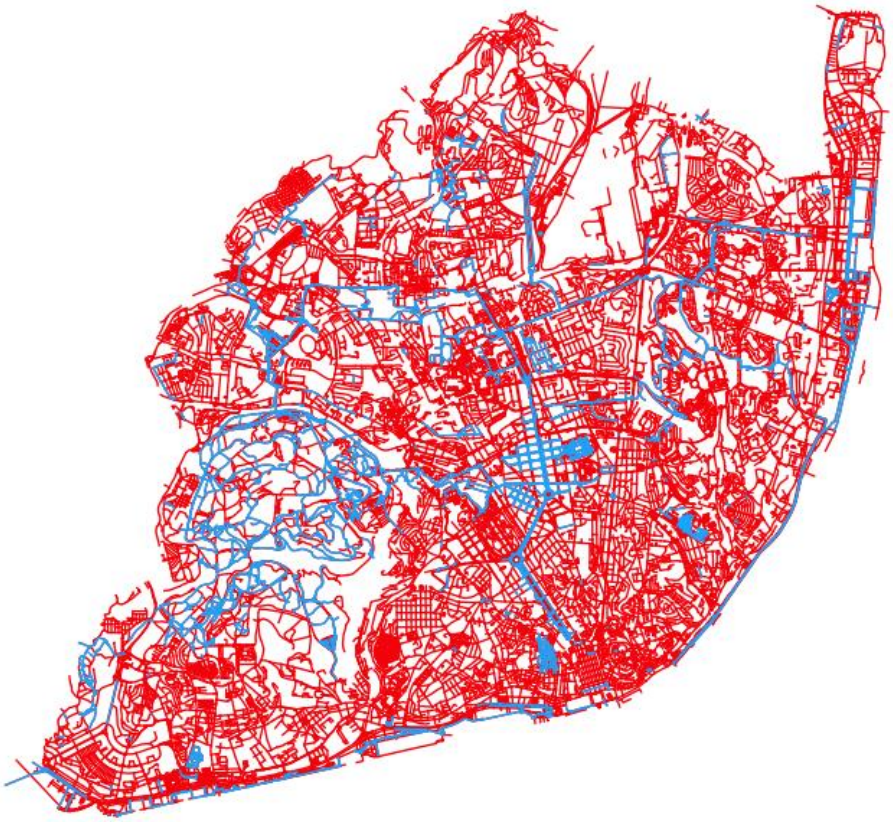
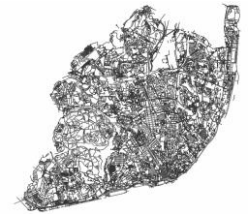


# BIKE NETWORK ANALYSIS LISBON

Open Data for Open Cities v 2.0 - AGILE 2018 Workshop

June 12th, 2018

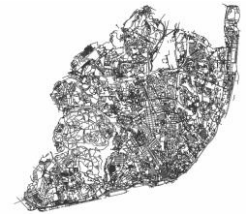


# INTRODUCING OURSELVES

LORENA ABAD

LUUK VAN DER MEER

Master students in
Geospatial Technologies



# PROBLEM DEFINITION


SOURCE: KASPER THYE @ VISITCOPENHAGEN.COM

# PROBLEM DEFINITION

"The municipality of Lisbon is executing a program for traffic volume reduction in the city of Lisbon, which implies the joint use of public transport and bicycles as fundamental means to achieve this objective and also calming traffic fluxes."

Câmara Municipal de Lisboa

# PROBLEM DEFINITION

peopleforbikes™

The BNA score defines how well the bike network in a city connects people with the places they want to go to

# OBJECTIVE

Based on the BNA score defined by *peopleforbikes*, compute a score to measure how well the **Lisbon bike network** connects people with the places they want to go to

# PRESENTATION OUTLINE

- Methodology
  - Data sources
  - Tools used
  - Steps taken
- Results
- Conclusion & discussion

# METHODOLOGY

OpenStreetMap

XV recenseamento geral da população
CENSOS 2011
V recenseamento geral da habitação
Portugal conta connosco. Nós contamos consigo.

