

D4.5 Advisory Board, Transferability platform and Capacity Building Activities

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Acronyms

Acronyms	Explanation
B2B	Business to Business
B2C	Business to consumers
C2C	Consumer to consumers
CNG	Compressed natural gas
CoP	Communities of Practice
DT	Digital Twin
EDVs	Electric vehicles
EMT	Transport municipal company of Madrid
EV	Electric vehicle
E-vans	Electric vans
EVs	Electric Vehicles
GHG	Greenhouse gases emissions
ICT	Information and communication technology
KPIs	Key Performance Indicators
LEAD	Low-Emission Adaptive last-mile logistics supporting 'on Demand economy' through digital twins
LCV	Light Commercial Vehicle
LEZ	Low-emissions zone
LL	Living Lab
LNG	Liquefied Natural Gas
LSP	Logistics Service Provider
MVP	Minimum Value Product
PPP	Public-private partnership
SI	Sustainable ideas
SULP	Sustainable Urban Logistics Plan
SUMP	Sustainable Urban Mobility Plan
TEN-T	Trans-European Transport Network
UCC	Urban consolidation centre
UVAR	Low-emissions zone of Madrid
WP	Work Package

Executive Summary

This **Deliverable - D4.5 Advisory Board, Transferability platform and Capacity Building activities** – consists of a report summarising all LEAD activities related to its Advisory Board, the Transferability Platform and Capacity Building for the entire duration of the project.

The actions explained in this document cannot be dissociated from more general communication, dissemination and engagement activities, and as such, overlap with activities also described in **D4.4: Communication and Outreach Activities and LEAD website: Period 2** and **D4.2: International collaboration – Liaison with other EU projects and initiatives**

This deliverable provides an overview on:

- Transferability Platform & Advisory Board: information on the application and evaluation process, together with main activities carried out;
- Capacity Building activities: focus on the LEAD Massive Open Online Course: ***Unlocking the potential of Digital Twins for sustainable on-demand urban logistics*** (hereafter MOOC).

1 Introduction

LEAD has created Digital Twins (DTs) of urban logistics networks in six cities to support experimentation and decision-making with on-demand logistics operations in a public-private urban setting. Innovative solutions for city logistics are represented by value case scenarios that address the requirements of the on-demand economy while aligning competing interests and creating value for all stakeholders. Each value case combines several measures (LEAD strategies): a) innovative business models, b) agile urban freight storage and last-mile distribution schemes, c) low-emissions, automated, electric, or hybrid delivery vehicles, and d) smart logistics solutions.

Cost, environmental, and operational efficiencies for value cases have been measured in 6 Living Labs (LL). Evidence-proven value cases and associated logistics solutions have been delivered as exploitable DTs, incorporating the models that support adaptation to different contexts and provide incentives for public-private partnerships (PPPs).

The LEAD consortium comprises 22 partners, all of whom are involved in the LLs. This structure incentivised the co-creation of solutions by city authorities, logistics industry leaders, start-ups, and research experts in freight modelling, complex simulation and logistics optimisation.

2 Transferability Platform & Advisory Board

The **LEAD Transferability Platform (TP)** brings together external cities and regions to benefit from a tailored transferability programme building upon LEAD's results. This includes capacity-building, training, technical visits, interactive workshops, and feedback. The idea was also for this exchange to be bilateral, meaning that TP members were also expected to weigh in with specific knowledge for specific LEAD activities.

LEAD also set up an **Advisory Board (AB)** comprising a well-balanced group of advisors representing research and business interests, drawn from across Europe and beyond and embracing the whole range of knowledge of the project focus areas. The AB counted with **17 members** (see Table 1).

2.1 Application & Evaluation Process for Transferability Platform

In November 2020, POLIS launched a **call for potential members of the TP**, open until the end of January 2021. The call was initially supposed to close in December 2020, but was extended to allow more time for potential applicants. A [Terms of Reference document](#) was drafted, together with an short questionnaire that applicants were requested to fill in.

TP members would benefit from a dedicated budget to fund travel expenses or personnel time spent on project engagement, including internal meetings and discussions. The main activities planned were:

- Interviews and surveys for the identification and analysis of the requirements and necessities of cities, and your expectations towards the LEAD solutions.
- Capacity building activities: webinars, e-training and bilateral meetings/discussions with the partners responsible for the LEAD LL and specific solutions of their interest.
- Direct access to the project's key reports and events, while you will receive tailor-made and hands-on advice on the knowledge and tools developed in LEAD.

Members of the TP were expected to:

- Actively participate in LEAD TP meetings and discussions.
- Provide feedback on LEAD measures and strategies and their implementation in the Living Labs (LLs).
- Follow the progress and assess the results of the project in a constructive manner.
- Disseminate LEAD through your communication channels (events, website, newsletters).
- Participate in the transfer activities planned.

Potential members were required to a) be cities or regions and b) be active and/or interested in at least one of the LEAD strategies, namely:

1. Innovative business models.
2. Agile urban freight storage and last mile distribution schemes.
3. Low emission, automated, electric or hybrid delivery vehicles.
4. Smart logistics solutions.

To promote the call, specific communication materials were created, **including visuals for news and social media posts** (see Figure 1). The call was heavily promoted on LEAD channels, and beyond (i.e., sister projects, ELTIS, POLIS channels, ALICE-ETP, etc.).



Figure 1: LEAD call for Transferability Platform Members

The questionnaire that applicants had to complete included the following questions:

1. What relevant policies, strategies or commitments does your city have in place (e.g. Sustainable Urban Mobility Plan, Digitalisation Strategy, Sustainable Urban Logistics Plan, etc.)?
2. Living labs are special settings aimed at testing and demonstrating the viability and scalability of new solutions in real-life conditions by engaging stakeholders, citizens, and the local community. Is there a Living Lab in the field of mobility, logistics and automotive sectors that is currently operating in your city?
3. What activities has your city already undertaken to support experimentation and decision making with on-demand logistics operations in a public-private urban setting? What results have been achieved? What future plans do you have in this area?
4. Are you active in one of the LEAD Strategies? Which one(s)?
 - a) Innovative Business Models
 - b) Agile urban freight storage and last-mile distribution schemes
 - c) Low-emission, automated, electric or hybrid delivery vehicles
 - d) Smart Logistics Solutions
5. What is your main aim in becoming a member of the LEAD Transferability Platform? Are there any specific needs you wish to address?
6. What insights and experiences could your city share with other partners involved in the project?
7. Do you have any questions for us? Or any other information you would like to share?

The first step of the evaluation process was to carry out an eligibility check, as the partnership received applications from entities which were not cities or regions, deeming them ineligible. The following step was the analysis of the short questionnaire that applicants had to fill in. This was the basis for evaluation process to join the TP, as these were instrumental in assessing applicant's urban logistics profile and assess the complementary and relevance to LEAD LLs.

Having received 14 applications – after an eligibility check - a decision was made to bring in **ten cities and regions from seven countries** as members of the LEAD TP (see Figure 2 for full list).¹ The members are at different stages when it comes to the development of Sustainable Urban Logistics Plans, participation in projects and ambitions to create Digital Twins.

Even if the initial idea was to accept six members, the project (in coordination with the project officer), decided to accept a higher number of members. This is because, given the COVID-19 pandemic, travel had come to a halt and the existing budget for travel was to be used at a later stage, with an adapted plan with less face-to-face meetings.²

¹ Toulouse was initially in this list, but did not engage in the activities of the TP (see section challenges for additional information)

² Additional information on travel covered by LEAD for Transferability Platform and Advisory Board members can be found in the following sections (with concrete figures reported in the financial reporting).



Figure 2: LEAD Transferability Platform Members

2.2 Advisory Board Members

Table 1 provides information on the LEAD AB Members.

Table 1: LEAD Advisory Board Members

Name	Organisation
Francois-Regis Le Tourneau	L'Oréal, ALICE
Fernando Liesa	ALICE-ETP
Juan Azcarate	Madrid City Council
María Eugenia López Lambas	UPM, CIVINET Spain And Portugal ³
Mark Gohlke	CARA European Cluster for Mobility Solutions
Toril Presttun	Norwegian Public Roads Administration (NPRA)
Michelle Coldrey	City of Gothenburg
Yossi Sheffi	MIT Center for Transportation & Logistics
David Gonsalvez	Malaysia Institute for Supply Chain Innovation
Rafael Florez	CLI-Logyca
Francesco Ferrero	LIST

³ CIVINET Spain and Portugal does not exist anymore. It has been replaced by CIVINET Iberia and the secretariat is assumed by BABLE.

