

Urban morphology as an open reproducible data science

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Urban Form

What does a city look like?

“Physical structure and appearance of cities”

What do we talk about...

... when we talk about urban morphology?

buildings

streets

plots

open
spaces

**How can we describe it...
... numerically?**

Urban morphometrics

“quantitative analysis of urban form”

All about measuring.

Measuring

dimension

intensity

shape

connectivity

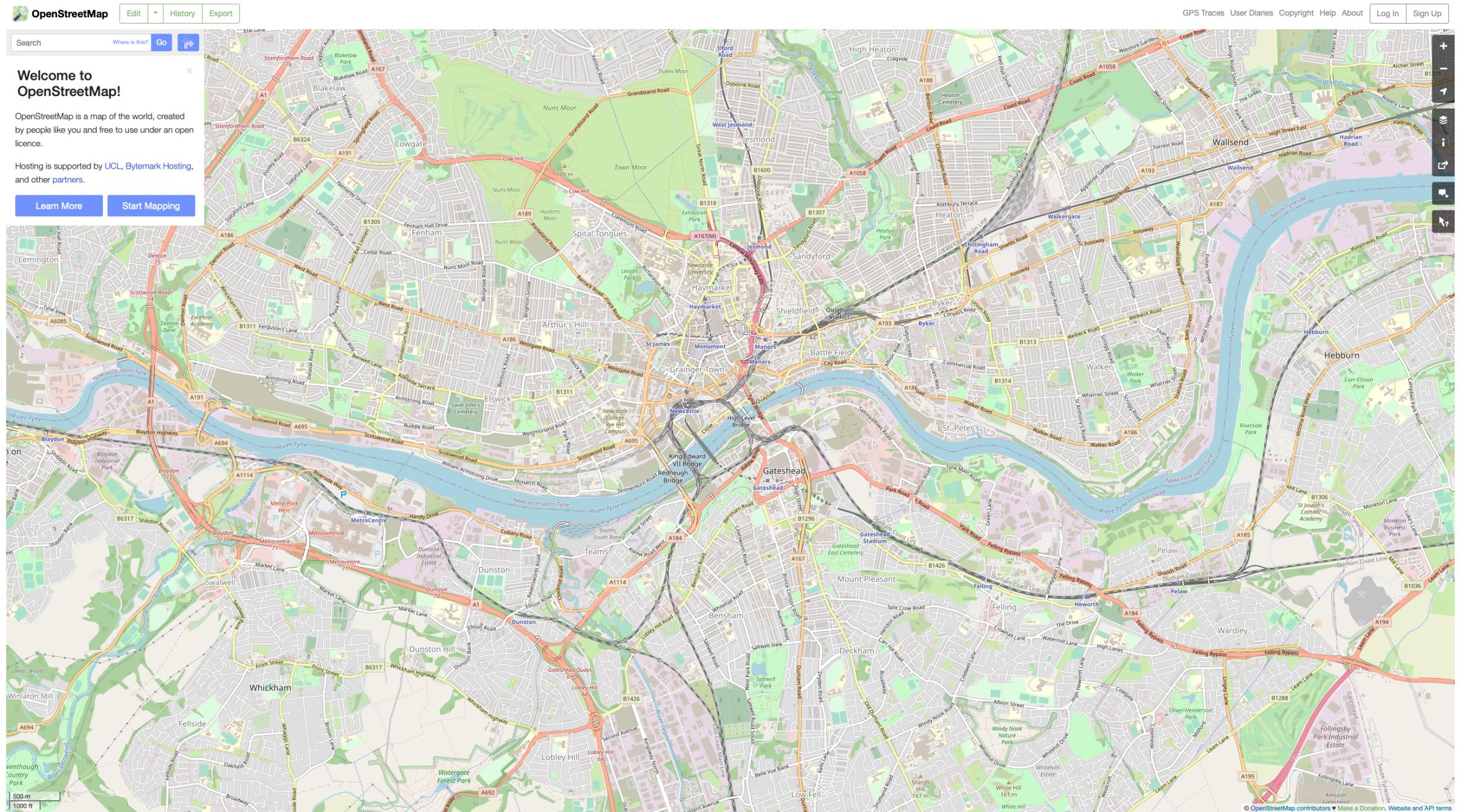
spatial
distribution

diversity

Why?

Because we (finally) can!

Data



Tools

GeoPandas

PySAL

momepy

GeoPandas

GeoPandas is an open source project to add support
for geographic data to pandas objects.

geopandas.org

PySAL

Python Spatial Analysis Library

pysal.org

momepy

Urban Morphology Measuring Toolkit

momepy.org

Few examples

3.83, 15.81
15.81, 34.28
34.28, 74.87
74.87, 172.93
172.93, 398.09

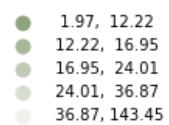


longest axis length
dimension

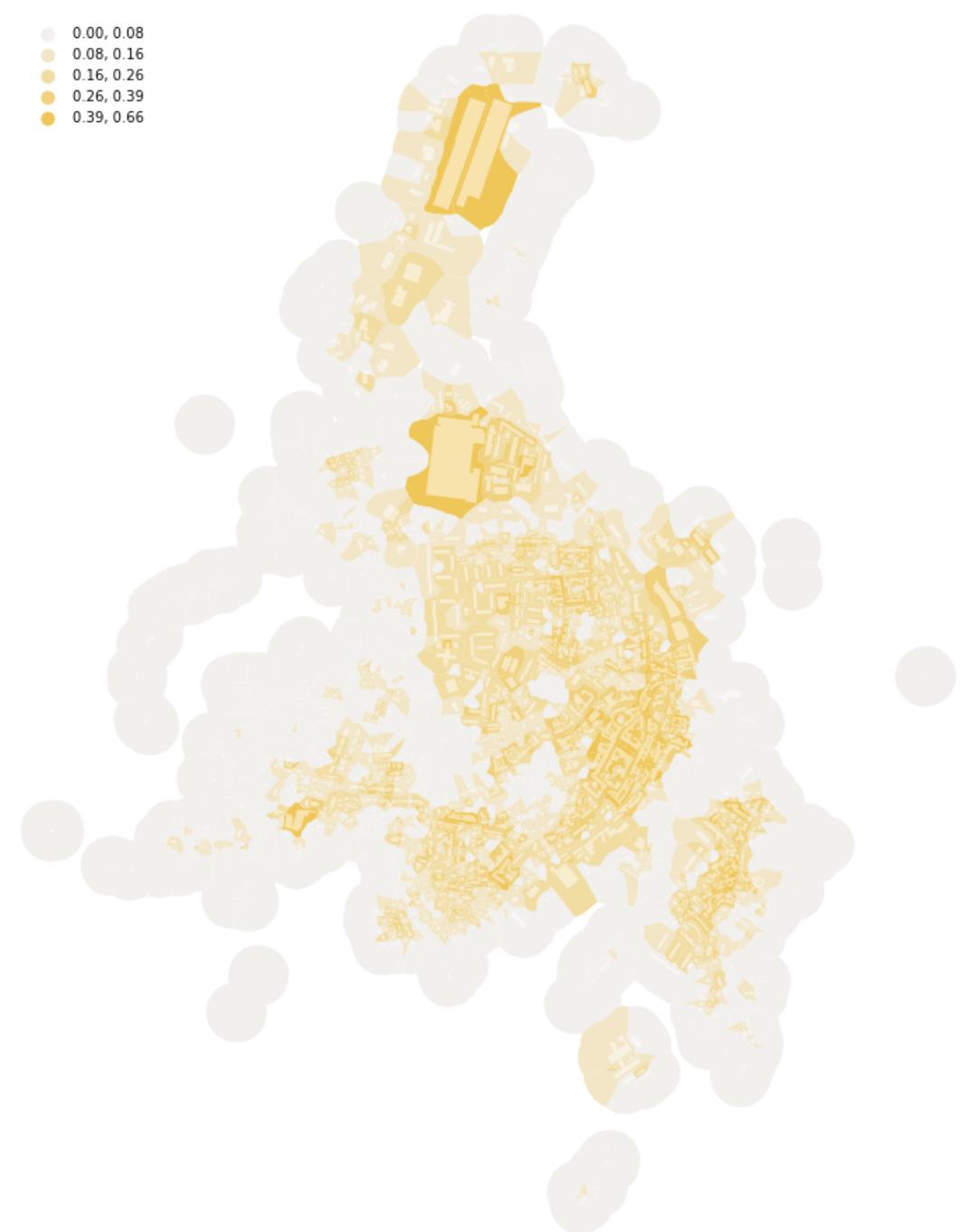
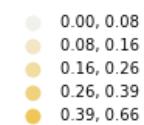
0.43, 0.72
0.72, 0.83
0.83, 0.91
0.91, 0.97
0.97, 1.12



