ULB UNIVERSITÉ LIBRE DE BRUXELLES

VUB mobi MOBILITY, LOGISTICS & AUTOMOTIVE TECHNOLOGY RESEARCH CENTRE

ESTIMATION OF PUBLIC CHARGING DEMAND USING CELLPHONE DATA AND POINTS OF INTERESTS-BASED SEGMENTATION

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INTRODUCTION

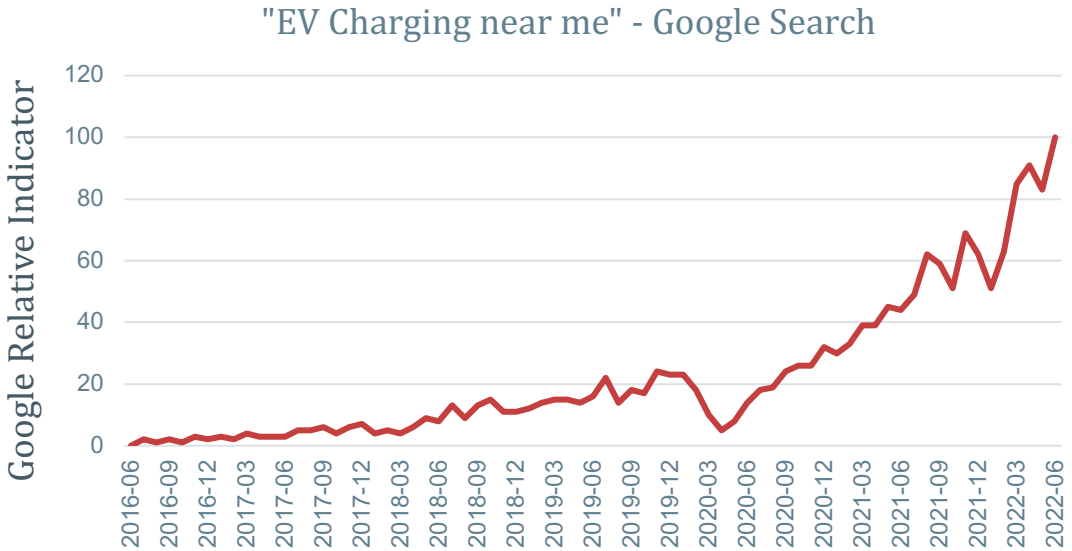
THE NEED OF CHARGING INFRASTRUCTURE

Lawmakers back EU-wide ban on new fossil fuel cars from 2035, despite strong lobbying

Lawmakers in the European Parliament's environment committee voted to uphold a proposed ban on the sale of polluting vehicles from 2035 but narrowly rejected proposals for stricter 2030 targets on cars and vans that would have made the transition smoother.

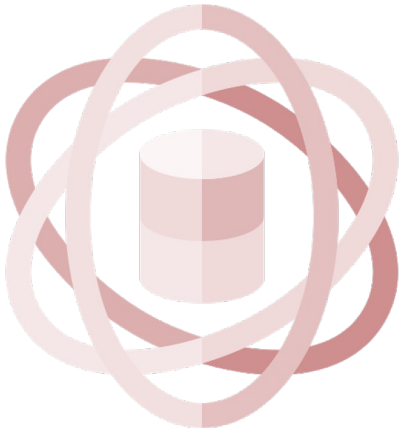
INTRODUCTION

THE NEED OF CHARGING INFRASTRUCTURE



INTRODUCTION

How can we leverage data analytics to help the development of charging infrastructure roll-out strategies ?



WHERE ? Where should the chargers be built?

