, interview, 2020)

“I find this ecosystem to be quite dynamic because what we experience is that they are also collaborating across, so they are testing both physical equipment, a new combination of components, but also new ways of collaboration. This is quite a simple area where they have common ground to start testing ways of collaboration. If they succeed, or if it shows potential, then they have learned more from one another, and they can scale that collaboration if they want to.”

(Gate 21, interview, 2020)

“The partners who are even more engaged look at this also from a business/product development perspective, being an innovation platform that they can enter. Here, they have license to fail, the ability to test and demonstrate new combination of components, either components they have within their own business, or together with other partners.”

(Gate 21, interview, 2020)

Living labs provide R&D and market upscale projects with **networking and collaboration opportunities**, encouraging the creation of new ideas, products, and partnerships. This platform of discussion and a node for open innovation provides access to local knowledge, better understanding of findings and brings to the surface hidden potential combinations of people, products, services, and companies. Living labs provide an ecosystem where companies have the possibility not only to test and demonstrate specific innovation, but also to experience new combinations of components and partnerships.

“Organizing a living lab brings a lot of synergies between the different individual projects and pilots. We see that projects support each other, work with the same stakeholders, build on the collaboration, share data and information across projects. On our website, there is a data and materials section where we provide info about previous pilots and if anyone contacts us about this, we are open for collaborating.”

(Forum Virium, interview, 2020)

“The pure benefit of that is that you keep on building on what has been already built.”

(KTH Royal Institute of Technology, interview, 2020)

Living labs enable **synergies** between the on-going projects. They allow **building up on the previous generation of experiments**, which lead to a shorter learning cycles for new projects. Living labs facilitate added value creation by integrating activities of different experiments and generating new insights from cross-learnings of different project results. Data sharing within the living lab provides opportunities for new value creation and achievement of higher impact from the experiment. Living labs create multi-expertise ecosystem, where technical project can be efficiently supplemented with additional expertise: e.g., behaviour scientists, psychologists or urban designers studying behavioural or built environment effects of the technical innovation.

“We, first and foremost, facilitate, and then we can match the different partners with one another. Our main contribution is matchmaking innovation and the access to new markets.”

(Gate 21, interview, 2020)

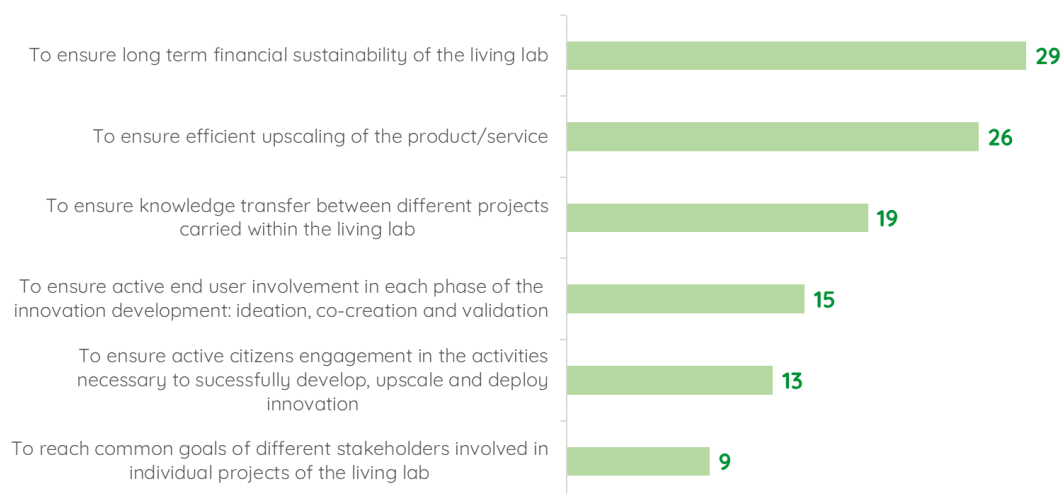
Next to the standalone project-based living lab experiments, fixed-location living labs and not-fixed location living labs, some countries also develop an overarching living lab approach, referring to such platforms as mobility meta-labs or programs. These programmatic and cooperation structures have an objective to coordinate locally spread urban mobility living labs/ living lab projects, looking into the synergies between those and common facilitation of the challenges they are focusing on.

5.3 Areas of support for the further development of the urban mobility living labs

Ensuring long term financial sustainability of the living lab as well as efficient upscaling of products and services were indicated as the two main challenges by both active and non-active living labs. This is specifically seen as a challenge by the research, industry and public authority “owned” living

labs. Next to it, university and private public partnership “owned” living labs consider the knowledge transfer between different projects carried within the living lab as another challenge. Finally, universities as living lab “owners” also experience end-user and citizens engagement as a challenge in relation to the mobility living labs operation.