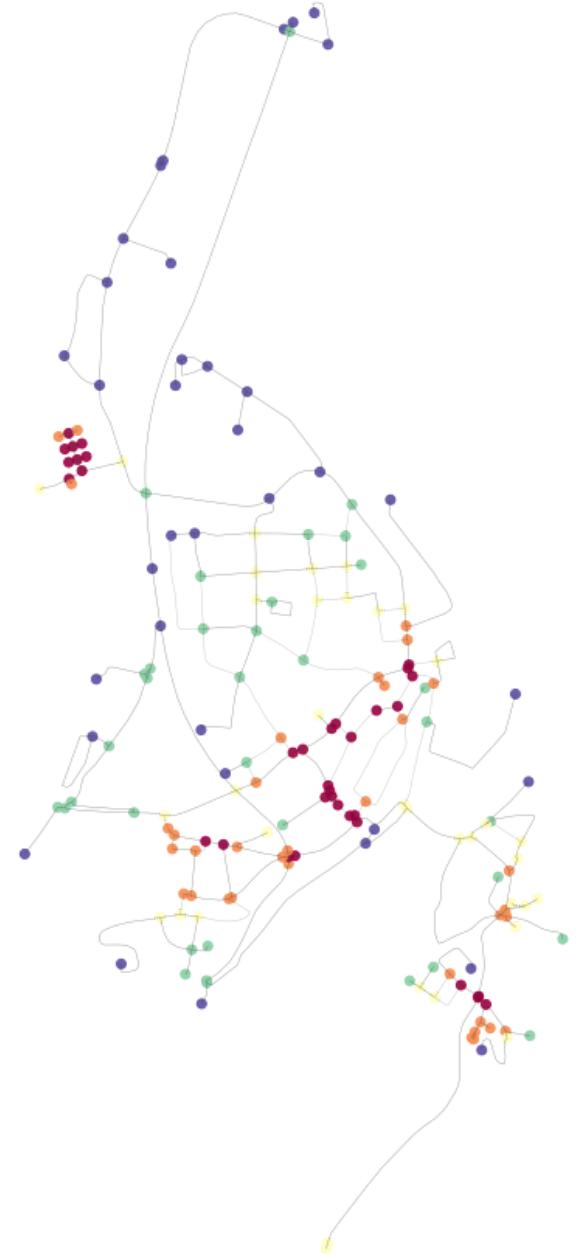
equivalent rectangular index
shape



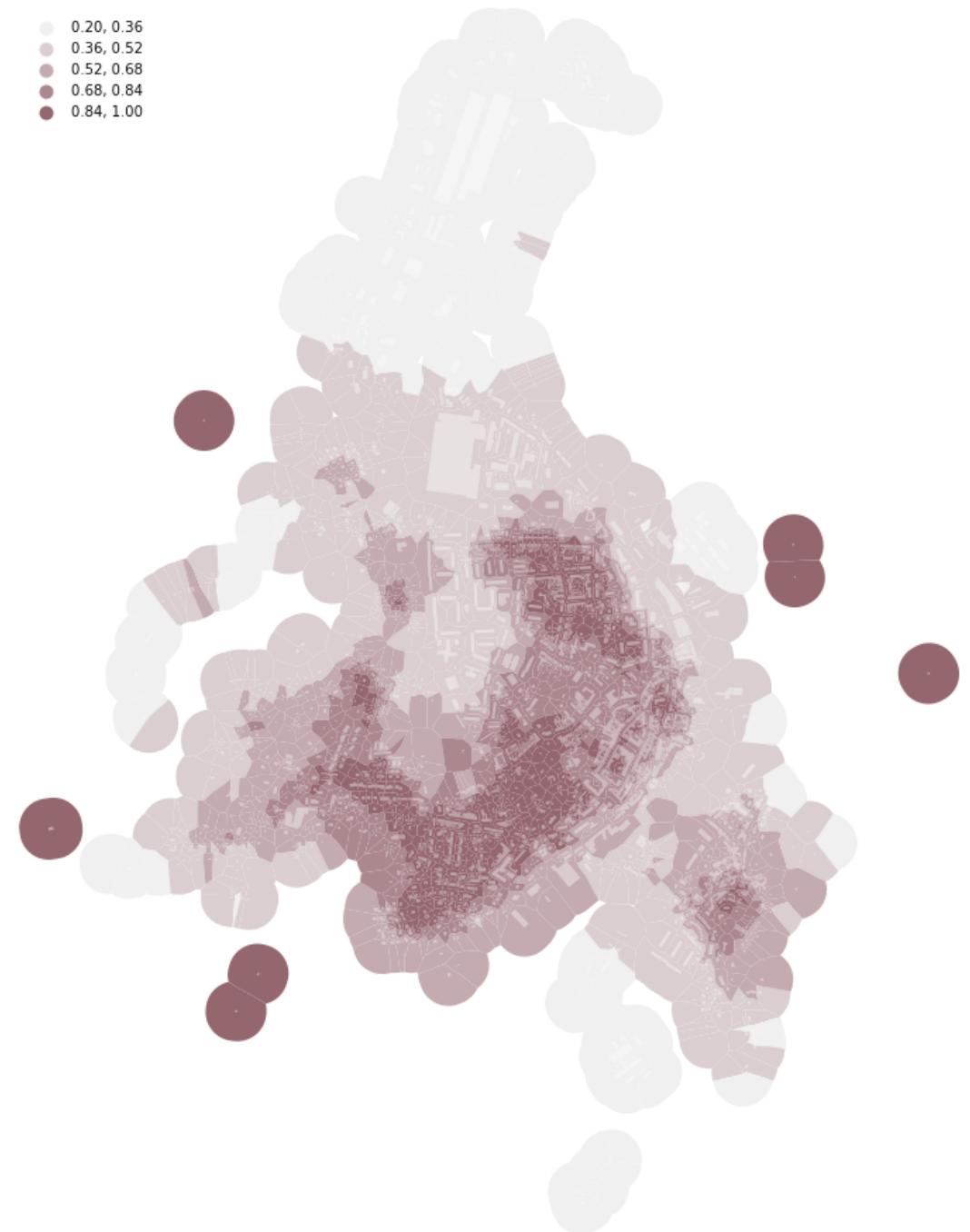
distance to neighbours
spatial distribution



