Identifying the optimal location for opening a bikeshop in CPH

Based on the analysis of publicly accessible data

Background: cycling is deeply woven in Danish culture

Cycling is closely woven into Danish culture, and the market is expected to further expand

DID YOU KNOW?

35 times around the world
- that's how much people cycle every day in Copenhagen

Odense's National Cycling City project 1999-2002 resulted in
20 % increase in cycling
20 % less accidents
2,100 extra years of life
248 million € in saved health costs

Results from the Mass Experiment in 2012 indicate that
children who cycle or walk to school are much better at concentrating in school
compared to children who arrive to school by car, bus or train.
The positive impact of cycling or walking to school even turned out to be greater than the importance of eating breakfast

Cyclists in Copenhagen **ride 4,9 million km** between each casualty

When we build a bicycle track, bicycle traffic increases 10-20 %
- some places it almost doubles – **and car traffic is reduced locally 9-10 %**

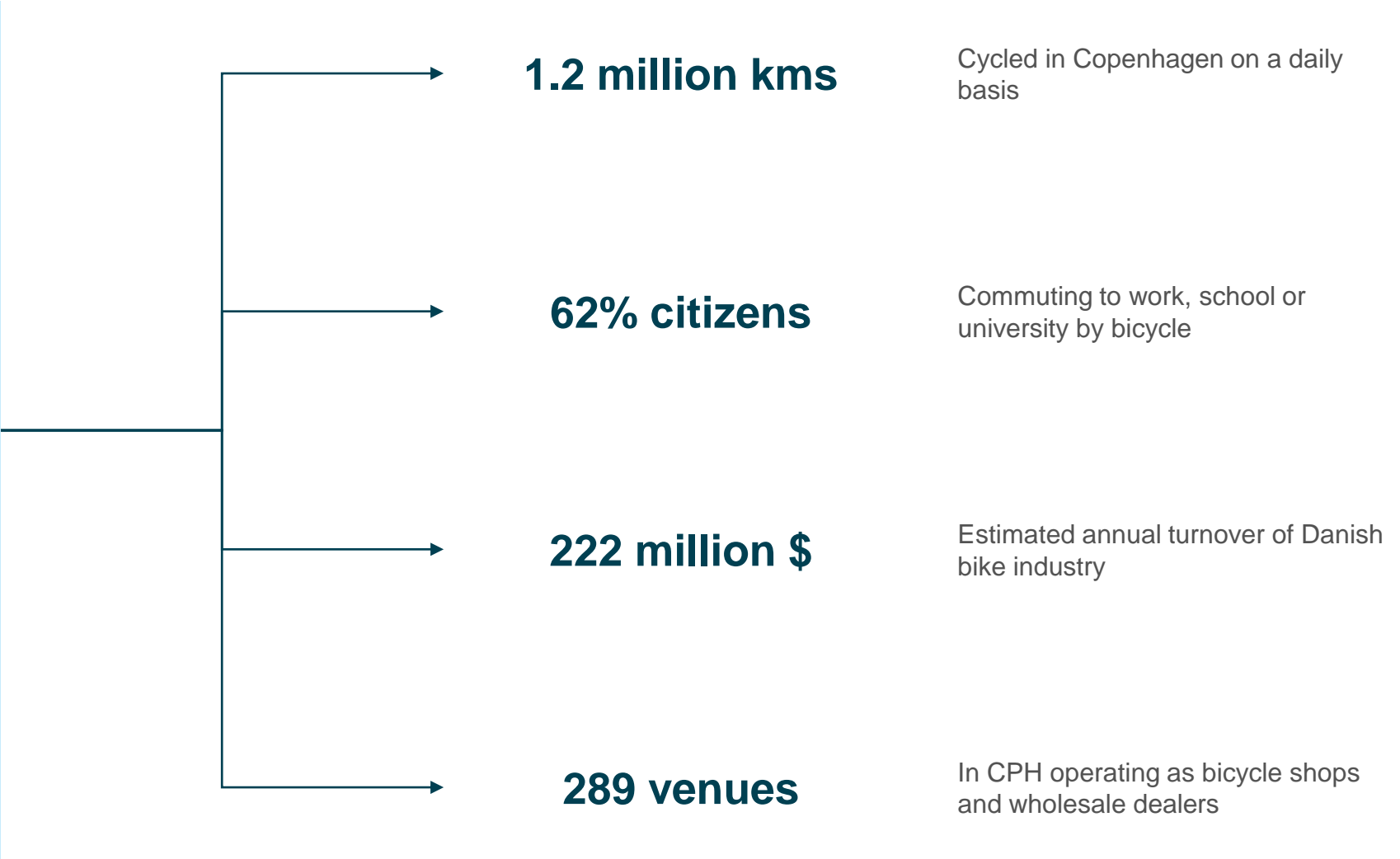The **recommended minimum width** for a **Danish cycle track is 1.7 – 2.2 meter**

In 2016 the number of **cyclists crossing the city centre of Copenhagen exceeded the number of cars**

For every time people in the Capital Region of Denmark **bike 1,200 km** the number of **sick days is reduced by 1**

