Planning tool for sustainable charging network development

Partners involved : ICOOR, MOSAIC, VUB, NEXXTLAB

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Final Event - 7 November 2024
Barcelona - Spain

Planning tool for sustainable charging network development

- *Objectives*
- *Tool architecture*
- *Challenges faced*
- *Demonstrations*
- *Validation*

photos: unsplash.com

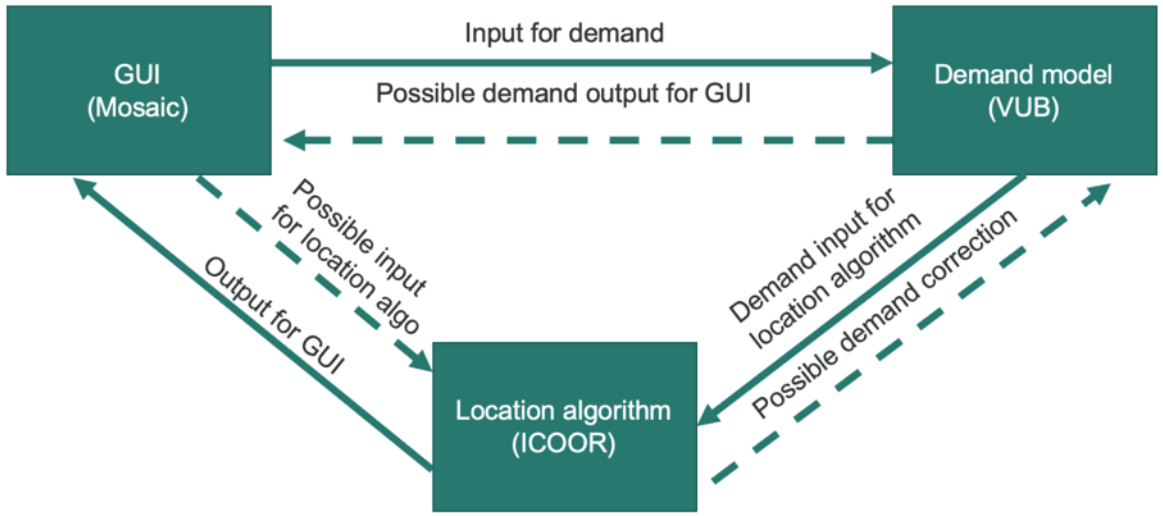
Objectives for a charging point location planning tool

- Obtaining a tool that administrations and CPOs can use to plan the deployment of charging infrastructure
- Offering a user-friendly web interface with interactive maps for input/output
- Allowing easy creation of scenarios, different penetration levels of EVs
- Taking into account:
  - low- and high-power charging stations
  - users' mobility needs and habits
  - existing charging infrastructure and its accessibility
  - needed costs for new investments

→ Demonstration and validation in Barcelona, Luxembourg and Gardone val Trompia in Northern Italy

Tool architecture, joint capabilities in one tool

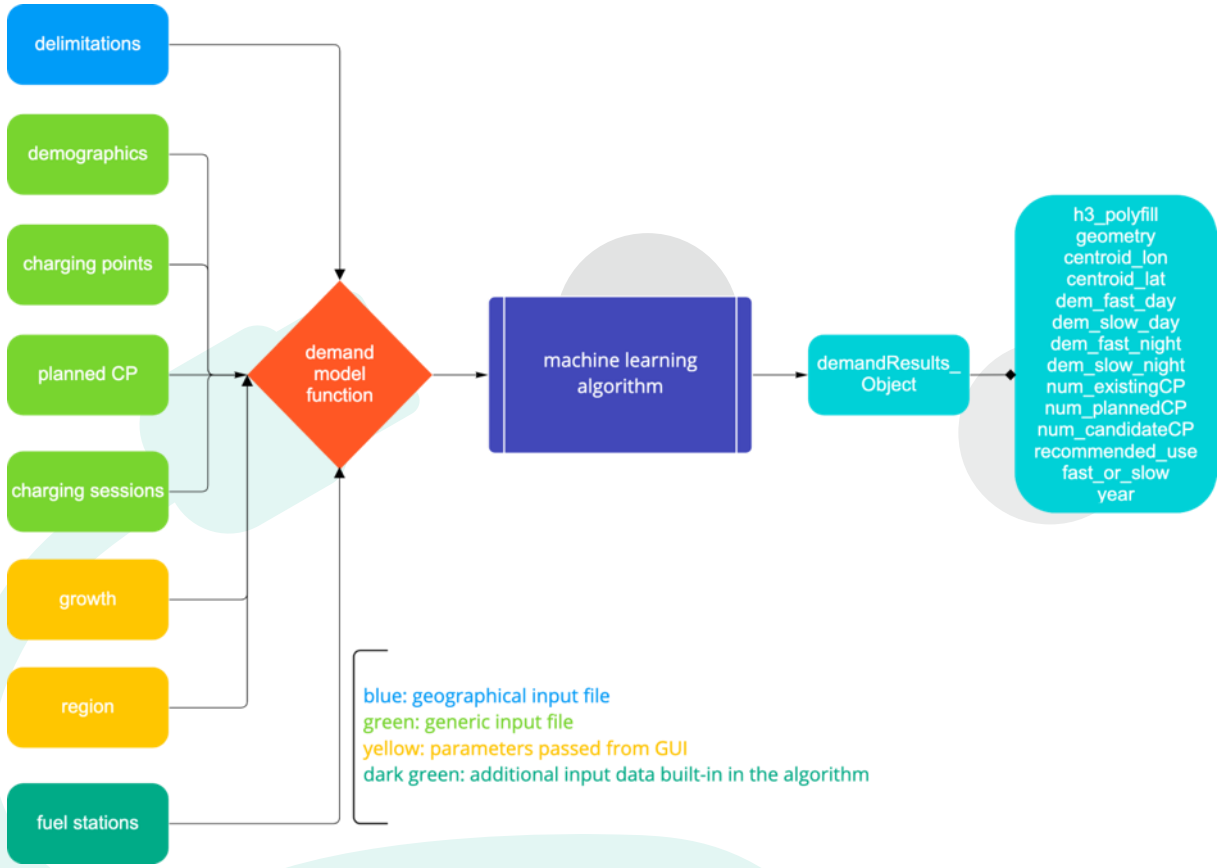
The **user interface** aims to facilitate the end-users' navigation through the tool functionalities, allow data input and output, and visualise results.