covered area ratio
intensity



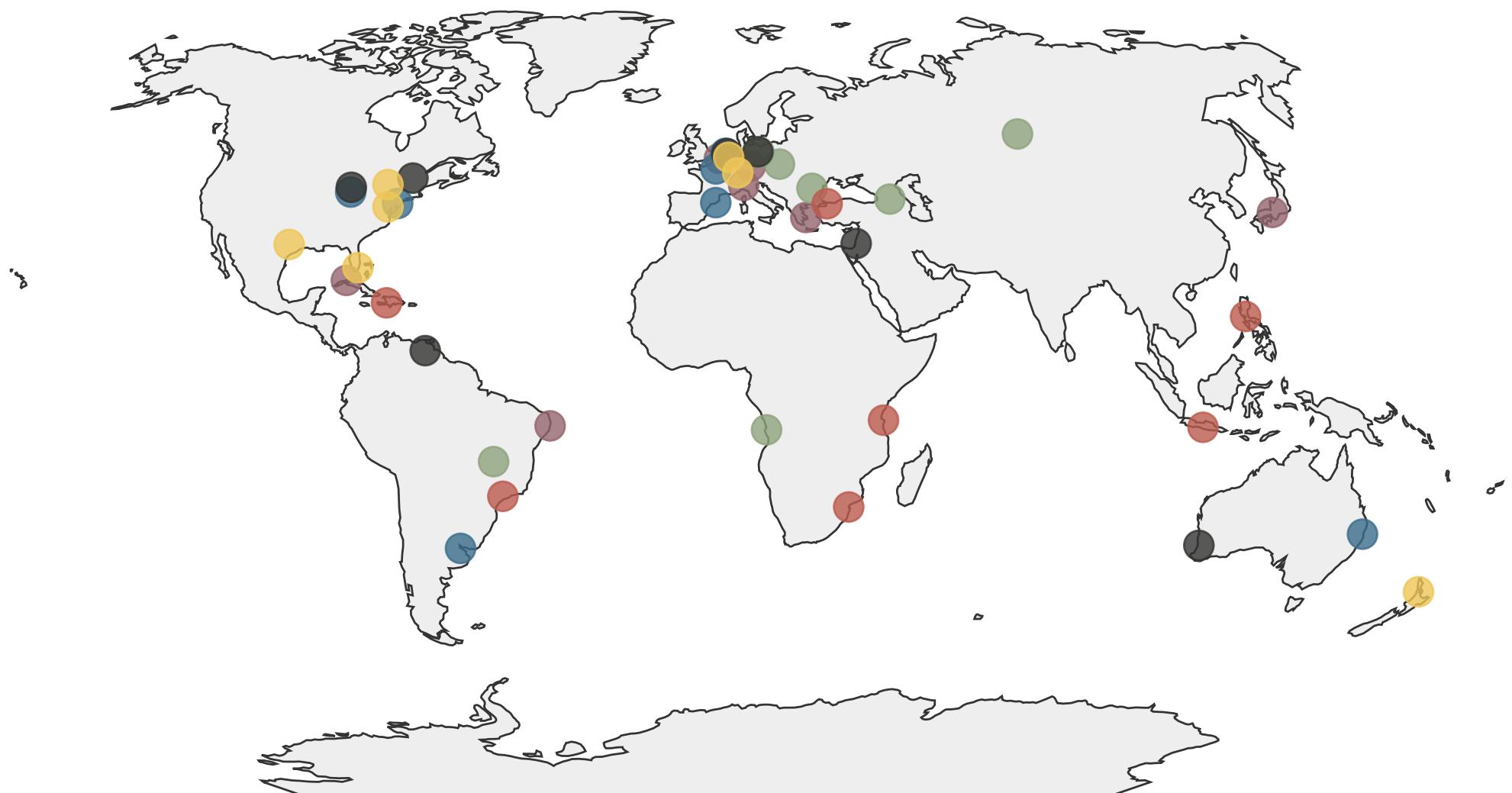
closeness centrality
connectivity



Simpson's diversity of tessellation area
diversity

Evolution of urban patterns

42 places, 6 historical periods



400 m buffer

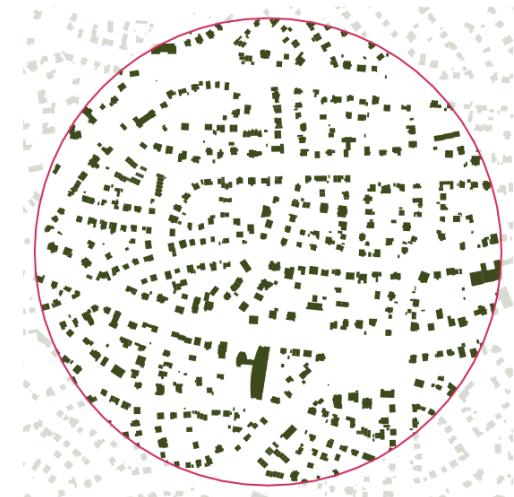
Kyoto
(pre-industrial)



Chicago
(industrial)



Frohnau
(garden city)



Brasilia
(modernist)