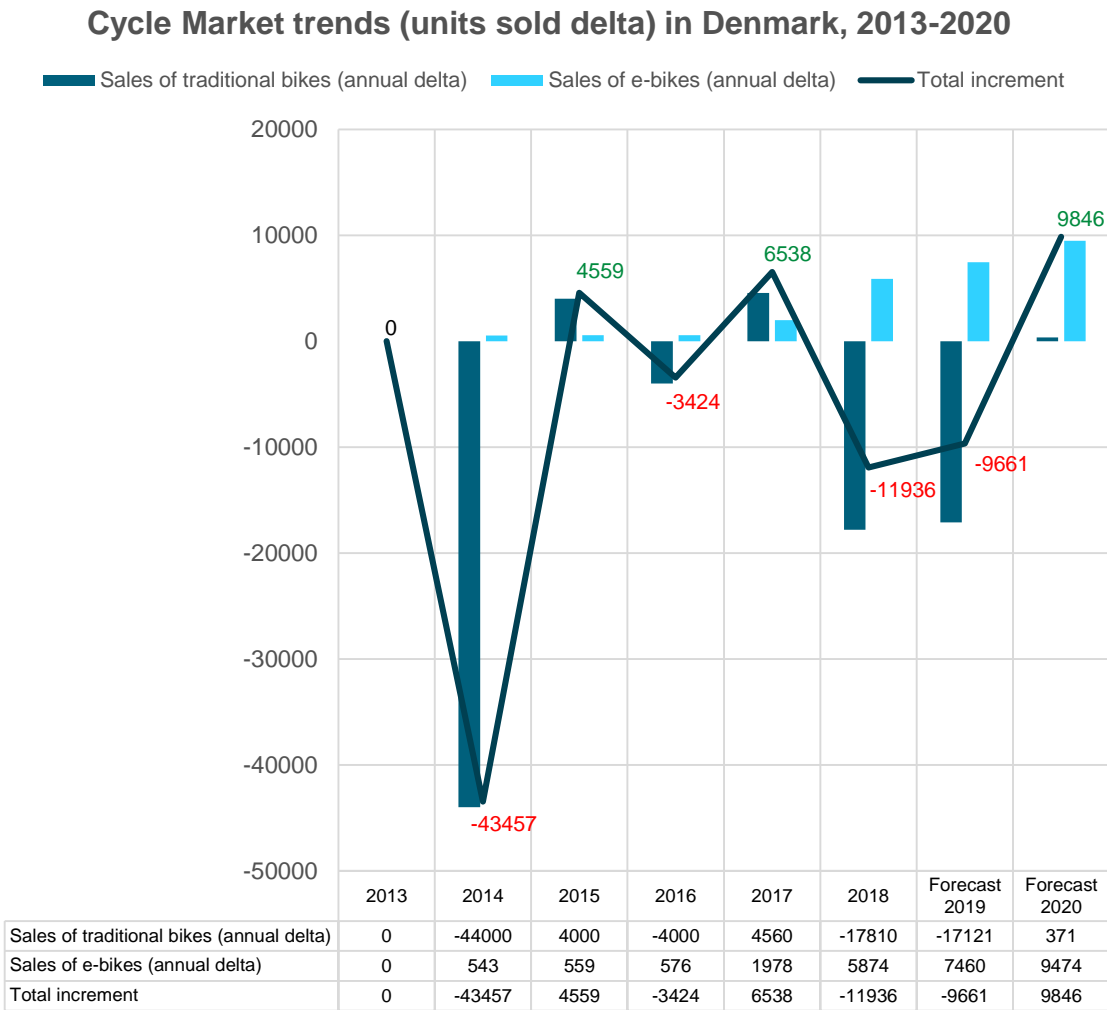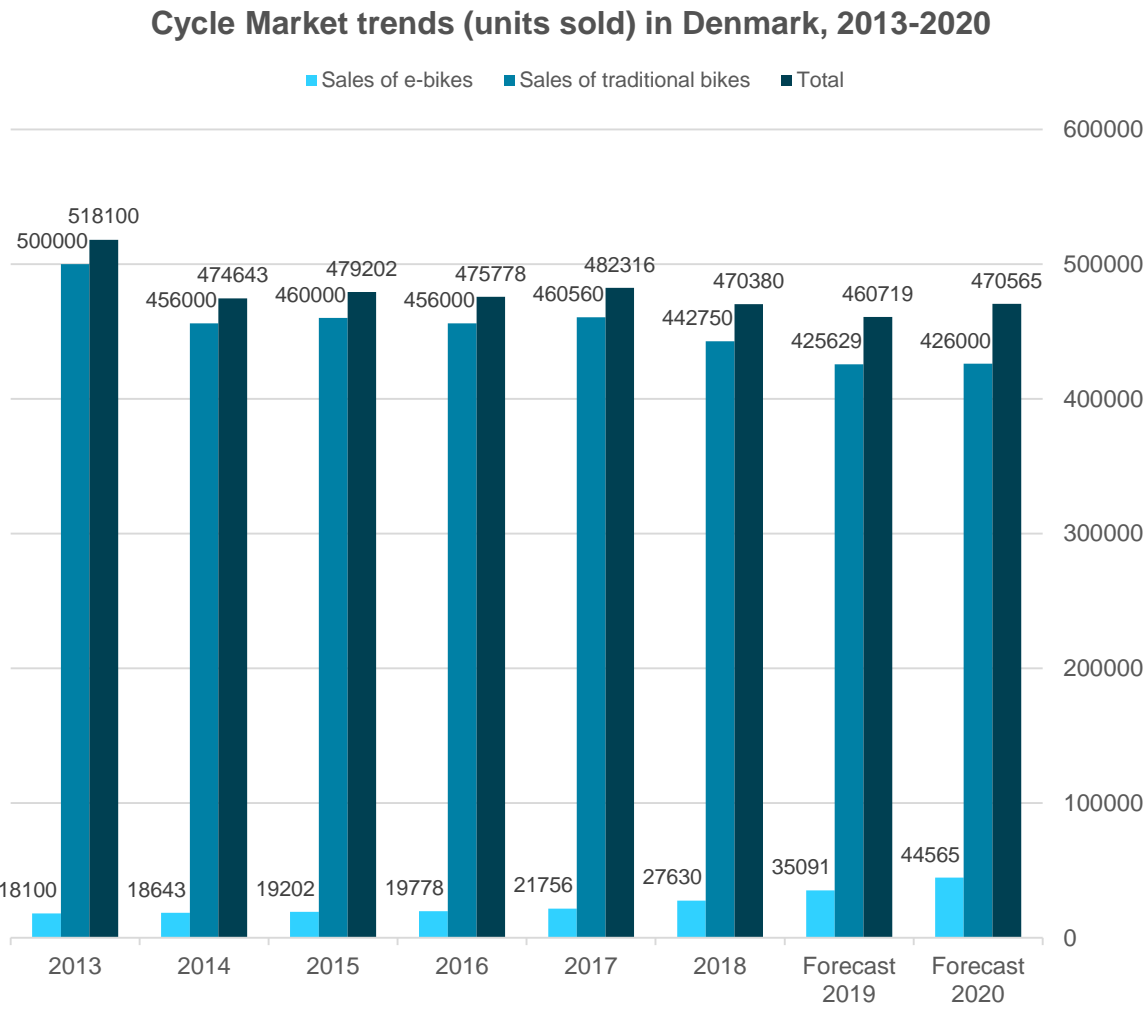**35 %** of all danish cyclists **wear helmet**

