



# e-SMART LIVING LAB CONCEPT

A transnational quadruple-helix cooperation model

**Interreg**  
Alpine Space  
e-SMART   
EUROPEAN REGIONAL DEVELOPMENT FUND



## Contact & Disclaimer

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The e-SMART project is co-financed by the European Regional Development Fund through the Interreg Alpine Space programme.

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# Abbreviations

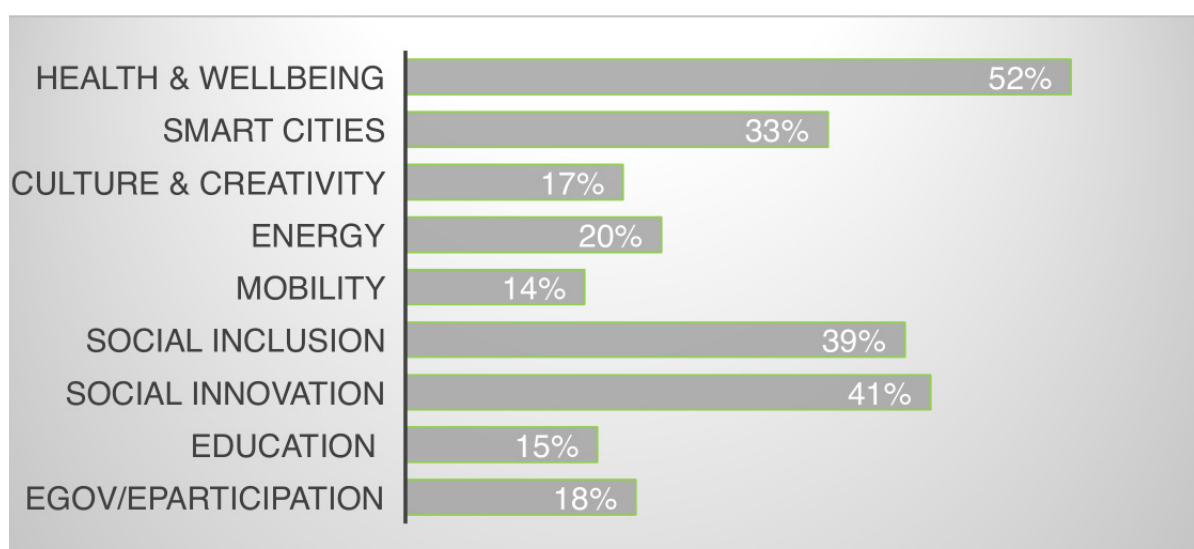
AF	Application Form
BEV	Battery Electric Vehicle
AS	Alpine Space
E-CS	Electric Charging Stations
ENoLL	European Network of Living Labs
ERDF	European Regional Development Fund
EU	European Union
LML	Last-Mile Freight Logistic
LPT	Local Public Transport
OBS	Project Observer
PA	Public administration
PP	Project Partner
RLL	Regional Living Lab
SMT	Smart Monitoring Team
TNLL	Transnational Living Labs Network
WP	Work Package

# 1 Overall objectives of Living Labs within the e-SMART project

## 1.1 What is a Living Lab?

The potential for societal and innovative development through co-creation in all sectors of society is widely recognized at the regional and national stage as well as at the European level. As an example, Horizon Europe is a program that addresses social challenges and its cross-cutting issues by widely relying on open innovation, citizen involvement and real-life experimentation with users. Furthermore, this programme directly suggests living labs as an experimentation and innovation instrument for application in such areas as smart cities, urban development, and international cooperation to include societal and pioneering development opportunities within public-private-people partnerships.

Today, there are over 150 active living lab members in the European Network of Living Labs (European Network of Living Labs, 2017) representing the following thematic areas:



**Figure 1** – Thematic areas of the active ENoLL members, 150 European Network of Living Labs, 2017

All these initiatives are socially inclusive and facilitate value co-creation with local stakeholders.

In research and practice, a lot of different definitions have been proposed for what a living lab is. Living labs have been described as a methodology, an organization, a system, an arena, an environment, a systemic innovation approach<sup>1</sup>. ENoLL also has its definition of what a living lab is: “user-centered, open innovation ecosystems based on a systematic user co-creation approach, integrating research and innovation processes in real life communities and settings”.<sup>2</sup> Finally, according to Leminen, living labs are “physical regions or virtual realities, or interaction spaces, in which stakeholders from public-private-people partnerships (4Ps) of companies, public agencies, universities, users, and other stakeholders, all collaborating for

<sup>1</sup> Bergvall-Kåreborn and Ståhlbröst, 2009

<sup>2</sup> European Network of Living Labs, 2017

creation, prototyping, validating, and testing of new technologies, services, products and systems in real-life contexts”<sup>3</sup>.

Even more, living labs are both practice-driven organisations that facilitate and foster open, collaborative innovation, as well as real-life environments or arenas where both open innovation and user innovation processes are studied and new solutions are co-created.<sup>4</sup>

Due to the complexity of living lab activities and relationships between different stakeholders, we distinguish three different levels of analysis within the living lab phenomena, as suggested by Schuurman (2015): macro, meso and micro level.

Level	Description	Research Paradigm
Macro	Living lab constellation consisting of organized stakeholders (PPP-partnership) and/ or infrastructure	Open Innovation: knowledge transfers between organizations
Meso	Living lab innovation project	Open & User Innovation: real-life experimentation, active user involvement, multi-method and multi-stakeholder
Micro	Living lab methodology consisting of different research steps	User Innovation: user involvement & contribution for innovation

Table 1: Living lab levels of analysis by Schuurman (2015)

In order to fully embrace the living lab approach, we established our action plans regarding these three interrelated levels of analysis. First of all, this report introduces our living labs as seen from the macro perspective. Secondly, it summarizes our living lab pilot projects considering both meso and micro levels. The next chapter is dedicated to the living lab elements that we have considered to design our pilot projects.

## 1.2 Living labs requirements

The ENoLL considered the following characteristics as essential and defining for living lab activities<sup>5</sup>:

### 1.2.1. The end-user’s active involvement

To develop products and services that meet user needs and wishes, the users’ engagement in living lab activities is fundamental. Therefore, the solutions proposed by the LLs must be designed with the citizens.

However, to keep users motivated and engaged it is important to know what motivates them to participate and contribute to these specific living lab activities as their effectiveness depends on the creative power of user communities. The specific context is always important to fully understand the users’ intentions.

<sup>3</sup> Leminen, 2013

<sup>4</sup> European Network of Living Labs, 2017

<sup>5</sup> European Network of Living Labs, *The Living Lab Methodology Handbook*, 2017

### 1.2.2. The real-life setting

Unlike laboratories, LLs activities are conducted in a “real-life” environment. Indeed, researchers and practitioners have recognized the importance of evaluating and testing products or services in such environments.

### 1.2.3. The multi-stakeholder participation

In living labs users and other partners from academia, businesses, and public sector work together to create products and services that meet users’ needs. By facilitating collaboration and knowledge sharing, living lab projects interconnect a wide diversity of actors, who will then align their different interests and expectations, and combine their multidisciplinary expertise and experience. When creating a living lab ecosystem, it is important to create and share value within the ecosystem. As stated by Veeckman et al. (2013), there should be an added value for all partners involved, in order to create a long-term stakeholder engagement and identification with the living lab. Partnerships and collaboration networks are important aspects related to the sustainability of a living lab<sup>6</sup>.

### 1.2.4. The multi-method approach

Living labs involving different partners as co-creators in the innovation processes face challenges arising from different knowledge, expertise, and needs of involved actors. Thus, methods and tools used by living labs for co-creation, collaboration and communication are substantial. Even more so, living lab effectiveness is directly related to the capacity of methods employed in mediating user insights and participation (Almirall and Wareham, 2008).

There is a broad variety of methods and tools used to support innovation processes in living labs. According to Leminen and Westerlung (2017), more experienced living labs tend to use standardized tools but emerging living labs on the contrary follow a more customized approach. In their paper, Leminen and Westerlung (2017) propose a framework for categorizing living labs based on their innovation process (incremental vs linear) and tools (standardized vs customized). They further argue that:

1. Standardized tools decrease the complexity of innovation activities, and decreasing complexity leads to predefined incremental innovation outcomes in living labs.
2. A predefined linear innovation process decreases the complexity of innovation activities, and decreasing complexity leads to predefined incremental innovation outcomes.
3. Adopting an iterative, non-linear innovation process and customized tools for innovation activities increase the likelihood of an undefined and novel innovation outcome. (Leminen and Westerlung, 2017)

### 1.2.5. The Co-creation

Co-creation is the central process for value creation in living labs. Different stakeholders have different value perceptions and propositions, creating heterogeneity across their value spectrum (Hagy, Morrison and Elfstrand, 2016). Co-creation however, links distributed sources of knowledge and creates value for the mutual benefit of stakeholders involved (Veeckman et al., 2013).