Koen Triangle	IMEC
Jon Onland	Association of Dutch Municipalities
Ondřej Přibyl	Czech Technical University in Prague
Karsten Hülsemann	City of Bremen
Shaoxuan Lin	MIT Centre for Transportation & Logistics
Fabien Nonnez	IKEA

In addition to being invited to consortium meetings, members of the AB benefited from the activities organised for the TP members, as detailed in the next sections.

2.3 Main Activities

Kick-Off of Activities for the TP

The **kick-off meeting of the TP** took place on **April 20th, 2021**, with a first moment for the members to contact with partners. LL leaders presented the objectives of their activities, whereas TP members presented the profile of their region/city and their expectations of the cooperation.

The agenda was as follows:

- 11:30: **Welcome by Project coordinator and brief introduction to LEAD**, Irene Blázquez, Project Coordinator, EMT MADRID
- 11:40: **Presentation of the Transferability Platform activities**, Giacomo Lozzi, POLIS
- 11:50: **Presentation of TP members**, TP Members,
- 12:15: **Brief presentations of each LEAD Living Lab**
 - Madrid (Sergio Fernández Balaguer, EMT Madrid)
 - The Hague (Sven Mittertreiner, The Hague)
 - Budapest (Vivien Nagy, BKK)
 - Porto (Nuno Gouveia, SONAE)
 - Oslo (Svein Bråthen, Molde University College)
 - Lyon (Yann Briand, IRT SystemX)
- 12:40: **Q&A**
- 13:00: **END**

Webinar: City Logistics landscape in the era of on-demand economy: main challenges, trends and factors influencing city logistics

On **June 8th**, the first Webinar organised specifically for members of the TP took place. It focused on presenting and discussing the main findings of the LEAD report [City Logistics landscape in the era](#)

[of on-demand economy: main challenges, trends and factors influencing city logistics](#). POLIS and Molde University College were responsible for this action.

The agenda was as follows:

- 11:00: **Welcome and introduction**, Giacomo Lozzi, POLIS
- 11:05: **Presentation of the Report: City Logistics landscape in the era of on-demand economy: main challenges, trends and factors influencing city logistics**, Valerio Gatta & Edoardo Marcucci, Molde University College:
- 11:20: **Guided discussions, delivery locations, modes and time: Typologies of agile storage & last-mile distribution schemes: loading and unloading area management, consolidation, new technologies**, Giacomo Lozzi, POLIS
 - *Research findings*
 - *Discussion on cities' & regions experience/testing activities*
 - *Discussion on most promising categories*
- 12:15: 12:20: **Wrap-up**
- 12:30: **END**

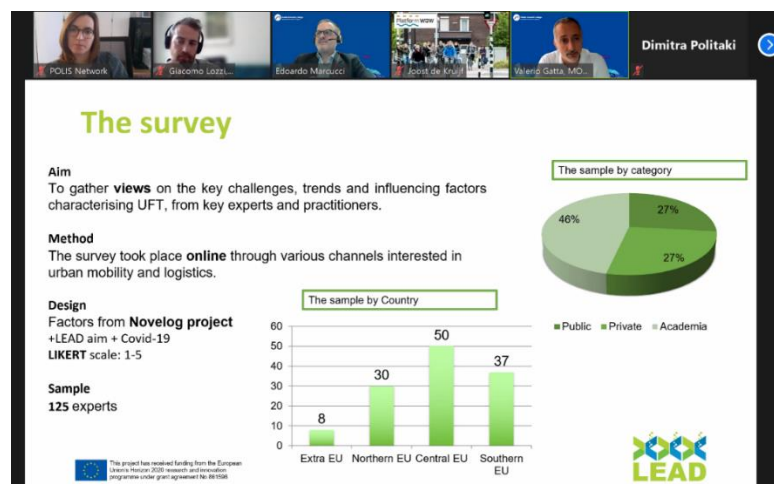


Figure 3: LEAD webinar main challenges, trends and factors influencing city logistics

A satisfaction survey was shared with participants afterwards. The majority of respondents (83.3%) agreed that the webinar fulfilled their expectations and was satisfied with the webinar. Some of the topics they would like to explore further were: crowdshipping, microhubs, challenges in Digital Twins deployment and potential solutions.

Bilaterals

From **September to October 2021**, a series of **bilateral meetings** were carried out with each one of the LEAD TP Members. During these discussions, participants exchanged on:

- a) the existing urban freight and/or Digital Twin plans/strategies in their context,
- b) the members' expectations/needs for their cooperation with LEAD, and

- c) what kind of inputs they could bring not only for the implementation of LEAD LLs activities but also as course materials for the LEAD Capacity Building Programme.

The outcomes of these meetings informed the activities to be organised for TP members during the remainder of the project.

Futureshop: Hyperconnected city: The Hague

On March 3rd and 4th 2022, LEAD organised a hybrid workshop: “Futureshop:Hyperconnected city”, within the scope of the Hague LL in the LEAD project. The first day took place at TU Delft, with the possibility of joining remotely. The second day consisted of a side visit to The Hague to see and hear more about the implementation of the city’s LL.

Event participation was by invitation only. **The first day was open to a wider group of stakeholders, whereas the side visit was organised exclusively for LEAD AB and TP Members.**

The LL of The Hague envisions a ‘Hyperconnected City’ where the city logistic web of numerous multi-modal logistics and transportation service providers can co-operate to ensure smart consolidation and synchronisation. In the workshop, a digital representation of this vision was presented, together with other Dutch Digital Twin experiences.

The agenda was as follows:

- 13:00: Welcome, Prof. Lóránt Tavasszy, TU Delft
- 13:10: What is the LEAD project, Sergio Fernández Balaguer, EMT Madrid
- 13:20: Living Lab The Hague, partner introduction, Local partners
- 13:30: LEAD Value Cases, Thomas Robers, Next2Company
- 13:50: Discussion
- 14:40: Coffee break
- 14:55: Experiences from other Digital Twins, Bram Kin, TNO
- 15:05: Digital Twin Platform, Dimitra Politaki, Inlecom
- 15:25: The Hague Modelling, Rodrigo Tapia, TUDELFT
- 15:45: Discussion: Digital Twin and Decision-Making
- 16:40: Closing
- 17:00 Networking drinks

Futureshop: Hyperconnected city

3 March, 2022 from 13:00 to 17:00
TU Delft/Hybrid

This workshop is organised within the scope of the activities of The Hague Living Lab in the LEAD project

The event will be hybrid. Event participation on-site is no longer possible, but you can join us online. The registration deadline is February 18th.

Register using the QR Code:



Organisers:



SAVE THE DATE

You are cordially invited to the workshop *Futureshop: Hyperconnected city*. This workshop is organised within the scope of the activities of The Hague Living Lab in the LEAD project.

City Logistics and Physical Internet are two major concepts aiming to profoundly change freight transportation and logistics for increased economic, environmental and societal efficiency and sustainability.

The living Lab of The Hague envisions a 'Hyperconnected City' where the city logistic web of numerous multi-modal logistics and transportation service providers can co-operate to ensure smart consolidation and synchronisation. In the workshop, a digital representation of this vision will be presented, together with other Dutch Digital Twin experiences

The preliminary programme is enclosed, as well as the link for registration. Registration deadline: February 18th.

Event participation is by invitation only. The event will be hybrid. COVID-19 prevention measures will be in place for attendance on site.

As a member of the LEAD Transferability Platform and/or Advisory Board, if you wish to participate on-site, the project will cover your travel costs. Make sure you select the appropriate option in the registration form, and we will contact you to make travel arrangements.

Organisers



Register using the QR Code:



LEAD CIVITAS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 861598

Figure 4: Promotional materials of LEAD The Hague's event

The event counted with a participation of 67 participants online and 23 onsite. **Four TP members and two AB members** travelled to the Netherlands, with their trips reimbursed by LEAD. Seven AB members joined online.



Figure 5: LEAD The Hague's event

Working Group Meeting on Urban Freight, co-organised with LEAD

A meeting of the POLIS Working Group on Urban Freight (WG UF), took place in Madrid on 13th June, co-organised with LEAD. The gathering of the POLIS WG UF was exceptionally open to **the LEAD AB and TP members**, with the scope to further exchange and network with POLIS members on ongoing activities and projects dealing with urban logistics.

