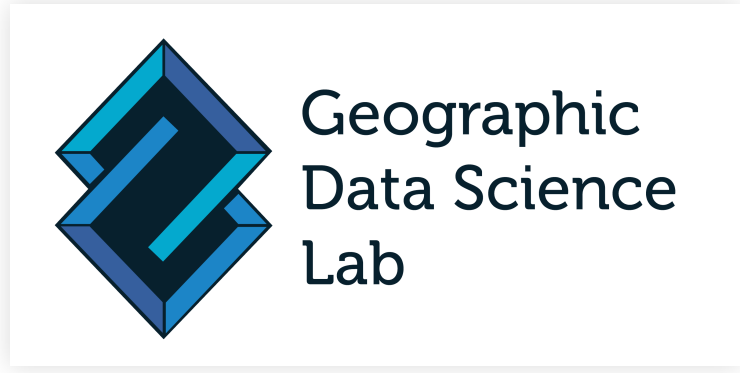
Urban Analytics

Maximising the value of big data for enhanced urban policy making

Dani Arribas-Bel [@darribas]



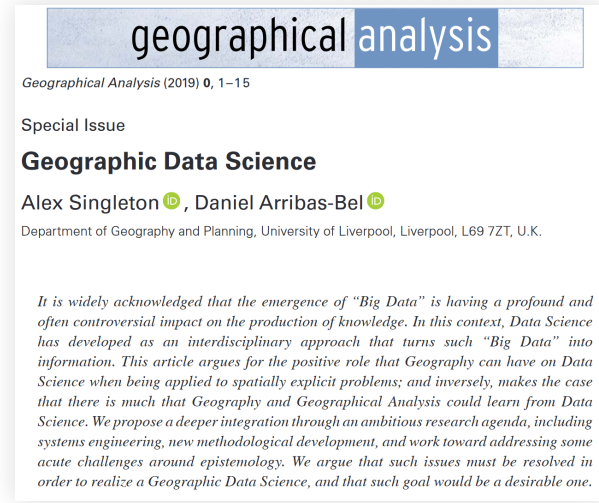
Today

- Urban Analytics
- For example…
- Some thoughts on *“how”*

Urban Analytics

Urban Analytics

- Data, data, data
- (Geographic) Data Science: the "data refinery"
- More and better measurement



geographical analysis

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Special Issue

Geographic Data Science

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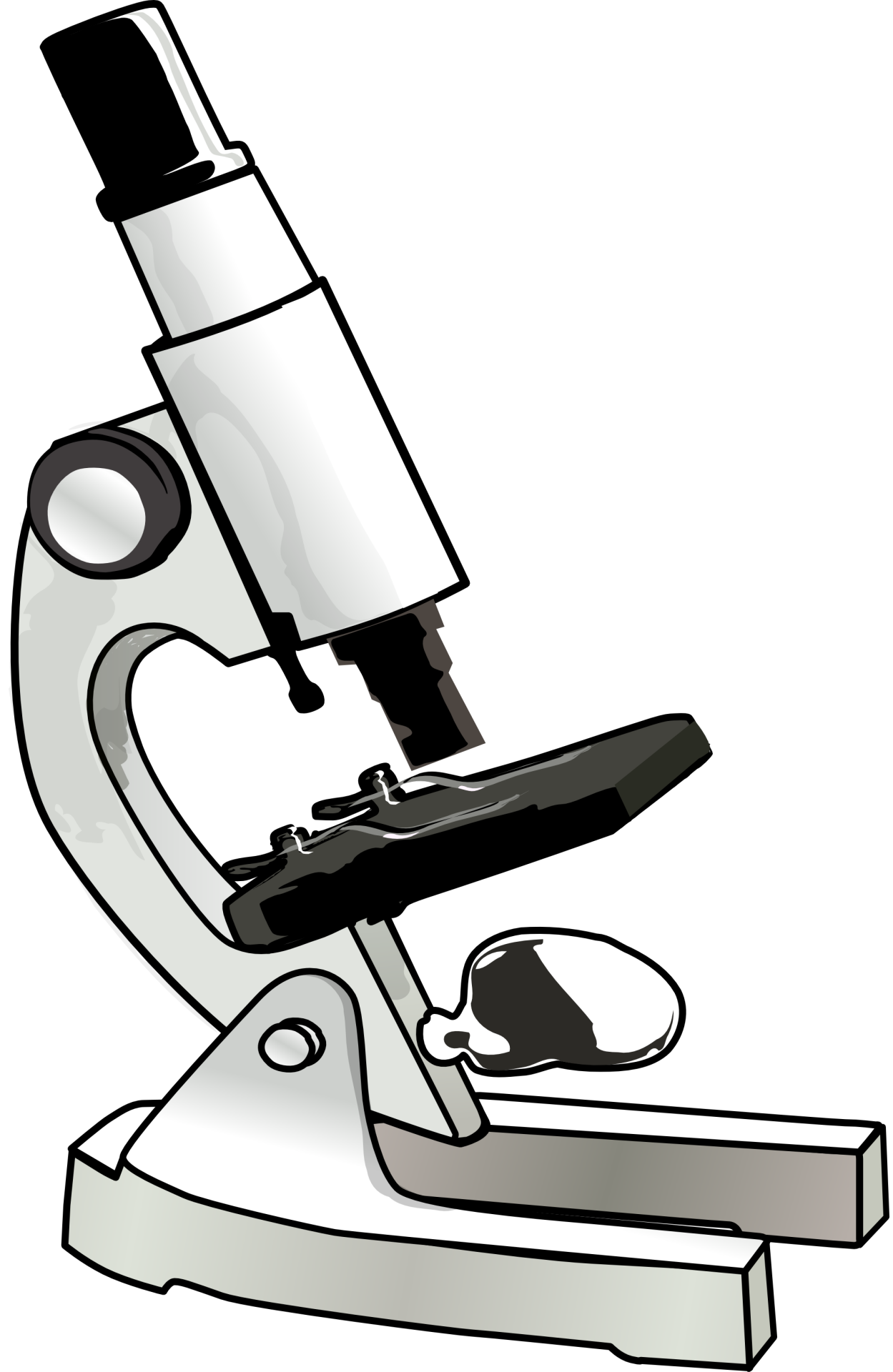
It is widely acknowledged that the emergence of "Big Data" is having a profound and often controversial impact on the production of knowledge. In this context, Data Science has developed as an interdisciplinary approach that turns such "Big Data" into information. This article argues for the positive role that Geography can have on Data Science when being applied to spatially explicit problems; and inversely, makes the case that there is much that Geography and Geographical Analysis could learn from Data Science. We propose a deeper integration through an ambitious research agenda, including systems engineering, new methodological development, and work toward addressing some acute challenges around epistemology. We argue that such issues must be resolved in order to realize a Geographic Data Science, and that such goal would be a desirable one.