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6 Bergvall-Kåreborn et al., 2009

### 1.3 Living lab as an environment

A living lab aims to achieve quattro helix by aligning the innovation process between four main stakeholders: companies, users, public organisations, and researchers. They all can benefit from the Living Lab method in various ways, for instance companies can get new and innovative insights, users can get the innovation they wish, researchers can get study cases and public organisations can get higher return on investment on innovation research.



A Living Lab must be part of an environment of good relations between users willing to participate in innovation processes. Any Living Lab must also have access to multi-contextual environments, as well as high-end technology and infrastructure that can support both user participation processes and technology development and testing. Lastly, Living Lab must have access to a variety of expertise in terms of partnerships that can contribute to ongoing activities.

e-SMART partners decided to base their network of LLs on the FormIT methodology<sup>7</sup>, which has been developed to suit and support Living Lab activities (see Annex 1 for more details).

### 1.4 e-SMART Objective

Even though e-mobility diffusion is increasing in Alpine Space (AS) countries, to ease a wider diffusion of e-mobility and its innovative modalities, Public Administrations (PA) should address e-mobility applied to Local Public Transport (LPT) and to City/Last-Mile Freight Logistic (LML) in synergy with private e-mobility and energy integration. Key barriers are represented by the lack of coordination among public and private actors, lack of a participatory approach based on smart territory, an extended smart city logic, and lack of energy and mobility networks integration in the deployment of e-mobility in LPT & LML. Moreover, PA's competences on energy and smart grid functionalities and digitalization topics should be increased. e-SMART is meant to activate cooperation among PAs and e-mobility and energy operators through LIVING LABS. It will lead, through a ROAD MAP for AS decision makers, to a common approach in development of e-mobility services in LPT & in LML and in planning of an adequate E-CS network for the entire AS. It designs and tests a set of transnational operational instruments for public and private technicians to plan e-mobility infrastructure and services in passengers and freight transports in the framework of smart grid and smart territories: a TOOLKIT.

PAs and private sector will benefit from cooperation with research centres & e-mobility users through transnational Living Lab, based on quadruple helix approach. They will collaborate on a common definition of the Road map and on testing appropriate innovative measures of e-

<sup>7</sup> Birgitta Bergvall-Kåreborn and Anna Ståhlbröst, Living Lab - An Open and Citizen-Centric Approach for Innovation



mobility applied to LPT&LML, overcoming local approaches. Cooperation model of Living lab will be replicable in all AS countries, Road Map and Toolkit will guide a common transnational approach and method for national, regional and local PA Energy and Mobility Strategic Plans improvement.

### Three Specific Objectives:

- SO1 - Foster the transnational cooperation between public and private actors for an integrated planning of E-CS and e-mobility services development in LPT and LML sectors & energy and mobility integration.
- SO2 - Promote a harmonised AS level approach for energy and e-mobility planning in E-CS of LPT and LML.
- SO3 - Increase methods and tools to plan e-mobility E-CS and services in the field of smart energy and mobility.

## **1.5 Living Lab as a tool for e-SMART: the e-SMART Living Lab Objective**

The objective of the Smart Living Labs work package was to develop a capacity building environment involving experiential learning based on active inclusion of stakeholders, experts and end users.

This has been achieved through the set up and operation of a Transnational Network of 5 Regional Living Labs (RLLs), one hub per country, capitalizing experiences of other EU initiatives (EnoLL, INTENSSS PA), activating a four-helix approach by involving partners (PP), observers (OBS) and territorial stakeholders in the fields of energy, mobility, local public and freight transport and logistic (PAs, service providers, utilities, research centres, multipliers, sectoral agencies and end-users).

The e-SMART Living Lab concept is a cooperation model for PAs and private actors of e-mobility for LPT & LML with active involvement of research centres and e-mobility users (citizens and students). Both RLLs and TLLN were designed for in-depth co-working, through living lab methods, on two key topics requiring integration in e-SMART:

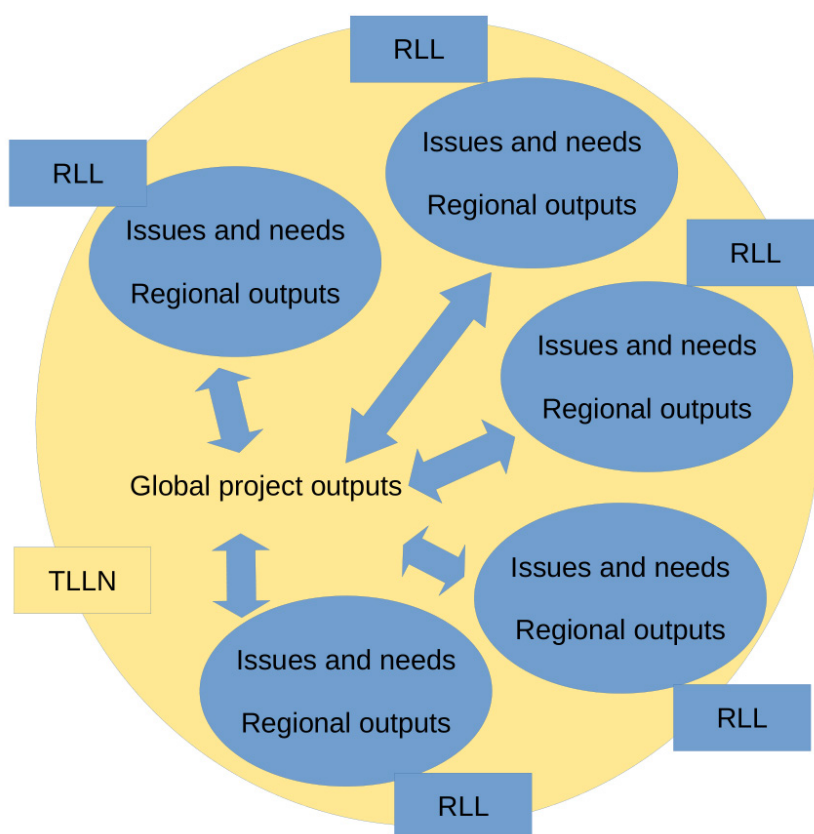
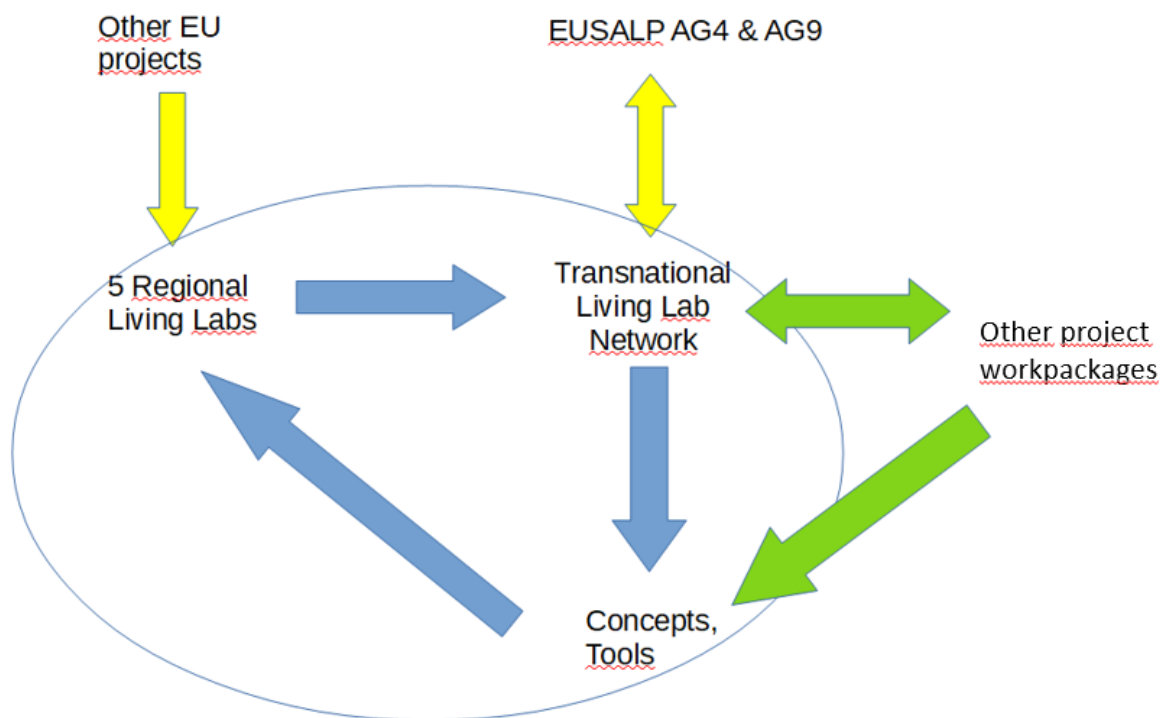
- SMART Mobility (LPT and LML)
- SMART Energy (Smart grid in smart territories framework)

Interactive learning sessions have ensured key knowledge and best practice were delivered to Living Labs stakeholders to support a coherent and transnational learning environment.