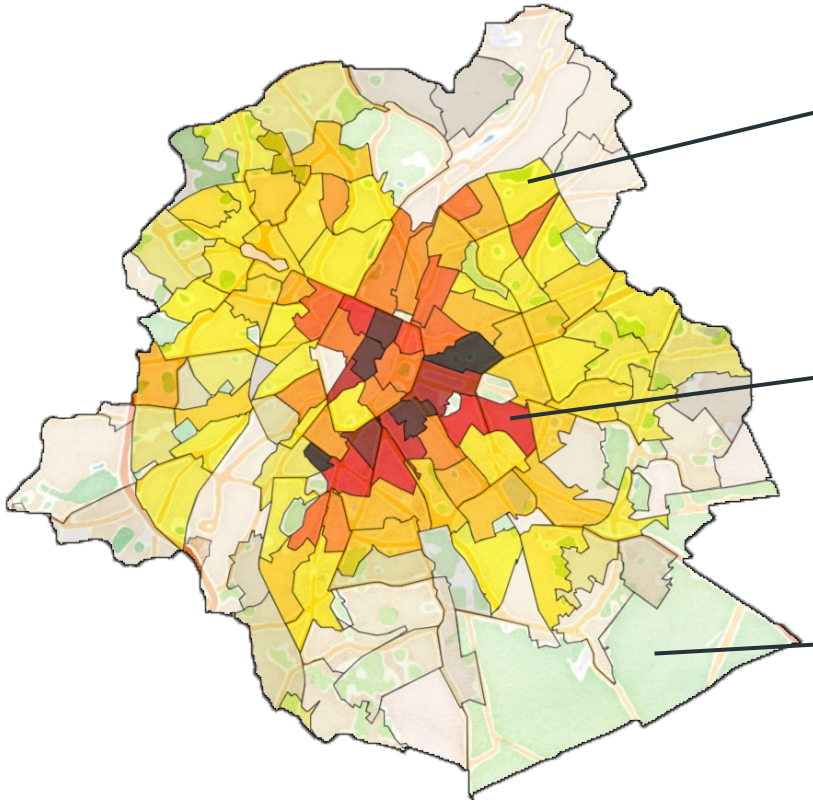
HOW MANY ? How many chargers should be built?

WHICH ? Which type of chargers should be built?

WHERE ?

HOW MANY ?

WHICH ?



Normal	105
Semi-Rapid	14
Fast	0

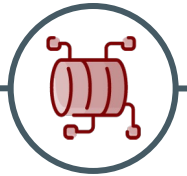
Normal	320
Semi-Rapid	50
Fast	2

Normal	55
Semi-Rapid	10
Fast	1

METHOD

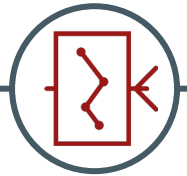
PROPOSED PIPELINE

WHERE?



1| Granularity
Balance between precision and computational performance.

HOW MANY?



2| Demand Estimation
Estimate the charging needs of each zone

WHICH ?

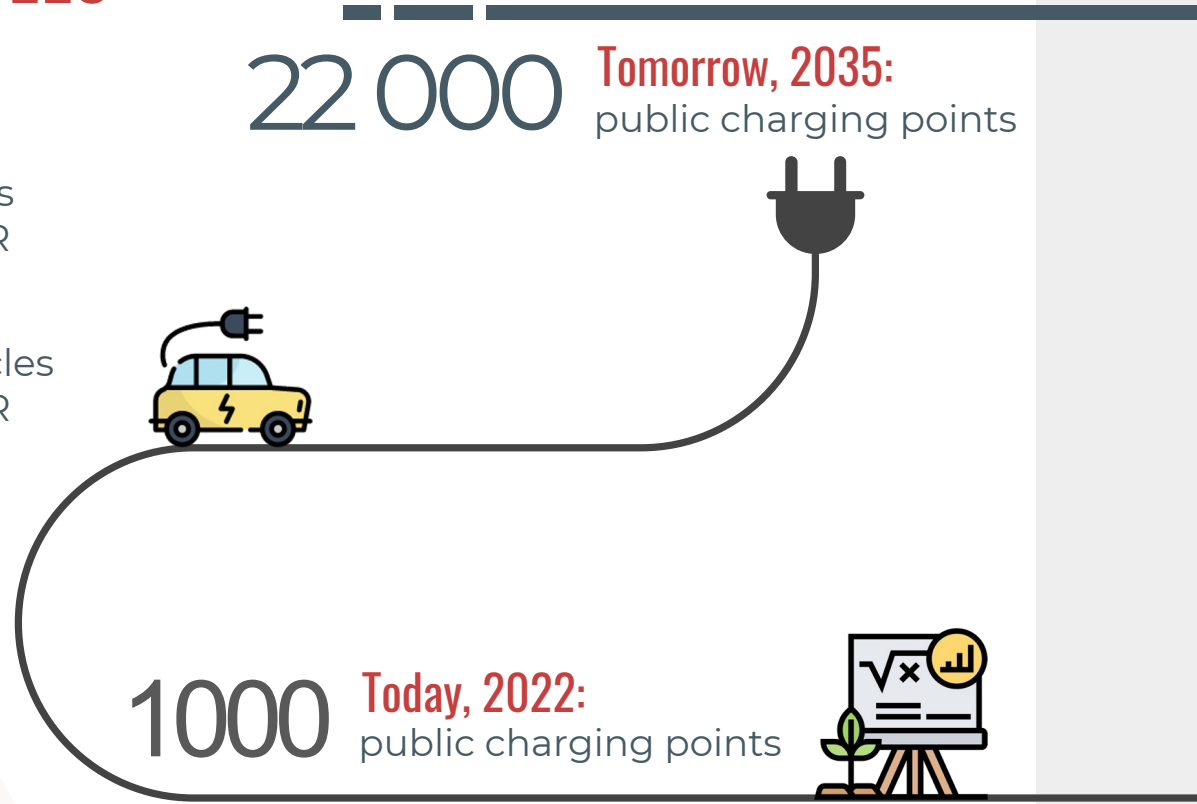
3| Demand Segmentation
Segmentate the demand into the existing charging technology