LISBOA
CÂMARA MUNICIPAL

# METHODOLOGY

- Methodology
  - Data sources ✓
  - Tools used
  - Steps taken
- Results
- Conclusion & discussion

# METHODOLOGY

python™

pandas

geopandas

NumPy

Folium

urllib module

PostgreSQL

pgRouting

PostGIS

HSTORE

QGIS

DB MANAGER

MMQGIS

# METHODOLOGY

- Methodology
  - Data sources ✓
  - Tools used ✓
  - Steps taken
- Results
- Conclusion & discussion

# METHODOLOGY

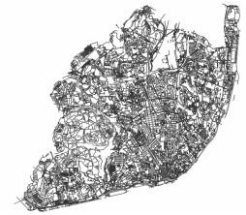
## STEP 1:
## DEFINE AND SELECT THE LOWSTRESS NETWORK

# METHODOLOGY

High Stress

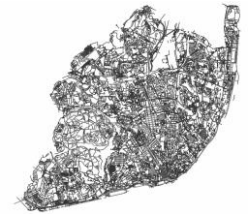
Low Stress

SOURCE: PEOPLEFORBIKES

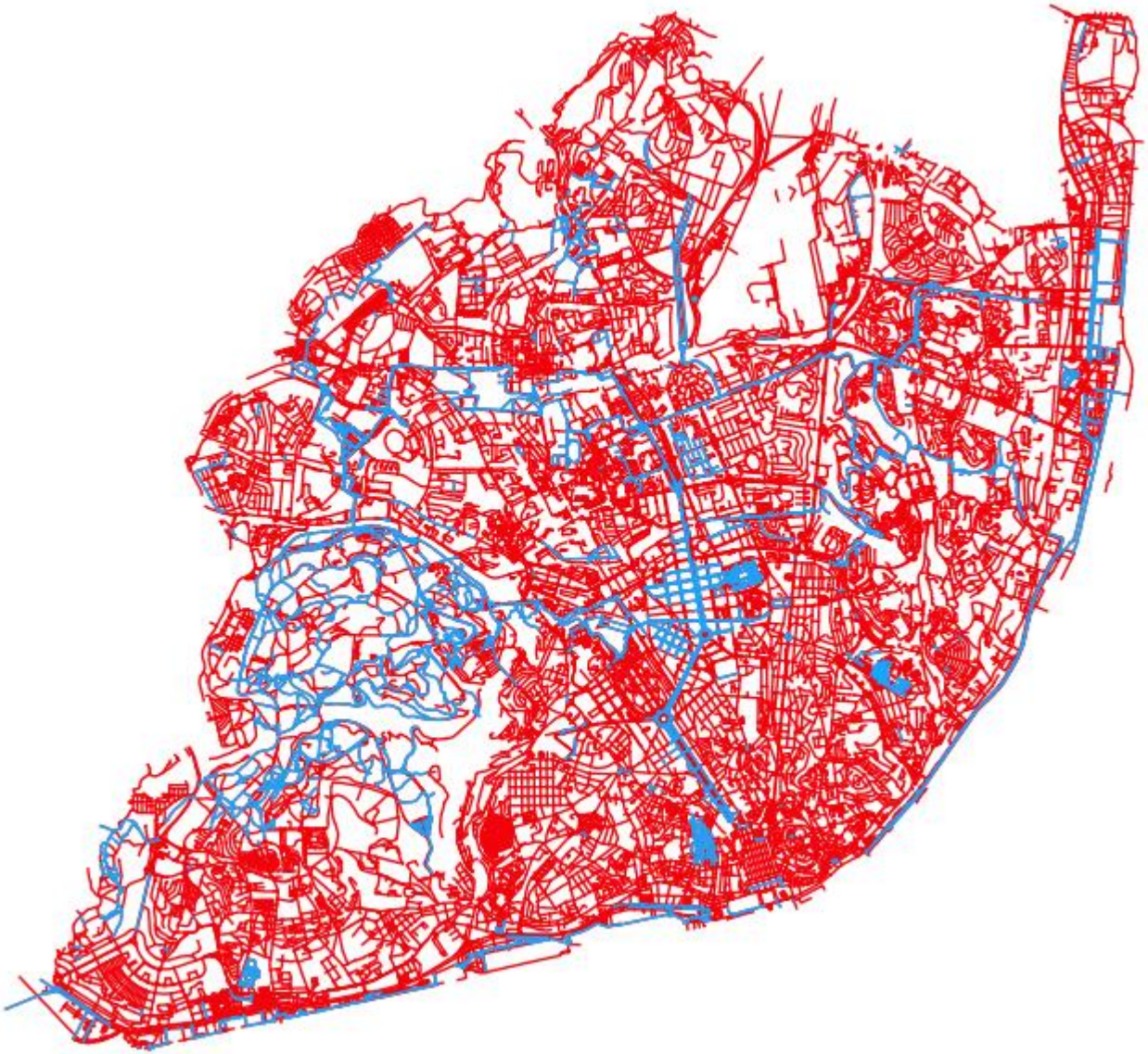


# METHODOLOGY

| Type of segment | Maximum speed | Residential area | Number of lanes | Slope | Bicycle tag | Stress Level |
|---|---|---|---|---|---|---|
| Municipality Designated Cycleway | ---------- | ---------- | ---------- | ---------- | ---------- | Low |
| OSM Tagged Cycleway | ---------- | ---------- | ---------- | ---------- | ---------- | Low |
| Shared Lanes | ≤ 35 km/h | Yes | ---------- | ---------- | ---------- | Low |
| | ≤ 35 km/h | No | 1 | < 10% | ---------- | Low |
| | > 35 km/h | No | ---------- | ---------- | ---------- | High |
| Motorized road network (road, primary, secondary and tertiary segments and links) | ≥ 50 km/h | No | >1 | ---------- | ---------- | High |