The focus of the meeting was to discuss on challenges posed by last-mile on-demand logistics in European cities, and exchange insights about potential solutions to tackle these, including the adoption of Digital Twins in an urban environment. Digital twins could have a significant impact on the design, operation, and optimisation of logistics infrastructure, such as warehouses, distribution centers, and cross-dock facilities in European cities. Other solutions tested by other participating local authorities, such as microhubs and urban consolidation centers, were discussed.

The meeting was followed by a technical side visit to the micro hub in Plaza Mayor the day after, created in the scope of the activities of the LEAD LL. Participants were also granted access to the "Global Mobility Call" Congress.



Figure 6: Promotion Materials of meeting

Agenda on Monday 13th June 2022 – 16:00 – 17:30 CET

Time	Title of the intervention	Speaker / Facilitator
16:00	Welcome to the participants	Lola Ortiz Sanchez , Chair of the POLIS Working Group on Urban Freight
16:05	Scope of the meeting	Claudia Ribeiro - Project Manager (POLIS) All participants

	Brief tour de table of all participants	
16:15	Brief explanations of the best experiences implemented in Madrid on city logistics, emphasising Madrid's micro-hub in Plaza Mayor and the LEAD Living Lab & Digital Twin (to be visited the day after)	Lola Ortiz Sanchez , Chair of the POLIS Working Group on Urban Freight
16.45	Sharing of (ongoing) experiences from participants across Europe	Members of the LEAD AB and TP (e.g. Hasselt, Leuven), POLIS WG UF members, LEAD partners
17:05	Discussion and synergies with LEAD / other running projects / future calls	All participants – facilitated by POLIS
17:30	Wrap – up and closure	Raffaele Vergnani – Coordinator of the Working Group on Urban Freight (POLIS)
20:00	Dinner	



Figure 7: LEAD/POLIS Working Group Meeting

Agenda on Tuesday 14th June 2022 – 03:30 – 13:00 CET

Time	Title of the intervention	Speaker / Facilitator
09:30	Technical visit - Plaza Mayor microhub (1h30) - Meeting point: Equestrian statue of Philip III in the centre of the Plaza Mayor (https://goo.gl/maps/yjmXWoMdRF5aqDe19)	All
11:00	Transfer to IFEMA by special EMT bus	All
11:30	Arrival to IFEMA	All

As of 11:30	• Free visit to the "Global Mobility Call" Congress - Access enabled by the LEAD project	Everyone who requested access pass
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There were several key findings resulting from the discussion. Stronger collaboration between cities and logistics players is key to the development of effective and successful measures. The range of solutions and approaches shown by Madrid can be useful and replicated – of course considering the specific needs and size of each city – in other European contexts. E.g. replace the current fleet with cleaner vehicles, e-commerce, and infrastructure, tackle the lack of data issue, start implementing a LEZ for freight, and define specific Key Performance Indicators (KPIs) to assess and monitor city logistics performance.

As the population in cities continues to grow there are increasing challenges for all city logistics stakeholders to cope with growing levels of congestion and disruption. More integrated and real-time data from sensors provide an opportunity to develop richer information and improved models, such as digital twins.

An increased emphasis on financing modelling will be required to develop new business models for successfully implementing city logistics solutions. More integrated models are necessary for designing multi-modal freight networks. There is also a need for improved decision-making tools for enhancing land use planning that considers freight and logistics.

The meeting counted with the attendance of **four members of the LEAD TP and three members of the AB**, with their trips reimbursed by LEAD.



Figure 8: Side visit to the micro hub located in Plaza Mayor

The ABCs of Digital Twins for Urban Freight: the LEAD project so far

On March 13th, 2023, as LEAD drew closer to its conclusion, it organised a webinar to share its main findings on Digital Twin's potential to respond to the serious strain put on last-mile delivery systems by on-demand logistics, counting with 24 participants.

Participation was possible by invitation only, but registration was mandatory. The webinar was organised with the **LEAD AB and TP members as the core group**. However, it was decided to also open it to members of the [ALICE-ETP Digital Twin Knowledge Platform Group](#), as well as members of [the POLIS Working Group on Urban Freight](#).

The agenda was as follows:

- 14:00 – 14:05 Welcome, Claudia Ribeiro, POLIS
- 14:05 – 14:20 Quick recap of LEAD, Ioanna Fergadiotou, INLECOM
- 14:20 – 14:35 Towards a Digital Twin Framework for Adaptive Last Mile City Logistics, Sebastian Hörl – IRT SystemX,
- 14:35 – 14:55 The LEAD Digital Twin Platform, Dimitra Politaki, INLECOM
- 14:55 – 15:15 Q&A and discussion
- 15:15: END

The initial version of the agenda included the participation of the LEAD TP Member Noord-Brabant to explain their experiences with Digital Twins locally, as well as from Argaleo: a company that has been working on Digital Twins on different fields in the Netherlands. However, due to last minute commitments, they were not able to participate.

When exchanging on the main existing challenges to build a Digital Twin for UF, participants highlighted, for the most part unsurprisingly, the following:

- Data collection, integration, sharing, availability and data protection policies,
- Cooperation among competitors
- Interoperability with other Digital Twins/standard framework.

One of the main conclusions from the webinar is the need for “more problems” – in other words, what-if scenarios in the cities - to scale up the possibilities of the modelling tool for different types of use cases, as well on how to make this exercise more accessible to city practitioners who might not be data and modelling specialists.

Two types of new cases could be considered:

1. New use cases that could use the current LEAD-models from the model library,
2. New use cases that need new models to feed the library.

As for the first type, LEAD could enquire:

- How do cities know which models are already available in the library?
- Clarify what type of use cases have already been answered using the current models, so they can formulate new use cases.

The idea of creating templates for formulating the “what if question” was suggested, but this might be too complex for city stakeholders. An alternative could be providing guidance on how to make formulating a use case easier, for instance, by developing a set of questions regarding:

- As-is and what-if scenarios,
- The type of data needed,

- The KPIs to measure the efficiency/sustainability (or other goal) of the new situation,
- Added value needed for different stakeholders.

This would allow to provide more insight on the potential of the LEAD platform and to formulate useful use cases to enhance the platform even further. The conclusion was that cities would like to dive into the LEAD project starting from some well-chosen “what if” questions and easy use cases, and then explore how the models put in a sequence to create a data-driven scenario and present a solution and its impact.

Therefore, and given the complexity of the topics at hand, participants (particularly cities from the LEAD TP) voiced their interest in participating to a practical workshop during which project partners would walk them through the LEAD Platform with practical exercises.

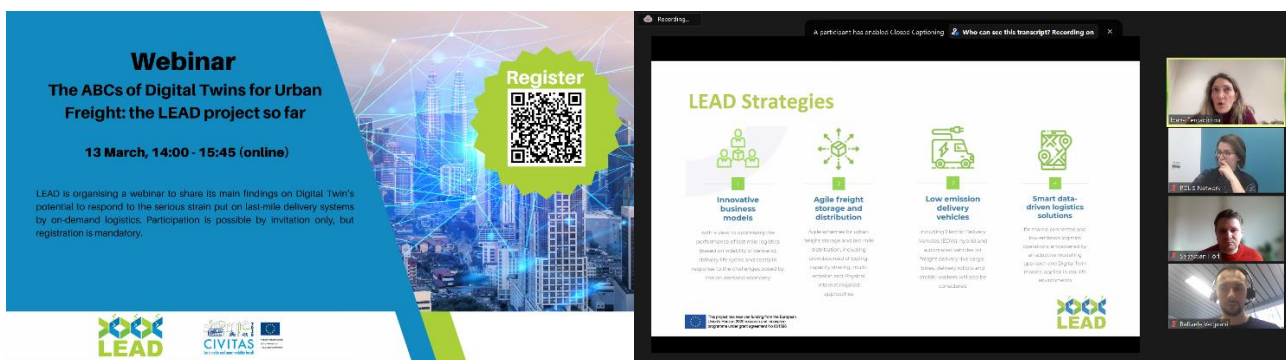


Figure 9: LEAD webinar: The ABCs of Digital Twins for Urban Freight

Participation to LEAD Final conference

The LEAD Final Conference (Urban Logistics Innovation Day) took place on 26 September, in Brussels, counting with 101 participants. Among these participants, featured 9 representatives from the LEAD AB and LEAD TP, namely from IKEA, the Norwegian Public Roads Administration, LIST, the borough of Southwark, and the cities of Leuven, Bremen, and Hasselt.⁴ Additional information about the LEAD Final Conference – including agenda – is included in Deliverable 4.4: Communication and Outreach Activities and LEAD website Period 2.