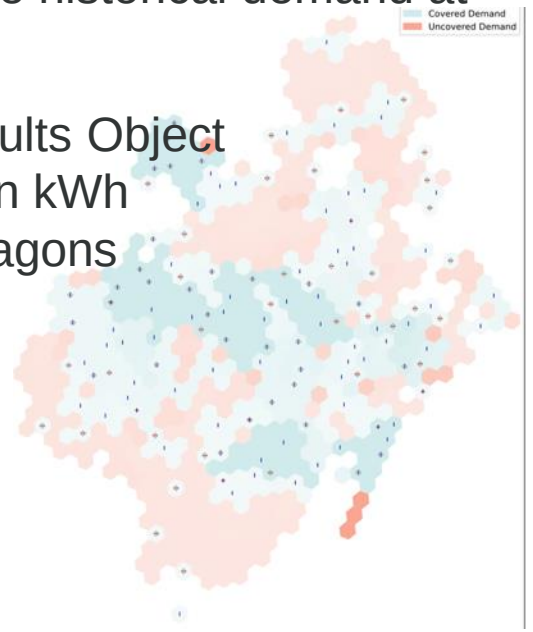
The **demand model** aims at estimating the amount and location of demand for EV charging infrastructure that exists in the scope that is studied

The **location planning algorithm** uses this demand to identify locations that maximize the service coverage of the charging infrastructure or minimi s e the budget while maintaining a target service coverage.