The TLLN has led to e-SMART roadmap for decision makers (OT2), joining an e-SMART tactical roadmap designed by TLLN and operational roadmaps developed by each RLL, which also tested the appropriate measures and tools to assess and plan e-mobility applied in LPT and LML through the e-SMART Toolkit (OT3).

This Living Lab approach allowed a smooth collaboration process between stakeholders at the national (regional) and transnational levels for the e-SMART project to reach its ambitious goals. Help create communities and interlink them at the AS level on both addressed topics: LPT - Local Public Transport (people) & LML - City/Last-Mile Freight Logistic (goods).

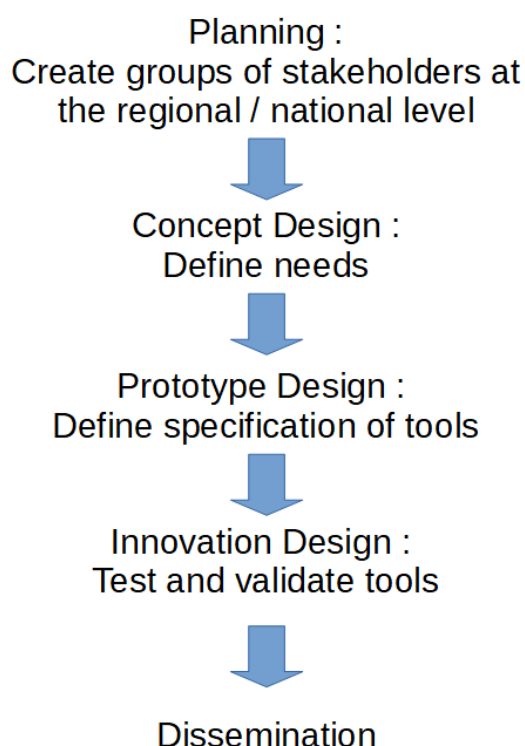
As part of the e-SMART project process, Living Labs elaborated on needs, requirements and specifications for the tools developed in the frames of other work packages, and provided testing and evaluation environments for these tools.



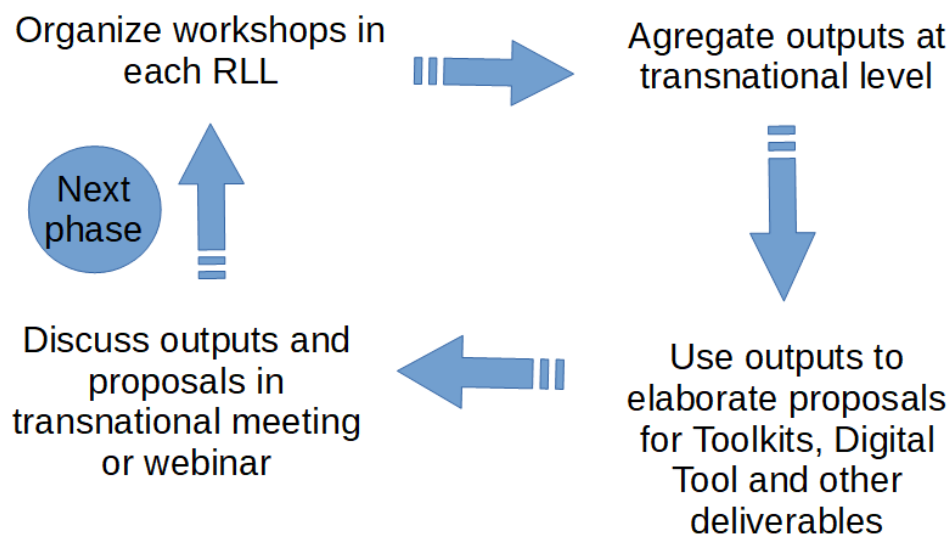
## 2 The e-SMART Living Labs

### 2.1 General Methodology

The general structure is described in the following picture, also detailed in Annex 1 of the deliverable:



During each phase, we worked using the following scheme:



## 2.2 Real-life implementation

As a rule, we tried to stay as close as possible to the theoretical operation defined, but the hazards of the project, and the covid crisis, forced us to make adjustments.

### a. PLANNING Phase: Identify and characterize stakeholders at the regional / national level

**Goal:** Identify and characterize stakeholders

**Duration:** January to March 2020

#### Types of Stakeholders:

- Public Administrations
- Energy
- Logistics
- Public Transport
- End-users
- Associations
- Research Centres

#### 5 Regional Living Labs (RLL):

- Italy : Leader PP2 – Regione Piemonte
- Slovenia : Leader PP6 – ACS
- France: Leader PP8 – AURAE
- Germany: Leader PP15 – Landkreis München
- Austria: Leader PP11 – City of Klagenfurt

In each country, RLL leaders together with regional PPS and OBS listed the relevant stakeholders on their territory, and assessed their needs and motivations, using templates provided by the coordinator. This was done in different ways: telephone contacts, physical meetings, but also reuse of previous knowledge acquired during previous projects or due to the professional activity of the partners.

### b. CONCEPT DESIGN Phase

**Goal:** Collect issues, needs and proposals

**Duration:** April to July 2020 (except that the TNLL meeting was formally held in September due to covid delays)

- Organize Regional Workshops and share feedbacks
- Discussion in TLLN meeting
- Workgroups to create prototypes of deliverables

This phase was the first to be impacted by the covid crisis: all scheduled physical meetings, including consortium meetings, were transformed into webinars, which was initially disruptive. Nevertheless, the different actors of the project, both partners and stakeholders, have gradually learned to use digital tools, and activities have been able to continue under satisfactory conditions.

#### Inputs:

In parallel, a series of preliminary work has been conducted in the context of other work packages:

- “Definition of Smart territories Ecosystem in relation to energy and mobility integration” to propose issues to be addressed and a set of questions to ask stakeholders
- “Mapping of e-mobility LPT and LML infrastructure and services” to propose a questionnaire

### ***In each country***

RLL leaders contacted stakeholders to motivate them and organize a first set of regional/ national meetings and communicate the meetings schedule to the LL Work package leader and Project Leader.

Goal: Motivate stakeholders to take part in the Living Lab process - Discuss and evaluate knowledge of the issues, share information, identify needs and possible actions – Provide feedback on first deliverable proposals to the other work packages.

These meetings engaged in each of the RLL of all types of stakeholders and addressed the whole content spectrum of the project, but some issues have been addressed in separate meetings depending on the regional situation.

Based on the questionnaire already provided and the input of stakeholders before and during the meetings, the RLL leader made a report to be shared with the other RLLs using an online shared document.

### ***At the transnational level***

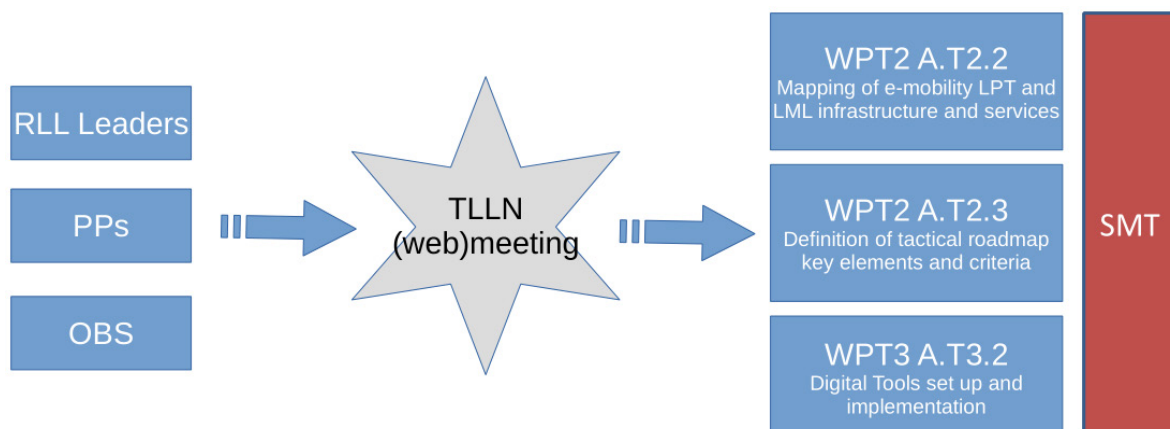
The LL work package leader organized a web meeting with RLL leaders, work package leaders and LP to discuss the main issues and decide what to share at the TLLN level.