⁴ Additional information on travel covered by LEAD for Transferability Platform and Advisory Board members can be found in the following sections (with concrete figures reported in the financial reporting)



Figure 10: LEAD Final conference

2.4 Challenges

The engagement with members of the AB and TP was not without challenges.

The most obvious one, which impacted all ongoing projects in the last years, was the COVID-19 pandemic. One of the main added-values of engaging with LEAD were face-to-face exchanges between AB and TP members and consortium members, as well as visits to the different LLs. Unfortunately, the first moment that such an exchange was possible was during The Hague's workshop, one year into the project. Even then, there was a reluctance on the part of members to travel, mostly conditioned by travel restrictions imposed by local authorities, which meant that most cities present were those in the vicinity of the venue (i.e. Belgium). To address this bottleneck, LEAD incentivised online meetings, workshops and webinars to engage with the stakeholders.

An additional challenge was related to the people who applied for the TP in each city and lack of internal coordination. For example, a specific city applied and was selected for the TP. However, upon selection, we received the news that the person who had applied on behalf of the city had gone on parental leave. There were no instructions left for another colleague to follow-up, and when attempting to contact city staff, we obtained no response. Other changes in staff in other applicants had similar effects: as they were replaced by others, there was no possibility for follow-up.

On a positive note, Belgian cities involved in the TP – Leuven and Hasselt – have since then engaged in closer cooperation in the domain of urban logistics, after having connected via the LEAD project.

3 Capacity Building

3.1 LEAD Massive Open Online Course

The LEAD Massive Open Online Course: ***Unlocking the potential of Digital Twins for sustainable on-demand urban logistics*** (hereafter MOOC) was organised between end of February and mid-June.

The objectives of LEAD's MOOC were defined as:

- Using the results of the LEAD the LLs to deliver a Digital Twinning Capacity Building Programme,
- Providing a general introduction to urban freight, with a focus on on-demand and last-mile logistics,
- Establishing a mechanism to facilitate knowledge sharing & enabling the exchange between experts,
- Delivering a dynamic course in a flexible and modular format,
- Improving the capabilities and skills of personnel of authorities and researchers on open-source tools and modelling for Digital Twins.

The overall approach to Capacity Building was defined as follows:

- Leveraging on different interactions with other **projects and initiatives** for potential production of common capacity building material/lectures (i.e., CIVITAS, DUET, SENATOR, UlaaDS, Living-in.EU, etc.),
- Invite **external experts** contributing with specific knowledge to our courses,
- Creation of a **MOOC** (online modules) to improve the capabilities and skills of personnel of authorities and researchers,
- Organise **hands-on workshops**, on the features and use of LEAD products and models,
- **Target groups**: Local & Regional Authorities, university students, mobility practitioners.

In addition to exchanges between LEAD partners, we have endeavoured in discussions with the members of the TP to gather insights into what type of topics they would like to see addressed, as well as which type of formats they would favour.

LEAD also used the workshop at the **European Week of Regions and Cities (Local Digital Twins: Forging the Cities of Tomorrow)** to also get inputs about what are the existing training needs for cities and regions. Participants indicated that data availability, digital awareness at the political level, and data quality and format as the most pressing training needs, while also raising the point of LL management.

The following sections focus on the overall development of the MOOC, including formats, platforms, content, communication campaign, among others.

3.2 Process and methodology

A task force was created for the conceptualisation of the LEAD Massive Open Online Course, including the following partners: POLIS, MOLDE, Next2Company, EMT Madrid, IRT SystemX,

TUDELFT, UPM, ZLC, INLECOM, CITYLogin, LastMile Team. The task force convened on a regular basis to assess the status of the process and plan next steps (i.e. topics to be addressed, the modalities of training, the allocation of responsibilities, duration, etc.).

The group decided that the course would include the following formats:

- **Video lectures:** self-recorded video lectures with guidance instructions to a) ensure format consistency and b) simplify the recording process for lectures. Post-recording editing was carried out by an external agency hired for the purpose. The videos were uploaded to the learning platform (see below), but also made available via YouTube.
- **Exchange Session:** The exchange session was an opportunity for students to directly interact with lecturers, diving deeper into specific topics explored in the videos, and clarifying existing questions in an online workshop.
- **Assignments:** quizzes, self-assessment tests, open-ended questions based on project results were created for students. The completion of the assignments was a criterion for course certification.
- **Resources:** slides, deliverables, reports, scientific papers, presentations, and other additional materials.
- **Moderation forum:** a discussion forum available on the learning platform where students can interact among themselves, but also with the coordination team.

To ensure that the content of the course was streamlined and no delays in delivering material would happen, some requirements were established, namely:

- All content to be delivered 1 month before course starts so that video editor had time to prepare,
- Maximum: 30 minutes per module,
- Maximum video duration: 10 minutes per video,
- Runtime: on average 1 week per Module
- Total run time: 16 weeks in total.

Additionally, several **guideline documents** were prepared and shared with partners and/or potential lecturers, including:

- Thorough instructions for video recording shared with lecturers,
- Templates for lecture slides,
- A timeline for development of course content and video editing,
- Organisational checklists for Unit leaders.

Massive Open Online Course

Unlocking the potential of Digital Twins
for sustainable on-demand urban logistics

Scenarios comparison – April 2022

Service from	Distribution leg	Working time	Driving time	Time to serve	km driven
S. Fernando	Last-mile	19:32	06:02	12:30	222
	Delivery to CityHub	01:20	01:00	00:20	
Plaza Mayor	Last-mile	17:49	04:19	12:30	
	Total	18:49	05:19	12:50	149



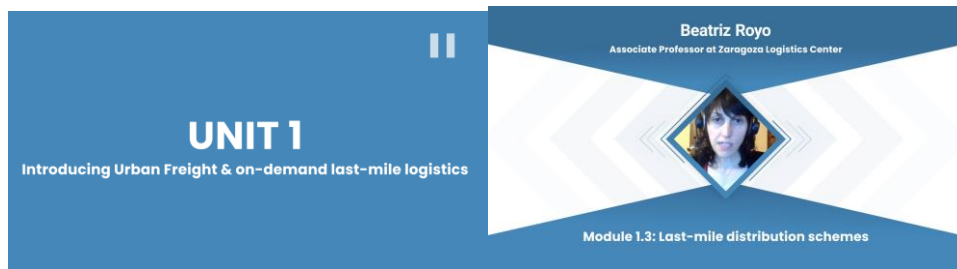


Figure 11: Print screens of LEAD MOOC lectures

3.3 Learning Platform

The initial idea to host the LEAD MOOC was use [eDX⁵](https://www.edx.org), an open-source Learning Management System, by potentially using the installation of one of the LEAD university partners. However, after enquiring, it was known that only one of the LEAD partners was using this platform and, due to internal reasons, did not manage to get authorisation to host the course. The option of buying a commercial licence of a learning management system to host the course through the project was not considered due to its high cost.

The following step was to try out different open-source alternatives, including edX, which was setup but proved not fit for purpose due to the complexity of managing the back-end, but mostly due to the lack of a simple registration process for students. These difficulties in finding a platform, also considering the existing budget (i.e. no initially planned dedicated budget to costs with a learning platform), resulted in a delay in the organisation and roll-out of the course.

The solution was to host the LEAD MOOC on the [Mobility Academy](#), an international Moodle-based learning platform developed and coordinated by Rupprecht Consult. It features over 40 online courses from 13 different EU-funded projects, covering a wide range of mobility-related topics.

A dedicated wing for LEAD was created on the platform, designed in line with the project's visual identity to ensure easy access and navigation for participants.