There are **more than 12,000 km** of **cycle tracks and lanes** in Denmark

Sources: City of Copenhagen's Bicycle Account 2014 and Cykelredegørelse 2017. The Capital Region of Denmark's Regional Cycling Report 2016, Denmark- on your bike! The national bicycle strategy.

32 % of supermarket and street level shop turnover is bought by bike in Copenhagen

Four out of ten Danes own a **car**

Nine out of ten Danes own a **bicycle**

26 % of all Copenhagen families with two children own a **cargo bike**

75 % of bicycle traffic continues throughout winter

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cycling-embassy.org

1.2 million kms — Cycled in Copenhagen on a daily basis

62% citizens — Commuting to work, school or university by bicycle

222 million $ — Estimated annual turnover of Danish bike industry

289 venues — In CPH operating as bicycle shops and wholesale dealers

Background: after some years of uncertainty, the Danish cycle industry is expected to grow

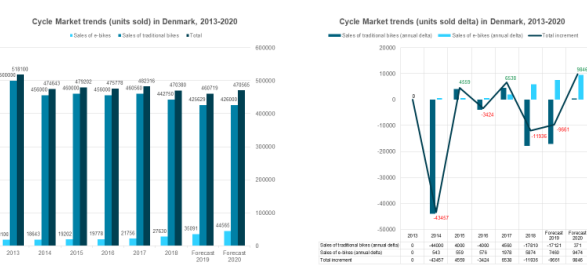The steady growth in e-bikes sales is expected to drive a trend reversal in overall market growth

Cycle Market trends (units sold) in Denmark, 2013-2020

■ Sales of e-bikes ■ Sales of traditional bikes ■ Total

Cycle Market trends (units sold delta) in Denmark, 2013-2020

■ Sales of traditional bikes (annual delta) ■ Sales of e-bikes (annual delta) ― Total increment

	2013	2014	2015	2016	2017	2018	Forecast 2019	Forecast 2020
Sales of traditional bikes (annual delta)	0	-44000	4000	-4000	4560	-17810	-17121	371
Sales of e-bikes (annual delta)	0	543	559	576	1978	5874	7460	9474
Total increment	0	-43457	4559	-3424	6538	-11936	-9661	9846

Business problem: challenge definition

Capturing a share of the growing Danish cycle market through a CPH-based business

- The cycle market is closely woven into Danish cultural fabric. Cycling indeed represents a **crucial resource** for Danes to move within urban and rural landscapes.

- The market is forecasted to expand throughout next years, in virtue of A) creation of new cycling infrastructures, and B) a growing demand for e-cycles (**27% forecasted CAGR** for the next 5 years).

- The competitive landscape for bike shops offering bike sales & repairs within the city of Copenhagen appears to be already **densely inhabited**.

The cycle market in Denmark presents interesting business opportunities due to a change in market growth trends. Thus, for an aspiring entrant seeking to capture a share of the growing market, the key business questions would be:

"To capture a (as big as possible) share of the expanding cycle market, where should someone establish a bike shop in Copenhagen?"

Overview - Project structure

The project is divided in five phases

Phase 1: Data acquisition, cleaning, and selection

- [ ] 1. 1. Analysis-critical metrics
- [ ] 1.2. Sources for data extraction
- [ ] 1.3. Data cleaning
- [ ] 1.4. Data selection and extraction

Phase 2: Analysis

- [ ] 2.1. Visualization of bikeshop concentration: heatmaps
- [ ] 2.2. Scope restriction – desk research
- [ ] 2.3. Candidate area selection, clustering and address identification
- [ ] 2.4. Final skimming

Phase 3: Results and discussion

Phase 4: Limitations

- [ ] 4.1. Methodology
- [ ] 4.2. Data Selection
- [ ] 4.3. Tools

Phase 5: Conclusions

Phase 1: Data acquisition, cleaning, and selection

Preparing the data for the analysis

1.1. Analysis-critical metrics

- **number of and distance** to **bike shops** in the neighborhood, if any

- **distance** of neighborhood from the **closest bike trail**

- **distance** of neighborhood from the **city center**

1.2. Sources for data extraction

• postal codes of Greater Copenhagen Region → **State registries** (https://www.regionh.dk/english/about-the-capital-region/facts-about-the-region/PublishingImages/PostalcodesEnglish.pdf) - pre-processed to select only the areas included in the 'City of Copenhagen'