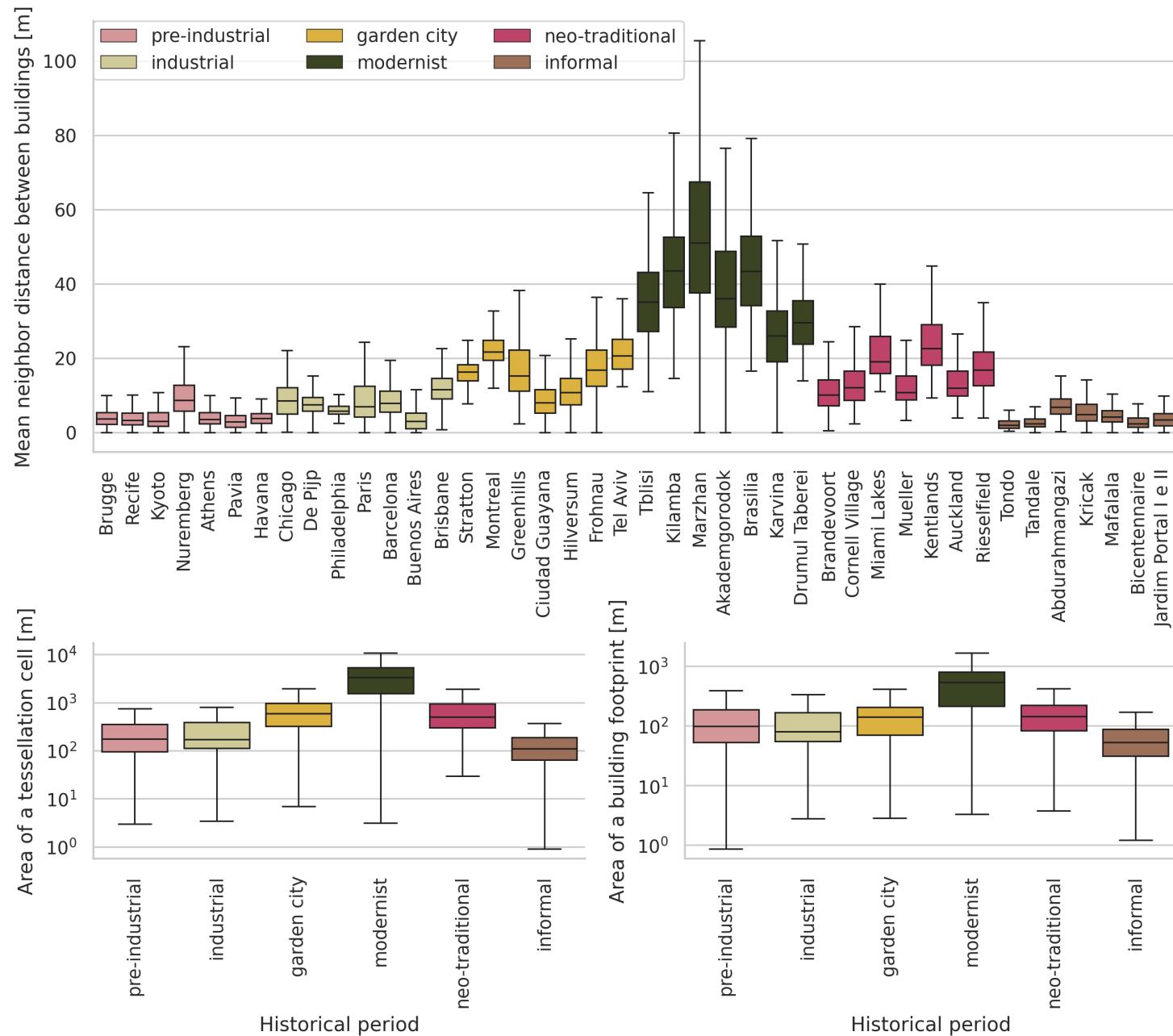
Miami Lakes
(neo-traditional)



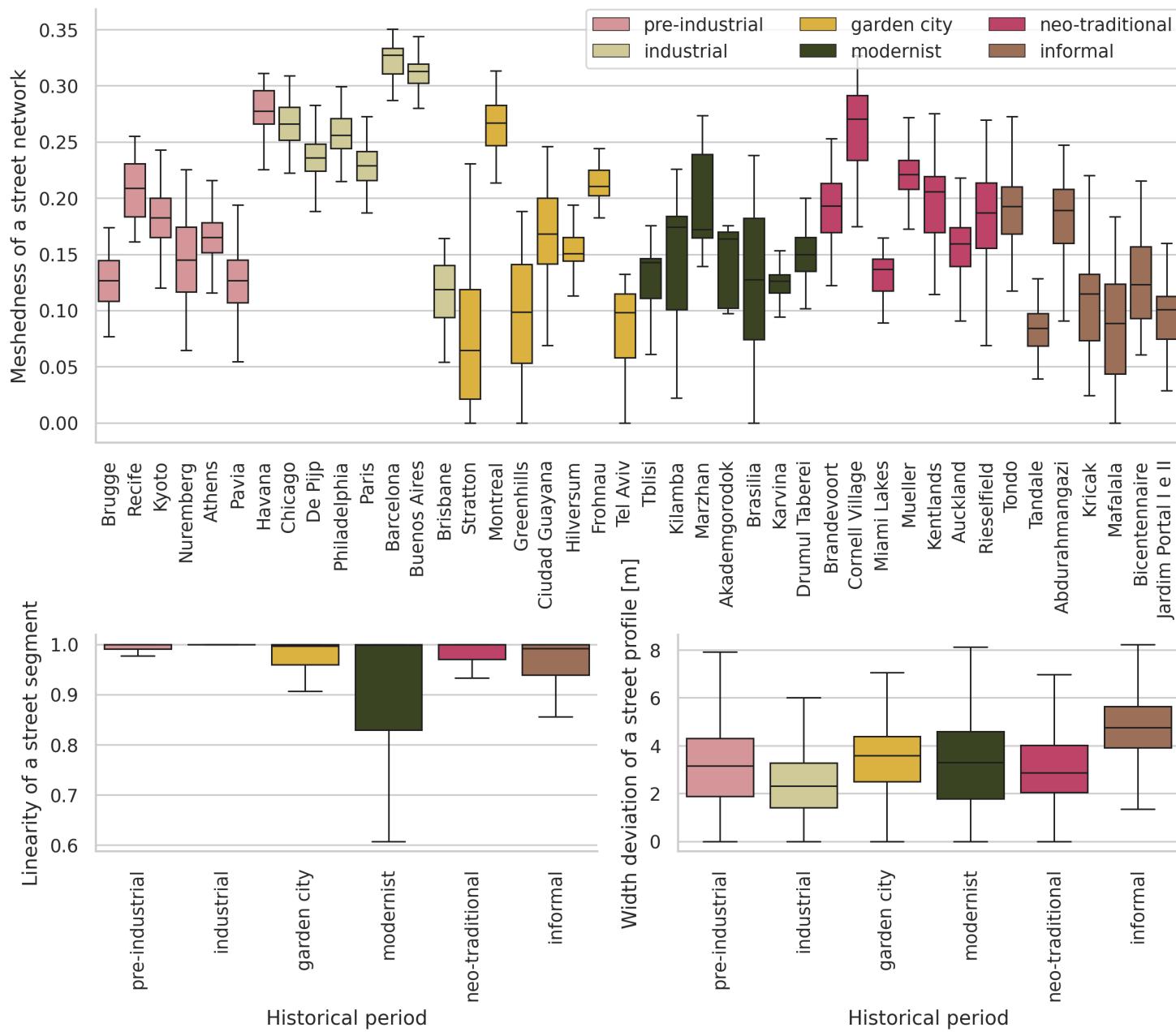
Tandale
(informal)