⁵ <https://www.edx.org>

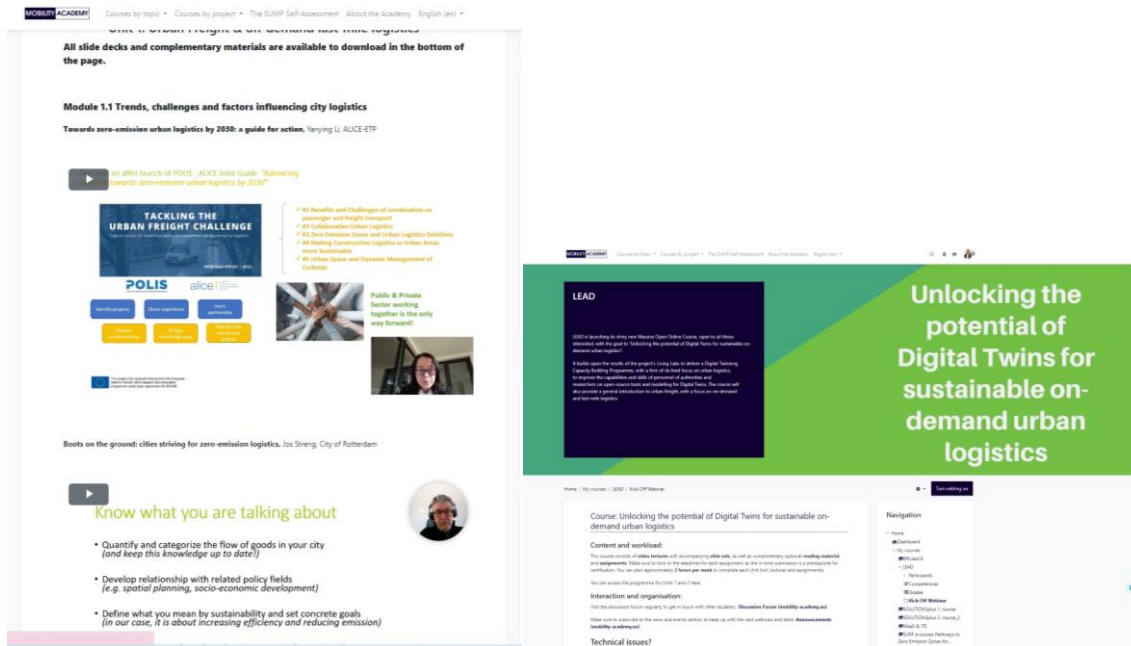


Figure 12: LEAD MOOC working space

The course was under live moderation between February and June 2023. In practical terms, this means that this was the period of time in which LEAD partners were publishing and grading assignments, announcing the video availability week by week, exchanging with students, etc. It also means that, to achieve certification, students would have to complete the assignments during this period. After this time period, students can still register to the MOOC and watch the lectures, but do not benefit from the live exchange benefits. Partners remain available to exchange with course takers in the case they reach out for additional information. The course will be available on the platform for **five years**. Other synergies and further usage of LEAD MOOC materials is explained below in the synergies section.

The Mobility Academy allowed including all the formats explained in the previous section (i.e. video lectures, assignments, resources, forum, etc.). The video lectures are uploaded to YouTube and then linked with the Mobility Academy. During the first phase, the videos were unlisted on YouTube, which means that individuals could not look for them, and only access them by using the link. This was the case to push participants to register via the Mobility Academy. After the live moderation period was over, the videos were made fully public on the YouTube channel to reach a higher number of participants.

3.4 Content

The MOOC LEAD task force worked closely on the conceptualisation of the course, based on project outcomes and deliverables. A decision was made to “divide” the course in two parts. A more introductory part in Units 1 and 2, and more advanced and focused look in the technical specificities of Digital Twins for Urban Freight in Units 3 to 5. Certification was also issued considering this division.

The rationale behind this choice was to also allow people who are less familiar with the topic of last-mile on-demand logistics to assess relevant information, while also catering for a target group with a more advanced level of knowledge.

The course is divided **into 5 Units**. These are, in turn, **split into different modules**. The final structure is presented below:

- 1. Introducing Urban Freight & on-demand last-mile logistics, led by POLIS**
 - New challenges of on-demand last-mile logistics, electrifying the last-mile (ZEZfs), last-mile distribution schemes, etc.
- 2. Living Labs for Urban Freight and Digital Twins, led by ZLC**
 - How to set-up a Living Lab, stakeholder engagement and co-creation, LEAD Communities of Practice.
- 3. Modelling, simulation, and data for urban freight planning, led by TU DELFT**
 - Review of existing models and simulations applied to urban freight, Data sharing & platforms for data sharing, application of modelling.
- 4. Digital Twin Technologies, led by IRT SystemX**
 - i.e., Basic concepts and architecture, technical requirements, interoperability
- 5. Decision-making, led by INLECOM**
 - i.e., How to use models for policy-making, visualisation and decision support system tools, with the LEAD Platform. In the context of this Unit, learners had the opportunity to use dedicated accounts to access the LEAD platform and complete hands-on assignments.

Each Unit leader oversaw coordinating the conceptualisation of the unit, identifying lecturers and collecting videos, creating the assignments, and managing the platform, while their Unit was under live moderation.

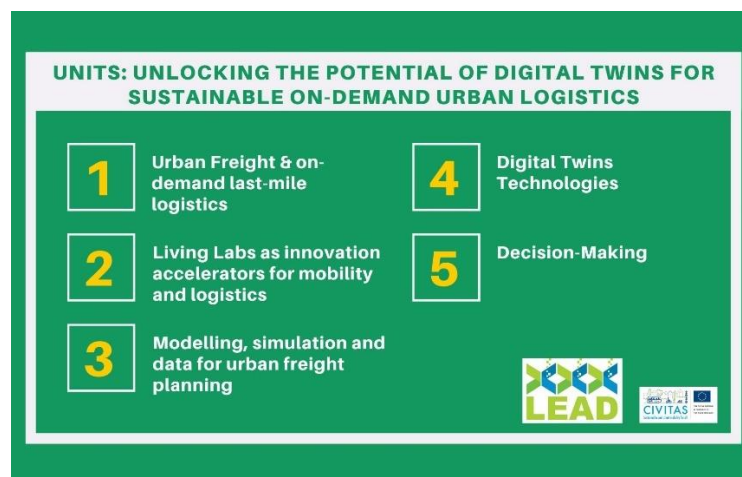


Figure 13: Units of the LEAD MOOC

The complete structure of the MOOC with corresponding Units, Modules and lectures is available on the Annex section.

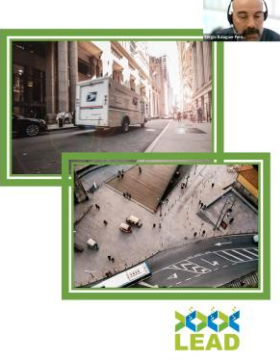
3.5 Kick-off Webinar

The Kick-off webinar was organised on the 27th of February, with the objectives of presenting LEAD, the course's goals, content and activities, the learning platform, and establish a first moment of interaction with registered and potential students. A total of 92 people participated.



Context

- Rise on-demand logistics → stress last mile delivery systems
- **Customer:** responsive system for customised products
- **Industry:** instant delivery
- **Cities:** possible negative consequences.
 - Urban planner + city authorities + stakeholder = prediction, evaluation, new business models
- **LEAD:** develop logistic solutions ↔ Low emission operations, adaptive model & Digital Twins models



Unit 1: Urban Freight & on-demand last-mile logistics

Unit Leader: **POLIS**

- Scope: It aims to provide an introduction to urban freight, with a focus on on-demand and last-mile logistics, namely current trends, challenges, influencing factors, and decarbonisation of operations. The content shared departs from the activities developed by LEAD project partners and external contributions from cities, local authorities, industry players and other EU-Funded projects.
- Dates:
 - Module 1.1 - 27 February to 3 March
 - Module 1.2 - 6 March to 10 March
 - Module 1.3 - 6 March to 10 March

Unit 2: Living Labs as innovation accelerators for mobility and logistics

- Module 2.1 *Future city logistics: the role of the CoPs, the Living Labs and the sustainable evaluation frameworks*
- Module 2.2 *UCC centers in the inner city*
- Module 2.3 *Crowd shipping and hyper connectivity*

Figure 14: LEAD Kick-Off webinar

3.6 Communication

A dedicated communication package was created to promote the LEAD Massive Open Online Course. This included the following:

- Images for promotion of Kick-Off Webinar and Registration for the course for social media,
- Images explaining the registration procedure,
- Visual identity for Kick-Off webinar and working environment of the Mobility Academy.



Figure 15: Examples of LEAD MOOC communication materials

Using the created materials, the LEAD MOOC was widely disseminated, namely through LEAD and partner channels, CINEA's LinkedIn, ALICE-ETP, ELTIS, Living-in.EU platform, Interoperable Academy Europe, CIVITAS Initiatives, channels of LEAD sister projects, European Network of Living Labs, Autonomy, World Economic Forum Zero Emission Urban Fleets, among others.

3.7 Exchange Session

The Exchange Session of the MOOC took place on the 25th of May, bringing together 24 participants. The goal of the session was for course participants to directly engage with course lecturers and contributors, to dig deeper into topics addressed in the video lectures.