• missing addresses → **Foursquare API**

• candidate area addresses → **ArcGIS and Google geocoder APIs**

• bikeshop and bike trail coordinates and addresses → **Foursquare API**

• coordinate of Copenhagen center → **ArcGIS and Google geocoder APIs**

1.3. Data cleaning

- Rows with postal codes associated to postboxes were dropped

- NaN values were replaced with the corresponding address via ArcGIS and Bing APIs. Respectively, ArcGIS API was used to associate lat/lon coordinates to each postal code, whether NaN or not. Then, Bing API was used to reverse geocode addresses based on the coordinates

- Obtained addresses were appended and duplicates were dropped based on the repetition of their respective latitude and longitude

## 1.4. Data selection and extraction

- **83** unique bikeshops found within inner Copenhagen

- **86** unique bikeshop found within Outer Copenhagen

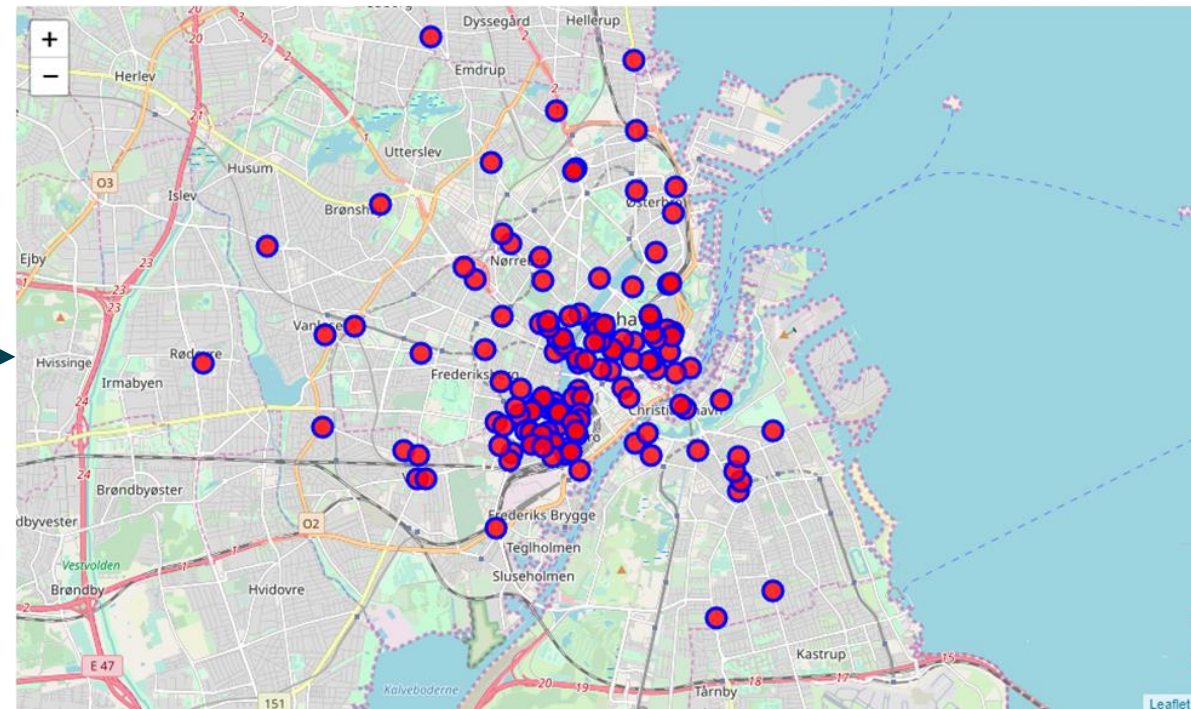- After duplicates dropped, final selection of **142** unique bikeshop venues

Phase 1: Exploratory visualization of data extracts

Exploratory analysis highlighted an uneven concentration of postal codes and bikeshops between Inner and Outer Copenhagen