Scale peaked in modernism



We forgot how to make a grid

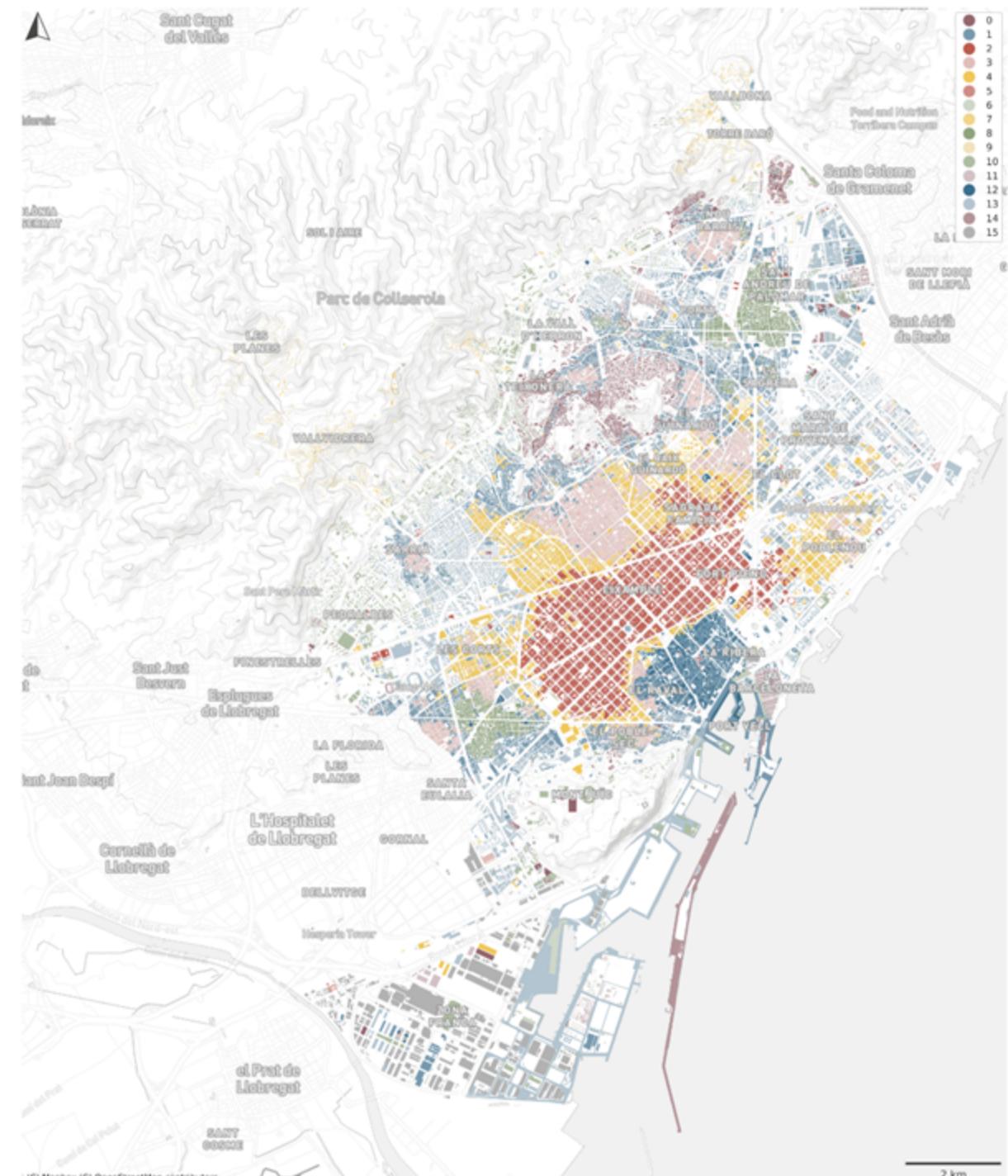
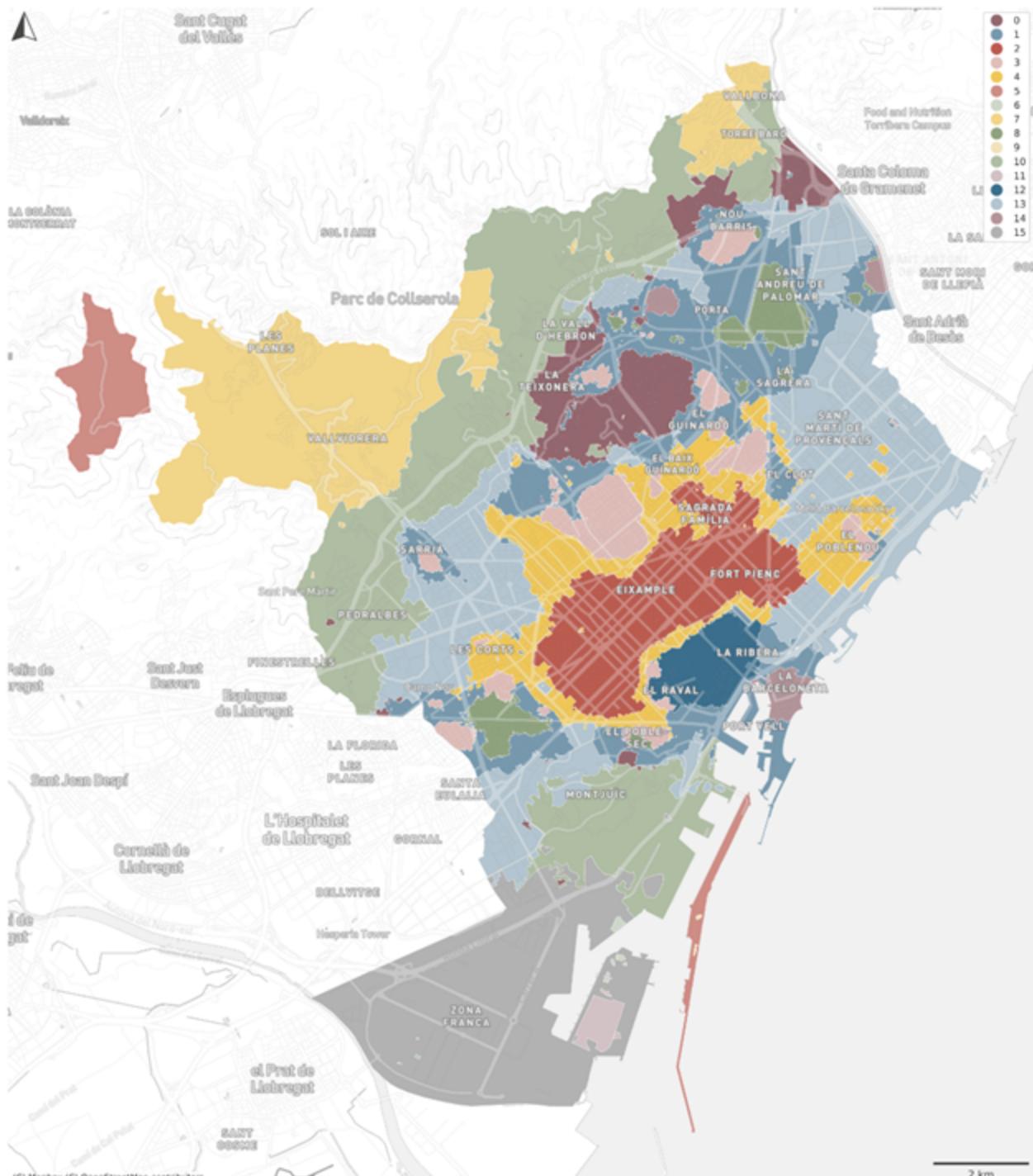