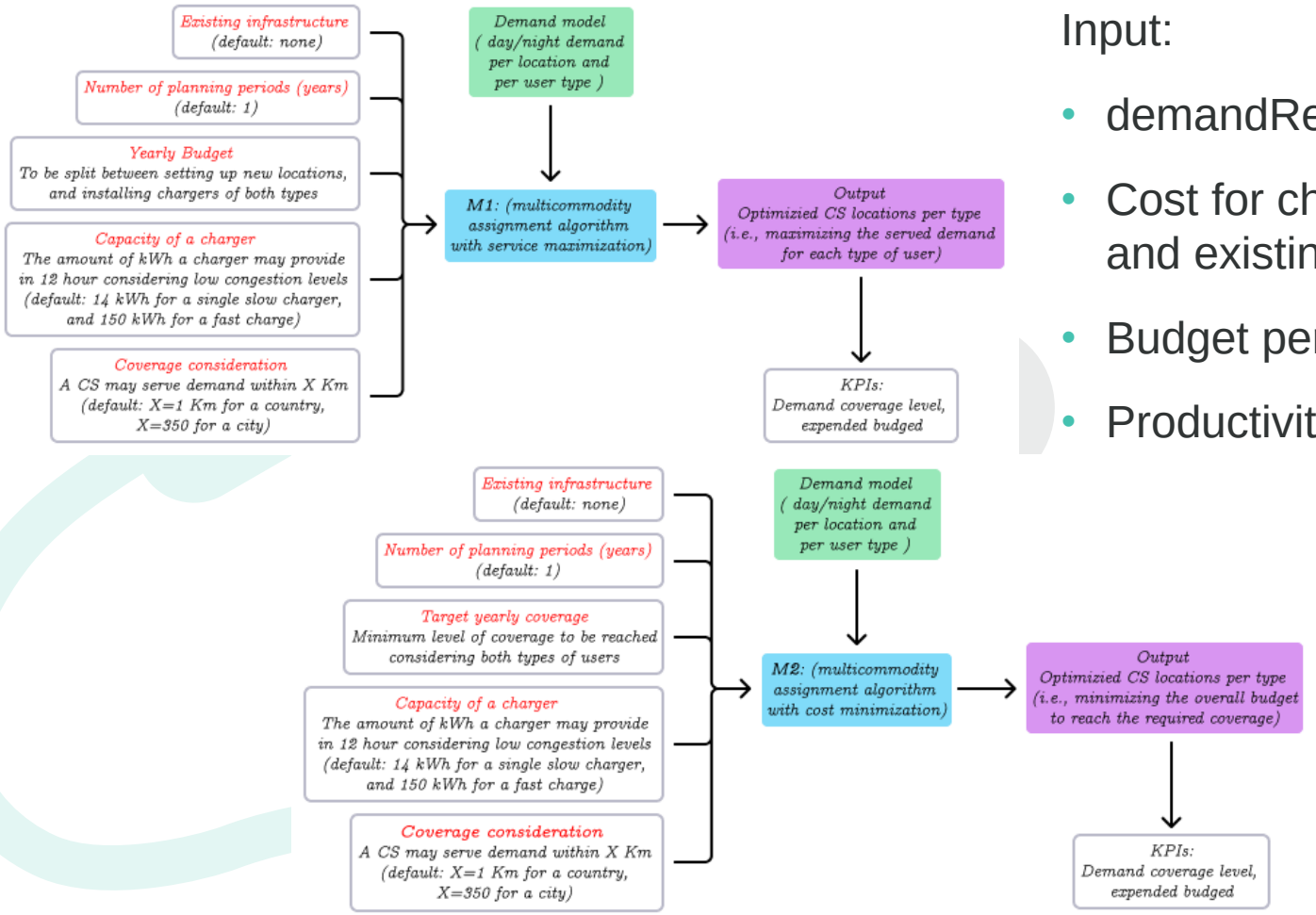
The demand model takes into account the demographics and charging needs in different situations



- Historical charging data (fast, slow)
- Data on socio-demographics
- Mobility and local activity indicators
- The regression model fits the provided data to forecast the expected demand at a location based on the historical demand at existing charging
- Output: demandResults Object with demand given in kWh per day/night in hexagons covering the area.



The location algorithm outputs yearly plans for chargers' installations in the area.



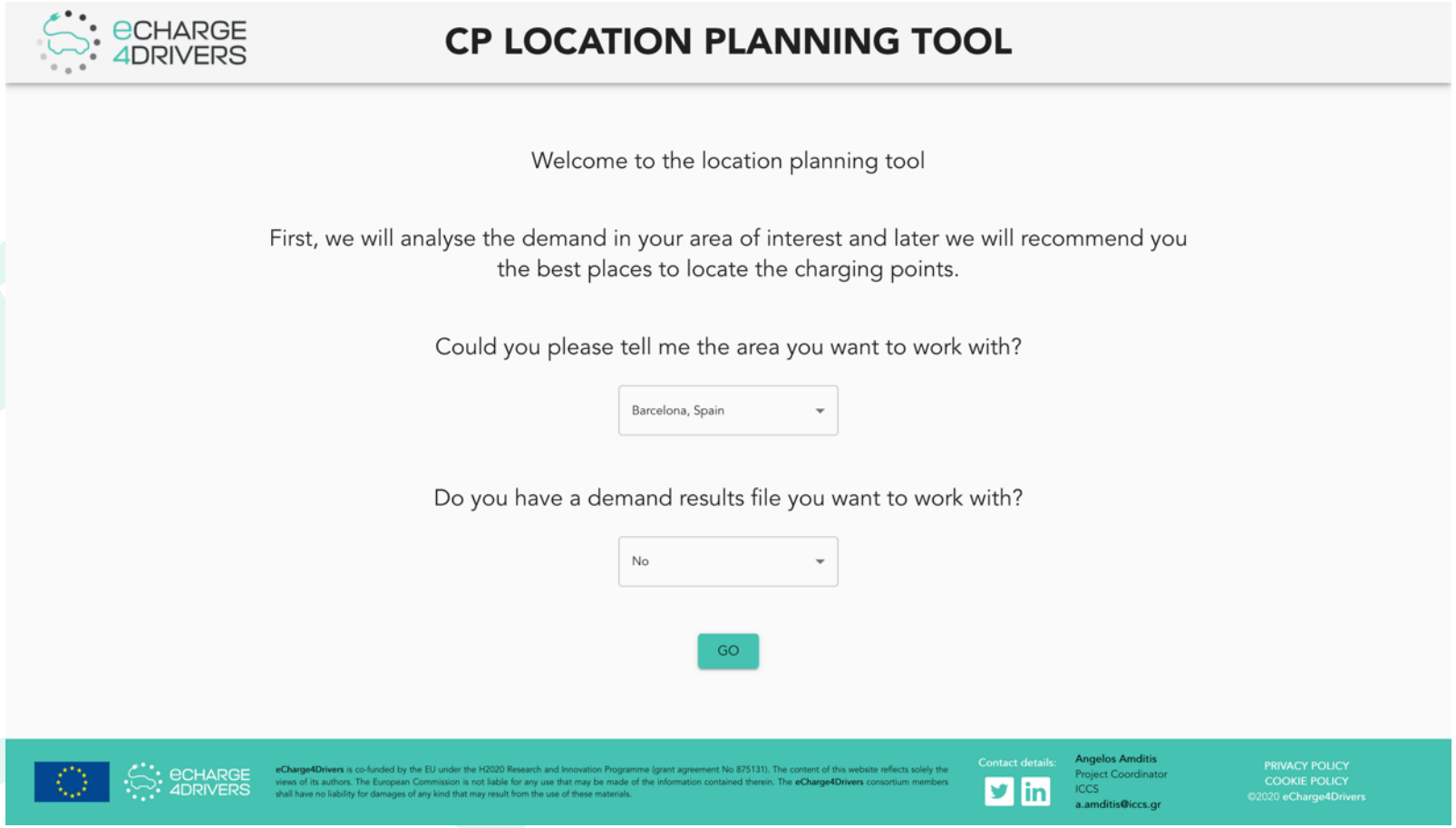
Input:

