



#### Madrid Living Lab May 23rd, 2022

Sergio Fernández, EMT Madrid Ángel Batalla, Last Mile Team Alfonso Molina, CityLogin



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#### Context

- Rise on-demand logistics (accelerated by COVID-19 new online purchasing habits) → stress last mile delivery systems
- <u>Customer</u>: responsive system for customised products
- Industry: instant delivery
- <u>Cities</u>: 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







#### What is LEAD?

- LEAD Digital Twins creation in 6 cities (TEN-T urban nodes)
- Solutions  $\rightarrow$  case scenarios



O3 EXPERIMENTS IN REAL LIFE LIVING LABS Adaptation of digital twin to intervention area context with city data – Logistics Solutions







#### **LEAD Innovations**



Living Lab (LL) is a stakeholder-centered ecosystem, operating in an urban node context, for the systematic evaluation of innovative ideas and technological solutions in real life use cases.





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

### **Expected Impacts**

#### Impact 1

 Clear understanding of cost-effective strategies, measures and tools to achieve essentially zero emission city logistics in major European urban centres by 2030.

#### Impact 2

 New tested, demonstrated practices and solutions for better cooperation between suppliers, shippers and urban/ regions policy makers (planners)

#### Impact 3

 Clearly provide inputs for the preparation and implementation of SULPs, SUMPs and other planning tools (big data and realtime traffic management)







#### **Living Lab** Transforming a Parking Lot to an Urban Consolidation Centre

#### **Status Quo**

- Madrid is an important logistics hub (between the Atlantic and the Mediterranean TEN-T corridors),
- Occasional air quality and congestion challenges,
- Madrid LEZ and current regulations (Madrid360),
- Rise of e-commerce and home delivery (even more due to COVID19 and post-COVID19 challenges).





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#### Ambition

- Demonstrate the **better efficiencies** in using a UCC connected to the TEN-T to deliver to the city center;
- Assess flows and congestion. **Route optimization engine** in many-tomany and many-to-one scenarios, combining vehicles of different fleets. Improving of environmental indicators;
- Explore alternative (and sustainable) business models;
- **Public-private cooperation mechanisms**, identifying new ideas for cooperation and evaluating the costs and benefits of implementation;
- The economic **efficiency and reliability** for courier companies, and henceforth for clients, of using the LEAD strategies compared to conventional freight delivery approaches;
- Explore potential incentives. Data management.







### **Pilot status**

Demonstrate the **better efficiencies** in using a UCC connected to the TEN-T, to deliver to the city centre







## **Pilot objectives & KPIs targets**



Stakeholder	Objective	KPI	Madrid LL Target	
	Reduce energy consumption	Energy consumption	-50%	
Operator/	Reduce GHG emissions	GHG emissions	-50%	
society	Reduce local air pollution per	Air guality [PM10: PM2 5: NO2: VoC]	-50% for all	Stakehold
	delivery		components	CityLogin
Society/ neigbourhood	Reduce noise	Noise impact	-30%	(operator)
Society	Increase number. of jobs created	Jobs created	+5%	
Society	Improve the quality of the jobs	Quality of the jobs	Average score >= 3.5	
Neighbourhood	Improve the neighborhoods quality of life	Neighborhoods quality of life	Average score >= 3.5	
Operator/	Increase the number of sustainable ideas (SI)	Users sustainable behaviour	Average SI vote >= 3.5.	
consumers	Increase the number of proposed	Cooperative solutions & incentive	Average vote on new	
society	solutions	measures	solutions >= 3.5.	
Operator/	Reduce the average cost of delivery	Average delivery cost of the business model	0%	
consumers	Reduce daily average time spent on road for delivery vehicles	Congestion 2	-20%	
Society/ operator	Reduce the urban space required	Urban storage and parking space	-10%	
Shops/stores	Increase retail benefits	Shop/retail benefits	Score >=3.5	
Operator/	Reduce delivery time	Delivery time (with attention to flexibility benefits)	-5%	
consumers	Increase delivery reliability	Delivery reliability within the time window	+10%	

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the next schedule.



# Madrid Living Lab Digital Twin

Ángel Batalla, Last Mile Team



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### Workflow (1)









# Open Data repository

Open Data set available for researchers, external city stakeholders and businesses interested in developing routing and scheduling algorithms in last-mile logistics





#### **As-Is scenario**







Avg	Avg	Avg
weight	volume	density
1 kg	0,036 m <sup>3</sup>	22 kg/m <sup>3</sup>

Engine type	Payload	Max nº parcels
Euro6CI	878 kg	152

Workday start	Workday end	Break
09:00	17:30	30 min





### **As-Is activity**

Dec to A	ember 1 <sup>st</sup> 2 April 30 <sup>th</sup> 20	.021 022
Working days	Services	km driven
124	28.109	38.053

					Pe	eriod a	ctivity	summ	ary					
V	ehicle:	S	S	Services km driven Time to serve Vehicles capacity utilization				acity on						
Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
4	1	20	227	45	1.326	307	84	1.430	18:44	3:45	108:50	35%	21%	46%





## **As-Is vehicles activity**

		١	/ehicles a	activity	summar	У		
	Services		km driven Time to serve				ve	
Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
57	34	74	82	66	110	4:42	2:50	6:10





#### **To-Be scenario**







Avg	Avg	Avg
weight	volume	density
1 kg	0,036 m <sup>3</sup>	22 kg/m <sup>3</sup>

Engine type	Payload	Max n⁰ parcels
Electric	250 kg	39

Workday start	Workday end	Break
09:00	17:30	30 min





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#### As-Is vs To-Be scenario









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## Scenarios comparison – April 29<sup>th</sup> 2022

Service from	Distributio n 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	50
Plaza Mayor	Last-mile	17:49	04:19	12:30	99
	Total	18:49	05:19	12:50	149
oject has received funding from the s Horizon 2020 research and innova	European tion		12% reductio n		33% reductio n



#### Cities, researchers, LSPs etc.: stay tuned



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#### Want to know more?

#### Contact Us

#### Claudia Ribeiro | CRibeiro@polisnetwork.eu Raffaele Vergnani | Rvergnani@polisnetwork.eu

Website: https://www.leadproject.eu/ LinkedIn: lead-h2020



