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.

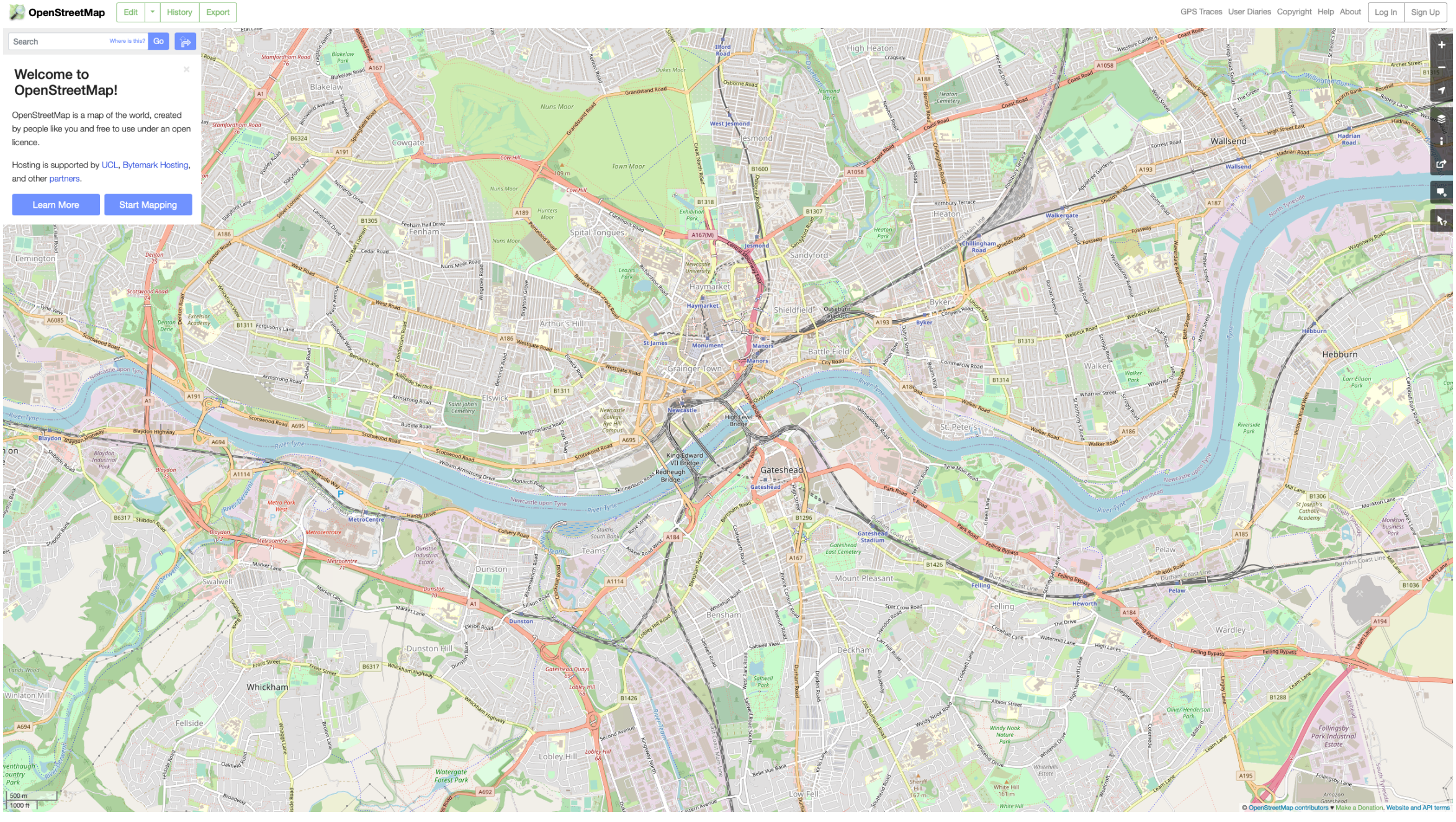
Measuring

dimension	shape	spatial distribution
intensity	connectivity	diversity

Why?

Because we (finally) can!

Data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Byker
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Gateshead
Pelaw
Mount Pleasant
Felling
Wardley
Dunston
Teams
Swalwell
Bensham
Deckham
Whickham
Dunston Hill
Fellside
Lobley Hill
Low Fell
Blaydon
MetroCentre
River Tyne
500 m
1000 ft
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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