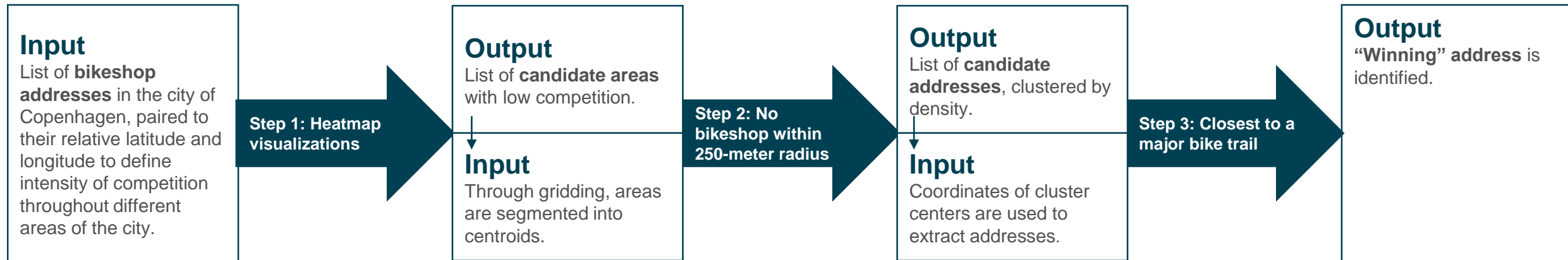### 1.5. Visualization 1: distribution of postal codes
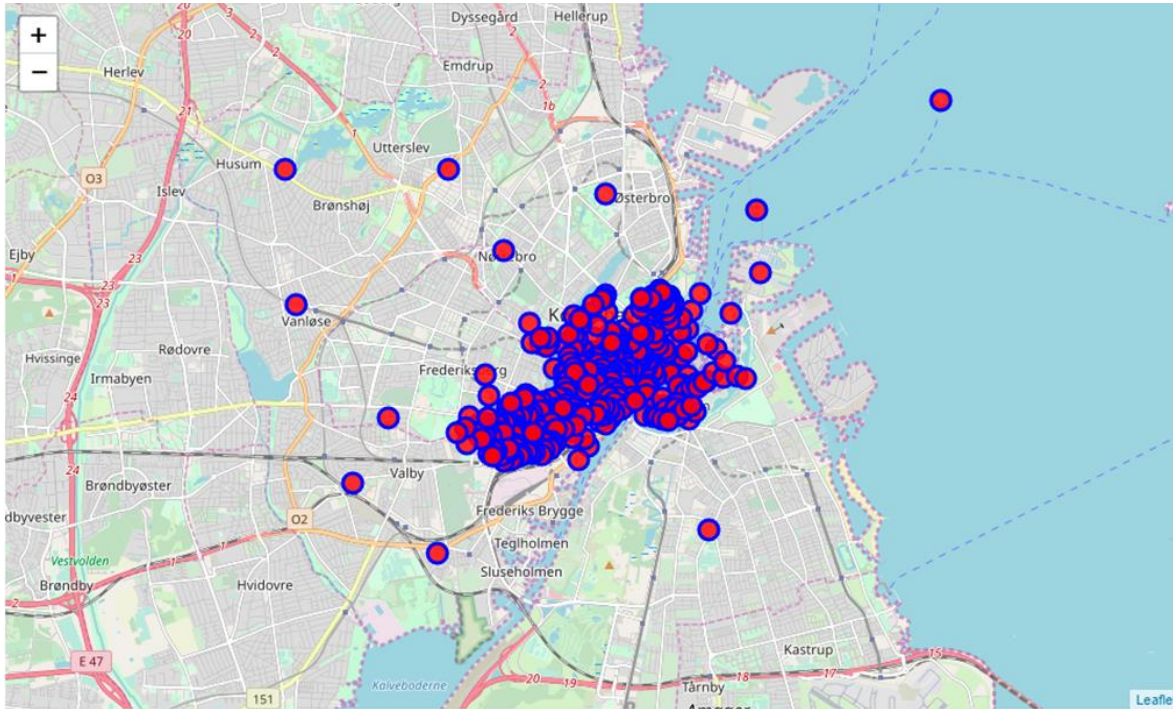
1.6. Visualization 2: distribution of bike shop venues

Analysis Methodology: Filtering criteria

Candidate addresses were skimmed based on density of competitors and proximity to bike trails

Input
List of **bikeshop addresses** in the city of Copenhagen, paired to their relative latitude and longitude to define intensity of competition throughout different areas of the city.

Step 1: Heatmap visualizations

Output
List of **candidate areas** with low competition.

Input
Through gridding, areas are segmented into centroids.

Step 2: No bikeshop within 250-meter radius

Output
List of **candidate addresses**, clustered by density.

Input
Coordinates of cluster centers are used to extract addresses.

Step 3: Closest to a major bike trail

Output
"Winning" address is identified.

Phase 2: Analysis

Based on the concentration of competition, the area between Frederiksberg and Nørrebro emerged as the most promising