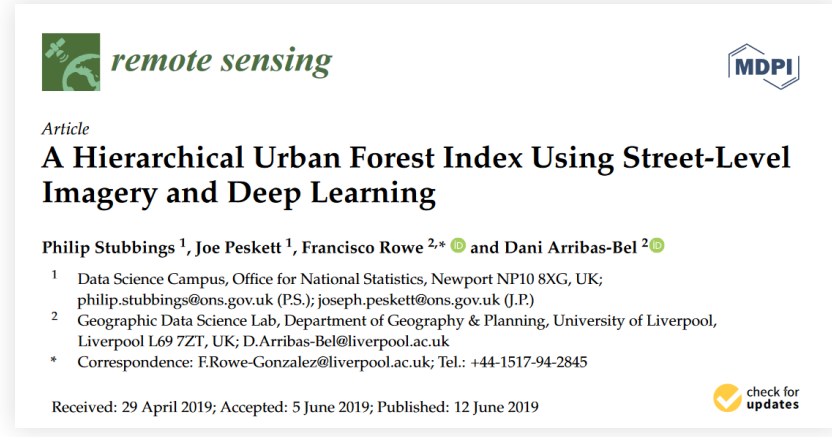


For example…

Measuring Urban Green Coverage

Measuring Urban Green Coverage

- Urban green space has many benefits to urban dwellers
- But is is hard/expensive to measure
- Better quantification can inform evidence-driven policies



remote sensing MDPI

Article

A Hierarchical Urban Forest Index Using Street-Level Imagery and Deep Learning

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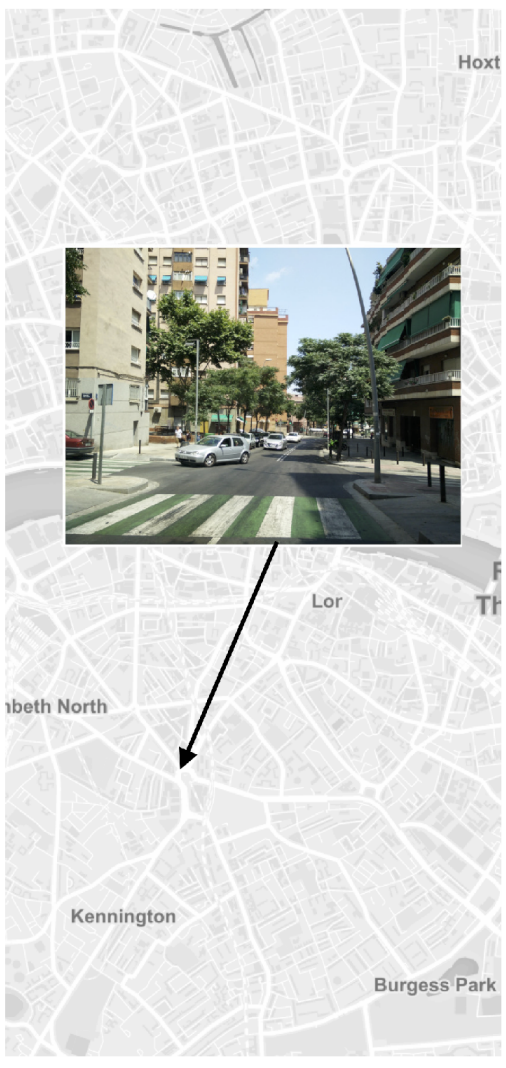
check for updates