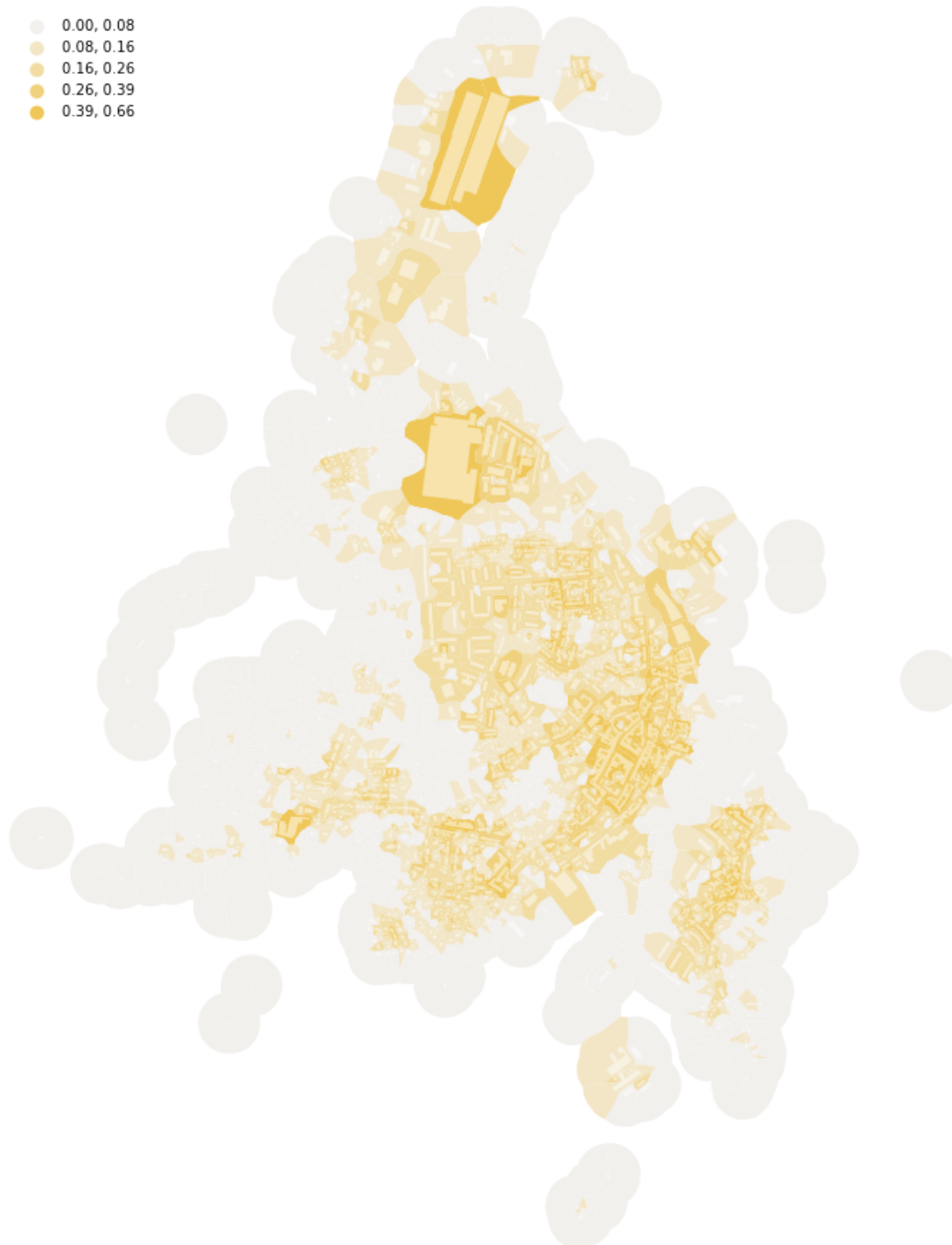
momepy.org

Few examples

longest axis length
dimension

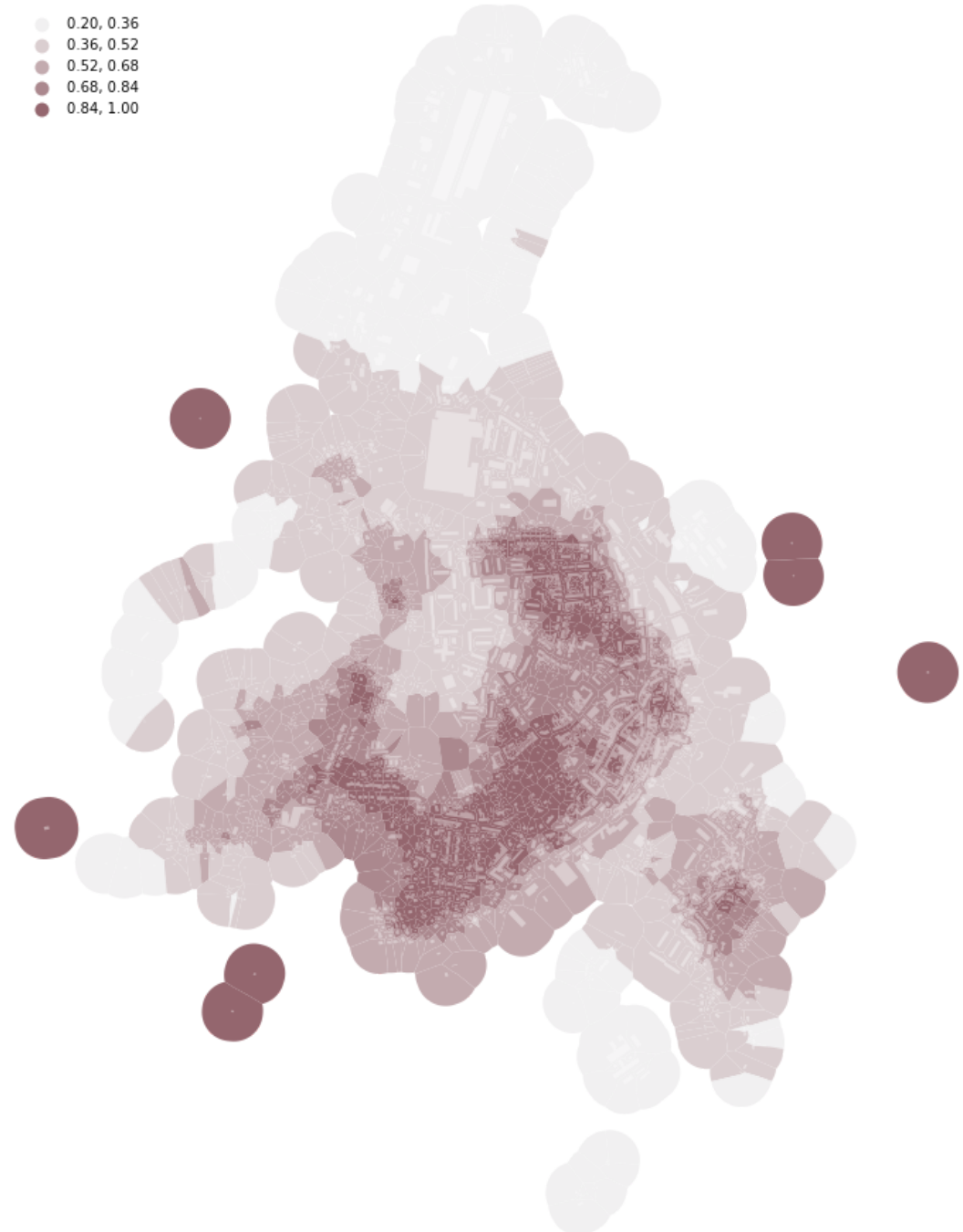
equivalent rectangular index
shape

distance to neighbours
spatial distribution



covered area ratio
intensity

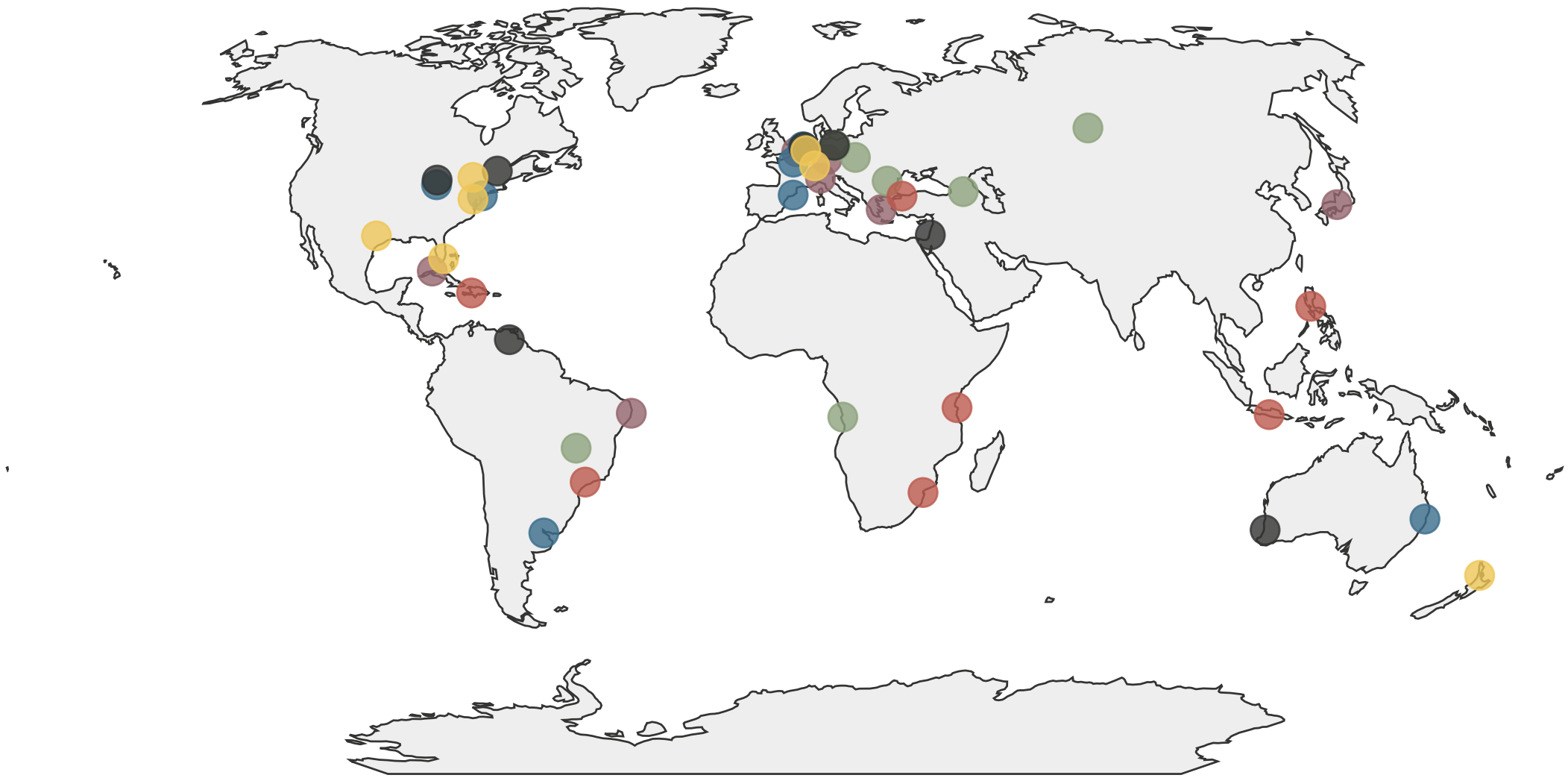
closeness centrality