Classification

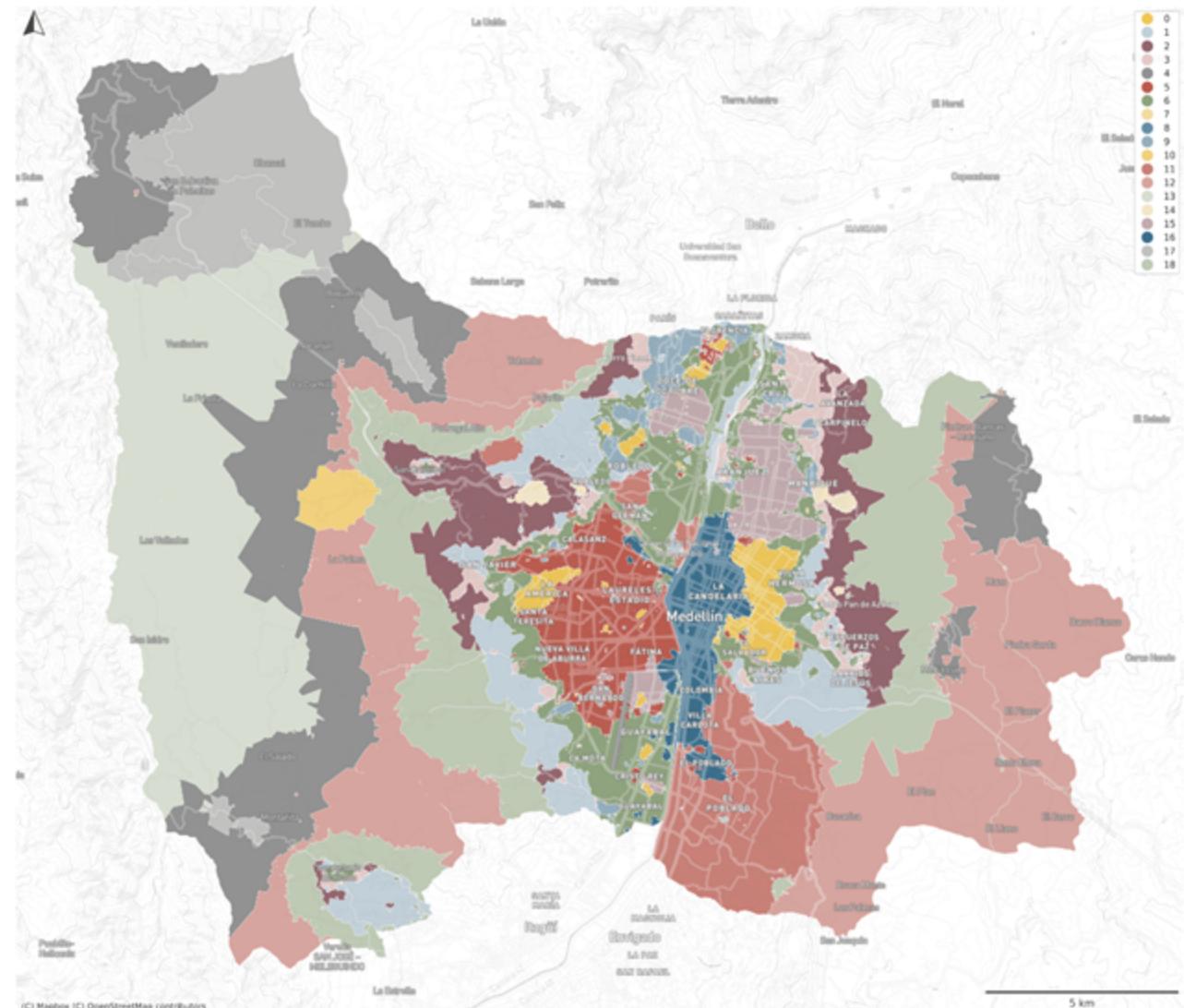
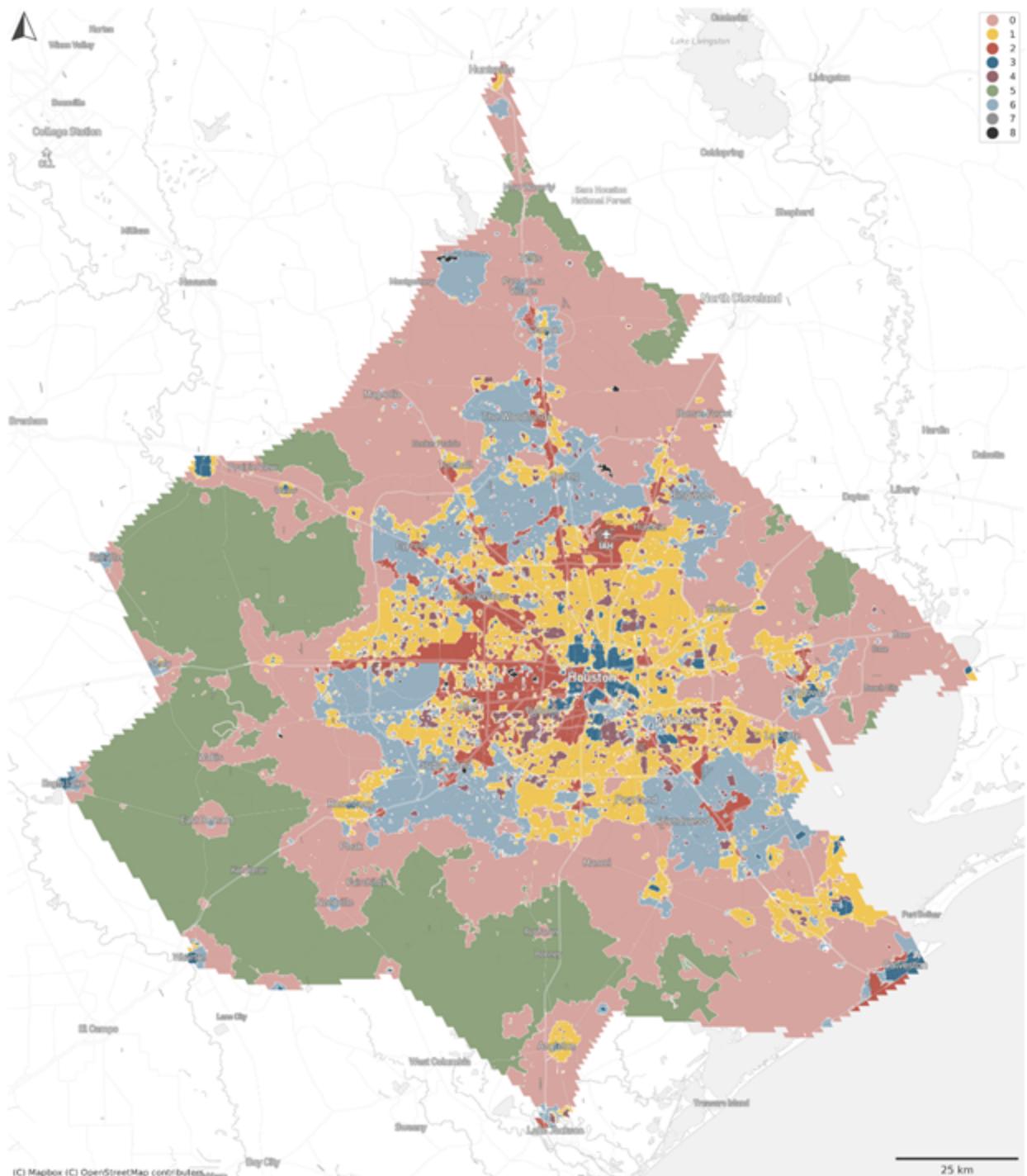
Detection of patterns