| | ≥ 50 km/h < 60 km/h | No | 1 | < 10% | ---------- | Low |
| | ≥ 50 km/h < 60 km/h | No | 1 | > 10% | ---------- | High |
| | ≤ 30 km/h | No | 1 | < 10% | ---------- | Low |
| Residental roads (unclassified, residential, living street) | > 40 km/h | ---------- | ---------- | ---------- | ---------- | High |
| | ≤ 40 km/h | ---------- | ---------- | < 10% | ---------- | Low |
| Pedestrian segments and footways | ---------- | ---------- | ---------- | ---------- | ---------- | High |
| Roundabouts segments without bikepath | ---------- | ---------- | ---------- | ---------- | ---------- | High |
| Service lanes (public transport) | ≤ 30 km/h | ---------- | ---------- | < 10% | ---------- | Low |
| | > 30 km/h | ---------- | ---------- | ---------- | ---------- | High |
| Paths | ---------- | ---------- | ---------- | ---------- | ---------- | Low |
| Tracks | ---------- | ---------- | ---------- | ---------- | ---------- | High |
| Remaining unclassified segments | ---------- | ---------- | ---------- | > 10% | ---------- | High |
| | ---------- | ---------- | ---------- | ---------- | - Yes<br>- Designated<br>- Destination | Low |
| | ---------- | ---------- | ---------- | ---------- | - No<br>- Dismount | High |