connectivity



Simpson's diversity of tessellation area
diversity

Evolution of urban patterns

42 places, 6 historical periods

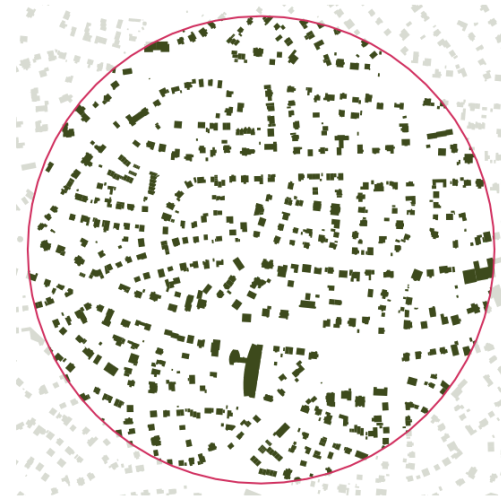


400 m buffer

Kyoto
(pre-industrial)

Chicago
(industrial)

Frohnau
(garden city)

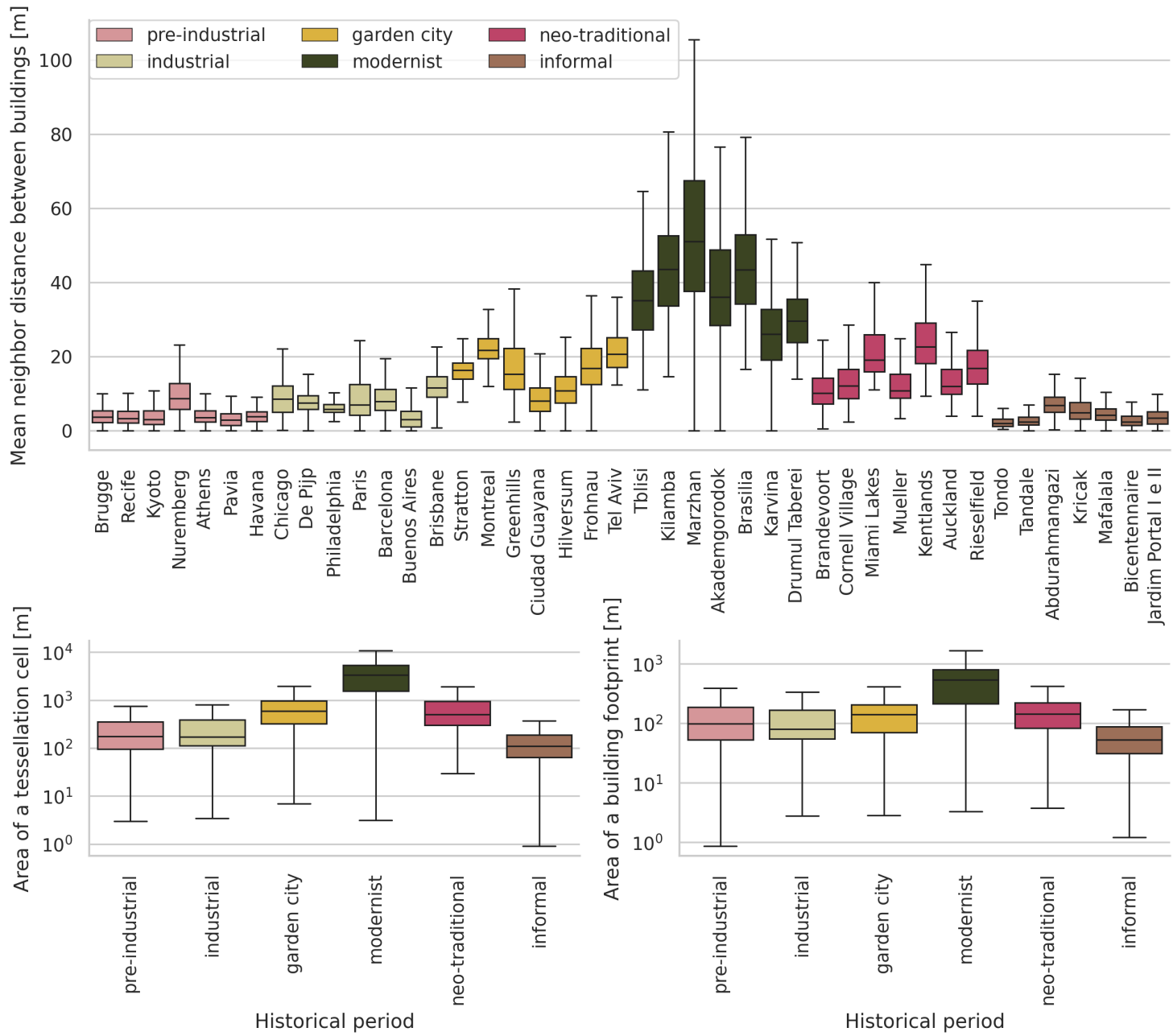


Brasilia
(modernist)