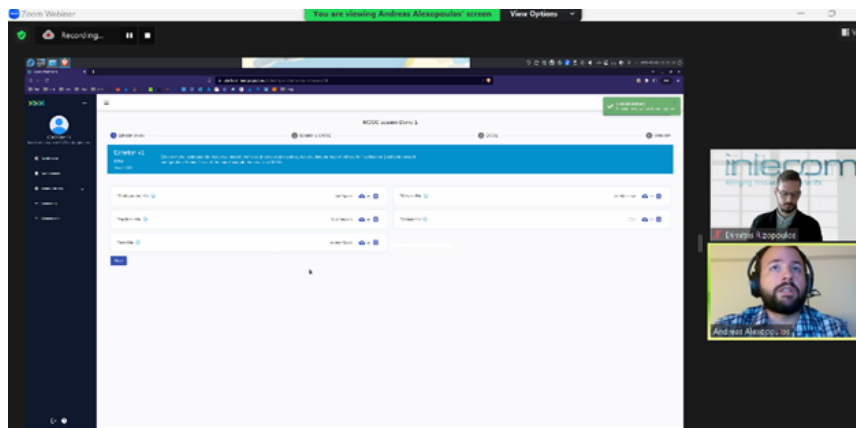


Figure 16: LEAD MOOC Exchange Session

Considering the complexity of Units 4 and 5, this session focused on a live walk-through demonstration of the LEAD platform, with a space dedicated to specific questions about the platform and beyond. A live discussion followed the demonstration, providing evidence of the high interest of the audience, including MOOC participants, on using the LEAD tools.

3.8 Statistics and certification

A total of 170 participants have registered and participated to the MOOC. Out of these 15 certificates have been issued for the whole course completion – referring to those students that successfully completed all 5 course assignments - and 30 for students that completed Units 1 and 2 and the corresponding assignments (#1 and #2). The decision was made to issue two types of certificates given that the course content was conceptualised considering two introductory units focusing as an intro to last-mile logistics (U1 and U2).

Activity	Participants
Kick-off webinar	92 participants

MOOC participants	190
Students that completed assignment #1	67
Students that completed assignment #2	51
Students that completed assignment #3	19
Students that completed assignment #4	15
Students that completed assignment #5	15
Exchange session	24
Complete MOOC certificates	15
Certificates Units 1 and 2	30



CERTIFICATE OF COMPLETION

the certificate awarded to

Student name

completed the Massive Open Online Course (MOOC) on
**Unlocking the potential of Digital Twins for
sustainable on-demand urban logistics**

The MOOC has been organised in the scope of the Horizon
2020 project LEAD, funded by the European Commission

5 units and 26 modules
February - June 2023

COURSE UNITS

UNIT 1 - Introducing Urban Freight & on-demand last-mile logistics (POLIS)

3 modules Trends, challenges and factors influencing city logistics
Electrifying the last-mile
Last-mile distribution schemes

UNIT 2 - Living Labs as innovation accelerators for mobility and logistics (ZLC)

3 modules Future city logistics
UCC centers in the inner city
Crowdsourcing and hyper connectivity

UNIT 3 - Modelling, simulation and data for urban freight planning (TUDelft)

5 modules Introduction
Urban freight models
Digital Twins 101
Define scenarios with modelling and simulations
Summary

UNIT 4 - Digital Twin Technologies (IRT SystemX)

5 modules Introduction
Digital Twin Approaches
Towards a conceptual digital twin for Urban Logistics
The LEAD Platform
Summary

UNIT 5 - Decision-making with Digital Twins (INLECOM)

10 thematic video modules



Figure 17: LEAD MOOC certificate template

3.9 Synergies

The course content of the MOOC counted with inputs from other projects and initiatives working in the domain of urban logistics and digital twins. Further, LEAD endeavoured in an effort to further disseminate and explore the course content to reach a wider audience.

The LEAD team has carried out the necessary adaptations and has published the LEAD MOOC on the CIVITAS E-learning centre, making it available in yet an additional channel. As previously mentioned, the course will be available in the Mobility Academy for five years.

LEAD Capacity Building activities and results will feed into the further development of the [Living-in.EU](https://living-in.eu) community, as they will also be included in their tool inventory.

Additional information about cooperation activities with international initiatives/projects can be found in the corresponding Deliverable - D4.2.

3.10 Feedback

After the course concluded, to ensure that we have feedback to improve future courses organised by the LEAD partners, and providing the best learning experience possible, we sent a request for participants to respond to a brief satisfaction survey. The answers were kept confidential and were used solely for the purpose of improving our courses.

The figures below show the overall responses provided by students

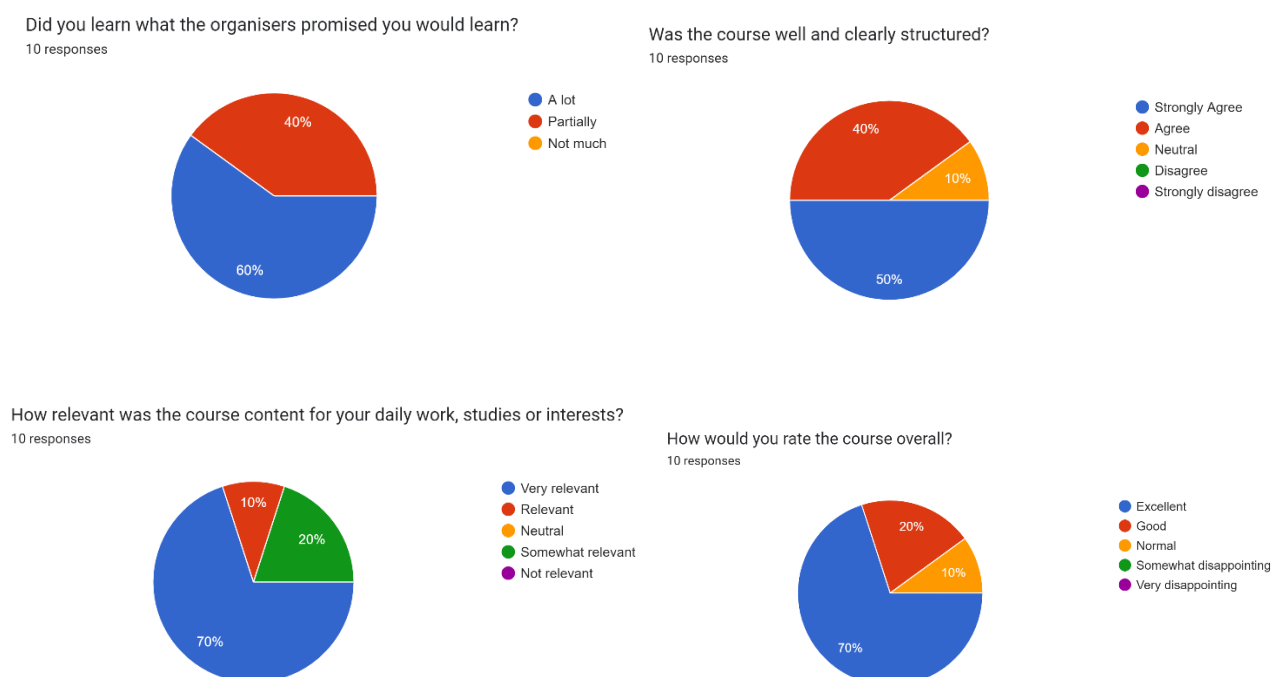


Figure 18: LEAD MOOC evaluation survey outcomes

As you can see from the figures, all in all, students were satisfied with the course, in terms of its structure, usefulness to their daily work, studies and/or interests, as well as delivering on the initially promised learning outcomes.

A few additional comments shared by users were as follows:

- Students would have liked to have more guidance and clarity on the process of feedback for assignments,
- Some found the learning platform a bit cumbersome, but shared that the content and lessons were very good,
- Some students would have liked to have had more simulation models practices.