Figure 27. Key challenges of the living labs.



(Source: EIT Urban Mobility survey, 2020, multiple-choice question)

Ensuring the long-term financial sustainability of the living labs is a challenge perceived by 29 (62%) from all 47 living labs. The second most common challenge among the 47 living labs is ensuring efficient upscaling of the product/service, perceived by 26 (55%) of them. Ensuring the knowledge transfer between the different projects of the living lab is a challenge for 19 (40%) living labs. Ensuring active end-user involvement in all co-creation stages is a challenge for 15 (32%) living labs, and ensuring active citizens engagement – for 13 (28%). Lastly, only 9 (19%) living labs perceive reaching common goals of the stakeholders involved in the living lab projects as a challenge.

The key challenges faced by the living labs differ per living lab “owner”:

- The two top challenges for the research entities, industry and public authorities are ensuring the long-term financial sustainability of the living labs and ensuring the efficient upscaling of the product/service.
- Universities find it most challenging to ensure the knowledge transfer between different projects carried within the living lab, to ensure active end user involvement in each phase and to ensure the long-term financial sustainability of the living lab.
- Public private partnerships experience challenges with regard to ensuring the long-term financial sustainability of the living lab (6), ensuring the knowledge transfer between

different projects carried within the living lab (6) and ensuring the efficient upscaling of the product/service (6).

Interviewed living labs have indicated difference in the experienced challenges depending on the level of the living lab maturity. In the initial phase of development living labs have operational challenges: they are looking into the ways to become more structured, to align the objectives and values of the main stakeholders, to develop a roadmap as well as to establish sustainable business models. Next to it, they need to trigger different partners to commit themselves towards the living labs, experimenting in the collaborative environments with different urban mobility ecosystem stakeholders.

“Because we are still at an early stage of the implementation, we do not yet have the full methodology in place. One of the challenges is to bring all our ideas into practice, and learn from the first experiences, and then refine the whole process. We can then set-in place some good governance and decision-making mechanisms. We still have a lot to understand and define together with the different people involved in this initiative.”

(JRC Ispra, interview, 2020)

Once living labs are established, the challenge is to maintain and further develop its main added value to the innovation companies (as described in section 5.2). Engaging new partners in living labs is often necessary to guarantee business model sustainability. Being able to facilitate the permits and administrative barriers, to engage with end users/citizens and to keep people engaged throughout the living lab experiments is a continuous process, which requires maintaining the cooperation with key urban mobility ecosystem stakeholders.

“A continuous critical challenge is to keep its high level of relevance. For this lab to be relevant and interesting for any stakeholder, we need to be on the forefront of the newest developments. This is demanding and is crucial to be a part of a bigger environment (like Gate21) where we are generating new projects all the time. This helps foster new activities/projects where we can work on the forefront of the development.”

(Gate 21, interview, 2020)

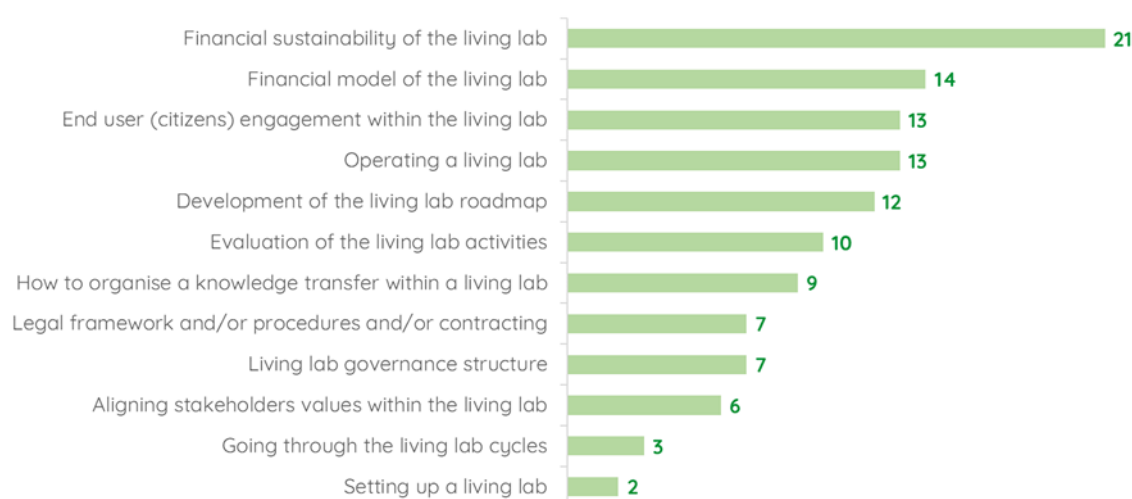
Another critical aspect for the established living labs is to maintain the retention rate of companies being customers of the living lab and in general, keep up their engagement in the living lab processes. Living lab needs to remain interesting to the participating stakeholders, stay on the top of the on-going policy, regulatory and innovative developments and have a good understanding of the local

mobility market and stakeholders. Operationally advanced living labs are also looking into the more structured frameworks and methods of rolling up and upscaling of the solutions developed within the living labs. For the project-based living lab experiments, additional challenge is to keep established community active outside and beyond the project funding.