2.1. Visualization of bikeshop concentration: heatmaps
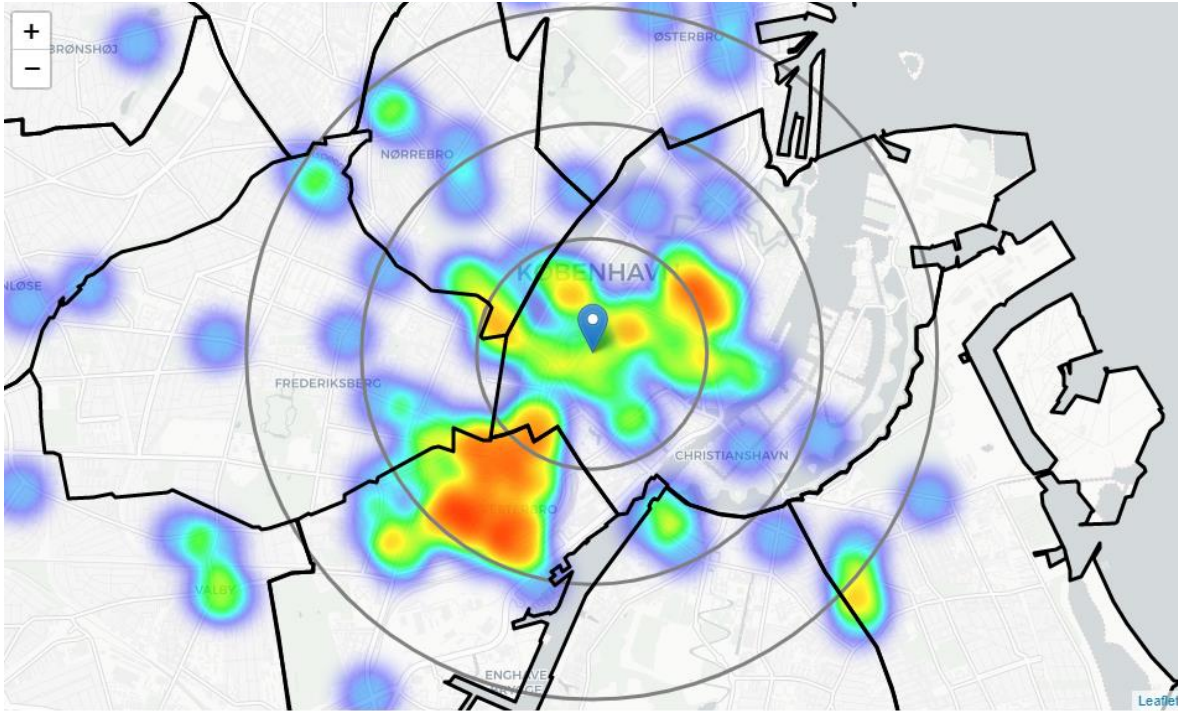
2.2. Scope restriction – desk research
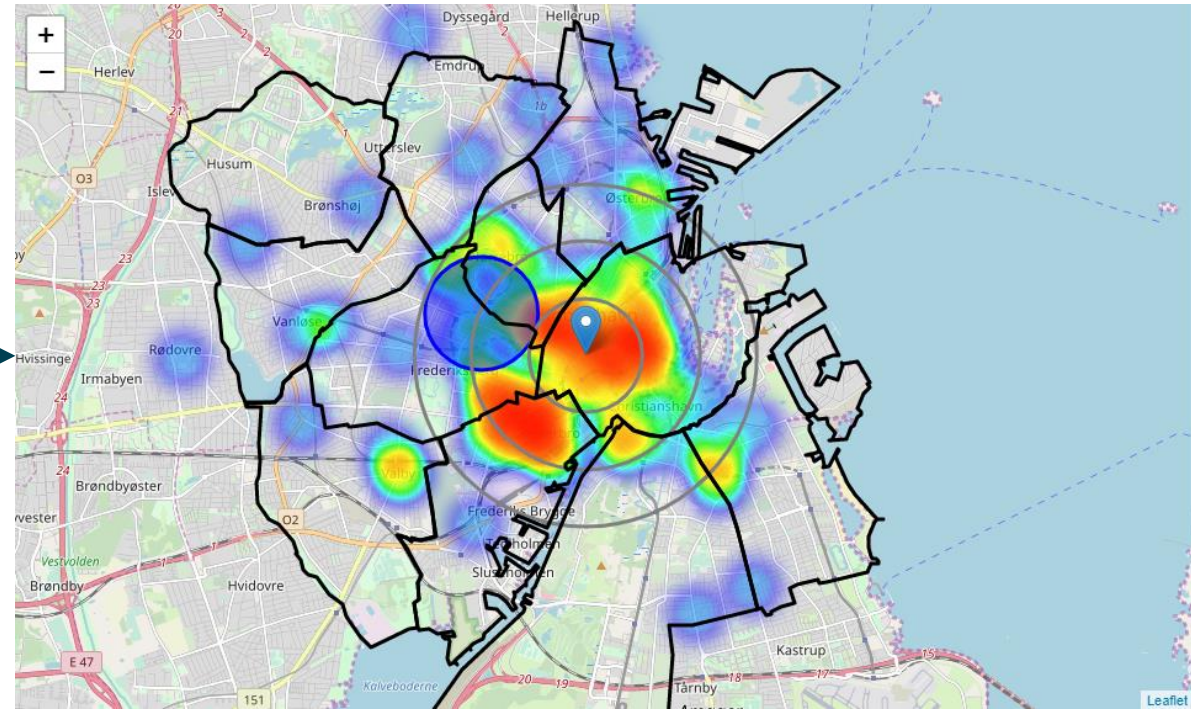
Phase 2: Analysis

By filtering out addresses with a bikeshop within a 250-meter radius, it was possible to identify 15 clusters of candidates