4 Conclusions

The successful implementation of the LEAD project can also be attributed to three key activities: the establishment of an AB, the development of a Cities' TP, and the execution of capacity-building activities, including a Massive Open Online Course (MOOC). The AB played a pivotal role in providing strategic guidance and expertise, comprising accomplished individuals with diverse backgrounds in urban development, policy-making, and sustainability. Their collective insights ensured the project remained aligned with the latest industry trends and best practices. The TP acted as a robust knowledge exchange hub, enabling cities to share successful strategies and innovative solutions in real-time and get informed about the LEAD LLs developments. This TP fostered a collaborative environment, accelerating the dissemination of proven urban development methodologies. Furthermore, the capacity-building activities, particularly the MOOC, revolutionised the learning experience for participants. The MOOC facilitated accessible and flexible training, equipping urban professionals with the necessary skills and knowledge to drive sustainable development in their respective cities or organisations, using the LEAD platform. Through these activities, the LEAD project not only harnessed a wealth of expertise but also democratised the process of urban transformation, leaving a lasting impact on cities across Europe.



Consortium information

The [LEAD project](#) created Digital Twins of urban logistics networks in six TEN-T urban nodes (Madrid, The Hague, Lyon, Budapest, Oslo, Porto), to support experimentation and decision making with on-demand logistics operations in a public-private urban setting. Digital Twins are a digital replica of a complex real-world urban environment that represents different processes, actors, and their interaction.

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5 Annexes

5.1 Final Programme of LEAD Massive Open Online Course

Massive Open Online Course: Unlocking the potential of Digital Twins for sustainable on-demand urban logistics

Overview



[LEAD](#) is launching its new Massive Open Online Course, open to all those interested, with the goal to “**Unlocking the potential of Digital Twins for sustainable on-demand urban logistics**”.

It builds upon the results of the project’s LLs to deliver a Digital Twinning Capacity Building Programme, with a first-of-its-kind focus on urban logistics, to improve the capabilities and skills of personnel of authorities and researchers on open-source tools and modelling for Digital Twins. The course will also provide a general introduction to urban freight, with a focus on on-demand and last-mile logistics. **You can consult the programme for Units 1 and 2 below.**

Sign up [here to join the kick-off webinar](#) on **23 February, 11:00 – 12:00 CET** to learn more about what to expect from the e-course and each unit.

Content and workload:

This course consists of video lectures with accompanying slide sets, as well as complimentary optional reading material, and assignments. The video lectures will be complemented with live Exchange Sessions, where you will get the chance to exchange with lectures and dig deeper in the topics presented. Make sure to stick to the deadlines for each assignment, as the in-time submission is a prerequisite for certification. You can plan approximately 2 hours per week to complete each Unit (incl. lectures and assignments).

Timeline:

- February to April: Part 1: Units 1 and 2
- May to June 2023: Part 2: Units 3 to 5.

Objectives:

- Using the results of the LEAD the Living Labs to deliver a Digital Twinning Capacity Building Programme,
- Provide a general introduction to urban freight, with a focus on on-demand and last-mile logistics,
- Establish a mechanism to facilitate knowledge sharing & enabling the exchange between experts,

- Deliver a dynamic course in a flexible and modular format,
- Improve the capabilities and skills of personnel of authorities and researchers on open-source tools and modelling for Digital Twins.

Target audiences: Local and regional authorities, Policy-makers, University students, Industrial/business/research sector.

Platform: The course will be hosted on the [Mobility Academy](#). Instructions to register [are available here](#).

Interaction and organisation:

- Visit the discussion forum regularly to get in touch with other students: [Discussion Forum \(mobility-academy.eu\)](#)
- Make sure to subscribe to the news and events section to keep up with the next webinars and tasks: [Announcements \(mobility-academy.eu\)](#)

Technical issues?

You can always reach us at:

- Claudia Ribeiro: cribeiro@polisnetwork.eu
- Raffaella Vergnani: rvergnani@polisnetwork.eu

Learning Programme: Units 1 and 2

Unit 1: Introducing Urban Freight & on-demand last-mile logistics (POLIS)

Scope: This unit aims to provide a brief general introduction to urban freight, focusing on on-demand and last-mile logistics, namely current trends, challenges, influencing factors, and decarbonisation of operations. The content shared departs from the activities developed by project partners, from LEAD outputs, and external contributions from cities, local authorities, industry players and other EU-Funded projects.

Kick-off webinar: Live event to explain course objectives, *modus operandi*, content, etc.

The **first module** will provide a quick overview of the [POLIS/ALICE guide for advancing together towards zero-emission urban logistics by 2030](#). It will be complemented by the testimony of the leading city of Rotterdam on the challenges and ambitions to reach zero-emission logistics. A lecture will be provided on the main concepts and components of urban freight, describing what last-mile logistics consists of, and different possibilities to organise last-mile deliveries. A final lecture will focus on the main factors and challenges influencing last-mile on-demand logistics as uncovered in the LEAD project.

The **second module** will focus on push and pull policies enabling the transition to zero-emission urban logistics, particularly the last-mile, such as Zero-Emission Zones. The lecture will focus on the context, opportunities, challenges, and requirements, taking hints from the [‘How-To Guidance to support cities and countries considering freight and service deliveries in their decarbonization strategies](#), drafted by POLIS, Transport Decarbonisation Alliance and C40.

The **third module** will shed light on different last-mile distribution schemes, from micro-hubs, to transport to mobile depots with the assistance of e-vehicles, dual flow hubs and cargo hitching. The lecturers will represent

the whole chain of knowledge, with city stakeholders, industry players, and fellow H2020 projects providing their insights on the topic.

Runtime: Two weeks: 27th of February to 10th of March

1. Introducing Urban Freight & on-demand last-mile logistics (POLIS)	<i>Module 1.1 Trends, challenges and factors influencing city logistics</i>	Towards zero-emission urban logistics by 2030: a guide for action	Yanying Li ALICE
		Boots on the ground: cities striving for zero-emission logistics	Jos Streng, City of Rotterdam Rotterdam
		ABCS of urban freight, e-commerce, and on-demand logistics	Edoardo Marcucci and Valerio Gatta, Molde University College
	<i>Module 1.2 Electrifying the last-mile</i>	Main factors and challenges influencing last-mile on-demand logistics	Edoardo Marcucci and Valerio Gatta, Mold University College
		Zero-Emission zones for Freight (ZEZf)	Claudia Ribeiro, POLIS
	<i>Module 1.3: Last-mile distribution schemes</i>	Last-mile configuration: from 1-echelon to 2-echelon distribution networks	Beatriz Royo, Zaragoza Logistics Centre
		Microhubs as fixed or mobile depots as a combination with e-vehicles: the experience of the city of Mechelen	Roos Lowette, city of Mechelen
		Dual flow hubs & CargoHitching: ULaaDS	Domien Stubbe, VIL

Unit 2: Living Labs as innovation accelerators for mobility and logistics (ZLC)

Scope: This unit aims to explain how real-life experiments are implementing the theoretical content of module 1. To this end, the course counts on the participation of LEAD Living Labs and other existing demonstrators will be the basis for the modules.

The **first module** will introduce the concepts of a community of practice, Living Labs, and the LEAD project. The last part of the module will explain the evaluation framework the LEAD project defined for assessing the sustainability impacts of the demonstrators.

The **second module** will explain the physical implementation of an Urban Consolidation Centre in the inner city in the [LEAD Living Lab Madrid](#). The Living Lab Madrid members will describe:

- The objectives of the Living Lab, the members of the CoP and their roles.

- b) The real-life implementation: BAU vs new business model. It will focus on the technical implementation of the Proof of Concept, the challenges and drivers experienced during the testing period. Finally, the pilot will explain the outcomes (benefits and drawbacks).
- c) The Living Lab Madrid digital twin: this video will explain the digital twin pipeline representing the real-life experiments (inputs, outputs (KPIs, operational information [routes]), sequence of models). The Living Lab Madrid will explain how the digital twin helps policymakers and business decision-makers in their daily and strategic decisions.

The **third module** focuses on crowdshipping and hyperconnectivity concepts in the [LEAD Living Lab The Hague](#). The Living Lab The Hague members will describe:

- a) The objectives of the Living Lab, the members of the CoP and their roles.
- b) The real-life implementation: BAU vs new business model. It will focus on the technical implementation of the Proof of Concept, and the challenges and drivers experienced during the testing period. Finally, the pilot will explain the outcomes (benefits and drawbacks).
- c) The Living Lab The Hague digital twin: this video will explain the digital twin pipeline representing the real-life experiments (inputs, outputs (KPIs, operational information [routes]), sequence of models). The Living The Hague will explain how the digital twin helps policymakers and business decision-makers in their daily and strategic decisions.