# METHODOLOGY

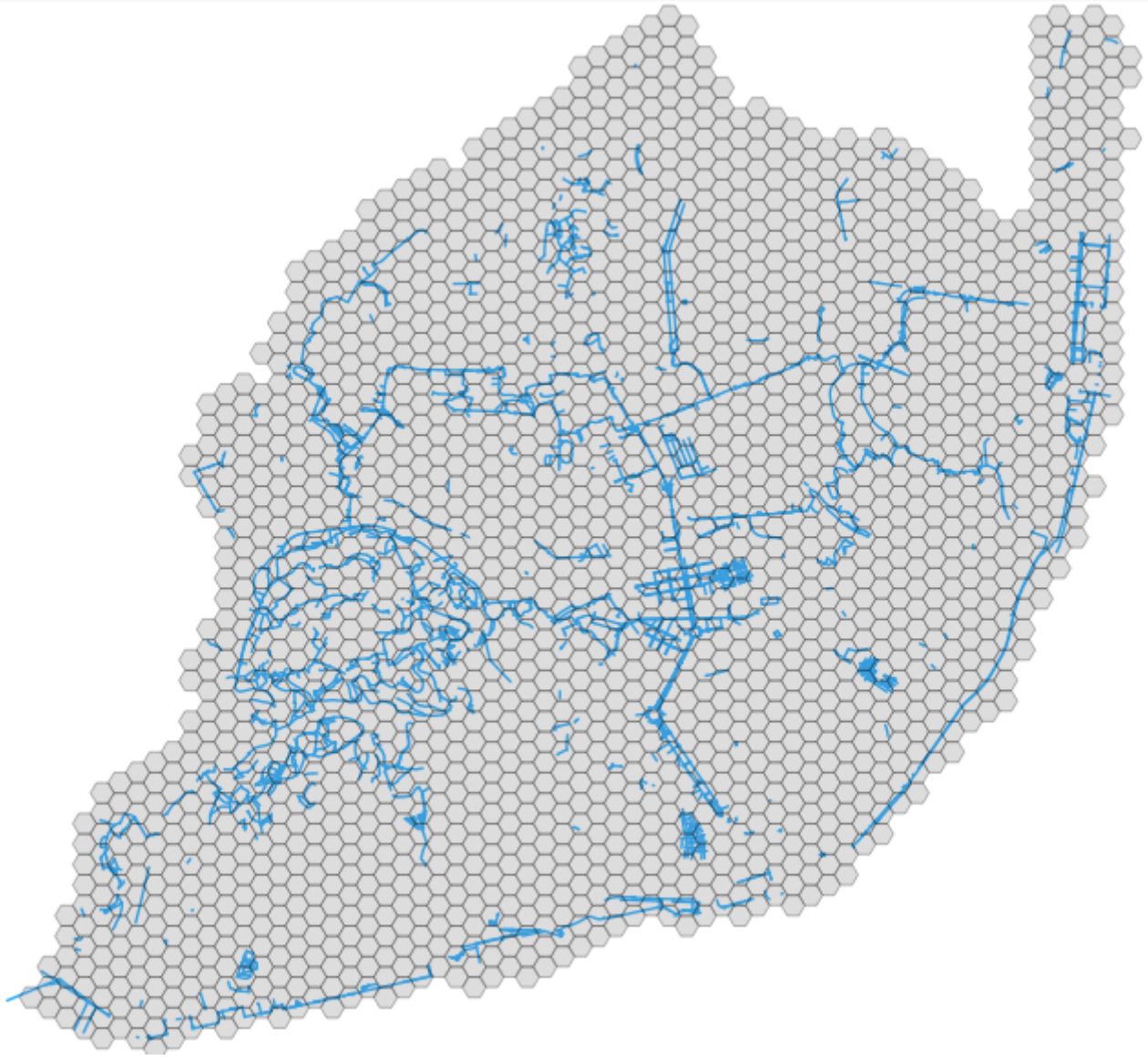


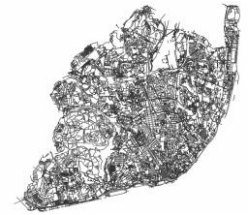
# METHODOLOGY

# METHODOLOGY

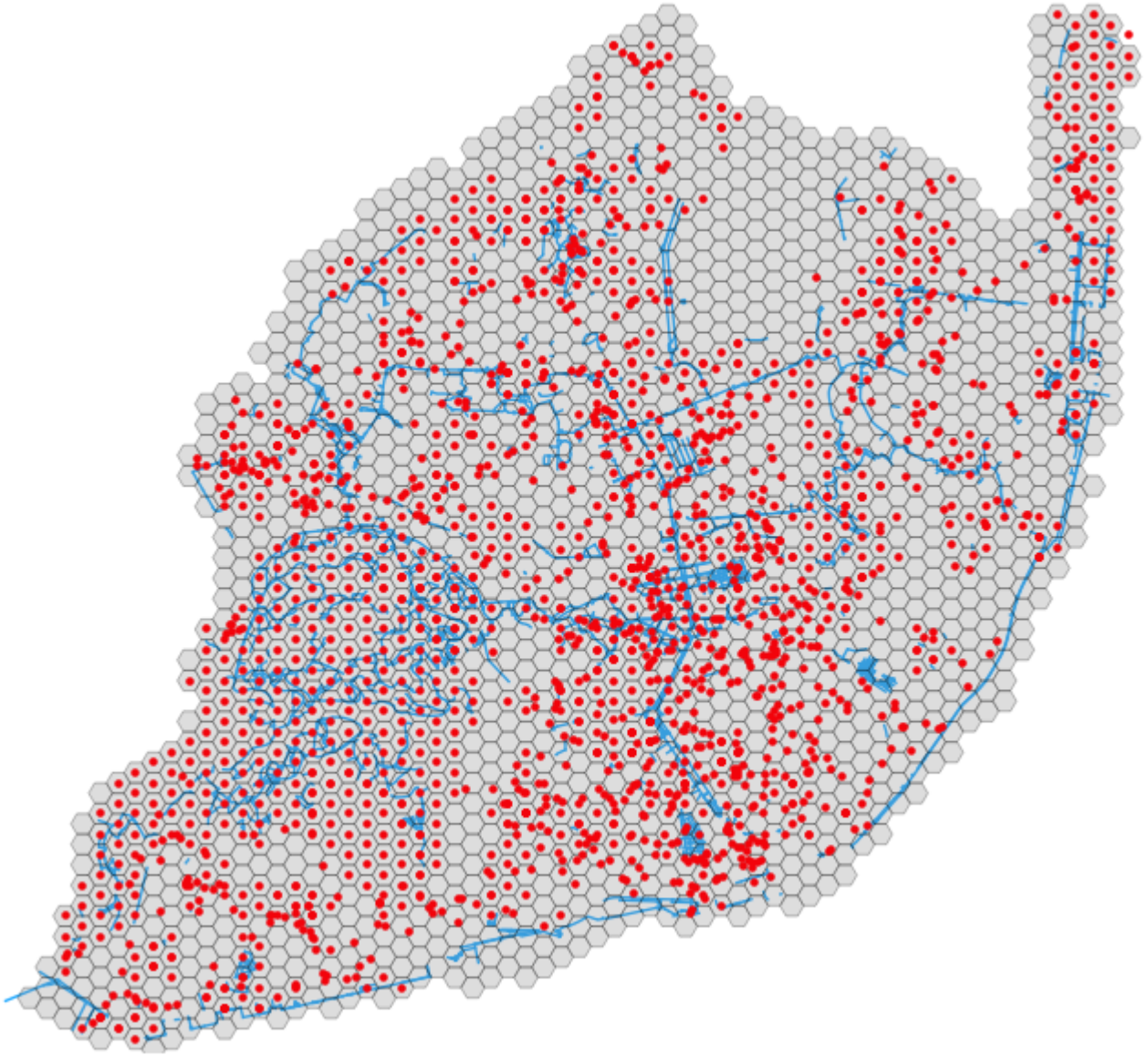
## STEP 2:
## RUN THE NETWORK ANALYSIS

# METHODOLOGY

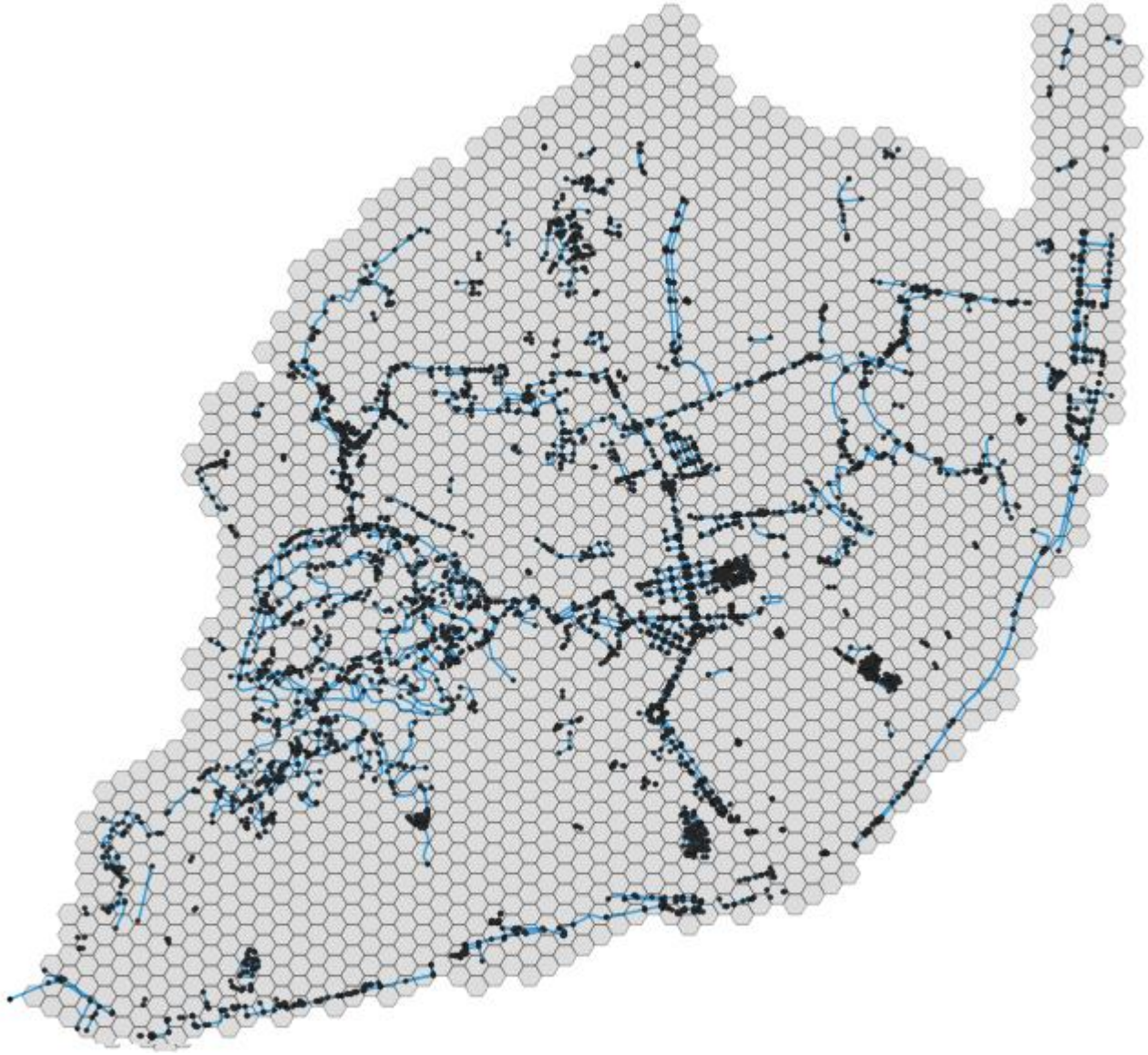




# METHODOLOGY



# METHODOLOGY



# METHODOLOGY

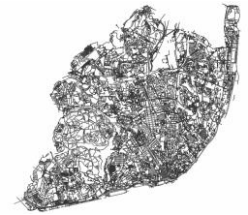
| Source cell | Target cell | Distance | Schools in target cell | Doctors in target cell | … |
|---|---|---|---|---|---|
| 1 | 2 | 1000 m | 1 | 0 | … |
| 1 | 3 | 800 m | 3 | 1 | … |
| 1 | 5 | 1800 m | 0 | 2 | … |
| 2 | 1 | 1000 m | 3 | 0 | … |
| 2 | 8 | 600 m | 0 | 4 | … |
| 3 | 1 | 800 m | 3 | 0 | … |
| 4 | 6 | 5600 m | 2 | 2 | … |
| … | … | … | … | … | … |