A TLLN meeting then took place. This meeting was meant to be a physical one with a web meeting organized in parallel so that a maximum number of stakeholders may participate, but due to the covid-19 crisis it was organized exclusively in web meeting format like all meetings of this phase.

During this TLLN meeting RLL leaders presented the main outputs of their regional meetings. These outputs were then discussed and assessed, for them to be used in the following activities:

- WPT2 A.T2.2 Mapping of e-mobility LPT and LML infrastructure and services
- WPT2 A.T2.3 Definition of tactical roadmap key elements and criteria
- WPT3 A.T3.2 Digital Tools set up and implementation

All activities were monitored by SMT.



### c. PROTOTYPE DESIGN Phase

**Goal:** Elaborate detailed specification of deliverables

**Duration:** August to December 2020 (except that the TLLN meeting was formally held in February 2021 due to covid delays)

- Organize Regional Workshops and share feedbacks
- Discussion in TLLN meeting
- Workgroups to create operational versions of deliverables

This phase was also severely impacted by the covid crisis. All contacts were again made electronically: not only meetings, but also individual requests to stakeholders in the context of the stakeholder survey proposed by the work package in charge of the operational roadmap.

#### Inputs:

A series of preliminary work have been conducted in the context of other work packages:

- “Definition of tactical roadmap key elements and criteria” => the related work package leader proposed first a survey that the RLL were responsible to submit to their stakeholders and then drafts to be discussed

#### *In each country*

RLL leaders organized a new batch of regional meetings adapted to the regional specific context and communicated the meetings schedule to LL work package leader and Project Leader. In parallel, they coordinated the transmission of the survey to the stakeholders in their country, helped them formalize their response, and transmitted the results to the corresponding work package manager.

Goal: Provide additional input and evaluate and discuss deliverables proposed by other work packages

RLL leaders made a report to be shared with the other RLLs using an online shared document.

#### *At the transnational level*

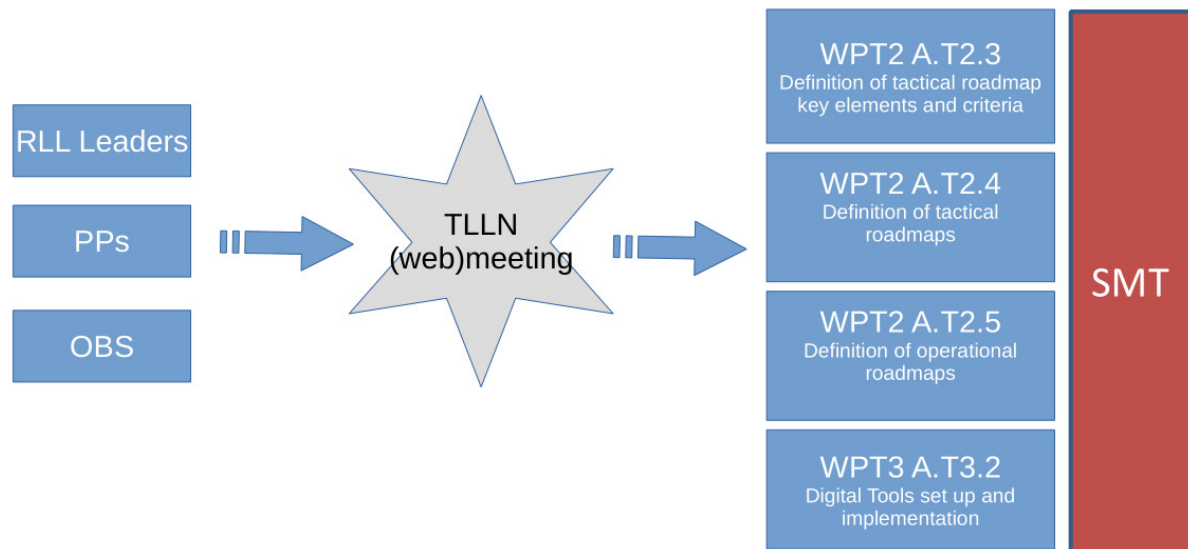
Again, the LL work package leader organized a web meeting with RLL leaders, work package leaders and LP to discuss the main issues and decide what to share at the TLLN level.

A TLLN meeting then took place. This meeting was meant to be a physical one with a web meeting organized in parallel so that a maximum number of stakeholders may participate, but due to the covid-19 crisis it was organized exclusively in web meeting format like the first one and like all other meetings of this phase.

During this TLLN meeting RLL leaders presented the main outputs of their regional meetings. These outputs were then discussed and assessed, for them to be used in the following activities:

- WPT2 A.T2.3 Definition of tactical roadmap key elements and criteria
- WPT2 A.T2.4 Definition of tactical roadmaps
- WPT2 A.T2.5 Definition of operational roadmaps
- WPT3 A.T3.2 Digital Tools set up and implementation

All activities were monitored by SMT.



#### d. INNOVATION DESIGN Phase

**Goal:** Test and validate deliverables

**Duration:** January to July 2021

- Organize Regional Workshops and share feedbacks
- Discussion in TLLN meeting
- Workgroups to issue final versions of deliverables

Again, this phase was marked by contact restrictions related to the covid crisis, and again all meetings were held by videoconference.

##### Inputs:

A series of preliminary work has been conducted in the context of other work packages:

- “Definition of tactical roadmaps”: a first draft has been proposed to be discussed
- “Definition of operational roadmaps”: a template has been proposed to be discussed

##### *In each country*

RLL leaders organized a new batch of regional meetings adapted to the regional specific context and communicated the meetings schedule to LL work package leader and Project Leader. The work focused in particular on the discussion of the operational roadmap. The RLLs were also asked to collect feedback for the mid-term evaluation of the project.

Goal: Test and validate deliverables proposed by other work packages

As usual RLL leaders made a report to be shared with the other RLLs using an online shared document.

##### *At the transnational level*

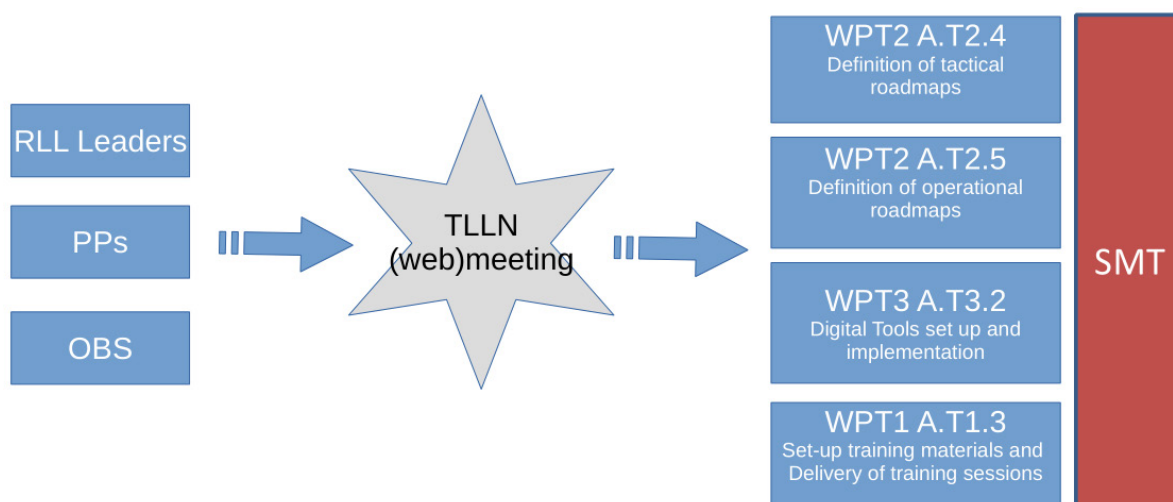
A TLLN meeting then took place. This meeting was meant to be a physical one with a web meeting organized in parallel so that a maximum number of stakeholders may participate, but due to the covid-19 crisis it was organized exclusively in web meeting format like the two previous ones and like all other meetings of this phase.