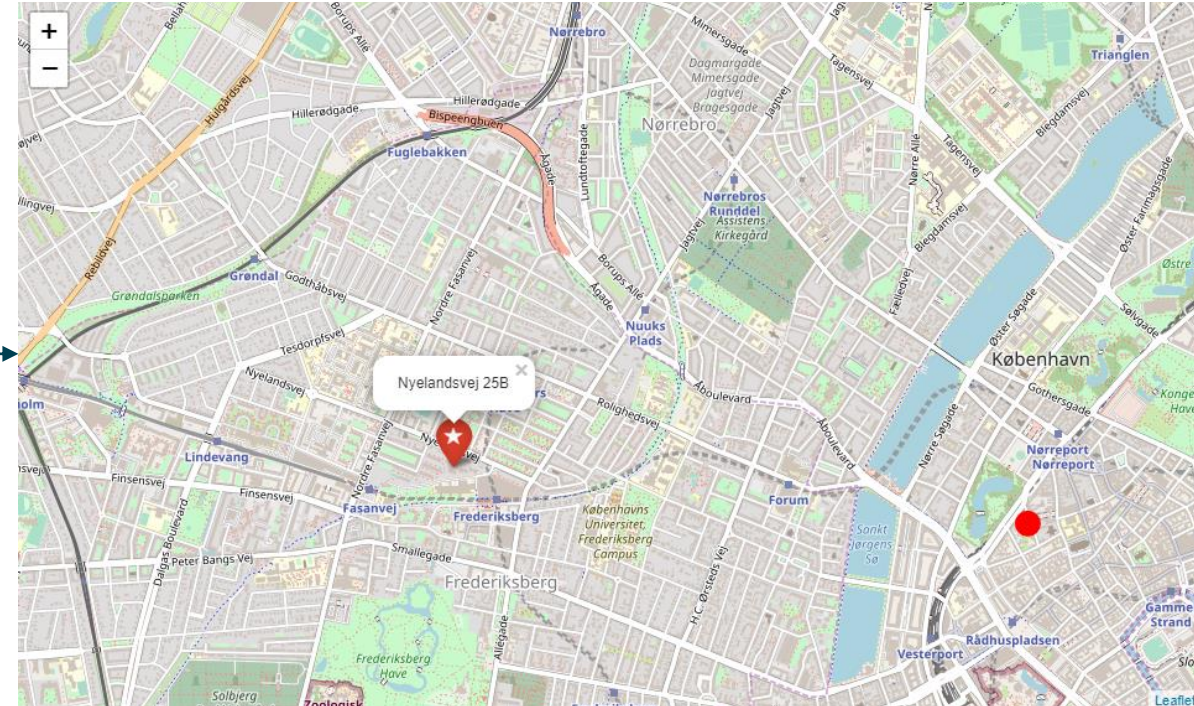### 2.3. Candidate area selection
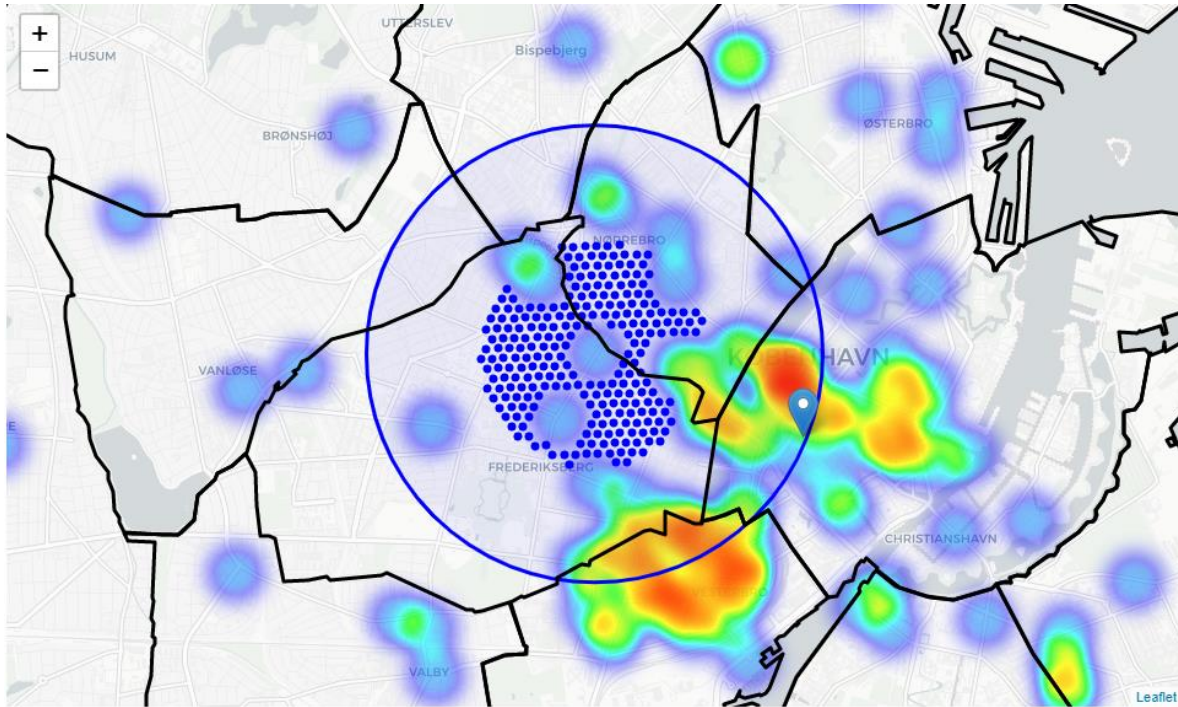
2.3. Clustering and address identification
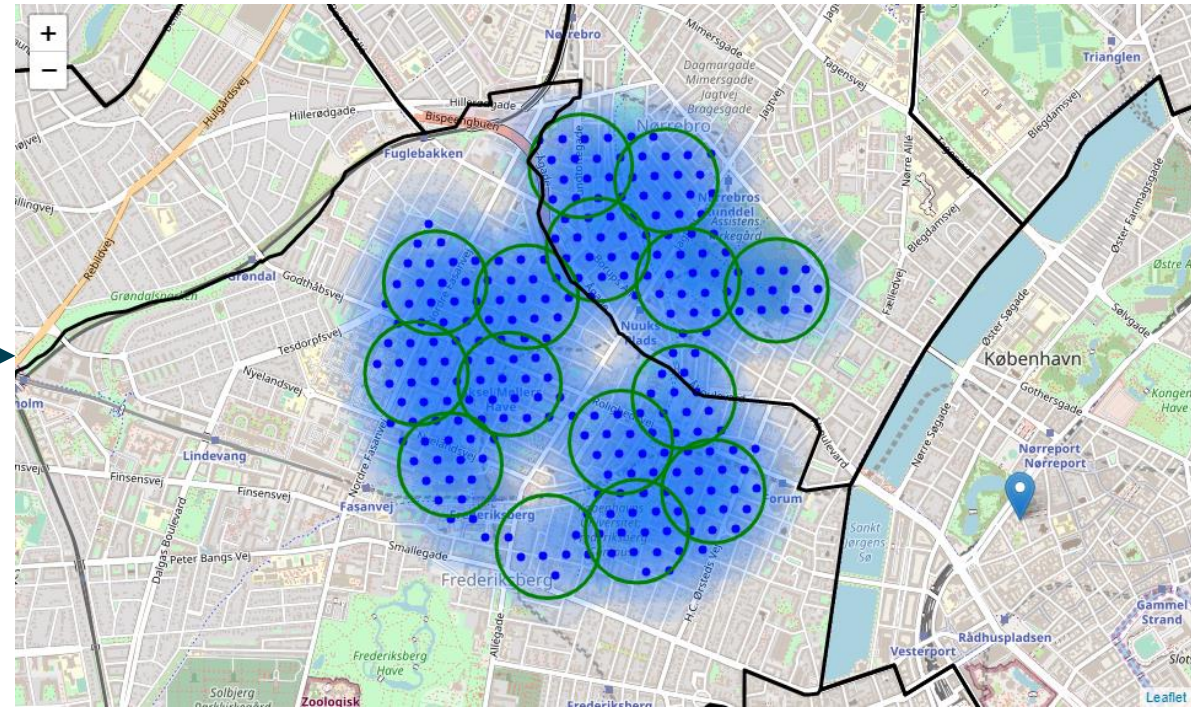
Phase 2: Analysis