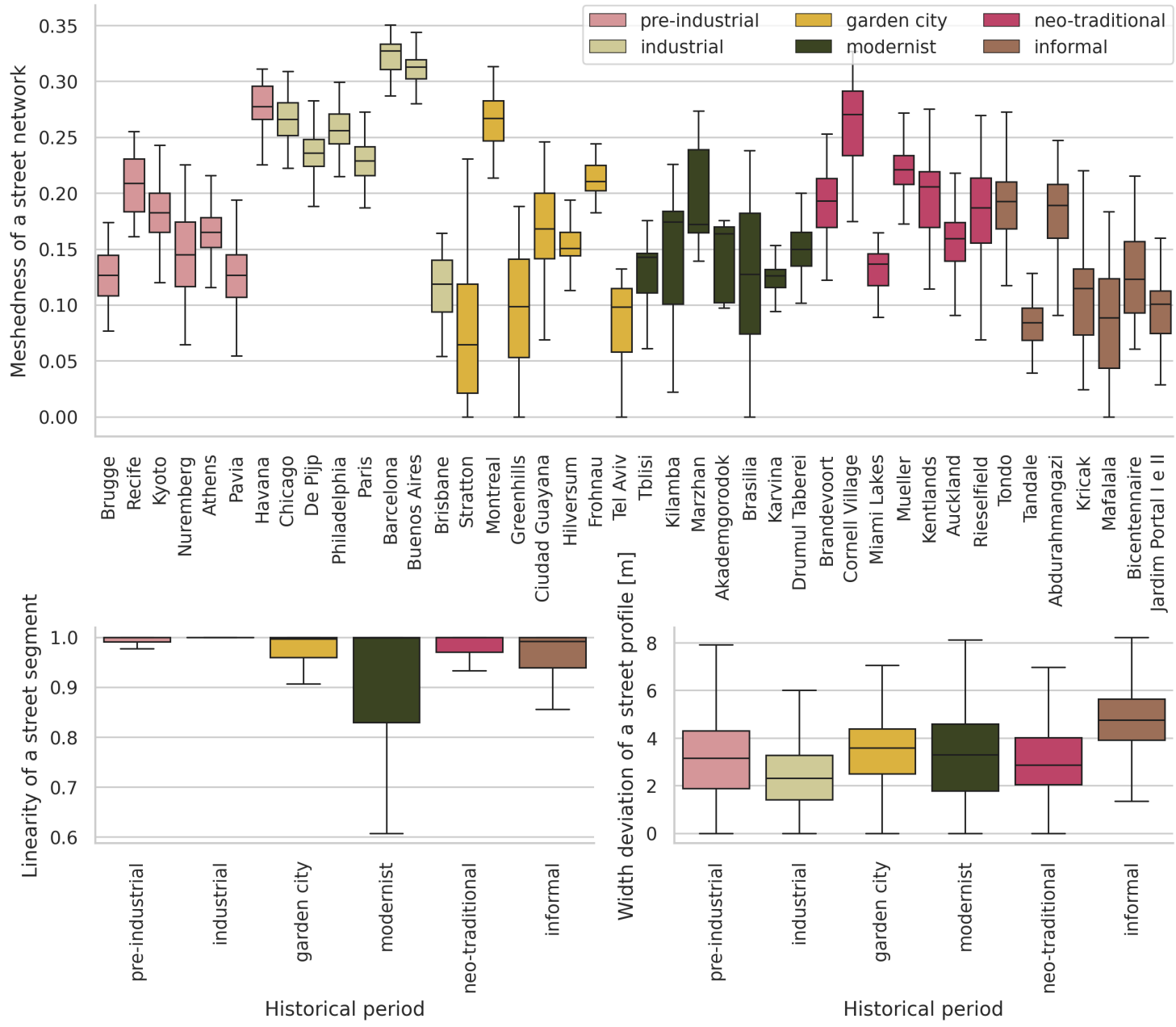
Miami Lakes
(neo-traditional)

Tandale
(informal)