“There is a lot of discussion in the living lab world in general about the challenge of scaling up experiments – how to find that actually something is promising and works, how to maximize its opportunities. It is something that has to be developed further in the future. If there were more structured frameworks for that, it would be valuable.”

(Forum Virium, interview, 2020)

Figure 28. Areas of support needed for the living labs.



(Source: EIT Urban Mobility survey, 2020, multiple-choice question)

Almost half of all 47 living labs have indicated that they need support with the financial sustainability of the living lab – 21 (45%). Next, 14 (30%) of the living labs have indicated that they need support with the financial model. 13 (28%) living labs have mentioned that they need support with the end-user (citizens) engagement, and also 13 (28%) - with the operation of the living lab.

“We would like to develop further the collaboration we have with residents. We do it quite often on ad hoc basis. When there is a need, we contact them. It would be nice to have a more structured framework for working with citizens. There is also a discussion how to make it more inclusive and diverse. So, we do not just contact the typical suspects. Thus, in the coming year we want to diversify our contacts with the residents.

If you do it the typical way, then you get these quite active well-educated people who have time and possibility to participate and they know how workshops are run. It is nice to have them, but it would be better if we would in a better way involve different groups in the co-creation.”

(Forum Virium, interview, 2020)

Additionally, some living labs have indicated that the development of the well-developed software for data collection (which is often the core infrastructure for the living lab activities) and establishment of the policy planning and procurement could be additional areas of support needed.

The focus in key areas of support in setting up, operation and management of the living lab slightly differs per living lab “owner”: while university, research entity, industry and public-private partnership led living labs would benefit from the support in the financial sustainability of the living lab and its financial model, public authorities as the living lab owners would additionally benefit from the support in the development of the living lab roadmap.

42 (89%) out of 47 surveyed living labs would be interested to be part of the structured network of the mobility living labs. They have indicated that sharing of the best practices as well as facilitating the upscaling of the developed innovations can be one of the added values of such a network.

Figure 29. Interest in the organised network of the mobility living labs (left); Added value of a structured European network of the urban mobility living labs (right).



(Source: EIT Urban Mobility survey, 2020, single-choice question (left); multiple-choice question (right))

Table 37. EIT Urban Mobility Innovation Hub North: activities, key challenges and areas of support needed.

EIT Urban Mobility Innovation Hub NORTH:						
City or region	Key living lab owner	Activities				
		Financial support for the (start up) initiatives/ companies	Connect different stakeholders	Perform testing of projects/ services in real life environment	Co-create new products/ services with an end-user	Accelerate roll out of innovations
Greater Copenhagen	Public private partnership		x	x	x	x
Gothenburg	Public authority	x	x	x	x	x
Hamburg	Public authority		x	x	x	x
	Public transport company	x	x	x	x	x
Helsinki	Public authority		x	x	x	x
Lund	Public private partnership		x	x		x
Oslo	Public private partnership		x	x	x	
	Research entity	x	x	x		
Stockholm	Public authority		x	x	x	x
	Public authority		x	x	x	x

Rank	Key challenges	Areas of support needed
1	To ensure efficient upscaling of the product/service (7)	Financial sustainability of the living lab (3)
2	To ensure long term financial sustainability of the living lab (6)	Operating a living lab (2) Evaluation of the living lab activities (2)
3	To ensure knowledge transfer between different projects carried within the living lab (5)	Living lab governance structure (1) Development of the living lab roadmap (1) End user (citizens) engagement within the living lab (1) Financial model of the living lab (1) How to organise a knowledge transfer within a living lab (1) Legal framework and/or procedures and/or contracting (1)

Within EIT Urban Mobility Innovation Hub North, all 10 living labs are performing testing of projects/ services in real life environment and connecting different stakeholders.

The most frequent challenge experienced by 7 from 10 living labs is ensuring the efficient upscaling of the product/service. Next to it, 6 living labs from 10 mention long term financial sustainability of the living lab as a challenge; followed by ensuring the knowledge transfer between different projects (5 living labs).

3 living labs have indicated that they can benefit from support in the development of the financial sustainability model of the living lab.

Table 38. EIT Urban Mobility Innovation Hub South: activities, key challenges and areas of support needed.