By using the centers of the clusters to extract addresses, the one closest to a major bike trail was identified

2.4. Final skimming
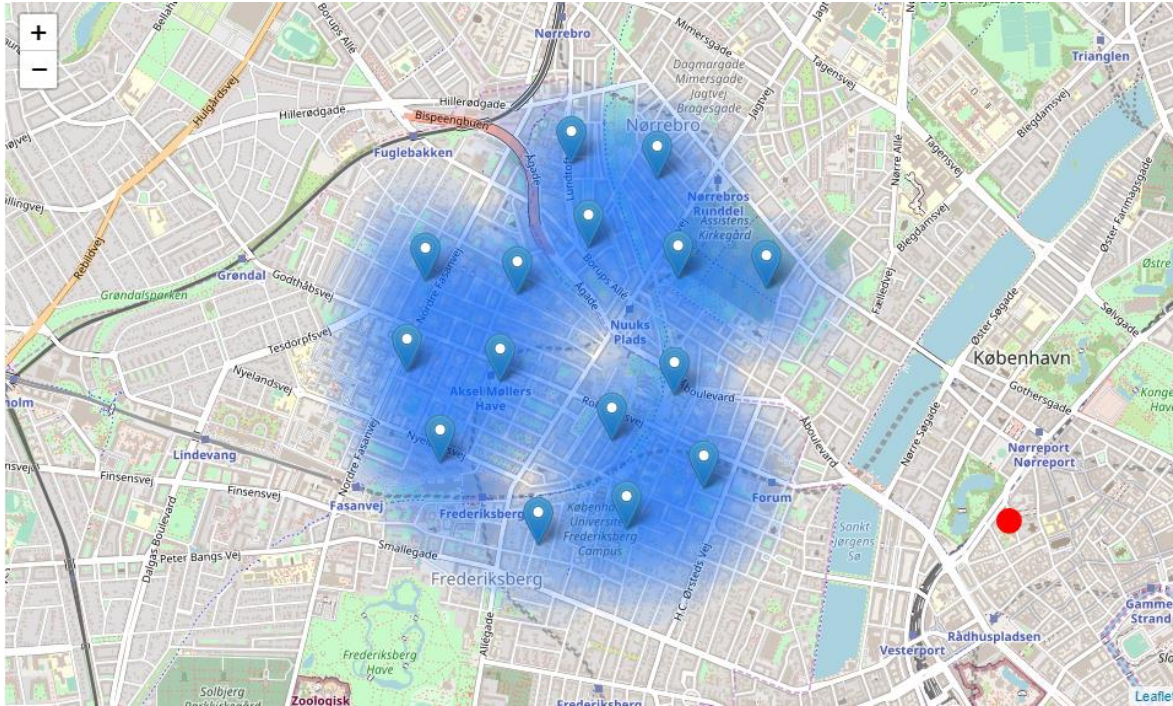
Winning address!

Phase 3 & 4: Results, discussion and limitations

A final address was obtained, but the reliability of the findings are limited by functional and non-functional limitations

3. Results: Nyelandsvej, 25B

4. Limitations

4.1. Methodology
Data extraction efficiency and overall consistency

4.2. Data Selection
Socio-economic factors & traffic data ignored

4.3. Tools
Individual API limits and inconsistencies

Phase 5: Conclusions

The results of the project represent a promising initial exercise, but more research is required to either confirm or reject them

Project recap

- Purpose of this project was to identify Copenhagen areas close to center with low number of bikeshops in order to aid stakeholders in narrowing down the search for optimal location for a new bikeshop.

- By calculating bikeshop density distribution from Foursquare data I have first identified general boroughs that justify further analysis (Frederiksberg and Norrebrø), and then generated extensive collection of locations which satisfy some basic requirements regarding existing nearby bikeshops.

- Clustering of those locations was then performed in order to create major zones of interest (containing greatest number of potential locations) and addresses of cluster centers were created to be used as starting points for final exploration by stakeholders.

Next steps

Final decision on optimal bikeshop location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like:

1. attractiveness of each location,

2. real estate availability, prices, socio-economic dynamics of every neighborhood

3. etc.