CASE STUDY: BRUSSELS

KEY NUMBERS

2030 All diesel vehicles forbidden in BCR

2035 All thermic vehicles forbidden in BCR

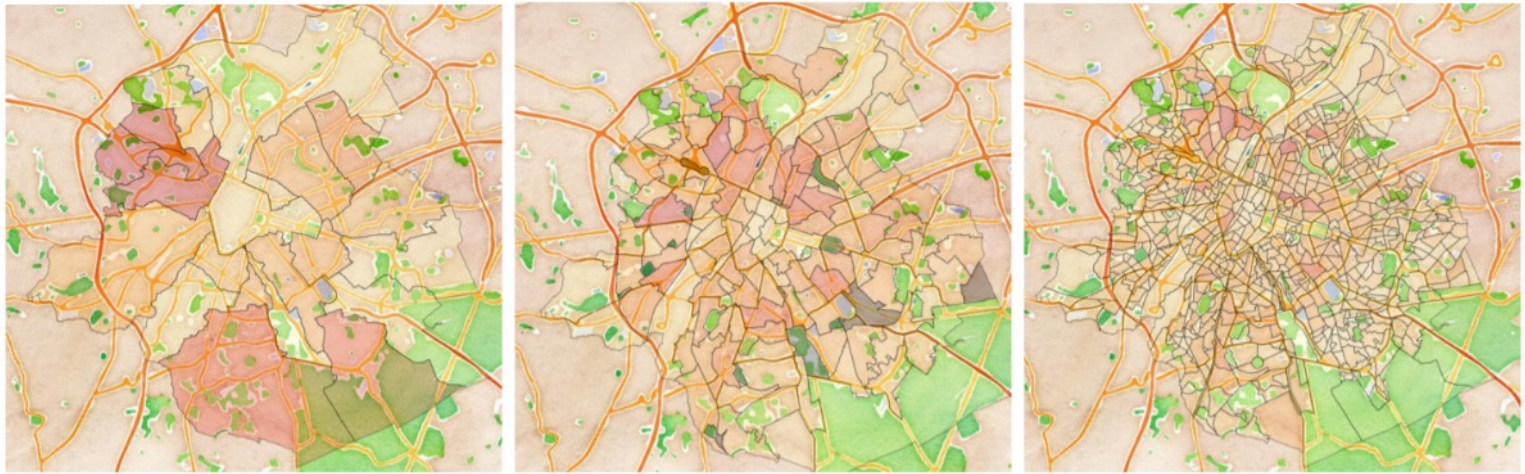


22 000 **Tomorrow, 2035:** public charging points

1000 **Today, 2022:** public charging points

01 GRANULARITY

Balance between data availability,
computational resources and performance.