EIT Urban Mobility Innovation Hub SOUTH:						
City or region	Key living lab owner	Activities				
		Financial support for the (start up) initiatives/ companies	Connect different stakeholders	Perform testing of projects/ services in real life environment	Co-create new products/ services with an end-user	Accelerate roll out of innovations
Alcobendas	Public private partnership	x	x	x	x	x
Barcelona	University		x	x	x	
	University		x	x	x	x
Madrid	Non-profit organization	x	x	x	x	x
Malaga	Industry		x	x	x	
Matosinhos	Public private partnership		x	x	x	
Sevilla	Non-profit organization	x	x	x	x	x
Terrassa	University			x	x	x
Thessaloniki	Research entity		x	x	x	x

Rank	Key challenges	Areas of support needed
1	To ensure long term financial sustainability of the living lab (6)	Financial sustainability of the living lab (5)
2	To ensure active end user involvement in each phase of the innovation development: ideation, co-creation and validation (4) To ensure active citizens engagement in the activities necessary to successfully develop, upscale and deploy innovation (4)	Development of the living lab roadmap (4) Financial model of the living lab (4)
3	To ensure knowledge transfer between different projects carried within the living lab (2) To ensure efficient upscaling of the product/service (2)	End user (citizens) engagement within the living lab (3)

Within EIT Urban Mobility Innovation Hub South, all 9 of the living labs are performing testing of projects/services in real life environment and 8 are connecting different stakeholders.

The most frequent challenge experienced by 6 from 9 living labs is ensuring the long-term financial sustainability of the living lab. Next to it, 4 living labs mention active end-user involvement in all co-creation stages as a challenge as well as ensuring active citizens engagement.

5 living labs have indicated that they can benefit from support in the development of the financial sustainability model of the living lab.

Table 39. EIT Urban Mobility Innovation Hub West: activities, key challenges and areas of support needed.

EIT Urban Mobility Innovation Hub WEST:						
City or region	Key living lab owner	Financial support for the (start up) initiatives/ companies	Activities			
			Connect different stakeholders	Perform testing of projects/ services in real life environment	Co-create new products/ services with an end-user	Accelerate roll out of innovations
Antwerp	Public authority	x	x	x	x	x
Grand Est region	University		x		x	x
Helmond	Public authority		x	x	x	x
Lille	University			x		x
Limerick	University		x		x	
Lyon	Public private partnership		x	x		
Paris	University			x	x	x
Province of North Brabant	Industry		x	x		
	Public private partnership		x	x		x
	Public authority			x		
The Hague	Research entity		x	x		x

Rank	Key challenges	Areas of support needed
1	To ensure knowledge transfer between different projects carried within the living lab (7)	Operating a living lab (4)
2	To ensure efficient upscaling of the product/service (5)	Living lab governance structure (3) Development of the living lab roadmap (3) Evaluation of the living lab activities (3) End user (citizens) engagement within the living lab (3) Financial model of the living lab (3) How to organise a knowledge transfer within a living lab (3)
3	To ensure long term financial sustainability of the living lab (4)	Aligning stakeholders values within the living lab (2) Financial sustainability of the living lab (2)

Within EIT Urban Mobility Innovation Hub West, 9 of all 11 living labs are performing testing of projects/services in real life environment and 8 are connecting different stakeholders.

The most frequent challenge experienced by 7 from 11 living lab is ensuring the knowledge transfer between the different living lab projects. Next to it, 5 living labs from 11 mention ensuring the efficient upscaling of the product/service as a challenge.

4 living labs have indicated that they can benefit from support in the operation of the living lab.

Table 40. EIT Urban Mobility Innovation Hub East: activities, key challenges and areas of support needed.

EIT Urban Mobility Innovation Hub EAST:						
City or region	Key living lab owner	Activities				
		Financial support for the (start up) initiatives/ companies	Connect different stakeholders	Perform testing of projects/ services in real life environment	Co-create new products/ services with an end-user	Accelerate roll out of innovations
Cluj-Napoca	Industry	x	x	x	x	
Constanta	Public authority		x	x		x
Rivne	University			x	x	x
No fixed location digital platform	NGO		x		x	

Rank	Key challenges	Areas of support needed
1	To ensure long term financial sustainability of the living lab (4)	Financial model of the living lab (3) Financial sustainability of the living lab (3)
2	To ensure efficient upscaling of the product/service (2)	Development of the living lab roadmap (2) Operating a living lab (2) How to organise a knowledge transfer within a living lab (2)

Within EIT Urban Mobility Innovation Hub East, 3 of all 4 living labs are performing testing of projects/services in real life environment, 3 are connecting different stakeholders and 3 are co-creating new products/ services with the end-user.

The most frequent challenge experienced by all 4 living lab is ensuring the long term financial sustainability of the living lab. Next to it, 2 living labs from 4 mention ensuring the efficient upscaling of the product/service as a challenge.