Scale peaked in modernism



We forgot how to make a grid

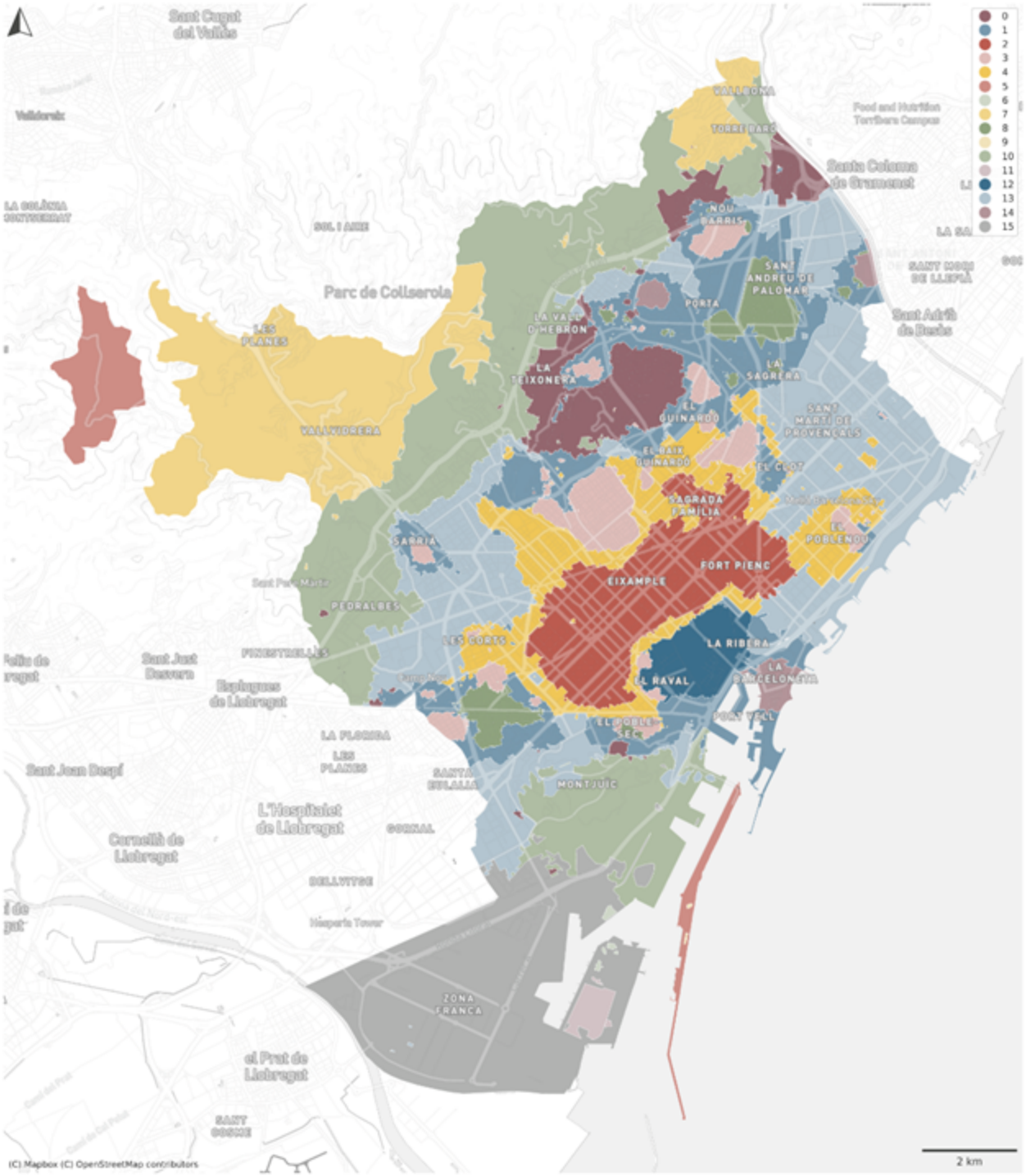


Classification

Detection of patterns

Spatial Signatures

A characterisation of space based on form and function designed to understand urban