(a) Municipalities **(b) Neighborhoods** (c) Statistical Sectors

02 DEMAND ESTIMATION

METHOD BASED ON CELLULAR SIGNALLING DATA

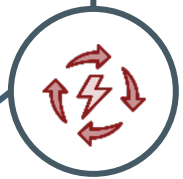
1| Cellular Signaling Data
Number of trips OD Matrix derived from SIM cards movements.

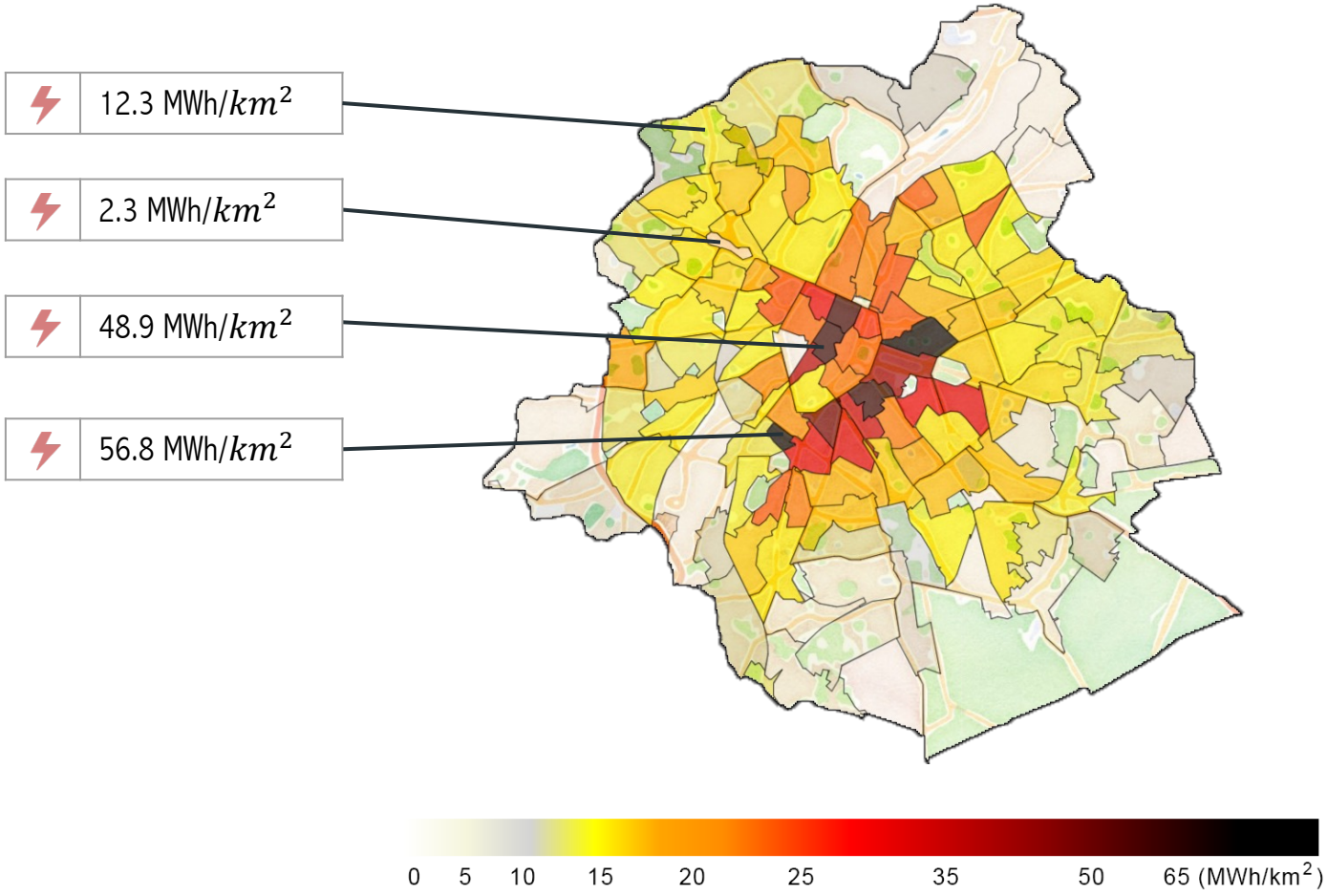
2| Origin Destination (OD) Matrix
Distance OD Matrix derived using BingMaps Services.