3 living labs have indicated that they can benefit from support in the development of the financial model and the financial sustainability of the living lab.

Table 41. EIT Urban Mobility Innovation Hub Central: activities, key challenges and areas of support needed.

EIT Urban Mobility Innovation Hub CENTRAL:						
City or region	Key living lab owner	Financial support for the (start up) initiatives/companies	Activities			
			Connect different stakeholders	Perform testing of projects/ services in real life environment	Co-create new products/ services with an end-user	Accelerate roll out of innovations
Geneva	Research entity		x	x	x	
	University			x		
Graz	Public authority		x	x	x	x
	Research entity	x	x	x		x
Ispra	Public authority		x	x	x	x
Ljubljana	Industry	x	x	x	x	x
Munich	Public authority	x	x	x	x	x
Rome	University		x	x		
Schorndorf	Research entity		x	x	x	
Sierre	Research entity		x	x	x	
Steyr	Research entity		x	x	x	
Vienna	University		x	x	x	x

Rank	Key challenges	Areas of support needed
1	To ensure efficient upscaling of the product/service (9)	Financial sustainability of the living lab (8)
2	To ensure long term financial sustainability of the living lab (8)	End user (citizens) engagement within the living lab (4) Financial model of the living lab (4)
3	To ensure active end user involvement in each phase of the innovation development: ideation, co-creation and validation (4)	Operating a living lab (3) Financial model of the living lab (3)

Within EIT Urban Mobility Innovation Hub Central, all 12 living labs perform testing of projects/services in real life environment and 11 connect different stakeholders.

The most frequent challenge experienced by 9 of the 12 living labs is ensuring the efficient upscaling of the product/service. Next to it, 8 living labs from 12 mention ensuring the long-term financial sustainability of the living lab as a challenge.

8 living labs have indicated that they can benefit from support in the development of the financial sustainability model of the living lab.

6 Learning and recommendations

In line with the EC Sustainable and Smart mobility strategy for Europe (COM (2020) 789 final) Urban Mobility Living Labs are a recognised vehicle to assure a real shift from the existing paradigm of incremental change to fundamental transformation of the present urban mobility system. Living labs will enable cities, research, and industry to have a real involvement and commitment of the citizens and therewith guarantee the success of the European Green Deal. It states that that “citizens are and should remain a driving force of the transition”. Moreover, “a new pact is needed to bring together citizens in all their diversity, with national, regional, local authorities, civil society and industry working closely with the EU’s institutions and consultative bodies”(COM (2020) 640 final).

Living labs provide R&D and market upscale projects with networking and collaboration opportunities, encourage the creation of new ideas, products, and partnerships. This platform of discussion and a node for open innovation provides access to local knowledge, better understanding of findings and brings to the surface hidden potential combinations of people, products, services, and companies. Living labs provide an ecosystem where companies have the possibility not only to test and demonstrate specific innovation, but also to experience new combinations of components and partnerships.

Based on the results from the inventory of the mobility living labs in Europe (initial desk research and an online survey), a dedicated set of interviews, 2 collaborative workshops, creation of a living lab capacity building toolbox and a geo-referenced map of urban mobility living labs, this study created an understanding of the magnitude of the mobility living labs movement in Europe, the shapes and forms these living labs are taking, their present added value for the mobility transition, and the barriers and opportunities they are facing.

The Inventory has illustrated that numerous EU and national financed urban mobility projects contain elements of the living lab approach and/or implemented within an established Living Lab. Noteworthy are the 80 CIVITAS Living Lab cities demonstrations as well as the 12 projects involving living labs or their elements in the framework of the EIT Urban Mobility Business Plan 2020. The total of 201 initiatives identified in this study through a desk research and an online survey contain not only living labs, but also test beds and initiatives containing living lab elements but not labelled as such. The analysis of these shows that a large number of the initiatives are mobility-focused (118) and located in the countries of Spain (25), the Netherlands (22) and Germany (18). The 47 living labs analysed more in depth are largely focusing their activities on the topic of mobility (29). They are led by a variety of institutions, such as public authorities (13) and university (11) leading the highest number of living labs.

Urban mobility living labs concretely contribute to a successful achievement of the goals laid down in the EU Sustainable and Smart Mobility Strategy, the Green Deal, and the upcoming updated Urban Mobility Package. Despite the recognised importance of the urban mobility living labs it was also found that they face several challenges and would need additional support from the EIT KIC Urban Mobility to fully achieve their objectives and impacts.

Table 42. Living lab key challenges identified and possible areas of EIT KIC Urban mobility support.