Spatial Signatures

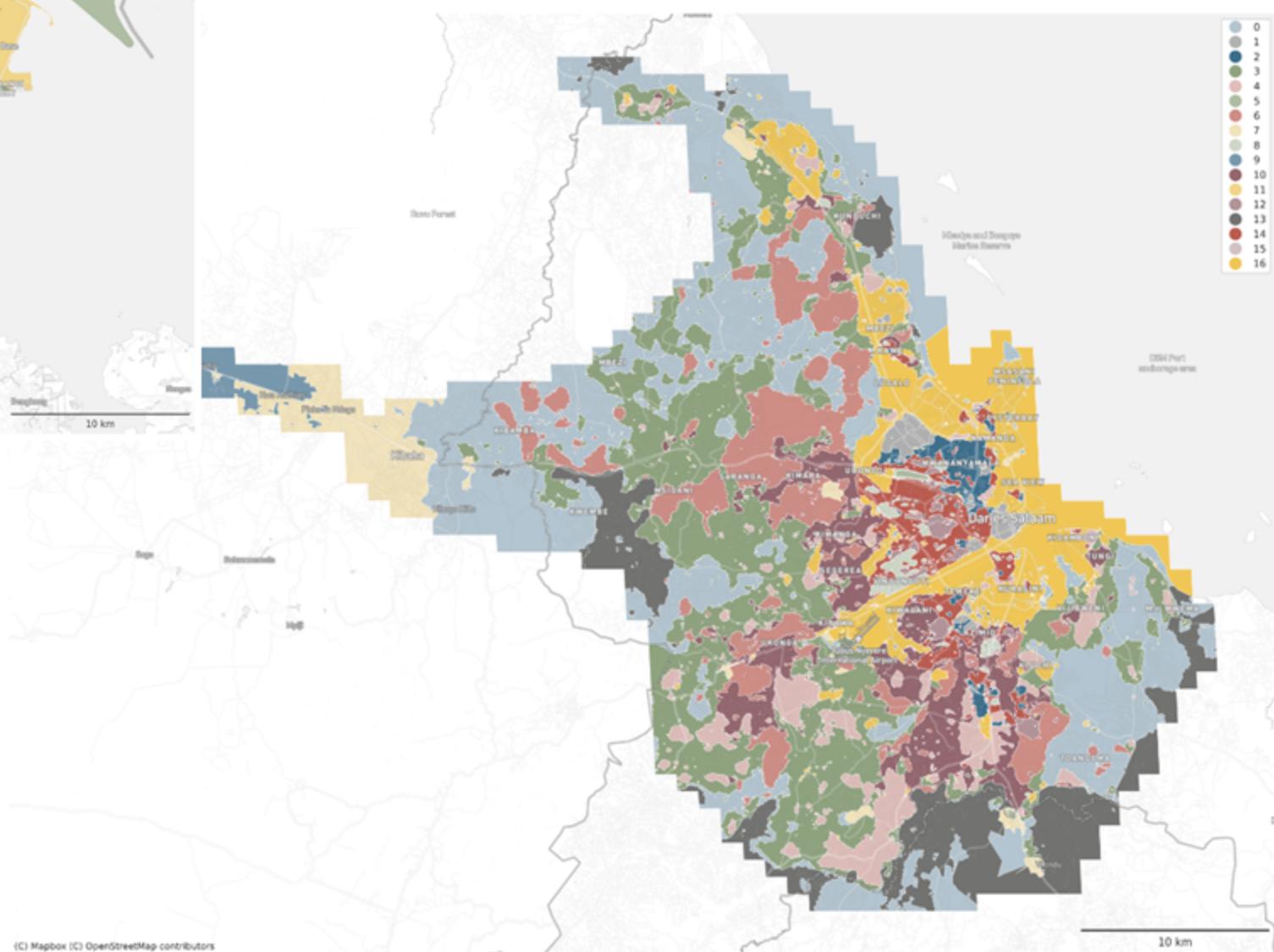
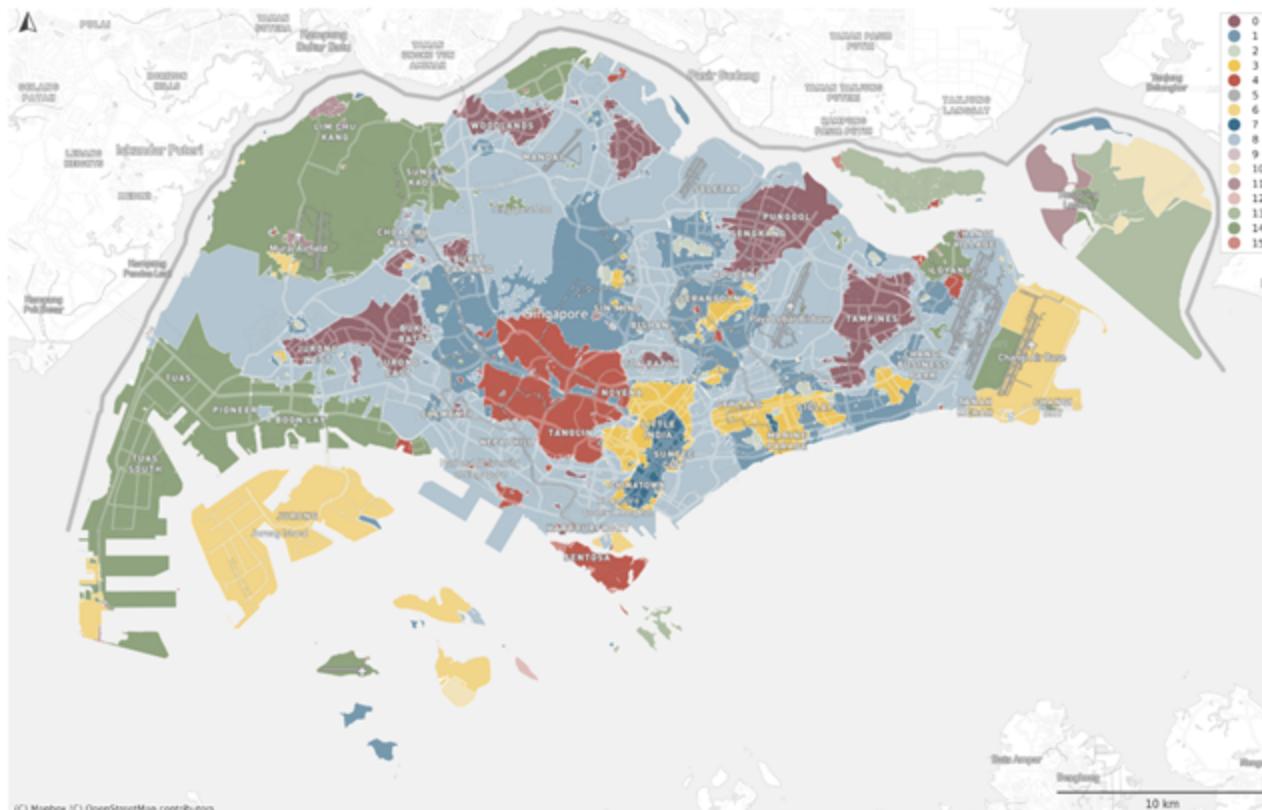
*A characterisation of space based on form and function
designed to understand urban environments*