environments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SANT ADRIÀ DE BESÒS
SANTA COLOMA DE GRAMENET
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2 km
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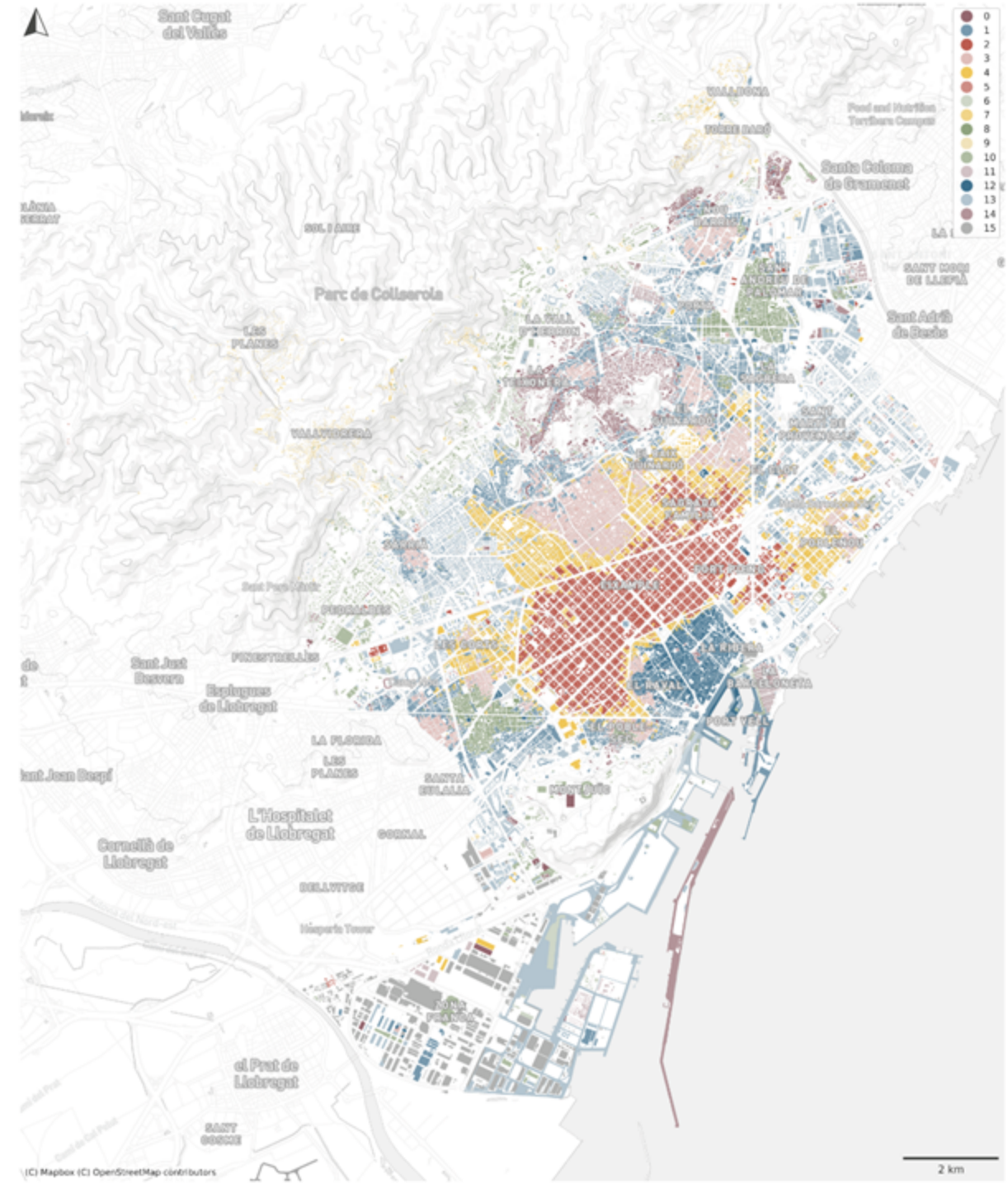