Key challenges identified	Related areas of support needed
Long-term financial sustainability of the living lab as well as dedicated resources for a successful upscaling of the tested LL innovations.	Financial model of the living lab
	Diversification of the financial resources
	Long(er) term assurance of funding, access to new forms of financing.
Ensuring an efficient upscaling of the product/ service.	Going more efficient through the living lab cycles and access to other channels open for upscaling.
Ensure knowledge transfer between different projects carried within the LL.	Organise a more efficient knowledge transfer within a living lab and beyond
Ensure active end user involvement in each phase of the innovation development: ideation, co-creation, and validation.	Improve end user engagement within the living lab
To ensure active citizens engagement in the activities necessary to successfully develop, upscale and deploy innovation.	Deepen citizens engagement within the living labs
To reach common goals of different stakeholders involved in individual projects of the living lab	Aligning stakeholders' values within the living lab
	Develop of living lab roadmaps
	Assistance in setting up a living lab
	Standardize legal frameworks, procedures and contracting
	Good practices in living lab governance structure
	Good practices of operating a living lab

Specifically, the first five challenges seem opportune for the EIT KIC Urban Mobility to play a role and assist the EU urban mobility labs.

Enable successful financial sustainability of the living labs toward the creation of wider social and green impacts

Availability of initial seed funding from local or national government, industry, and research, as well as individual funding for urban mobility projects with living lab elements often form one of the key elements that enable a Living Lab initiative to be launched.

This funding assures the first three, up to five years existence of a living lab. It helps to set up, operate and realise the first innovation projects. Having passed this first phase it was found that most living labs struggle to maintain the living lab structure financially sustainable. The living labs that succeed to proceed beyond this initial phase are often the living labs that were able to diversify and attract multiple streams of funding and financing.

Depending on the living lab goals, involved actors and organisations a sound financial model (i.e., based on public funding, individual project funding, subscription fees) provides the basis of a long term financial sustainability of the living lab. This might be enough to successfully maintain the living lab activities over time. Nevertheless, our analyses shows that even within the successful living labs that were able to assure the long term financial sustainability of the Living lab itself there is need to more effectively contribute to the EU urban mobility transformation as well as provision of real impacts on the local mobility strategies.

To enable the living lab projects, innovations, and start-ups to contribute on a wider scale to the necessary EU and local targets, successful living labs as well as their tested innovation should be supported with access to investors, available EU funding and financing yet also new forms of funding sources such as sustainable and social impact funds².

Enable a more efficient upscaling of living lab products and tested mobility services and knowledge transfer

Once there is an innovation successfully tested within a living lab the upscaling to a wider implementation in the cities seem not always to take place. This might be due to a lack of knowledge maybe even trusts by public authorities to integrate the know-how and the emerging solutions into the older legacy systems, ageing infrastructures and infrastructure and regulations.

The popularized innovation chasm theory³ observes that there is a major difficulty to pass from the early living lab product (the enthusiasts and visionaries) to the majority (the pragmatists, conservatist and sceptics). This fact is particularly true for mobility innovation in which cities/regions

² www.Luxmobility.eu

³ Moore, G. A. (1991). *Crossing the chasm – marketing a selling high-tech products to mainstream customers.*

are the customer with as a result the successfully tested solution ending up in the innovation Death Valley.

To accelerate the scale up of successful Urban Mobility Living lab innovation, the EIT KIC Urban Mobility could enabled and assist the living labs for example through dedicated City Club based scale-up programmes. This would allow the living labs to bring the developed products, services, and start-ups more effectively to the urban mobility market and bridge the gap between the initial testing and the large roll out of the innovations.

All the living labs expressed that they would benefit from talking to each other and from exchanging the best practices. Ensuring the knowledge transfer between the successfully tested living lab projects to a wider group of stakeholders was indicated as one of the provided services of a living lab, yet also considered a real challenge when reaching out beyond.

The EIT KIC Urban Mobility was set up to accelerate the transition towards more sustainable urban mobility and liveable cities through the integration of education, research, and exchange. The City Club could play a real role in enabling a knowledge transfer and results of tested living lab solutions. Establishing close cooperation with existing living labs would allow other cities, practitioners, experts, business developers and entrepreneurs to transfer and scale up the successful innovations.

Enable a higher levels of end-user involvement and citizens engagement

The inventory illustrated that about one-fourth of the living labs involve actual end users or engage citizens solely in the validation and evaluation stages. Surveys among the citizens within the respective areas, test panels are used yet lead often to only partial consultation and involvement. Actual collaboration with end users and/ or citizen empowerment as to say to provide the final responsibility and decision with the citizens is rarely happening. Providing good practices examples of actual collaboration with end users as well as citizen empowerment by the EIT KIC urban mobility might help the living labs to improve the uptake of their innovations and solutions. This could even be done through the creation and or facilitation of own end user/citizens engagement platforms available to all urban mobility living labs.