Runtime: Three weeks: 13th of March to 31st of March

2.Living Labs as innovation accelerators for mobility and logistics (ZLC)	<i>Module 2.1: Future city logistics: the role of CoPs, the Living Labs & sustainable evaluation frameworks</i>	Introduction to the Living Labs Concept	Carolina Cipres, ZLC
		Communities of Practice: role in the future of logistics	Carolina Cipres, ZLC
		LEAD LLs sustainable evaluation framework: description of the list of KPIs the LLs are using	Jose Manuel Vassalo, UPM
	<i>Module 2.2: UCC centres in the inner city</i>	LEAD Living Lab Madrid: Explain the physical implementation of an Urban Consolidation Centre in the inner city in the LEAD Living Lab Madrid <u>LEAD LL Madrid introduction</u>	Sergio Balaguer Fernandez, EMT Madrid
		<u>LEAD LL Madrid physical implementation</u>	Alfonso Molina, CityLogin
		<u>LEAD LL Madrid Digital Twin</u>	Angel Batalla, LastMile Team
		<u>LEAD LL Madrid Conclusions</u>	Sergio Balaguer Fernandez, EMT Madrid

	Module 2.3: Crowdshipping and hyper connectivity	• LEAD Living Lab The Hague: Explain the crowdshipping and hyperconnectivity concepts in the LEAD Living Lab The Hague	
		• <u>LEAD LL The Hague introduction:</u>	Thomas Robbers, Next2Company
		• <u>LEAD LL The Hague physical implementation</u>	Thomas Robbers, Next2Company
		• <u>LEAD LL The Hague Digital Twin</u>	Rodrigo Tapia, TU Delft
		• <u>LEAD LL The Hague: Conclusions</u>	Thomas Robbers, Next2Company
Unit 3: Modelling, simulation and data for urban freight planning (TUDelft)			
Scope: This unit aims to explain how real-life experiments are implementing the theoretical content of Units 1 and 2. To this end, the course counts with the participation of LEAD Living Labs and other existing demonstrators as the basis for the modules. This unit aims to present different urban freight models and their adaptation to the Digital Twin. It will give some theoretical knowledge of the models and present the digital twins from a modelling perspective (i.e., looking at what phenomena to be represented and looking for the tools and assumptions of them). An introductory video explain the organisation and contents of the Unit 3 modules. The first module will provide the basics regarding urban freight models. It will start characterising the main types of models present in the model library and give a general approach to their requirements. Moreover, it will give more detail to the different types of models in the LEAD model library. The second module will provide basics regarding the digital twin. It will start with defining a digital twin and how it differs from other approaches for decision support. Moreover, it will describe the model library in more detail and give an overview of the data requirements for the digital twin. The third module will give the notion on how the LEAD platform constructs the scenarios by mapping the KPIs and needs that the user (living labs) have and how it reflects on model selection. It will also illustrate the digital twins of other living labs that have not been described yet. A conclusion video gives an overview of what has been given in the unit.			
Runtime: 3rd to 21st of April			
3.Modelling, simulation and data for urban	Module 3.0	Introduction of Unit	Rodrigo Tapia, TUDelft
	Module 3.1	Model types and roles	Rodrigo Tapia, TUDelft
	Urban freight models	Demand and ABM models	
		Optimisation, network models and impact assessment	Ali Nadi, TUDelft

freight planning	Module 3.2 Digital Twins 101	What is a Digital Twin? Application to logistics and planning Digital twins: challenges and opportunities Model library Data requirements	Sebastian Hörl, IRT SystemX Carla Nascimento, Molde University Colleague Rodrigo Tapia, TUDelft INLECOM
	Module 3.3 Define scenarios with modelling and simulations	Introduction to scenario planning deployment Digital Twin for Lyon How can cities use the DT results for informed decision making	Rodrigo Tapia, TUDelft Sebastian Hörl, IRT SystemX Beatriz Royo, ZLC
	Module 3.4	Unit Summary	Rodrigo Tapia, TU Delft

Unit 4: Digital Twin Technologies (ISX)

Scope: The scope of the unit is to introduce digital twin architectures, which might vary between use cases and application domains. To that end, the unit starts with an overview of existing or ongoing efforts on constructing digital twins for applications related to transport, mobility and smart cities with a focus on the relevant inputs, outputs and processing architectures. After, a conceptual digital twin architecture that has been developed in the LEAD project is presented, followed by a general way on the concrete implementation of those components in the LEAD platform.

An introductory video explains the structure of the unit, pointing out the line of thought from various possible digital twin architectures for different use domains, over the need for a conceptual understanding of the needs and processes in the specific context of urban logistics, to the concrete implementation in the LEAD platform.

The **first module** introduces three digital twinning approaches in the scope of transport, mobility, and smart cities with different points of focus and application domains.

The **second module** introduces a conceptual architecture for digital twins on urban logistics that has been developed in the LEAD project. It introduces the need for such digital twins based on the state of the art, describes the business process that includes the interaction of sensors, actors, and users with the system, and describes, on an abstract level, the necessary components to set up the solution.

The **third module** focuses on the specific developments of the LEAD platform by presenting the general technical architecture that has been chosen and providing a deeper look into the crucial decision-making and data-processing pipelines that are at work behind the platform user interface.

A conclusion video gives a recap of the individual modules and provides the most prominent take-home messages.

Runtime: 24th of April to 12th of May

4. Digital Twin Technologies	<i>Module 4.0: Introduction</i>	• Introduction of the unit	Sebastian Hörl, IRT SystemX
	<i>Module 4.1: Digital Twin Approaches</i>	Transcality: Automated generation of simulations for traffic operations A Digital Twin approach for Sustainable Territories Planning: A case study on district heating	Lukas Ambühl, Transcality Abdelhadi Belfadel, IRT SystemX
	<i>Module 4.2: Towards a conceptual digital twin for Urban Logistics</i>	Need for a conceptual digital twin / state-of-the art Business process Technical components	Sebastian Hörl, IRT SystemX
	<i>Module 4.3: The LEAD Platform</i>	LEAD Digital Twinning Platform Components: Decision Support Systems, APIs	INLECOM
	<i>Module 4.4: Conclusion</i>	• Summary of the unit	Sebastian Hörl, IRT SystemX

Unit 5: Decision-making with Digital Twins (INLECOM)

Scope: This unit aims to explain how Digital Twins in the context of urban logistics can support decision making and serve as an impact assessment tool for:

- Modelling and simulating complex operation scenarios towards optimizing efficiency of last mile logistics operations,
- Evaluating alternative city logistics strategies by changing parameters such as parcel volumes, delivery time windows or types of fleets, and,
- Measuring the impact of interventions in terms of efficiency and carbon emissions.

To this end, the course enhances understanding of the Digital Twins concept, by presenting the digital twinning LEAD platform developed in the project. It also presents examples of models and simulations drawn from the Living Labs. Last learners that wish to experiment on their own with the tools will have the opportunity to enroll as users to the platform and run their own tests.

Introductory video (Unit 1): The LEAD Platform – Quick Walkthrough.

Videos 2 to 7 will present different features of the platform, namely User Registration, Models integration, Scenario Building, the use of Data Assets, Simulations Execution and Data sharing with collaborators.

Videos 8 and 9 will provide practical example of the use of the platform, associated with specific scenarios and reference data. These units present the full workflow of a user in the LEAD Platform Environment.

The conclusion video summarises the key takeaways for exploiting the power of data for greener logistics operations. Gives an overview of the basic concepts discussed in Units 1-9.

Runtime: 15th to 31st of May

5. Decision-making with Digital Twins	<i>Video 1</i>	The LEAD Platform Quick walkthrough	INLECOM
	<i>Video 2</i>	User Registration to the platform Account setup and gaining access to the platform.	INLECOM
	<i>Video 3</i>	Model Integration Explaining the process of embedding a model in the LEAD platform.	INLECOM
	<i>Video 4</i>	Scenario Builder Explaining the process of combining models together to automate their sequential execution.	INLECOM
	<i>Video 5</i>	Data Assets Presenting the capability to store and use data sets in the digital twinning processes.	INLECOM
	<i>Video 6</i>	Simulations Presenting the simulations engine that executes a series of models in a built scenario.	INLECOM
	<i>Video 7</i>	Sharing Explaining sharing capabilities of models and data assets across platform users.	INLECOM
	<i>Video 8</i>	Example 1 End to end scenario from LEAD Living Labs.	INLECOM
	<i>Video 9</i>	Example 2 End to end scenario from LEAD Living Labs.	INLECOM
	<i>Video 10</i>	Key Take Aways Summarising the key concepts from Units 1 to 9.	INLECOM