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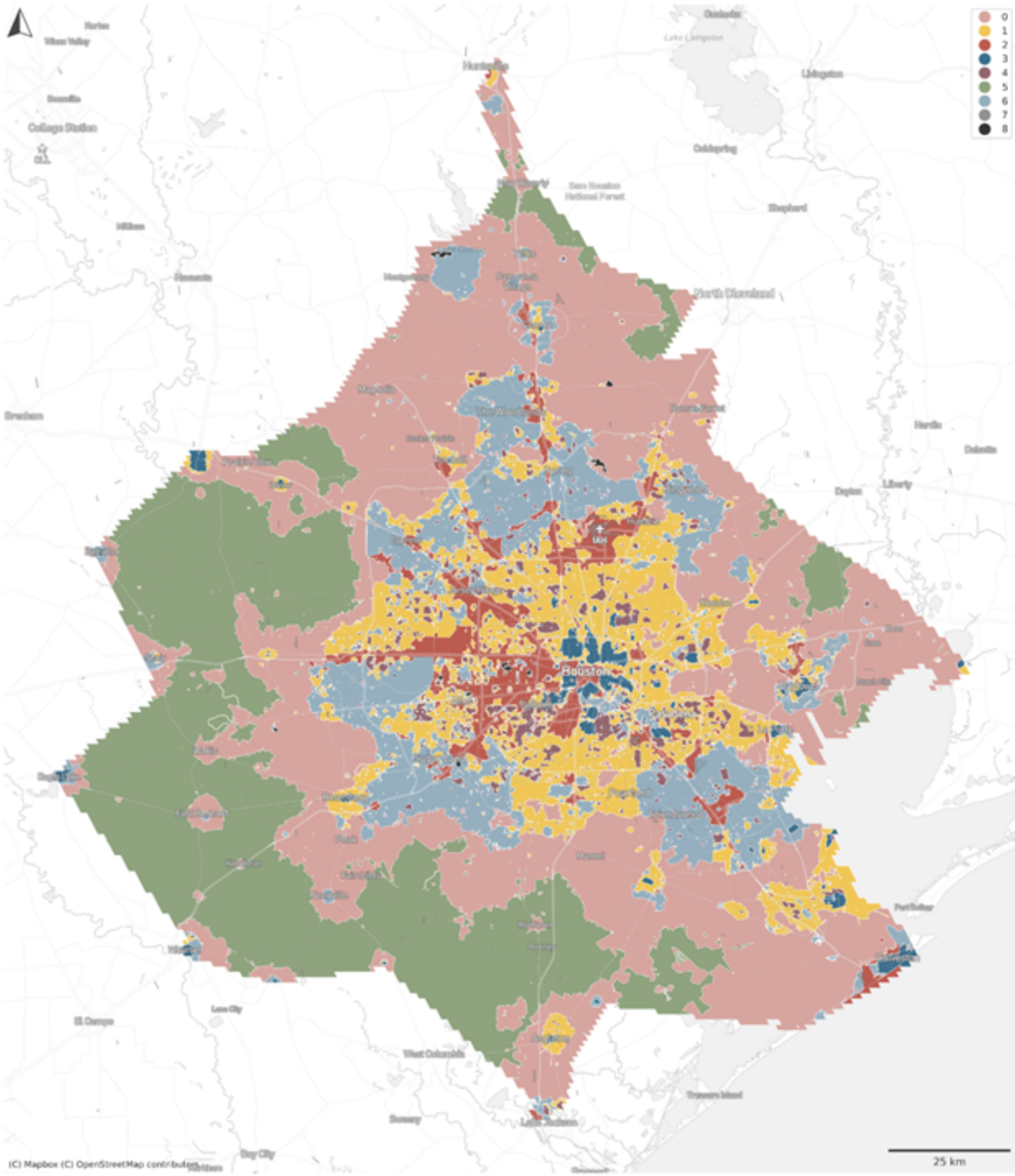
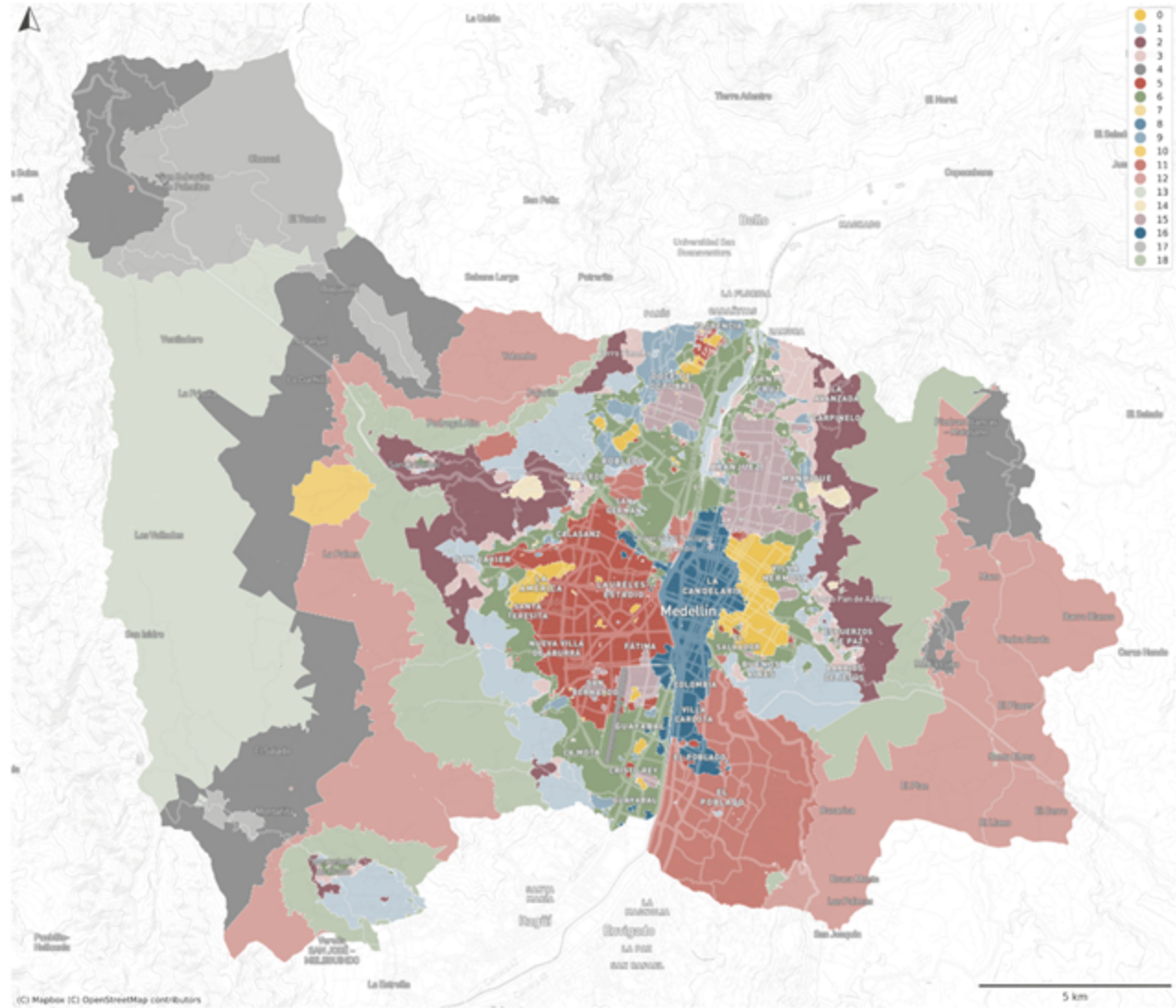
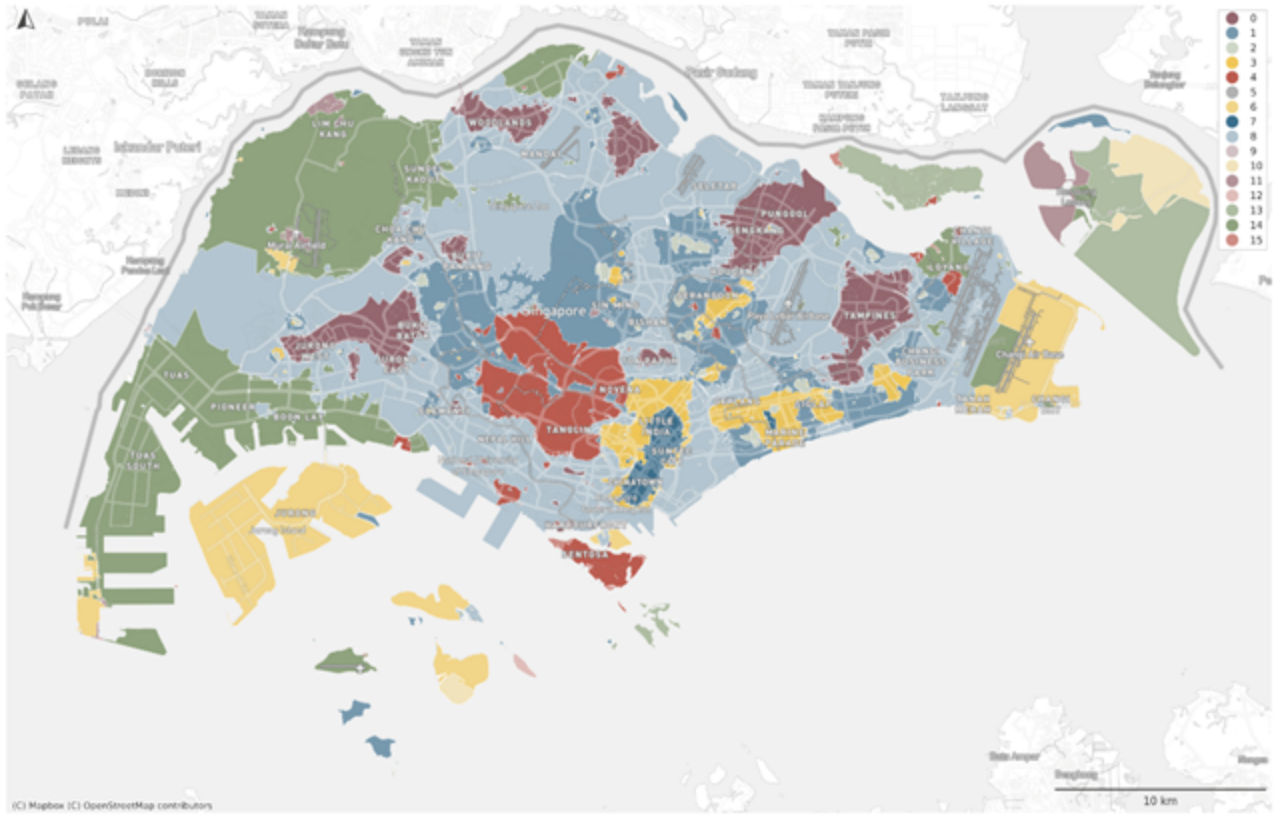
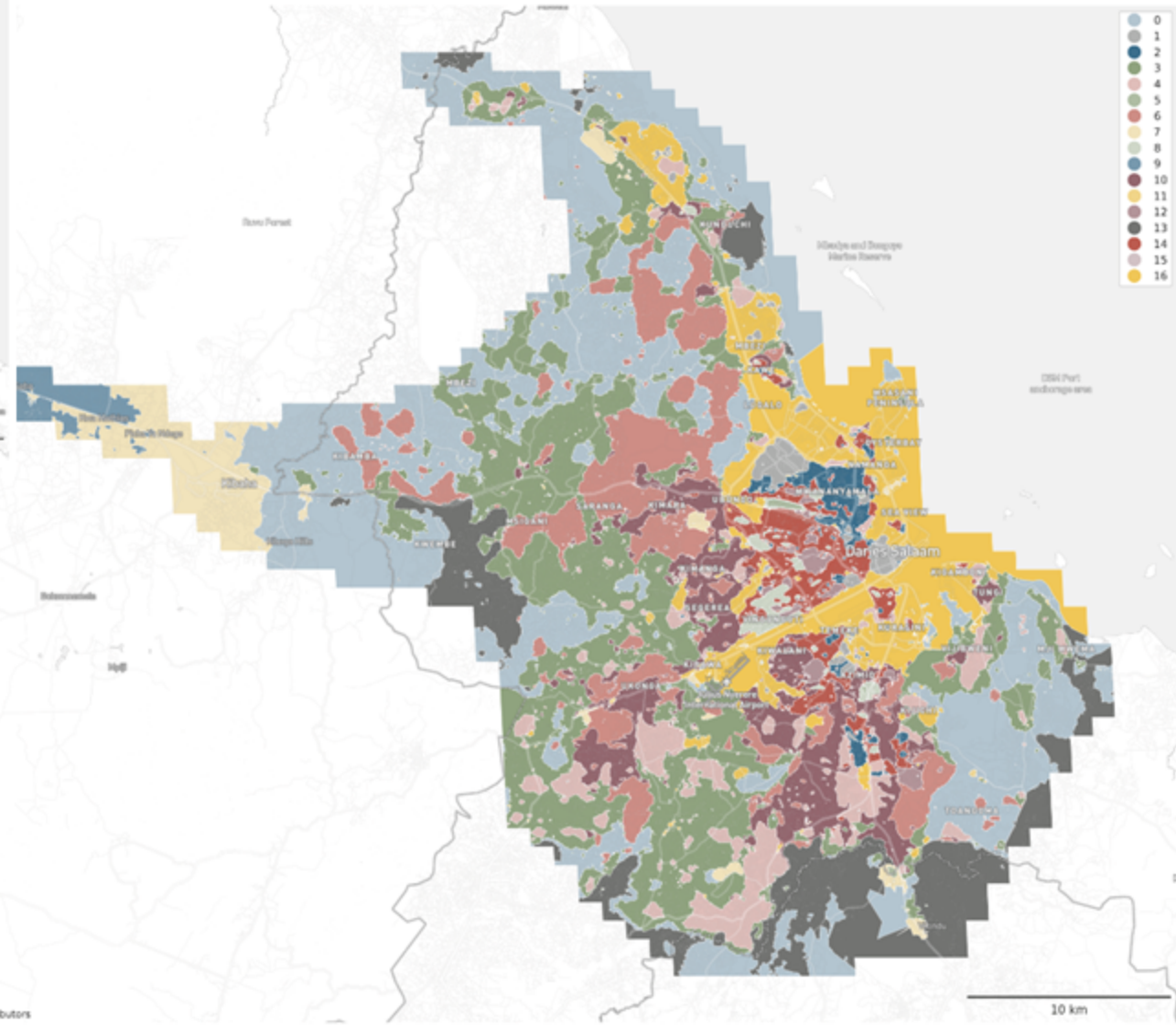
Barcelona