Outputs were then be discussed and assessed, for them to be used in the following activities:

- WPT2 A.T2.4 Definition of tactical roadmaps
- WPT2 A.T2.5 Definition of operational roadmaps
- WPT3 A.T3.2 Digital Tools set up and implementation
- WPT1 A.T1.3 Set-up training materials and Delivery of training sessions

All activities were monitored by SMT.



#### e. DISSEMINATION Phase

**Goal:** Disseminate project outputs

**Duration:** August 2021 to January 2022

- At regional level: each RLL co-design and validate an Operational Roadmap customized at regional level

At the transnational level:

- O.T1.1 e-SMART Living Lab concept – 2021.12
- Transnational quadruple-helix cooperation model to co-create, experiment and evaluate smart approaches and digital tools for an integrated E-CS planning and e-mobility services diffusion in LPT and LML in relation to smart grid
- Dissemination of the outputs of the project Toolkit, Digital Tool

#### Inputs:

A series of preliminary work was conducted in the context of WPT1, WPT2 and WPT3:

- WPT2 A.T2.4 Definition of tactical roadmaps
- WPT2 A.T2.5 Definition of operational roadmaps
- WPT1 A.T1.3 Set-up training materials and Delivery of training sessions
- WPT3 A.T3.3 Roll-out of Toolkit

#### *In each country*

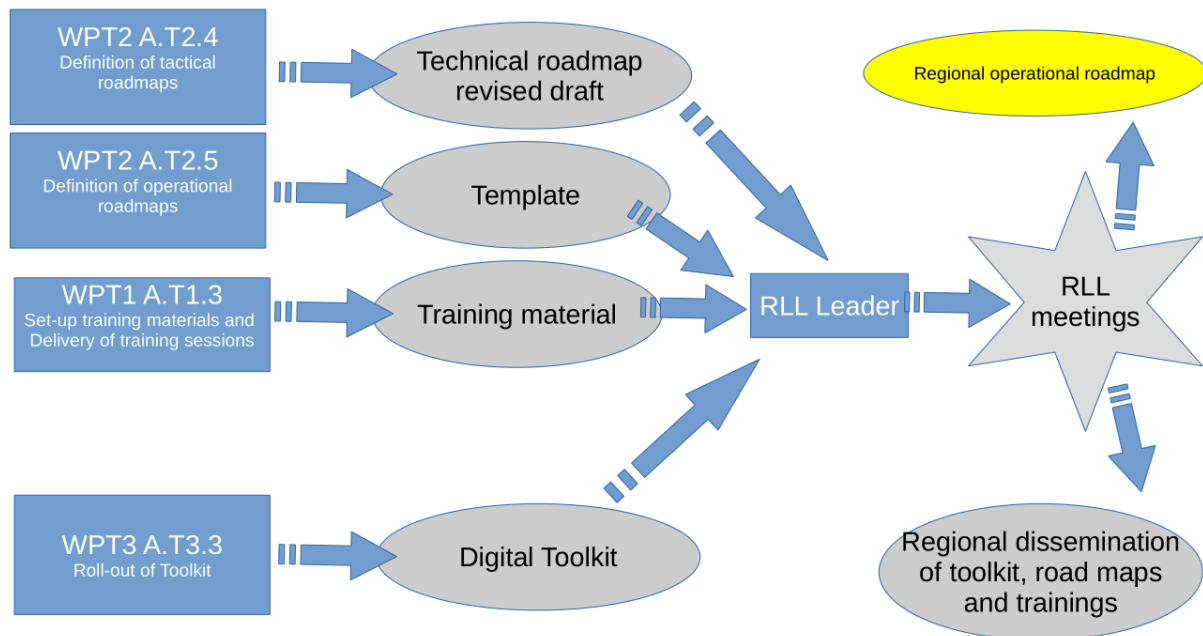
RLL leaders organized a last batch of regional meetings adapted to the regional specific context, to share with stakeholders the ideas and results and further refine related deliverables.



It was experienced that precise and elaborate interaction on documents in larger groups is in practice very difficult.

Therefore, in the majority of cases the final elaboration of the regional operational roadmaps was managed by RLL leaders thanks to one-to-one meetings or meetings in very small groups, whereas the identification of best practices could be shared more broadly.

On the other hand, dissemination activities benefited from group activities.



### ***At the transnational level***

A last consolidation of deliverables was performed by the related WP leaders with coordination of Lead Partner, to finally produce the final deliverables and outputs.

### 3 e-SMART local and transnational Living Lab relationship

The organization of the living labs in the project is based on a two-layer architecture:

1. At the level of each country, a regional living lab (RLL) brings together actors of all types, and manages interactions within the group and from the group to the project
2. At the level of the Alpine space, a transnational living lab (TNLL) makes the living labs interact with each other in order to pool experiences and work, and to draw up guidelines and an action plan for the project.

Each RLL leader was in charge of coordinating the living lab activities of regional /national PPs and OBS on the one hand, and other relevant regional / national stakeholders on the other hand.

The transnational process was managed through:

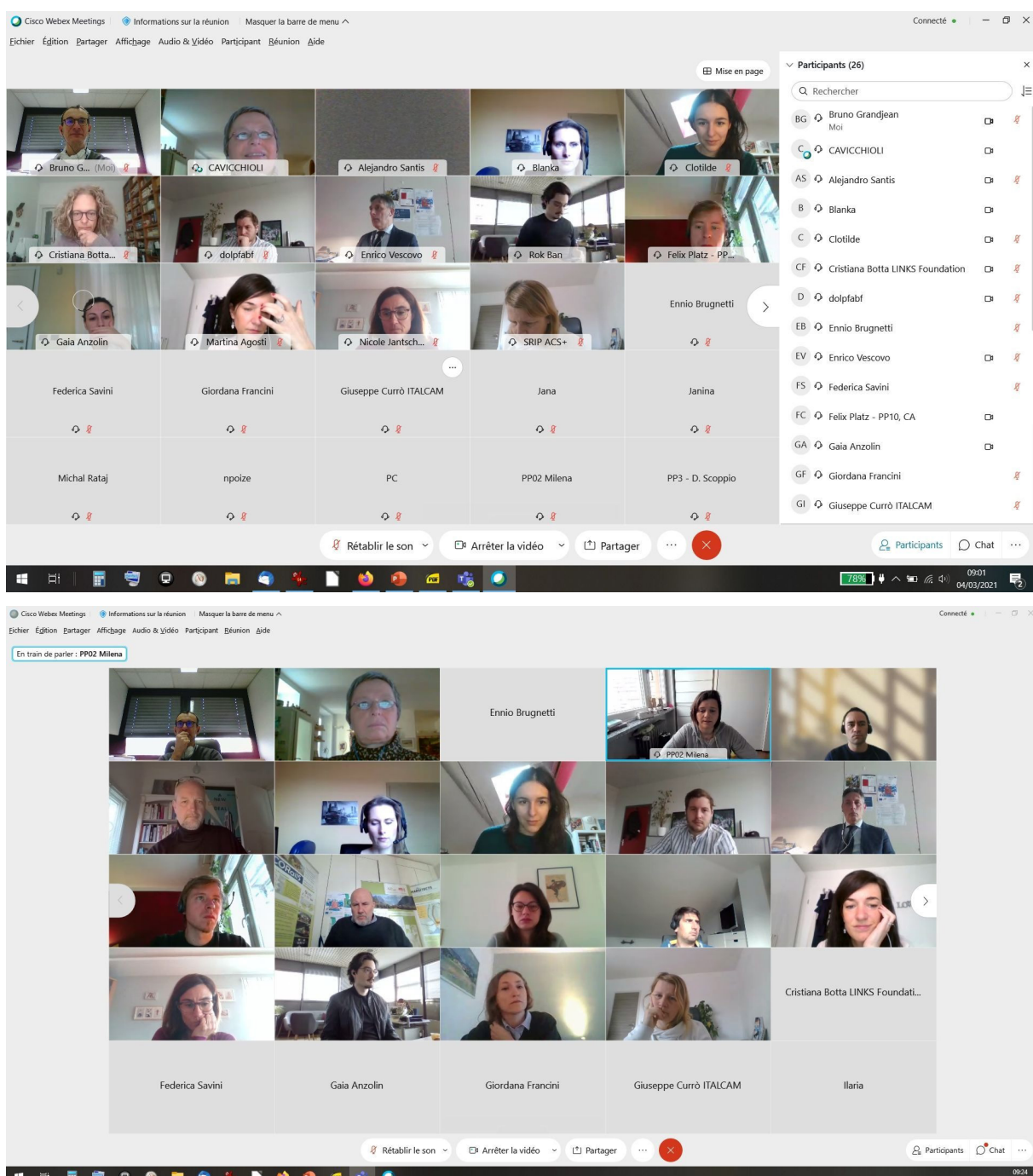
- RLL leaders and work package leaders' coordination web meetings
- TLLN meetings: although these were meant to be physical meetings (one during each official PP meeting), during the covid crisis the project switched into webinar format