7 References

- Alonso-Raposo, M., & Mourtzouchou, A. (2020, November 19). JRC Ispra Living Lab. (N. Nesterova, & E. Uzunova, Interviewers)
- Apeldoorn, N. (2020, November 06). METAMORPHOSIS Project. (N. Nesterova, & E. Uzunova, Interviewers)
- Attard, M. (2020, November 13). CIVITAS Living Labs. (N. Nesterova, & E. Uzunova, Interviewers)
- Ayfantopoulou, G., & Salanova Grau, J. (2020, December 14). Thessaloniki Smart Mobility Living Lab. (N. Nesterova, & E. Uzunova, Interviewers)
- Drescher, L. (2020, December 07). ZONE Cluster. (N. Nesterova, & E. Uzunova, Interviewers)
- Edgar, T., & Manz, D. (2017). *Research Methods for Cyber Security* (1 ed.). Syngress.
- EIT Urban Mobility. (2020). *EIT Urban Mobility Strategic Agenda*. Retrieved from https://www.eiturbanmobility.eu/wp-content/uploads/2020/02/Annex_1_Strategic_Agenda_EIT_Urban_Mobility.pdf
- ELTIS. (2019). *Mobility (definition)*. Retrieved from <https://www.eltis.org/glossary/mobility>
- Engels, F., Wentland, A., & Pfothner, S. (2019, November). Testing future societies? Developing a framework for test beds and living labs as instruments of innovation governance. *Research Policy*, 48(9). doi: <https://doi.org/10.1016/j.respol.2019.103826>
- ENoLL. (n.d.). *What are Living Labs*. Retrieved from <https://enoll.org/about-us/>
- European Commission. (2019). *The European Green Deal (COM (2019) 640 final)*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2019:640:FIN>
- European Commission. (2020, May 10). *Living Labs for regional innovation ecosystems*. Retrieved from <https://s3platform.jrc.ec.europa.eu/living-labs>
- European Commission. (2020). *Sustainable and Smart Mobility Strategy – putting European transport on track for the future (COM (2020) 789 final)*. Brussels. Retrieved from <https://ec.europa.eu/transport/sites/transport/files/legislation/com20200789.pdf>
- Finland's EU Presidency. (2006). *The Helsinki Manifesto*. Retrieved from <https://issuu.com/enoll/docs/290101063-helsinki-manifesto-201106>
- Gatta, V., Marcucci, E., & Lozzi, G. (2020, November 27). The Logistic Living lab of Rome – TRElab. (N. Nesterova, & E. Uzunova, Interviewers)
- Habibpour, A. (2018). Living Lab Research: A State-of-the-Art Review and Steps towards a Research Agenda : Research-in-progress. *OpenLivingLab Days 2018 conference*, (pp. 406-421). Geneva. Retrieved from <http://urn.kb.se/resolve?urn=urn:nbn:se:ltu:diva-70462>
- Kuipers, T., & Verhoef, L. (2020, November 17). AMS Institute Living Labs. (N. Nesterova, & E. Uzunova, Interviewers)

- Lozzi, G. (2020, October 06). POLIS - “umbrella” organisation operating with living labs. (N. Nesterova, Interviewer)
- Maas, T., Broek, J., & Deuten, J. (2017). *Living labs in Nederland: Van open testfaciliteit tot levend lab*. Den Haag: Rathenau Instituut. Retrieved from <https://www.rathenau.nl/sites/default/files/Living%20labs%20in%20Nederland.pdf>
- Neef, R., Verweij, S., Gugerell, K., & Moen, P. (2017). *Wegwijs in Living Labs in Infrastructuur en Ruimtelijke Planning: Een Theoretische en Empirische Verkenning*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3086267
- Nesterova, N., Talen, S., Quak, H., Andersen, J., Fossheim, K., & Klauenberg, J. (2018). *Deliverable 3.4: CITYLAB Handbook for City Logistics Living Laboratories*. Retrieved from <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5ba6024db&appId=PPGMS>
- Nybacka, M. (2020, December 01). KTH and Stockholm Living Labs. (N. Nesterova , & E. Uzunova, Interviewers)
- Pagès, L., & Aquilué, I. (2020, November 13). EIT Urban Mobility project FURNISH. (N. Nesterova, & E. Uzunova, Interviewers)
- Rinne, J., & Martijnse-Hartikka, R. (2020, November 10). Forum Virium Helsinki Living Labs. (N. Nesterova, & E. Uzunova, Interviewers)
- Robles, A., Hirvikoski, T., Schuurman, D., & Stokes, L. (2015). *Introducing ENoLL and its Living Lab community*. ENoLL. Retrieved from <https://issuu.com/enoll/docs/enoll-print>
- Sarjanen, S. (2010). *Living Lab – Discovering the Essence*. Retrieved from <https://core.ac.uk/download/pdf/38021954.pdf>
- Schuurman, D. (2015). *Bridging the gap between Open and User Innovation? Exploring the value of Living Labs as a means to structure user contribution and manage distributed innovation*. Retrieved from https://ec.europa.eu/jrc/communities/sites/jrccties/files/phd_schuurman_living_labs_2015.pdf
- Schuurman, D., & Protic, S. (2018, December). Living Labs versus Lean Startups: An Empirical Investigation. *Technology Innovation Management Review*, 8(12), 7-16. doi: <http://doi.org/10.22215/timreview/1201>
- Schuurman, D., De Marez, L., & Ballon, P. (2016). The Impact of Living Lab Methodology on Open Innovation Contributions and Outcomes. *Technology Innovation Management Review*, 6(1), 7-16. doi: <http://doi.org/10.22215/timreview/956>
- Sibbern Axelsen, T., & Thormann, A. (2020, December 01). DOLL Living Lab – GATE21. (N. Nesterova, & E. Uzunova, Interviewers)
- Vera, N., & May, C. (2020, December 18). Climate-KIC – Deep Demonstrations initiative. (N. Nesterova, & E. Uzunova, Interviewers)