- demandResults Object
- Cost for charging infrastructure fast, slow on new and existing sites
- Budget per year
- Productivity of chargers fast and slow

The algorithm may operate in two modes:

- **Cost minimisation** to reach a target level of demand coverage each year.
- **Coverage maximisation** using a predetermined annual budget

The user interface facilitates the end-users' navigation through the tool functionalities



CP LOCATION PLANNING TOOL

Welcome to the location planning tool

First, we will analyse the demand in your area of interest and later we will recommend you the best places to locate the charging points.

Could you please tell me the area you want to work with?

Barcelona, Spain

Do you have a demand results file you want to work with?

No

GO

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CP LOCATION PLANNING TOOL

Zone and socio-demographic data

1. Please, provide a GIS file (GeoJSON, decimal degrees) that contains the geometry of the area and subareas you want to analyse and for which you will provide demographic data (municipalities, districts, neighbourhoods or even a smaller entity if it exists). **A field containing the "subarea_ID" must be provided to combine the different datasets.**
Download example

Browse... No file selected.

2. If possible, provide a csv file including data per each subarea (i.e., per neighbourhood). Use the available template.
Download template

Browse... No file selected.

Charging Points data

3. Provide the **existing** infrastructure data (existing charging points) in a csv file. Use the available template.
Download template

Browse... No file selected.

4. Provide the **planned** infrastructure data (planned charging points) in a csv file. Use the available template. *Optional
Download template

Browse... No file selected.

5. Provide the **candidate** infrastructure data (candidate charging points) in a csv file. Use the available template. *Optional
Download template

Browse... No file selected.

Charging Sessions data

6. Provide the **charging sessions** data in a csv file. Use the available template. *Data will not be stored
Download template