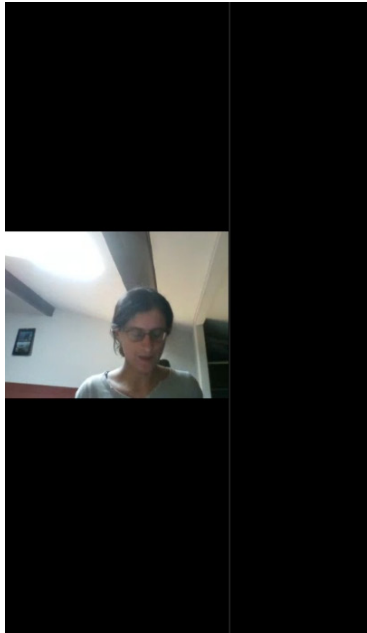
# 4 Lessons learned from e-SMART Living Lab experience

In general, the organization initially planned proved to be adapted to the need, even during a pandemic.

Relationships within the Regional Living Labs were intense, and coordination worked well.

The more intensive use of the webinar tools than expected even turned out to be an asset, and should be maintained at least in part even after the health constraints disappear.





## Le projet e-SMART

### Cadre du projet

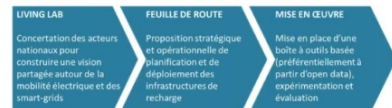
- Programme Interreg Espace Alpin
- Oct 2019 – Mars 2022
- 15 partenaires de l'arc alpin dont PVF et AURA-EE en France
- 57 observateurs associés

### Périmètre d'étude

> Transports publics collectifs	> Logistique du dernier km
Bus urbains et interurbains	Livraison de colis aux clients finaux (e-commerce, colis postaux)
Transport scolaire	
Trolleys, tramways	
Navettes gérées par des collectivités	Livraison des magasins
Autopartage	
Vélos électriques partagés	

### Objectifs

- Mieux planifier le déploiement des bornes de recharge pour les services de mobilité, les derniers kilomètres de fret et les transports publics électriques en
  - Améliorant la coopération entre acteurs publics et privés
  - Partageant une stratégie de déploiement commune
  - Outillant les territoires pour la gestion des services et infrastructures



1



## Six politiques remarquables de logistique urbaine

- Grand Londres : **Low Emission Zone** (Euro VI octobre 2021) trois *zero emission zones*
- Shenzhen : 70 000 **véhicules électriques logistiques**
- Livraisons '**off-peak hour**' à New York
- '**Curbside management**', partage de l'espace public : AreaDUM à Barcelone, Urban Freight Lab de Seattle
- **Urbanisme logistique** à Paris
- **Partage de données** aux Pays-Bas





**SAVE THE DATE:**

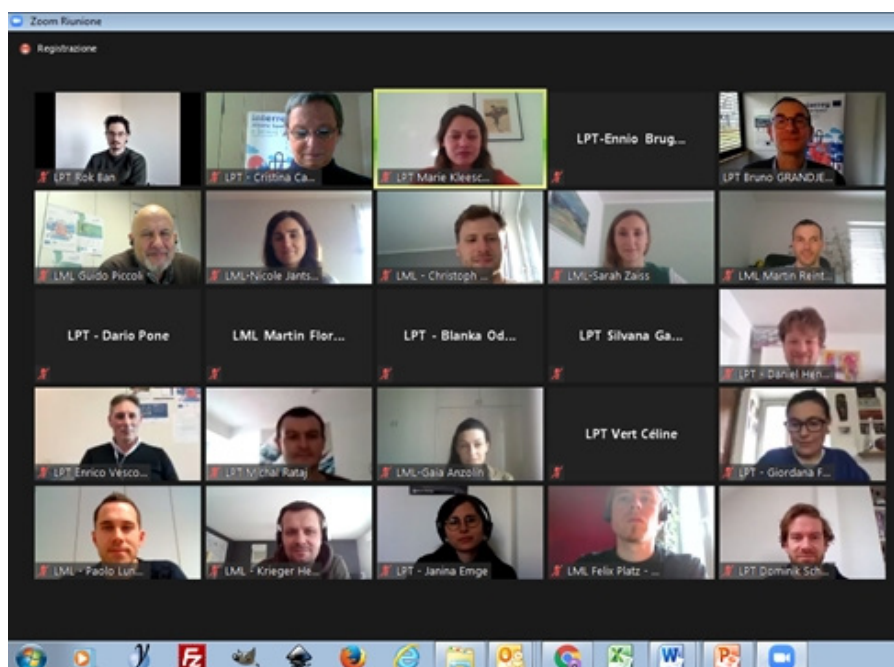
## **2<sup>ND</sup> MEETING OF E-SMART'S TRANSNATIONAL LIVING LAB**

**The promotion of e-mobility in local public transport and last-mile-logistic from a territory's perspective**

**Tuesday, 16<sup>th</sup> of February 2021 | 14:00 – 17:00 CET**

e-SMART is kicking the new year off with an online workshop dedicated to the identification and discussion of major challenges of developing an integrated electric charging infrastructure for Local Public Transport and Last-Mile-Logistics. The session will look at this goal from both a public authority's and the private sector's perspective to gain relevant insights. Furthermore, the workshop will dive into key elements necessary for a successful development and will showcase a brand new market analysis.

You are cordially invited to learn from the project's experience and contribute with your expertise and questions to a lively debate. A detailed agenda and the link to registration will be available on the **e-SMART website** soon.



The methodology for the regional living labs and the transnational living labs depicted right above was rather efficient, but it has faced great challenges, particularly because of the pandemic.



Although the very first events were held as “normal” meetings, the covid-19 crisis forced partners to shift to an entirely online process.



## Kick-off Meeting Regional Living Lab Germany 23 April 2020

PP15 - Landkreis München

23/04/2020

Kick off RLL Germany

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### Lista prisotnosti – Attendance list

Kraj, datum / place, date: Ljubljana, 18. 6. 2020

Namen sestanka / purpose of the meeting: e-SMART, predstavitev projekta in aktivnosti DS2, A.T2.2

Ime organizacije / Organization's name	Ime in priimek udeleženca / Participant's name and surname	e-naslov / E-mail	Podpis / Signature

It was a great challenge to conduct online ideation processes when none of the protagonists had any experience with such a thing and when most stakeholders were still trying to understand how to use Zoom and the likes.



Nevertheless, this process enabled the project partners to involve a significant number of stakeholders of the different e-SMART geographical areas in the long term.

The stakeholders were active in the RLL and TNLL and gave ideas for the sharing of best practices between the different participants, along with a comprehensive list of issues and challenges to overcome in order to foster e-Mobility. The large diversity of stakeholders allowed a comprehensive approach of the issues.

These best practices are also described in e-SMART Tactical Roadmap. Return on experience was also shared by the participating stakeholders, both during the RLL and the TNLL.

In addition, Project Partners needed to be flexible, and tried to exceed the first methodological framework by getting into contact bilaterally with the different stakeholders in the margins of the living labs. Indeed, it was a means for partners, especially Regional Living Lab leaders, to prepare living labs with the stakeholders and not only to animate these living labs thanks to the stakeholders' participation. This way to proceed aimed at proposing to stakeholders and companies the most operational regional and transnational living labs as possible.

Bilateral contact was also necessary to help stakeholders answer the very comprehensive survey that was devised during the course of the project, and also to motivate them to answer our mid-term evaluation questionnaire.

The use of the classic living lab methodology was also a way to test and trial this methodology. The e-SMART project partners and stakeholders are satisfied with the results obtained, which will be the subject of another part of this deliverable. The idea of starting from regional living labs before moving on to a transnational scale works and has allowed for the development of interesting reflections integrated into the various e-SMART deliverables.

It also allowed Project partners to submit project documents, in particular the roadmaps, to the analysis of the participants. Nevertheless, this process proved quite difficult to conduct with a large number of participants: reviewing sessions should be limited to a small number of motivated stakeholders to stay efficient. It is advisable to keep meetings with many participants for the expression of ideas or for topics requiring only simple feedback.