3| Correction: Driving Trips
Compute the proportion of people driving.

4| Correction: Private chargers
Compute the density of people having access to a private charger.

5| Energy OD Matrix
Convert the distances into EV consumption in kWh.




12.3 MWh/km^2
2.3 MWh/km^2
48.9 MWh/km^2
56.8 MWh/km^2
0 5 10 15 20 25 35 50 65 (MWh/km^2)

03 DEMAND SEGMENTATION

METHOD BASED ON THE CITY'S POINTS OF INTERESTS

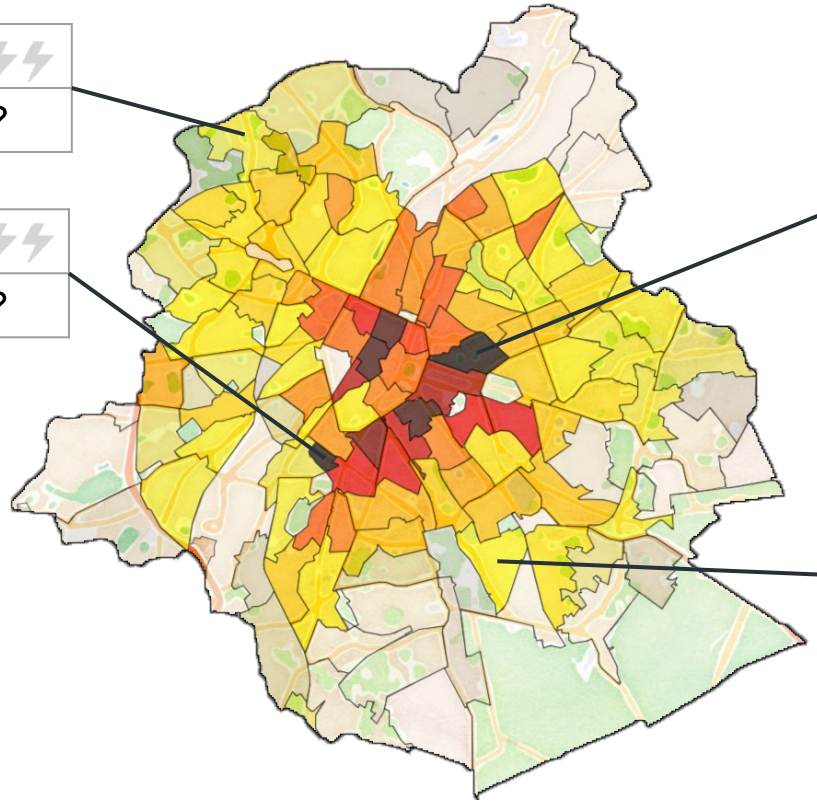
1| Residential Segmentation
Compute the proportion of residential charging demand.

3| Association
Link each POI to a charging technology.

2| Non-Residential Segmentation
Segmentate the non residential demand using Points of Interests (POIs).

Residential Segmentation

A	48 km	80%	⚡⚡⚡
	12 km	20%	?
B	2 km	12%	⚡⚡⚡
	14 km	88%	?