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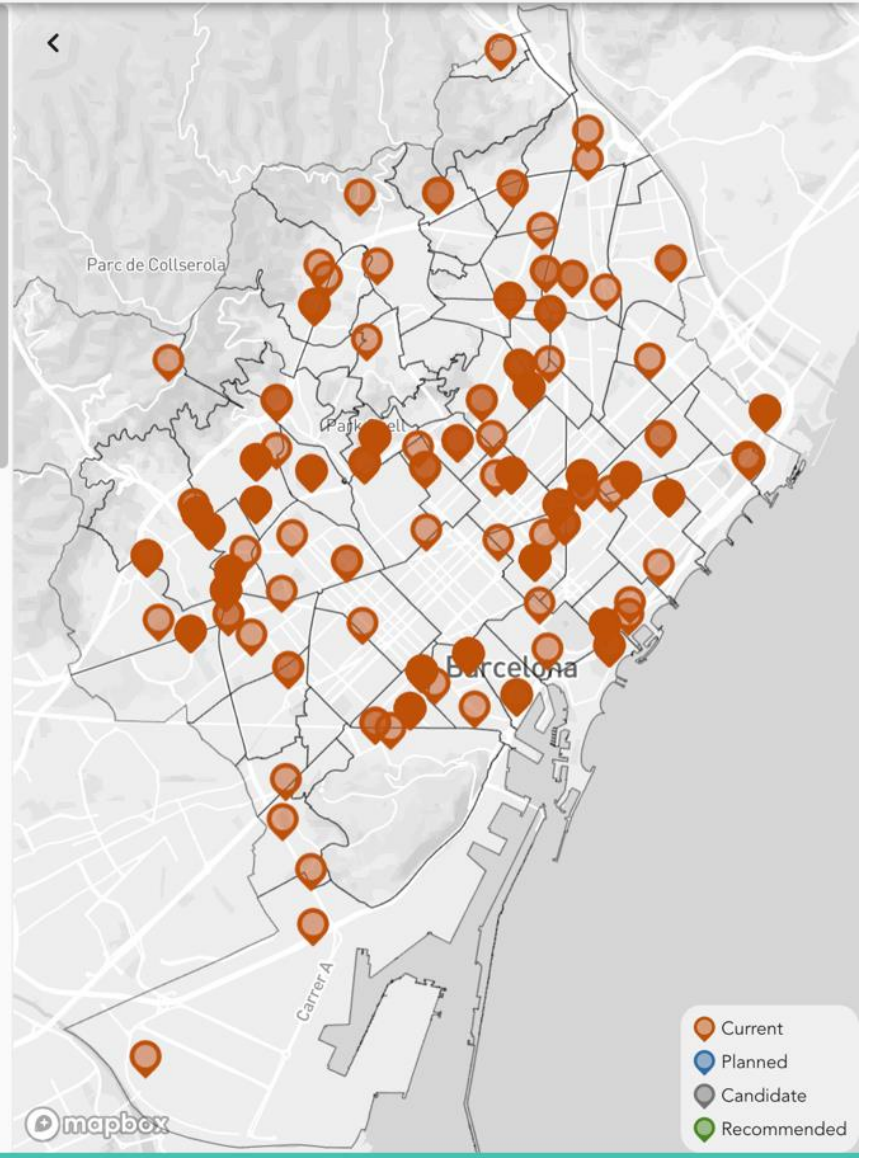

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Future scenarios

7. Select the **number of years** you want to analyse. *More time will be needed for larger numbers

3

8. Provide the **growth of electric vehicle usage** expected for each year (Compound Annual Growth Rate).

2024	2025	2026
20	20	20

Optimization

9. Choose what to optimize:

(•) Budget ( ) Coverage

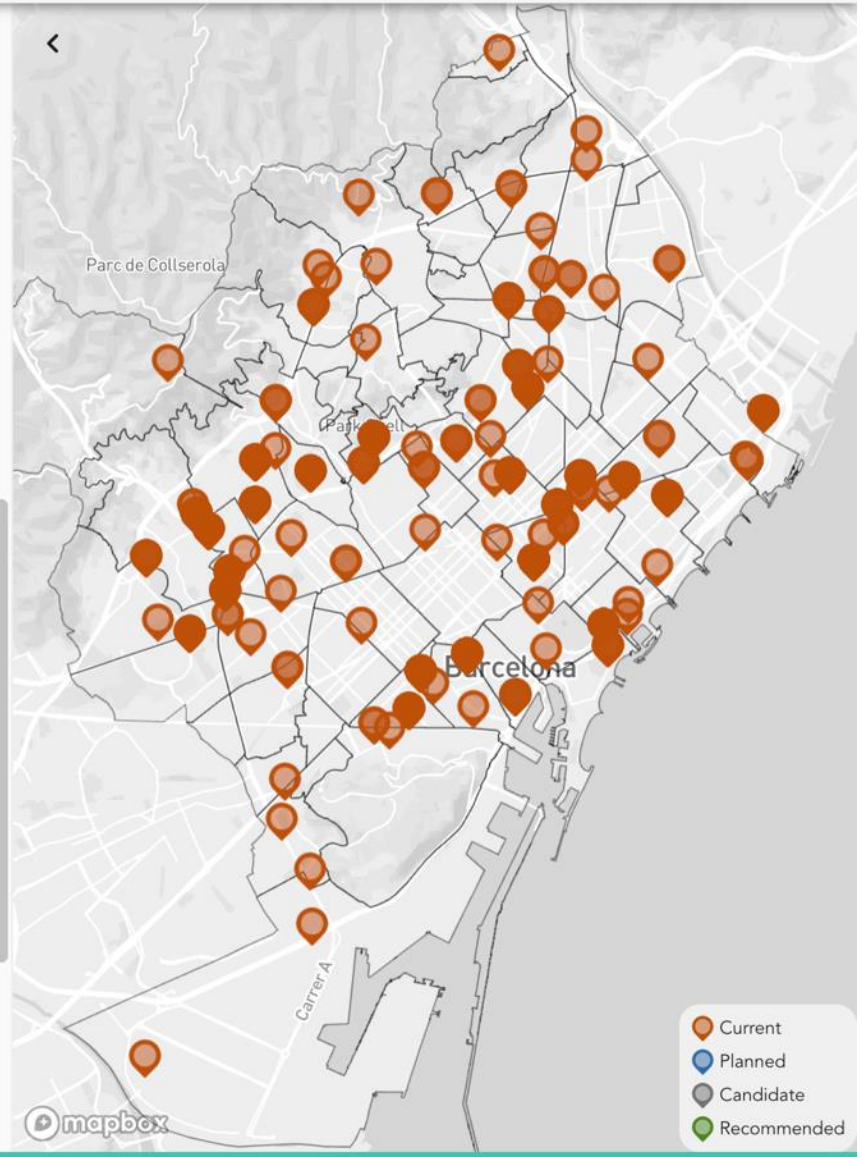
Provide expected coverage (%). The algorithm will minimize the budget reaching the specified coverage.