Furthermore, it should be noted that this living lab methodology requires the organisation of many meetings, both virtual and face-to-face, which was a source of complexity in the light of the Covid-19 pandemic. Indeed, as already mentioned all the meetings had to be organised virtually, which sometimes caused a certain amount of fatigue among the participants. One solution to overcome the lack of dynamism of the remote meetings was to use live ideation

software during the living labs, to boost the active participation of the connected people, but this also has its limits. Another good practice was to split meeting participants into smaller virtual rooms. We also conducted simple online surveys that provided additional momentum.

The e-SMART partners advise future Interreg project consortia planning to organise their activities around living labs to plan from the beginning of the project an adaptation of the methodology of these living labs to make them more efficient when organised virtually.



# 5 Summary of the Findings

In the e-SMART project we dealt with e-mobility applied to Local Public Transport (LPT) and to City/Last-Mile Freight Logistic (LML) in synergy with private e-mobility and energy integration.

The findings of the e-SMART living labs come from, on the one hand, the regional living labs and, on the other hand, the transnational living labs, during which the results of all RLL were put into emphasis and studied through a more general perspective.

Depending on the country and local conditions, some RLLs have been more inclined to focus on one or another of the themes (e-LPT / e-LML). Similarly, the work in each country was influenced by the composition of the groups involved.

Nevertheless, by aggregating the results it is possible to highlight problems and needs relevant to the Alpine region.

## **5.1 Common challenges**

Some of the issues identified in relation to electromobility are common to both urban logistics and local public transport: Costs, Uncertainty, and Infrastructure issues.

### **5.1.1 Costs**

- E-Vehicles are more expensive in terms of purchase cost as well as maintenance cost
- The operational costs are also higher: less flexibility (range + time to charge)
- The costs of infrastructure have to be added to the overall bill

### **5.1.2 Uncertainty**

- New vehicles need maintenance, we don't have enough information about their sustainability, TCO, residual value
- Technologies are also a factor of uncertainty: different kinds of batteries, H2 Fuel-cell – vs CNG / BioCNG
- Summer range / winter range are different

### **5.1.3 Infrastructure**

For the moment, it is mainly overnight charging: need massive investments, with various constraints.

But some challenges are specific to e-LPT or e-LML.

## **5.2 e-LPT specifics:**

Some characteristics are specific to electrified Local Public Transports:

- The global exponential increase: vehicles are becoming more and more available
- Operational constraints: very high predictability of the usage, can adjust very precisely
- On-street charging (very) expensive
- The PA funding (at least partially) is existing, on the contrary to e-LML
- There is a very high impact of user/ citizen acceptance (positive)

## **5.3 e-LML specifics:**

Specific characteristics to electrified Last Mile Logistics have also been identified:

- Vehicles are not available yet / not adapted to need (size, range)
- Overnight charging: only the big ones have their own parking spaces: it is a problem for the subcontractors (on-street charging?)
- Emergency solutions are still needed (on-street high power charging)
- For small range BeVs, there is a higher risk to unload rapidly and thus it occurs at higher costs. Who is going to pay for the extra costs? For the moment, they are all private stakeholders.
- There is an uncertainty on the evolution of regulation, since it also depends on the area
- The Public/ private concentration may help (+ fundings)

## **5.4 Actions needed**

In conclusion of the work, the main necessary actions identified are the following:

- e-LPT + e-LML: grid insertion of large quantity of E-CS at depot / company parking lot + legal
- e-LML: Overnight charging of subcontractors + opportunity charging
- e-LML: Concertation with PAs (visibility) + Share the extra costs with the help of PAs

These actions can also be found in the operational roadmap of the e-SMART project.

# 6 Annexes

## **Annex 1 – Theory and guidelines of the FormIT methodology**

e-SMART partners decided to base their network of LLs on the FormIT methodology<sup>8</sup>, which has been developed to suit and support Living Lab activities.

FormIT focuses on abilities and assets in the situation being studied, which is radically different from standard problem-solving techniques. It emphasizes the importance of the first phase in the concept design cycle, generally called analyses or requirements engineering.

As users expand their knowledge and skills, their needs and requirements evolve. It is therefore necessary to regularly review these needs to ensure that they are in line with everyone's expectations.

As a result, the FormIT method is iterative and interaction with users is a well-understood necessity. Knowledge grows through iterative interactions between phases and people with different skills and backgrounds. Cross-functional interaction facilitates the transfer of knowledge from one discipline to another in order to obtain new inputs, thus contributing to the emergence of innovative ideas.

The FormIT process can be seen as a spiral in which the focus and shape of the design gets clearer, while the attention of the evaluation expands from a focus on concepts and user-friendliness aspects to a global vision of the use of the system.

The FormIT process includes 3 repetitive cycles:

- Concept design cycle in the upper part of the figure
- Prototype design cycle in the middle
- Innovation design cycle in the lower parts of the figure.

Each cycle is divided into 3 phases:

- Appreciate Opportunities
- Design
- Evaluate

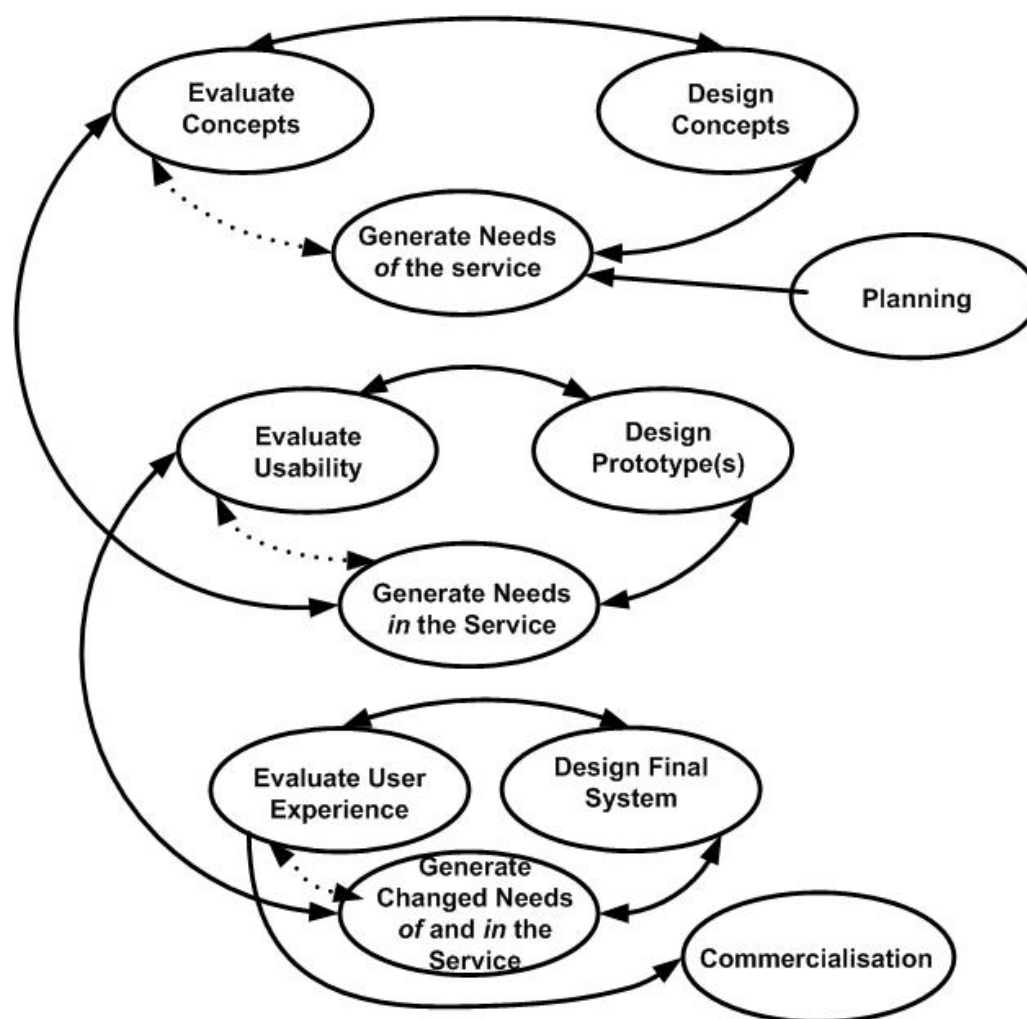
And in each phase, distinguish 3 aspects:

- Use
- Business
- Technology

Before and after these 3 cycles, 2 additional cycles are included in the process. The first is planning, seen in the upper part of the figure, and the second is commercialisation, which is visible in the lower part of the figure.