# METHODOLOGY

| Cell | Schools to reach | Doctors to reach | Dentists to reach | Libraries to reach | … |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 0 | … |
| 2 | 3 | 1 | 3 | 1 | … |
| 3 | 5 | 2 | 0 | 2 | … |
| 4 | 1 | 0 | 3 | 0 | … |
| 5 | 0 | 0 | 0 | 4 | … |
| 6 | 4 | 0 | 3 | 0 | … |
| 7 | 4 | 1 | 2 | 2 | … |
| … | … | … | … | … | … |



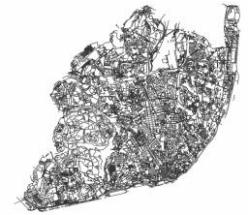
# STEP 3:
# COMPUTE BNA SCORE



# METHODOLOGY

| Scoring process | Criteria |
|---|---|
| A | - First low stress destination = 30 points<br>- Second low stress destination = 20 points<br>- Third low stress destination = 20 points |
| B | - First low stress destination = 40 points<br>- Second low stress destination = 20 points<br>- Third low stress destination = 10 points |
| C | - First low stress destination = 70 points |
| D | - First low stress destination = 60 points<br>- Second low stress destination = 20 points |

| Category | W | Type of destination | W | Scoring process |
|---|---|---|---|---|
| Opportunity | 40 | School | 30 | A |
| | | College | 30 | C |
| | | University | 25 | C |
| | | Library | 15 | B |
| Core Services | 40 | Doctors + Clinics | 20 | B |
| | | Dentist | 10 | B |
| | | Hospital | 20 | C |
| | | Pharmacies | 15 | B |
| | | Supermarket | 25 | D |
| | | Social Facilities | 10 | C |
| Recreation | 20 | Nature Reserve | 50 | A |
| | | Park | 50 | A |



# METHODOLOGY

## BNA TOTAL =

SUM(BNA CELL * POPULATION FRACTION)

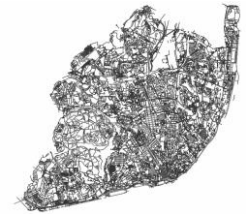
# METHODOLOGY

- Methodology ✓
  - Data sources ✓
  - Tools used ✓
  - Steps taken ✓
- Results
- Conclusion & discussion