2024	2025	2026
20	20	20

Additional information

10. Provide the following parameters:

Cost of setting up a location to house **slow** chargers (thousands of euros).	20
Cost of setting up a location to house **fast** chargers (thousands of euros).	100
Cost of a single **slow** charger (thousands of euros).	7.5
Cost of a single **fast** charger (thousands of euros).	80



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2024	2025	2026
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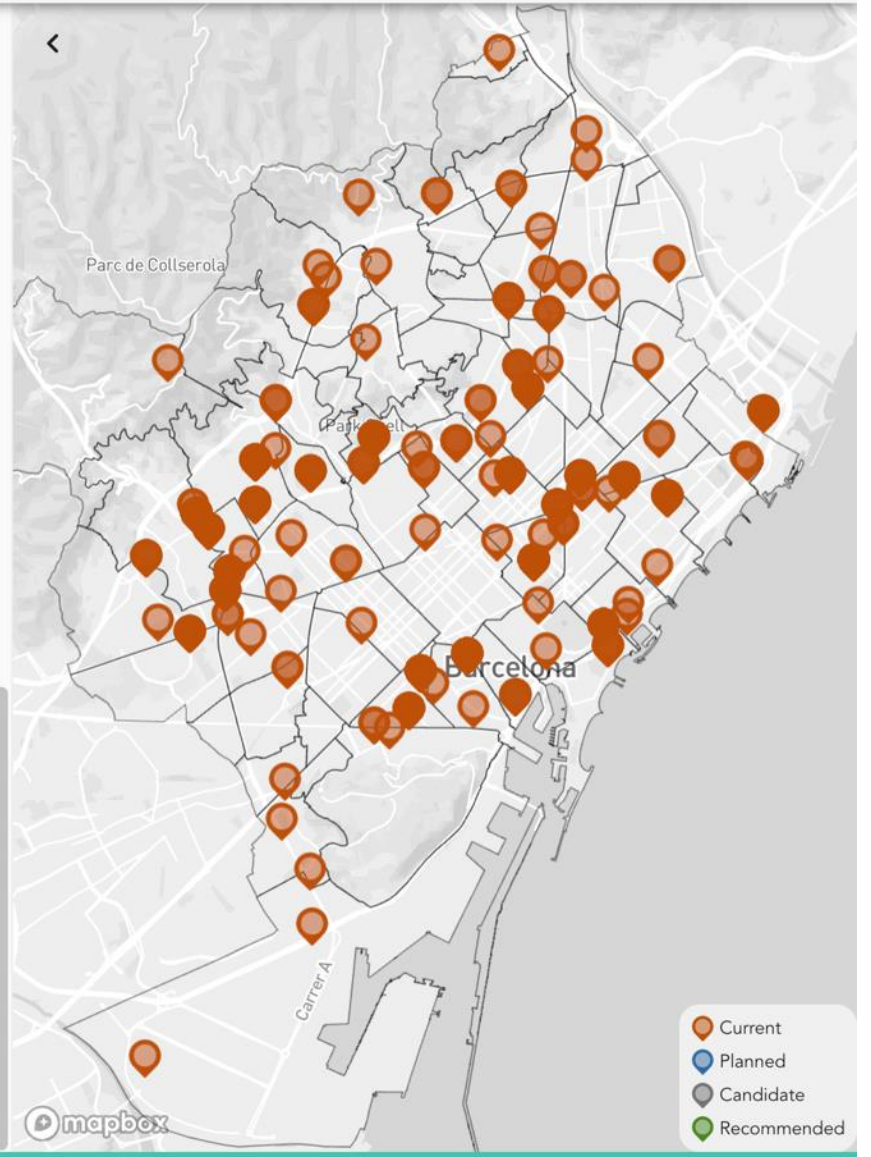
Cost of a single **slow** charger (thousands of euros).	7.5
Cost of a single **fast** charger (thousands of euros).	80
Minimum number of **slow** chargers that may be installed per location.	2
Minimum number of **fast** chargers that may be installed per location.	1
Capacity of a **slow** charger (kWh/day).	14
Capacity of a **fast** charger (kWh/day).	150