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8 Birgitta Bergvall-Kåreborn and Anna Ståhlbröst, Living Lab - An Open and Citizen-Centric Approach for Innovation



**Figure 2** – Birgitta Bergvall-Kåreborn and Anna Ståhlbröst, Living Lab - An Open and Citizen-Centric Approach for Innovation

### 6.1.1. Planning

The planning phase is essential to obtain as much information as possible about the surrounding characteristics of the project. The purpose of this phase is to combine skills to enhance knowledge sharing and a better understanding of each other's visions. The complexity here is to consider everyone's contributions in the different areas and then decide what to include or exclude from the intervention. Therefore, it is important to establish ongoing communication in order to build trust between all stakeholders.

### 6.1.2. CYCLE 1. Concept design

Concept design is the first cycle of FormIT. The appreciation of opportunities and generation of the basic needs that the various stakeholders have of the product or service should lead to the definition of a concept, which represents the generated needs from the first step in the cycle.

The needs in focus here are the needs that trigger the user's motivation to buy and use a particular innovation. This process is supported by obtaining a rich picture of different stakeholders and user groups.

When the data collection process is completed, the users' expressions should be analysed and needs should be generated and translated into concepts, which means that the focus for the work shifts from generating needs to designing concepts.

To avoid premature solutions, concepts should be designed in sufficient detail so that users understand the basic purpose of the innovation, without the need to design the innovation itself.

Once the design is completed, the focus is on the evaluation phase, the objective of which is to ensure that the involved stakeholders such as users agree with the basic objectives of the developed concept.

This means that the basic objectives and functions of the innovation should be related to the generated needs of the innovation to make sure that these are consistent. The objective of this evaluation is also to allow users to co-create the concept according to their needs.

### ***Cycle 1, phase 1 Appreciating Opportunities***

The objective is to better understand the needs that users might have for innovation.

FormIT suggests using **focus-group interviews as a data-collection method** since they are easy and effective and involve a panel of users, developers, business people and so forth.

This phase has to address the following issues and questions before designing the process as a whole:

- What is the purpose of the appreciating opportunities phase in the project? What do you want to achieve?
- Who are the target user-groups that need to be involved in this process? How should they be involved? What are the users expected to contribute with?
- Which needs, requirements and wants do the users have or express in the study?

### ***Cycle 1, phase 2 Designing Concept***

The aim is to develop concepts or rough prototypes based on the needs established in the former phase.

Questions that need to be discussed in the concept design phase can be:

- Which user expressions are most relevant?
- On what level should the concept be described to illustrate and transfer users' needs?

### ***Cycle 1, phase 3 evaluate utility and usefulness***

The goal is to encourage users to express their thoughts and feelings towards the concepts being developed as well as identifying any unexplored or somehow modified needs.

Concept evaluations should be repeated until concepts satisfactorily meet user needs and new insights about user needs cannot be identified. The aim is to identify how concepts should be related and refined to answer to the needs that have been identified in previous inquiries.

Issues that need to be discussed in this phase are for example:

- What is the approach and purpose for the evaluation? What results can be expected?
- What is the main question that needs to be answered?
- How are the identified needs and/or requirements reflected in the concept?
- How are the Key Principles addressed in this phase?

### 6.1.3. CYCLE 2. Prototype design

The second cycle begins with the identification of the stakeholders' needs in the innovation. In other words, when using an innovation, what needs are then important for the users?

As in the first cycle, this is done through a variety of data gathering methods, such as interviews and observations. One way to do this is to keep the concept design, with the related key needs, visible to users during data collection activities, so it can be referred to during the discussions.

When the data collection no longer generates new insights and findings, the focus shifts back to the design phase. However, in this cycle, the innovation's design expands to include basic functions, workflows, and interfaces.

The prototype must be detailed enough for the users to understand and experience how the final service will look and feel. This leads to the evaluation which focuses on usability aspects.

- how easy it is to learn
- how effective and enjoyable it is to use

The evaluation therefore focuses on INTERACTION between the user and the service. It is not limited to the user interface, even though this plays an important role in how the user experiences the interaction.

The challenge is to identify needs that user consider relevant, and the different expressions they may take

#### ***Cycle 2, phase 1 Appreciating opportunities***

The focus here is to determine what needs users have. We want to find the basis for the design of the system's interface and its functionality. The main goal is to collect enough relevant and suitable data to develop stable requirements.

- What is the purpose of the prototype? What situation does it aim to contribute to?
- In which physical, social, technical and organisational context is it going to be implemented?
- Decide which data-collection methods to use
- Which needs do the users have IN the system?
- How are the Key Principles addressed in this phase?

#### ***Cycle 2, phase 2 Prototype design***

The aim is to move from simple concepts to high-fidelity prototypes by focusing on the need identified by users all along the process. The main objective is to look beyond the immediate vision that comes to mind by focusing on the users' expressions to provide different design solutions.

- What is the overall purpose of the innovation to be designed?
- Which hardware should the innovation be designed for? (e.g., mobile phone, PC, surf pads, or other gadgets)
- Decide on what level the prototypes must be described to express the feeling you want to mediate.
- How are the Key Principles addressed in this phase?

### ***Cycle 2, phase 3 Usability evaluation***

The focus is to encourage users to express their thoughts and attitudes towards the innovation under development.

- What is the purpose of the evaluation? (e.g., Navigation issues, user satisfaction, graphical design, efficiency, utility, learnability?)
- Which evaluation method should be used? (e.g., think aloud, usability evaluation, field study, logging, cognitive walkthrough, focus-groups)
- Who is the typical user?
- Does the design answer to user needs, values and requirements which the prototype has been designed for? How can it be redesigned to better fulfil the needs?

### **6.1.4. CYCLE 3. Innovation design**

The third cycle starts by analysing the usability evaluation results in order to generate changes in the needs of and in the innovation.

Small changes and adjustments to requirements are quite common, especially with respect to innovation needs, as innovation develops and understanding of structure, content, workflow and interface deepens. These changes also lead to changes in the design of the innovation, as well as general development work to finish the innovation as a whole. Users' experience objectives can be both positive and negative. The latter relate to how an innovation is experienced by a user and differ from the more objective goals of usability, which focus more on how users experience an innovation rather than on assessing its usefulness or productivity.

#### ***Cycle 3, phase 1 Appreciating opportunities***

The aim is to collect information about what needs users might have both of and in the innovation. As in previous phases, the questions that need to be answered focus on identifying who the users are. This process can be combined with the evaluation phase in previous cycles. Questions concerning both utility and usability issues should be formulated and asked to users.

#### ***Cycle 3, phase 2 Innovation Design***

The objective of this phase is to move from a high-fidelity prototype with a focus on users identified needs to an innovation. Therefore, both business model aspects and designing a fully functional innovation must be considered. The main objective is to redesign the innovation according to feedback obtained in preceding phases.

#### ***Cycle 3, phase 3 User experience evaluation***

The focus is to encourage users to express their thoughts and attitudes towards the design. User experiences goals can be both positive and negative, for example both enjoyable or frustrating and focus on how users experience an innovation.

The following questions need to be clarified before beginning a user experience evaluation:

- What is the purpose of the evaluation? What do you want to achieve?
- How can we encourage and stimulate users to use the innovation during the test period?

- Develop a “test-storyline” to support the users in their test showing what is expected from them: activities they must do, for example, number of surveys, typical tasks, use of certain functionality, etc., activities they can expect from us, the time required...
- Are there any ethical considerations that need to be handled?

Conducting the evaluation: How does the innovation answer to user needs, values and requirements which the innovation has been designed for? Which improvements are needed to better fulfil the needs?

The analysis of the data from the evaluation should emphasise what went wrong as well as what needs to (or must) be changed and modified in the next iteration.

The results are to be presented in an evaluation report including users' comments and design suggestions.

The challenge is to assess users' actual experience of the final version of the innovation.

### **6.1.5. Commercialisation**

The commercialisation cycle can be viewed as a separate project in which the aim is to introduce the innovation to a potential buyer and assess its potential on the market.

In many cases, adoption of innovation only refers to the process of buying an innovation, but adoption also includes the use of the innovation. Generally, the adoption of an innovation is conditioned by a multitude of factors that influence the user

These factors can be learning, social and technological. Firstly, learning conditions are individual characteristics of a single user. These may affect the acquisition of new skills needed to use the new innovation. Secondly, social conditions explain the cultural and relational specifics shared within the communities to which the user belongs. Thirdly, understanding the technical features of the innovation is made easier thanks to the technological conditions.

Naturally, the importance of each of these conditions differs depending on the context in which the innovation is intended to be used. When a new innovation is implemented in a specific context, it is complex to study the changes in behaviour, determine what caused them, and understand all the different factors that could influence this change. The objective is to understand that the implemented innovation has actually been adopted and used by the users.