Barcelona

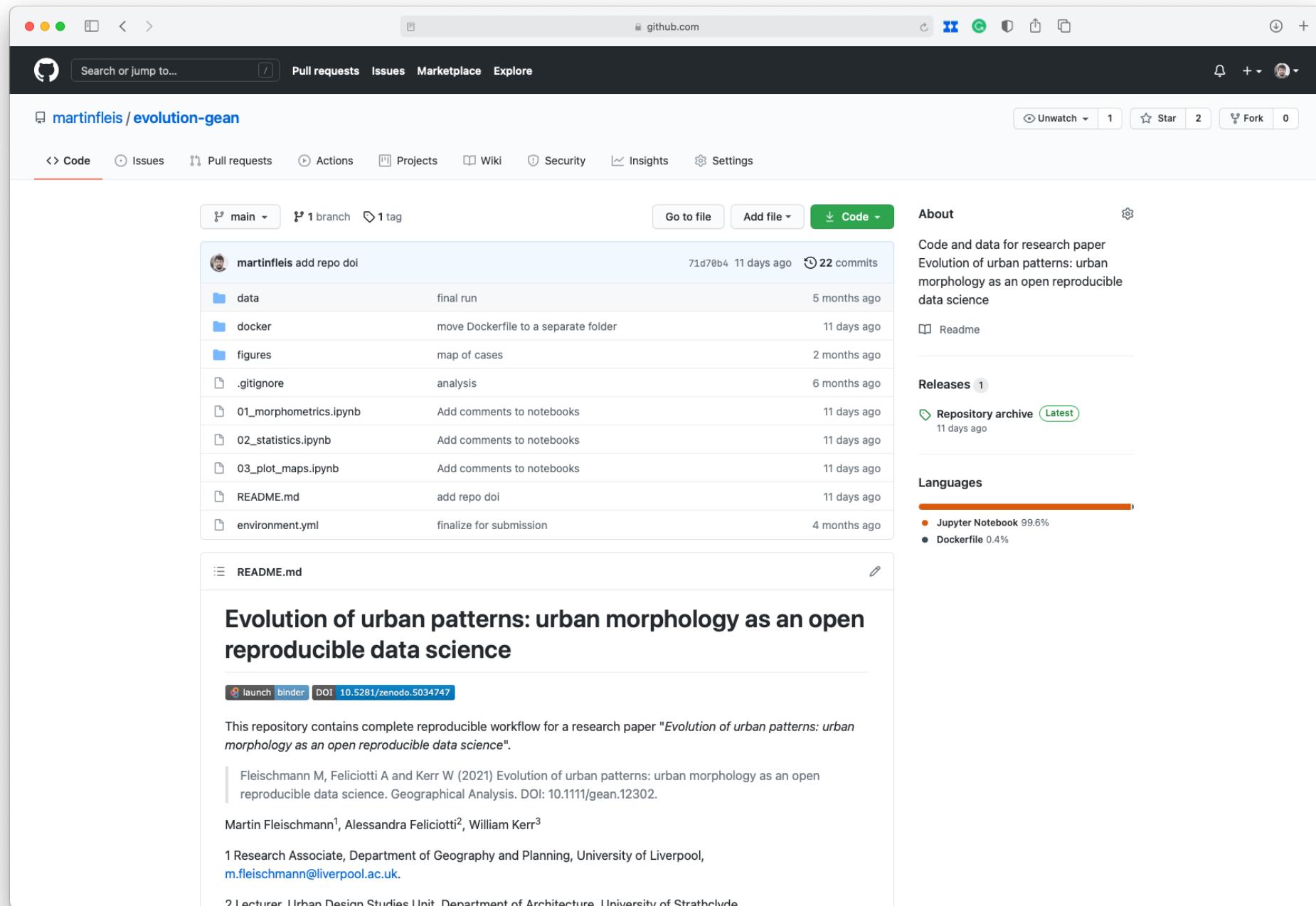


Houston | Medellin



Singapore | Dar es Salaam

Reproducible open science



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