- Wiederwald, D. (2020, November 09). Austrian Mobility Living Labs. (N. Nesterova, & E. Uzunova, Interviewers)
- Zavratnik, V., Superina, A., & Stojmenova Duh, E. (2019). Living Labs for Rural Areas: Contextualization of Living Lab Frameworks, Concepts and Practices. *Sustainability 2019*, 11(14), 3797. doi: <https://doi.org/10.3390/su11143797>



8 Acknowledgement

In this section, the authors of this report will acknowledge the efforts made by all individuals who have contributed to this project.

First and foremost, we would like to thank Mr. Floris Bakermans (ATOsborn), Mr. Carl Stolz and Mr. Gert-Jan Jacobs (DTV Consultants) who helped with the completion of this assignment.

We would like to thank all parties who filled in our online survey, which helped us apprehend the mobility living lab movement in Europe. We express our gratitude to the networks which disseminated the survey among their members, namely: EARPA, NMS and CIVINETS.

Furthermore, special thanks go to the individuals who agreed to be interviewed regarding their living lab initiative(s), namely: Mr. Nick van Apeldoorn (Breda University of Applied Sciences), Ms. Doris Wiederwald (AustriaTech), Mr. Janne Rinne and Ms. Renske Martijnse-Hartikka (Forum Virium Helsinki), Ms. Maria Attard (University of Malta), Ms. Maria Alonso-Raposo and Ms. Andromachi Mourtzouchou (European Commission, Joint Research Centre), Ms. Laia Pagès and Ms. Ines Aquilué (CARNET), Mr. Tom Kuipers and Mr. Leendert Verhoef (AMS Institute), Mr. Mikael Nybacka (KTH Royal Institute of Technology), Mr. László Drescher (ZONE Cluster), Mr. Valerio Gatta, Mr. Edoardo Marcucci and Mr. Giacomo Lozzi (TRELAB), Mr. Teddy Sibbern Axelsen and Ms. Anna Thormann (Gate 21), Ms. Georgia Ayfantopoulou and Mr. Josep Maria Grau Salanova (CERTH), Ms. Natalia Vera and Ms. Charlotte May (Climate-KIC).

Special thanks for further contributions and insightful comments during the two workshops we organized go to: Mr. Fredrik Hånell (Director Business Creation, EIT Urban Mobility), Mr. Gareth Macnaughton (Innovation Director, EIT Urban Mobility), Mr. Daniel Serra (Director Innovation Hub South, EIT Urban Mobility), Mr. Henrik Morgen (Director Innovation Hub North, EIT Urban Mobility), Mr. Traian Urban (Director Innovation Hub East, EIT Urban Mobility), Ms. Judith O'Meara (Director Innovation Hub Central, EIT Urban Mobility), Mr. Edwin Heesakkers (Director Innovation Hub West, EIT Urban Mobility), Mr. Bence Huba (Regional Innovation Scheme Manager, EIT Urban Mobility), Mr. Barry Ubbels (Chairman City Club, EIT Urban Mobility), Mr. Hans Christian Christiansen (Vice-Chair City Club, EIT Urban Mobility), Ms. Laia Pagès (CARNET), and Mr. Tom Kuipers (AMS Institute).

Finally, we would like to express our gratitude to Dr. Florinda Boschetti (Head of City Club, EIT Urban Mobility), Mr. Jordi Casas Juan (City Club and Living Labs Officer, EIT Urban Mobility) for their overarching support for the whole duration of this project.