Non-Residential Segmentation

C	135	⚡⚡⚡
	17	⚡⚡⚡
	126	⚡⚡⚡
	265	⚡⚡⚡
	4	⚡⚡⚡
D	6	⚡⚡⚡
	4	⚡⚡⚡
	14	⚡⚡⚡
	19	⚡⚡⚡
	0	⚡⚡⚡

Residential Streets

Non-Residential Streets

Office

Tourism

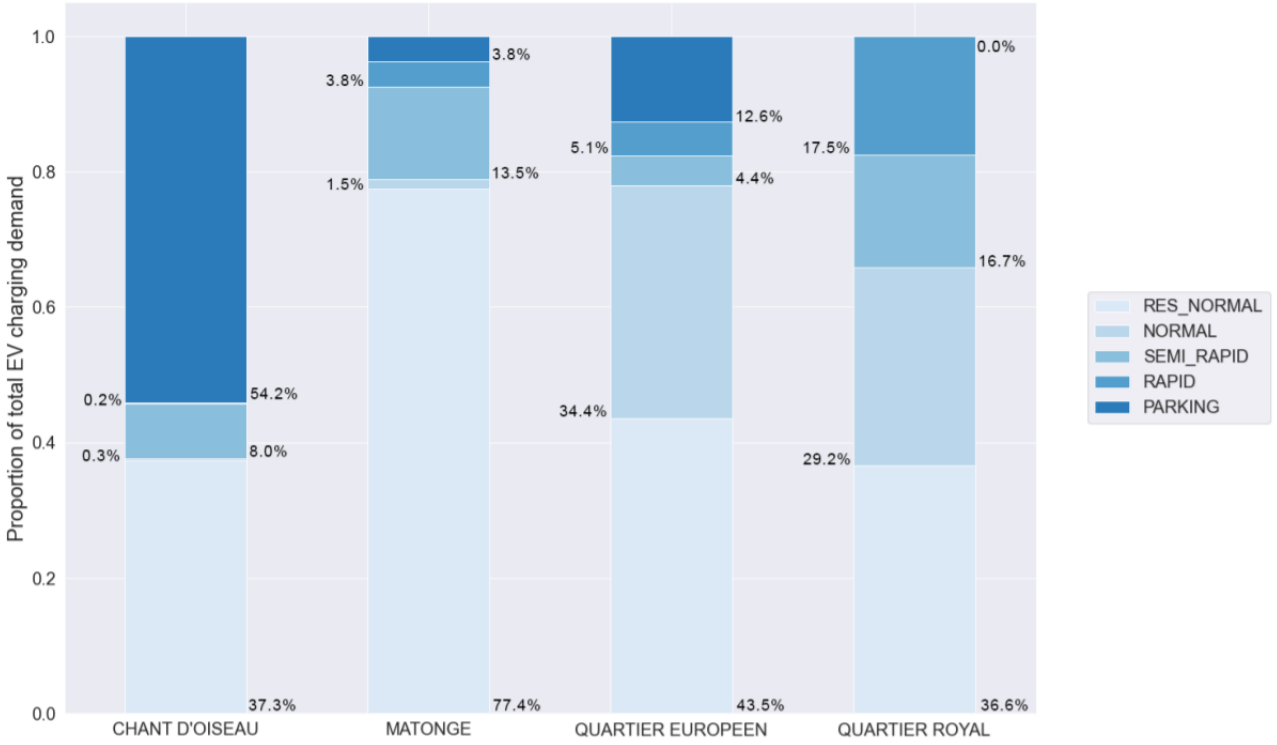
Shops

Cutlery

Health

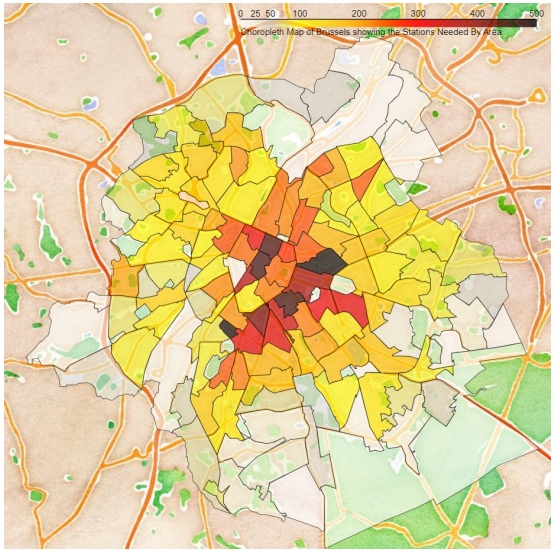
03 DEMAND SEGMENTATION

RESULTS

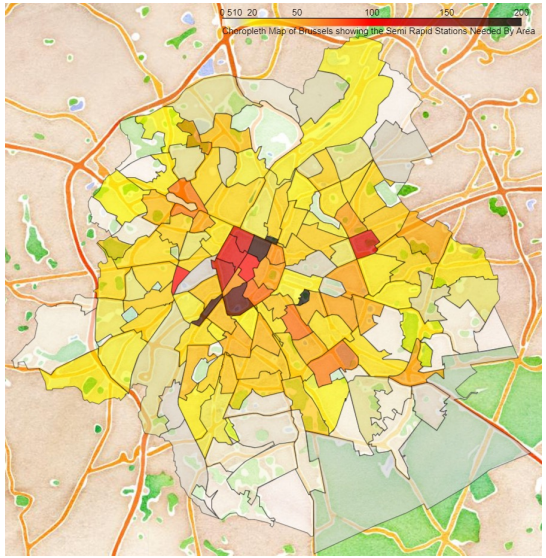


RESULTS

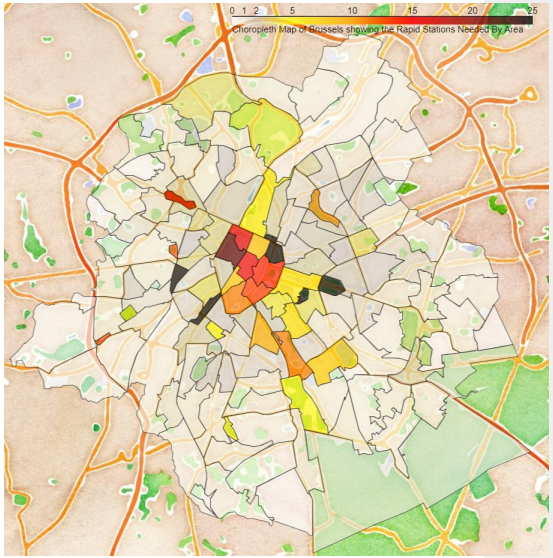
NUMBER OF STATIONS NEEDED



Number of **normal** charging stations divided by the area.