Get Results



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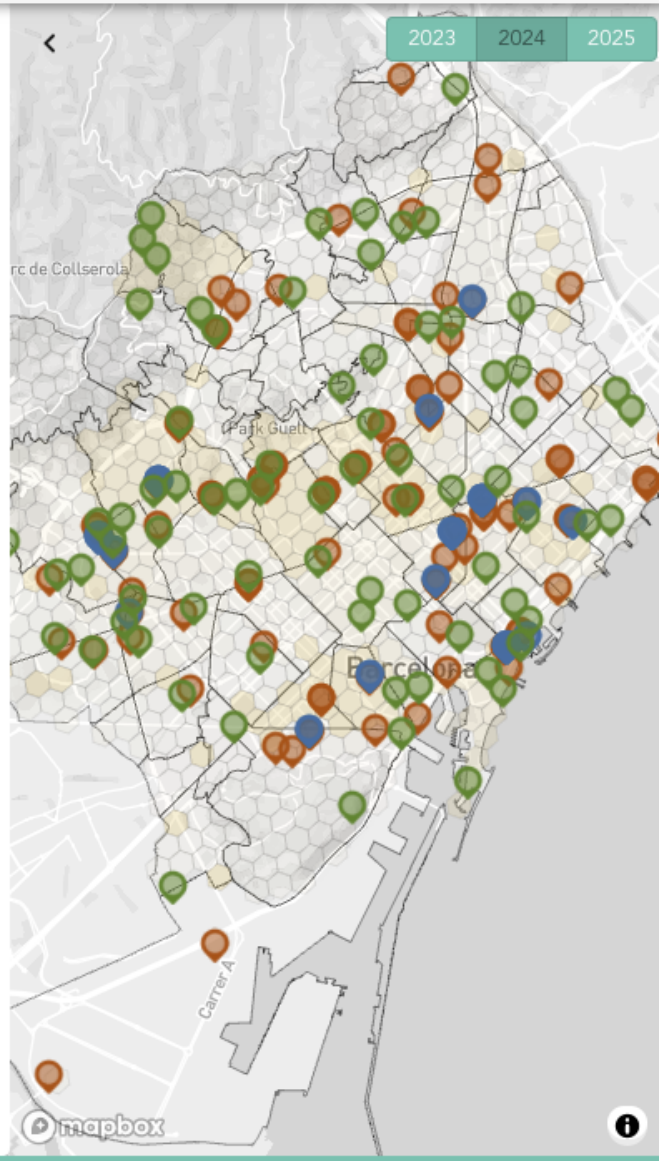
CP LOCATION PLANNING TOOL

Results

11. Download your results as csv files!

	2023	2024	2025
Demand Covered	0.201528	0.201174	0.201001
Used Budget	870	30	45

Download Results | Change Inputs



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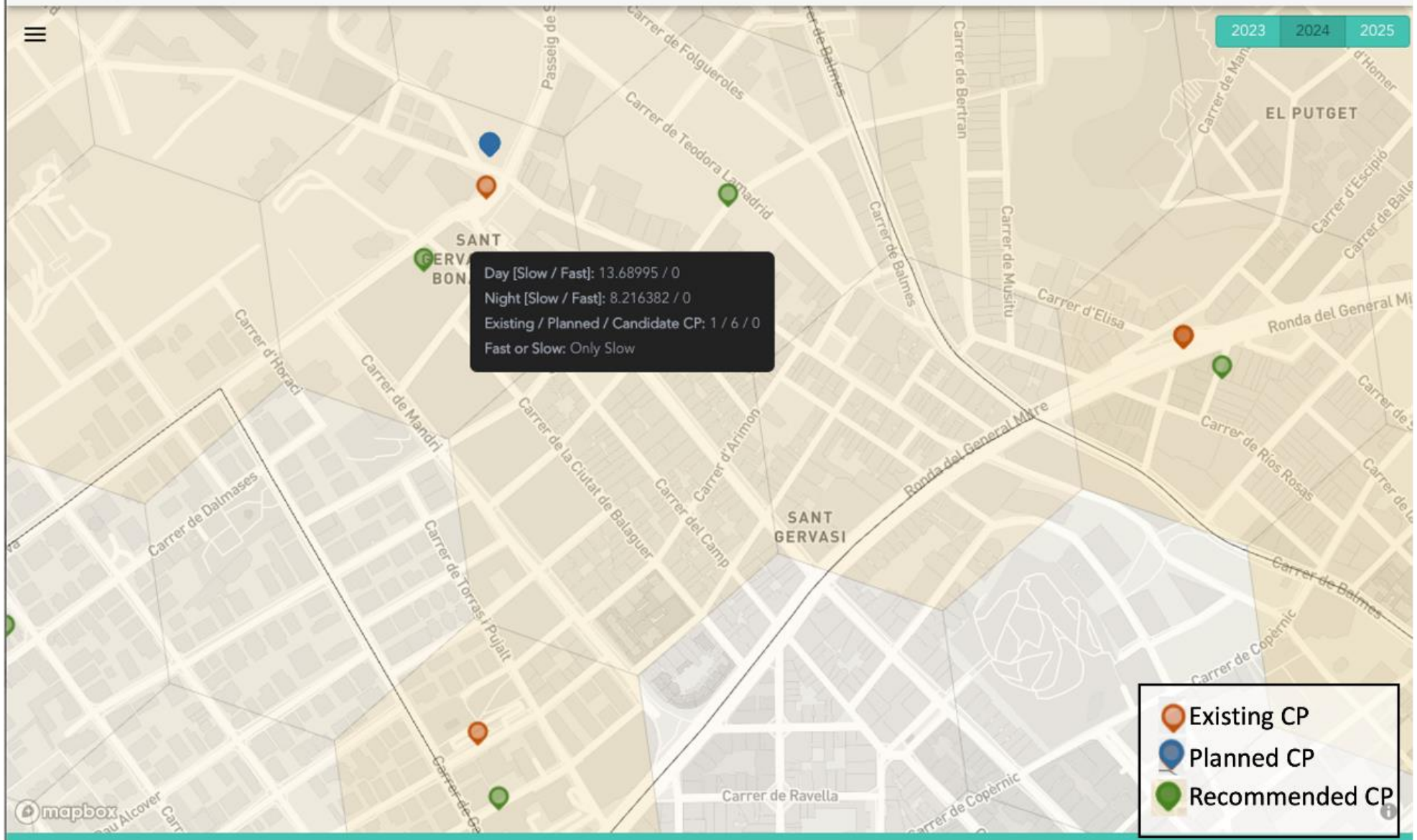