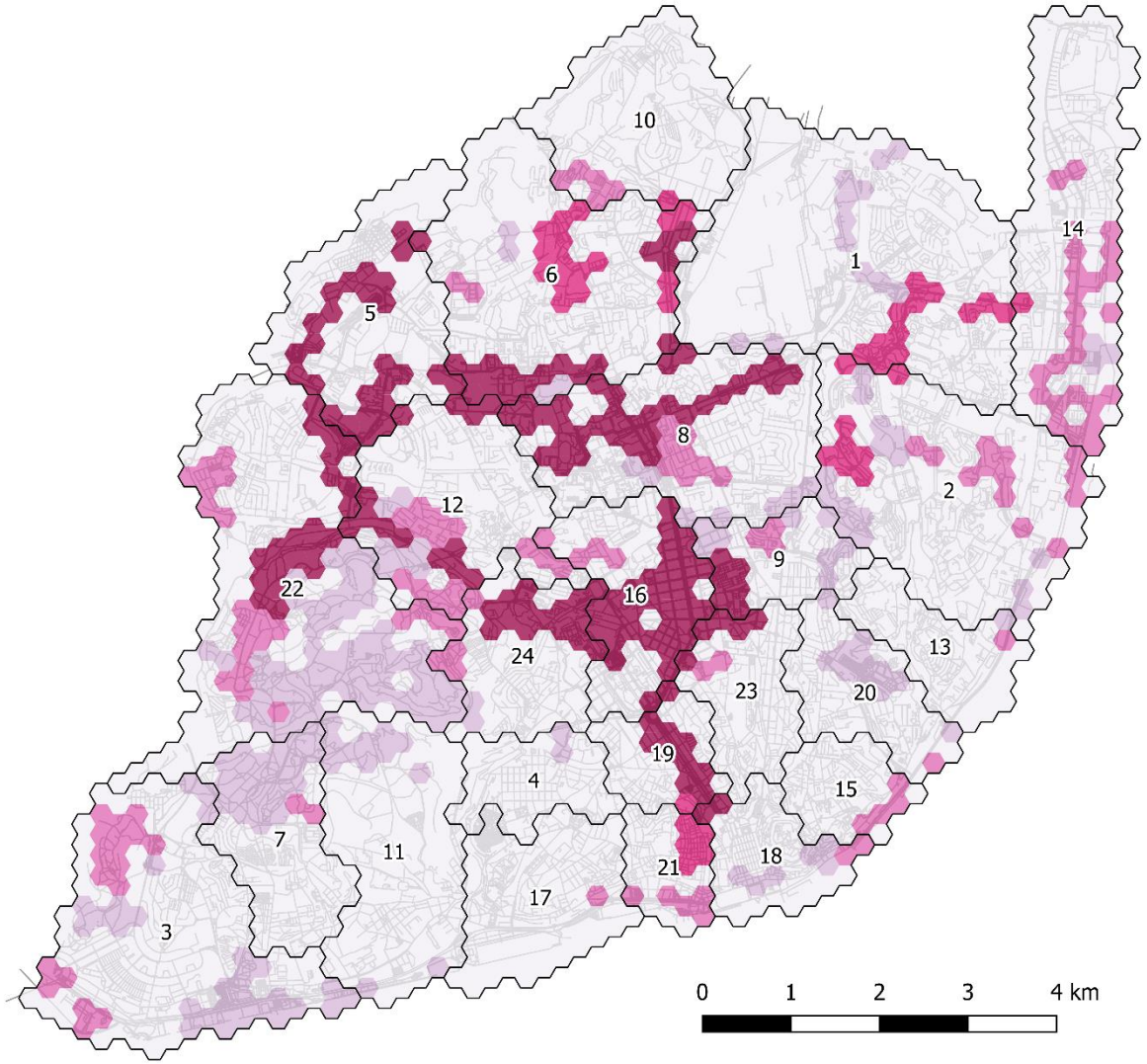
# RESULTS

## BNA LISBON:

8.6 out of 100



# RESULTS




Symbology

Stress network

BNA score

- 0.0 - 3.0
- 3.0 - 11.6
- 11.6 - 25.0
- 25.0 - 47.0
- 47.0 - 70.7

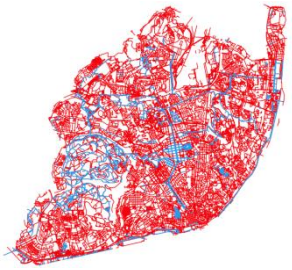
Parish outline

1. Olivais
2. Marvila
3. Belém
4. Campo de Ourique
5. Carnide
6. Lumiar
7. Ajuda
8. Alvalade
9. Areeiro
10. Santa Clara
11. Alcântara
12. São Domingos de Benfica
13. Beato
14. Parque das Nações
15. São Vicente
16. Avenidas Novas
17. Estrela
18. Santa Maria Maior
19. Santo António
20. Penha de França
21. Misericórdia
22. Benfica
23. Arroios
24. Campolide

# RESULTS

- Methodology ✓
  - Data sources ✓
  - Tools used ✓
  - Steps taken ✓
- Results ✓
- Conclusion & discussion