Number of **semi-rapid** charging stations divided by the area.



Number of **fast** charging stations divided by the area.

CONCLUSION

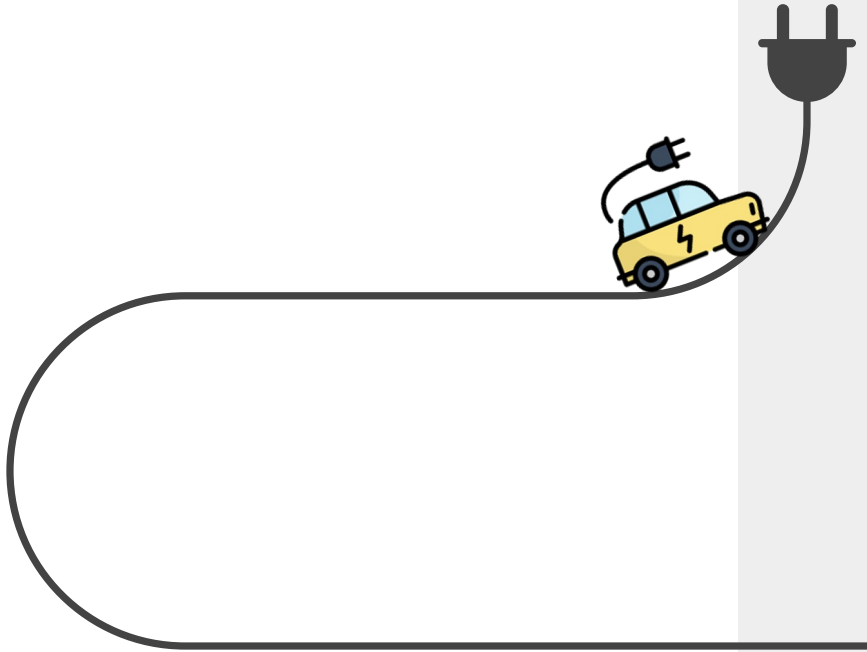
KEY TAKEAWAYS

Data-driven method providing actionable insights for city planning teams.

Charging demand segmentation methods are little covered by literature.

The methodology should be tailored to each city.

Methodology developed during my master thesis.



THANK YOU FOR YOUR ATTENTION

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