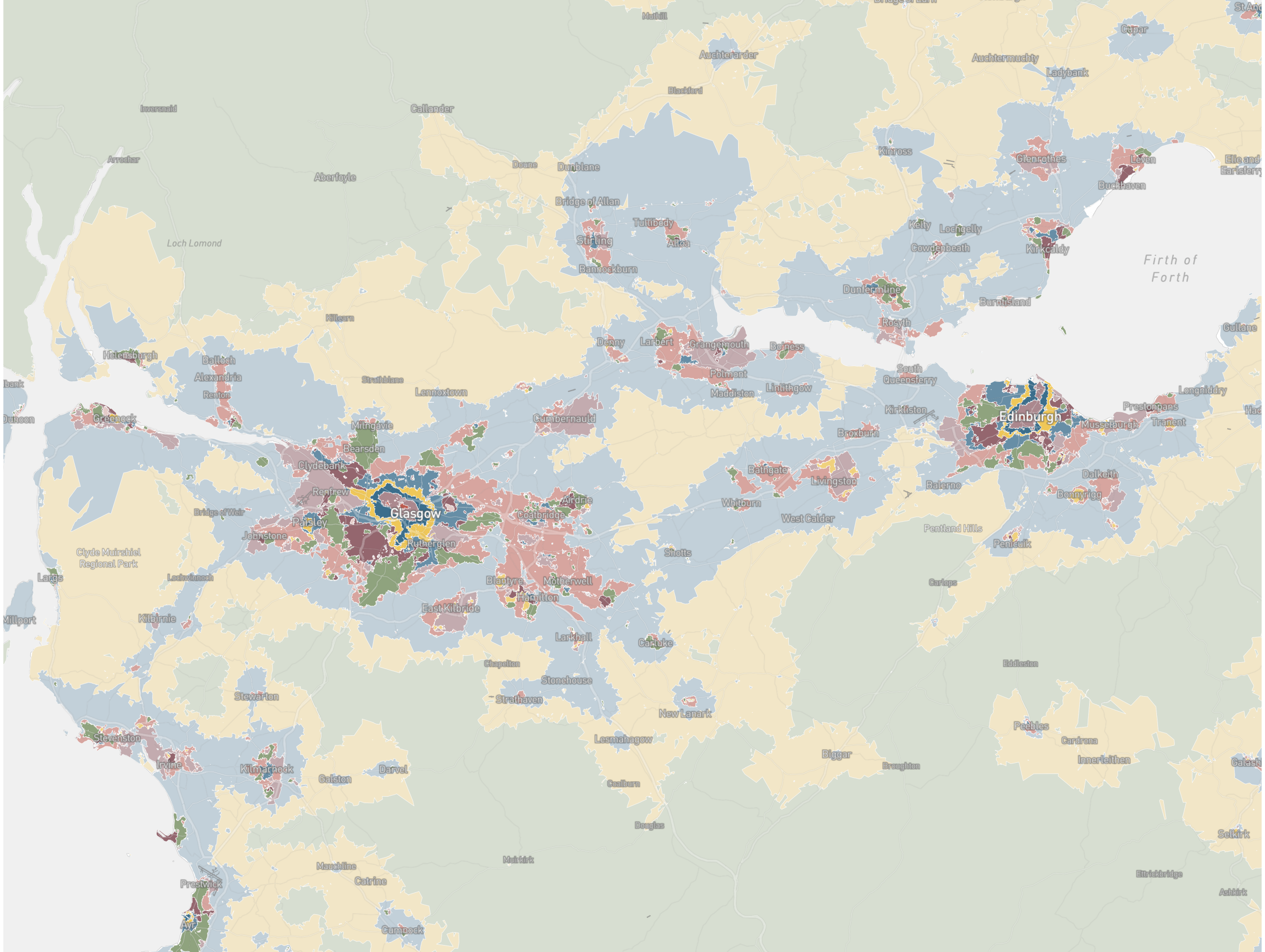
Houston | Medellin





Singapore | Dar es Salaam

Great Britain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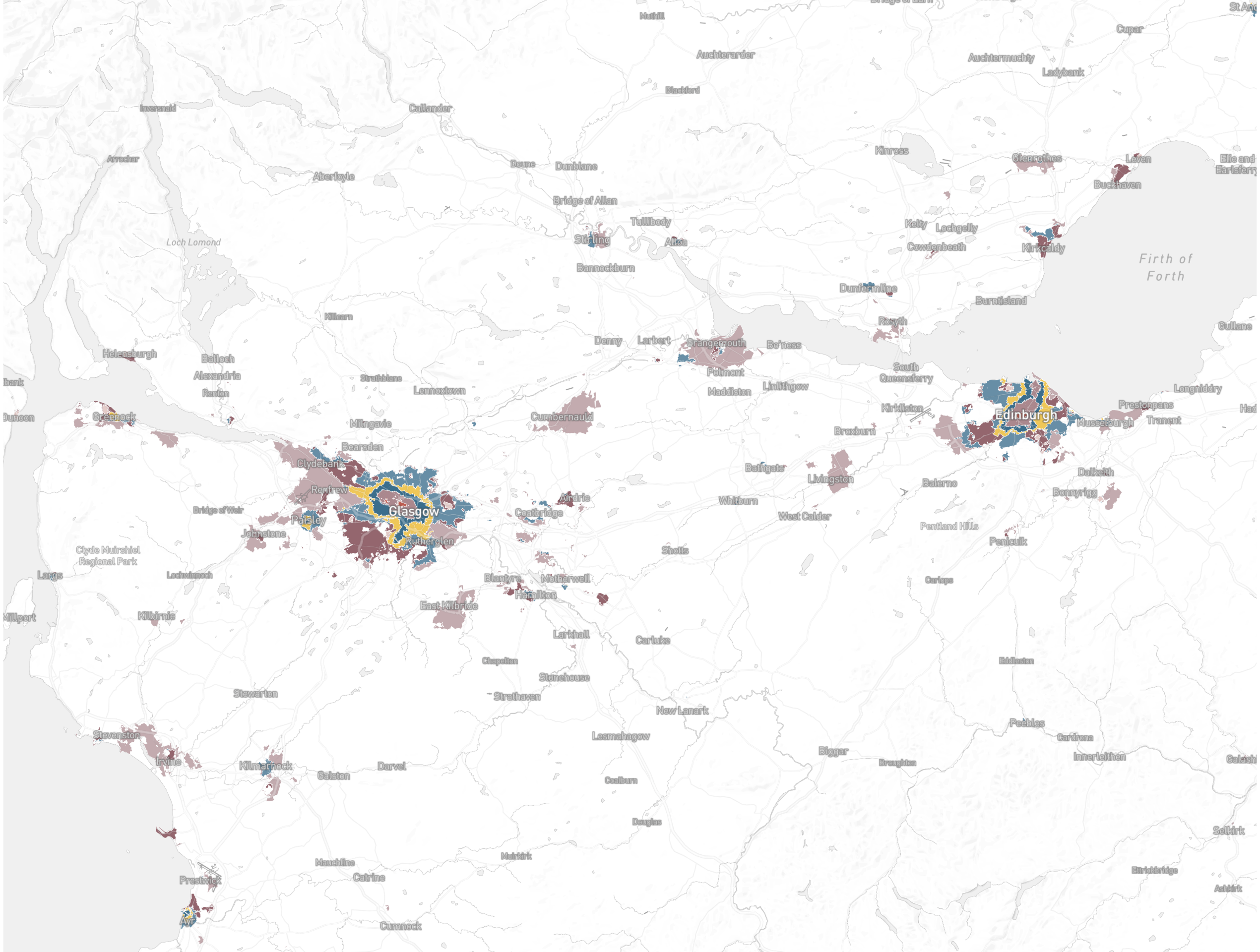
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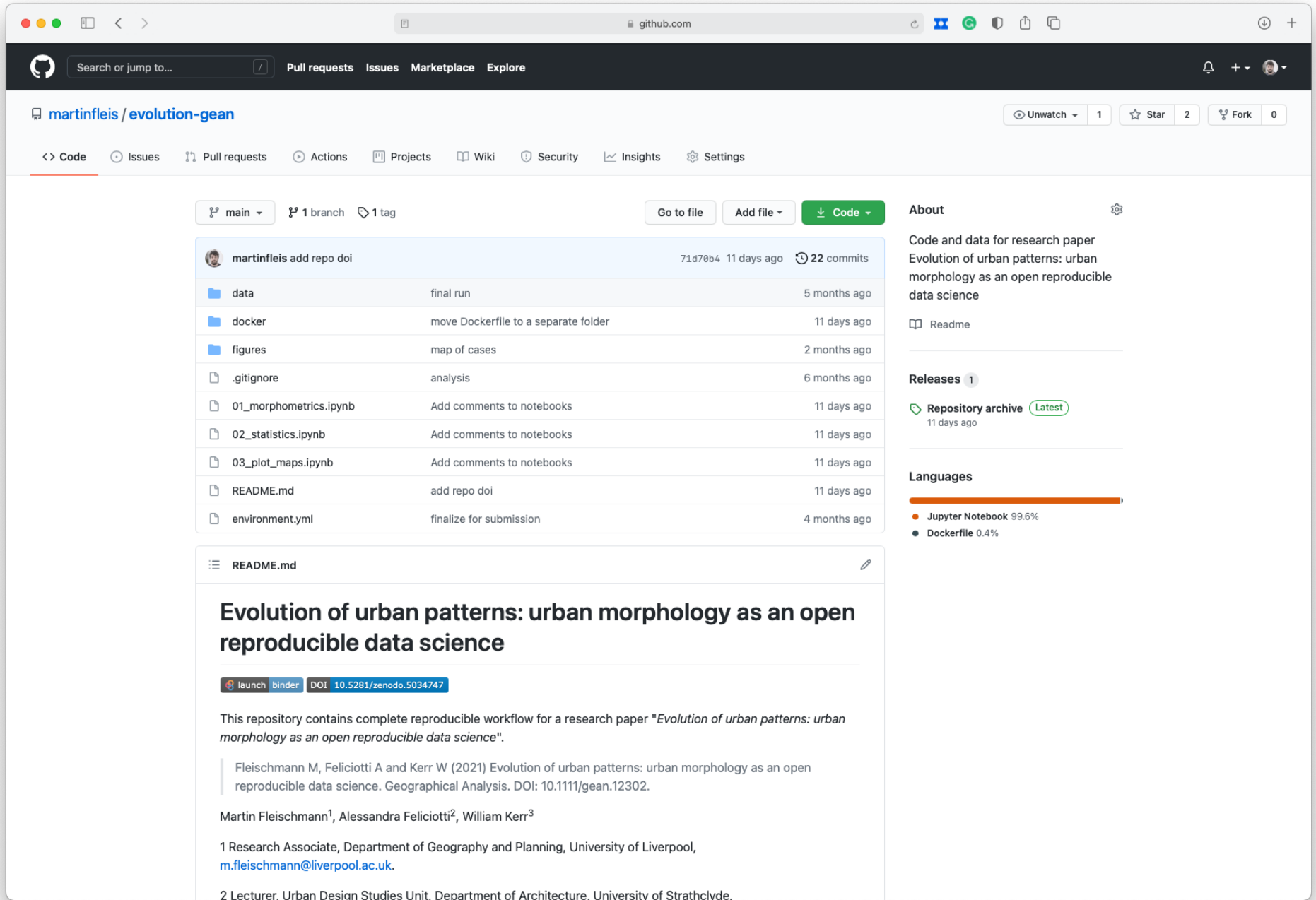

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