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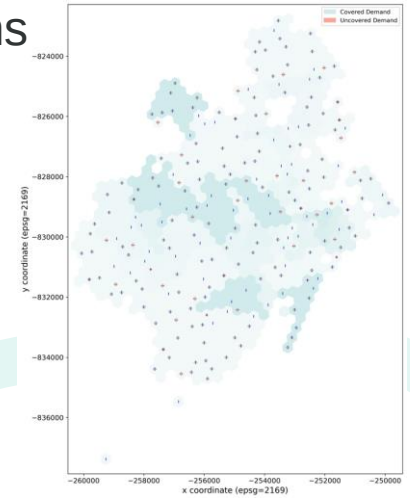
Demand model and location algorithm have to deal with various data available for the demo sites

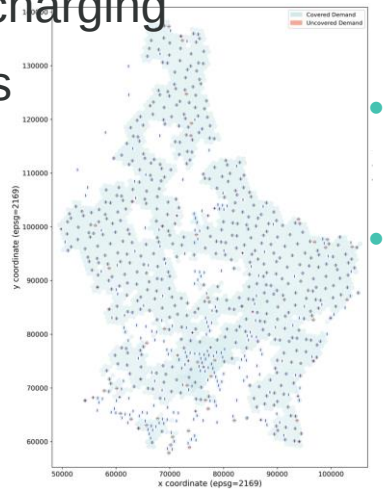
Barcelona

- 73 city sub-areas
- Partly available demographic parameters
- Existing and planned charging points
- Charging session data for normal public charging
- 650 hexagons



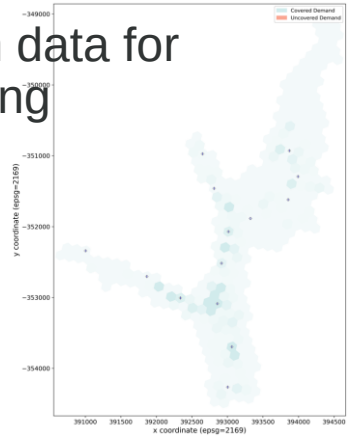
Luxembourg

- 102 communes of Luxembourg
- Partly available demographic parameters
- Existing and planned charging points
- Charging session data for normal public charging
- 2524 hexagons



Northern Italy

- Delimitations defined geographic information of buildings
- Demographic data only available for total area, usage of proxy information (based on building+ parking information)
- Data on existing and planned charging points not available
- No charging session data for normal public charging
- 113 hexagons



Validation of the charging point location planning tool with the target user group

- Which site to update first and where to deploy additional chargers?
- Informed decision-making rather than intuition-based placing charging points.
- Efficiency in resource allocation: Most promising sites first
- Anticipating utilisation rate and profitability
- Increased satisfaction of EV drivers, as the overall availability of accessible charging points increases where they would be needed the most.
- Long-term planning for 3 to 5 years

Thank you for your attention !

Please scan for a demo video

eCHARGE 4DRIVERS

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