# CONCLUSION & DISCUSSION



## Lisbon, PT

**Last updated:** February 8, 2018

**8.6**

**New York, NY**
Last updated: February 02, 2018

**41**

**Chicago, IL**
Last updated: February 03, 2018

**36**

**Los Angeles, CA**
Last updated: February 01, 2018

**20**

**Houston, TX**
Last updated: February 04, 2018

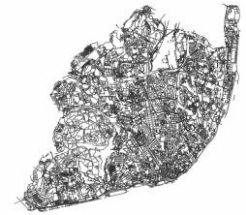
**19**

**San Francisco, CA**
Last updated: January 29, 2018

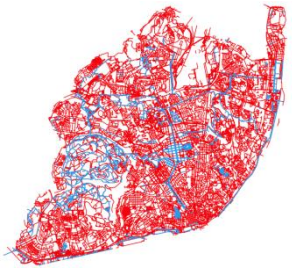
**57**

**Miami, FL**
Last updated: January 29, 2018

**21**



# CONCLUSION & DISCUSSION

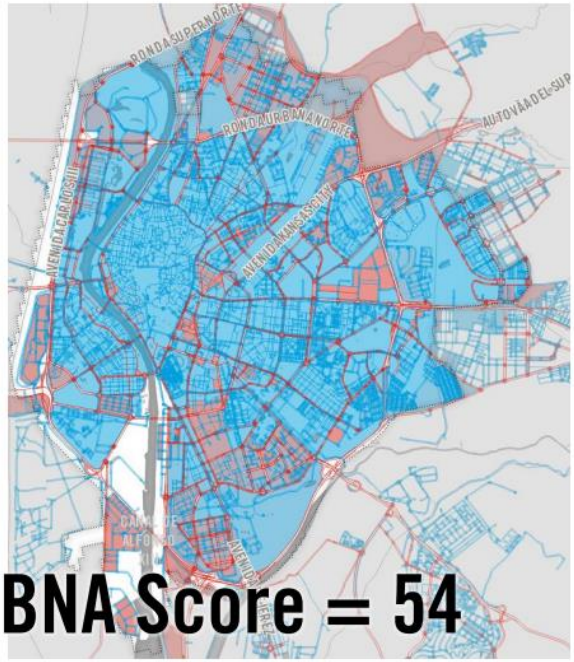


## Lisbon, PT

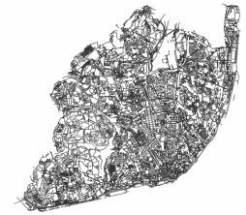
**8.6**

**Last updated:** February 8, 2018

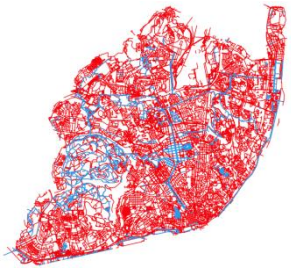
Seville, ES




SOURCE: PEOPLEFORBIKES



# CONCLUSION & DISCUSSION

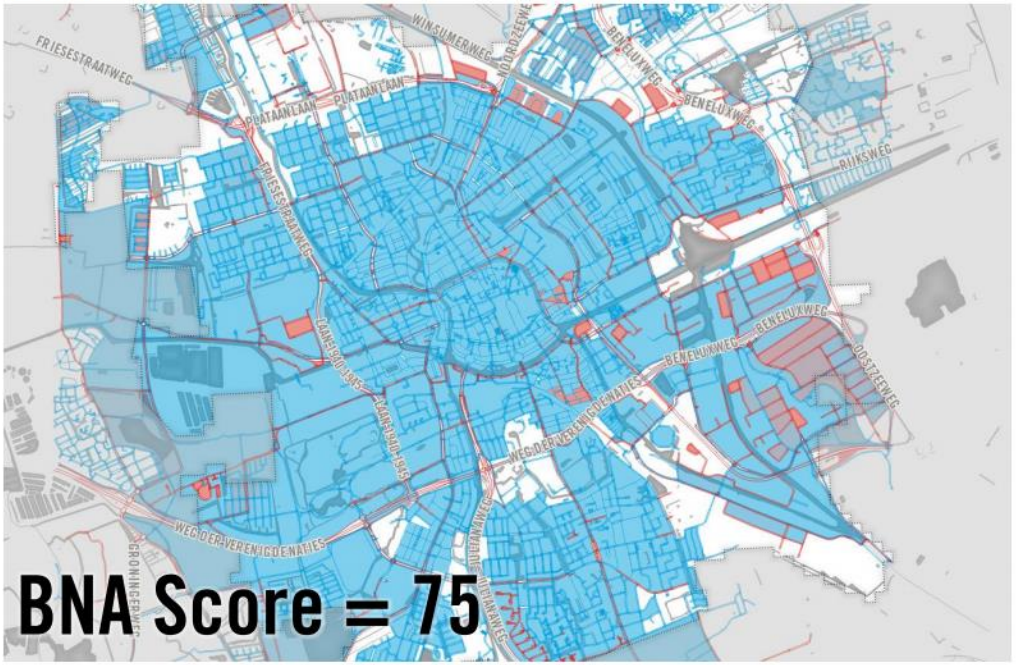


## Lisbon, PT

**8.6**

**Last updated:** February 8, 2018

**Groningen, NL**




SOURCE: PEOPLEFORBIKES

# CONCLUSION & DISCUSSION


SOURCE: CML

# CONCLUSION & DISCUSSION

"In a lot of countries they think that things will turn out right when they just build a lot of bike lanes. However, it is not about the kilometers, but about a good connectivity."

Mirjam Borsboom – Director of the Dutch Cycling Embassy

# THANK YOU

Time for discussion!