Input Data

Google Street View (GSV) Imagery



Stage 1

Vegetation Pixel Identification & Classification

Methods

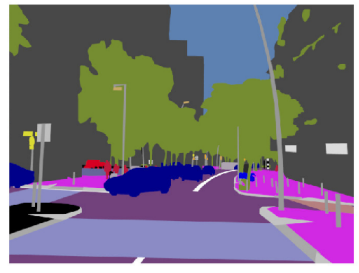
1. Threshold Methods

L^*a^*b

Random Forest

2. Semantic Segmentation

Pyramid Scene Parsing Network (PSPNet)



Pixel Class

Binary

- Green
- Non-green

Multiple

- Tree
- Grass
- Plant
- Earth
- Sky
- Car
- Boat
- Water
- River
- House
- Building
- Skyscraper
- Wall
- Floor

Pixel Classification

Image ID	Vegetation Pixel*
1	1
1	0
1	1
⋮	⋮
1	1
2	0
2	0
2	1
⋮	⋮
2	1
⋮	⋮
n	1
n	1
n	1
⋮	⋮
n	0

*1: Yes; 0: No

Stage 2

Aggregation Score

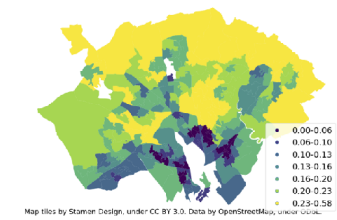
Hierarchical Regression Model

Level 1: Image level

Level 2: Geographic area level

Level 2: Area ID	Level 1: Image ID	Vegetation Pixel*
1	1	1
1	1	0
1	1	1
⋮	⋮	⋮
1	1	1
1	2	0
1	2	0
1	2	1
⋮	⋮	⋮
1	2	1
⋮	⋮	⋮
n	n	1
n	n	1
n	n	1
⋮	⋮	⋮
n	n	0

Hierarchical Tree Score



Outcome

So what?

- Information on exposure to vegetation in urban environments is hard to generate…
- … But very important for a variety of challenges, from pollution to mental health
- (Geographic) Data Science can help produce timely datasets at scale

Aerial/Satellite Imagery

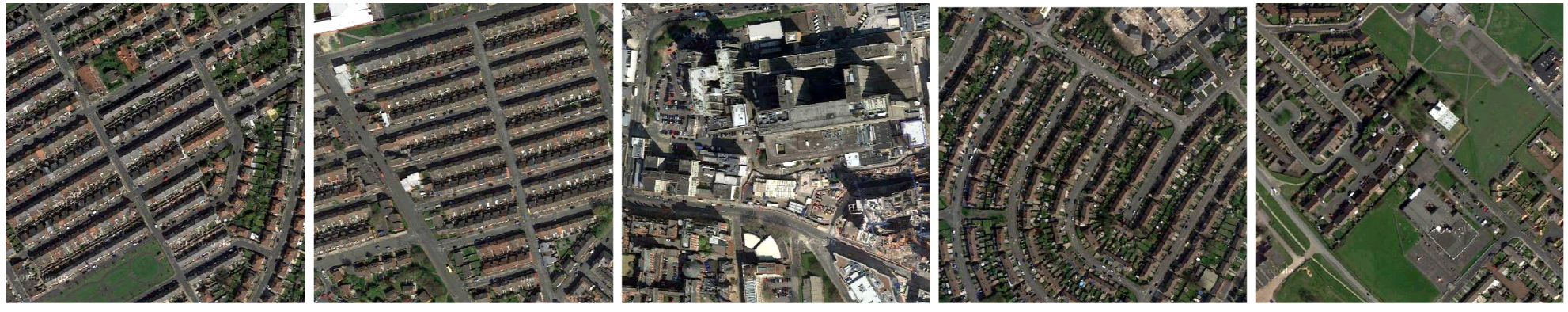
H.I

*The **physical appearance** of a human settlement is a **reflection** of the **society** that inhabits it*

H.II

*Urban areas with similar **built environment** have similar **social and demographic** characteristics*

RSF 1.31 1.35 1.40 1.45 1.51

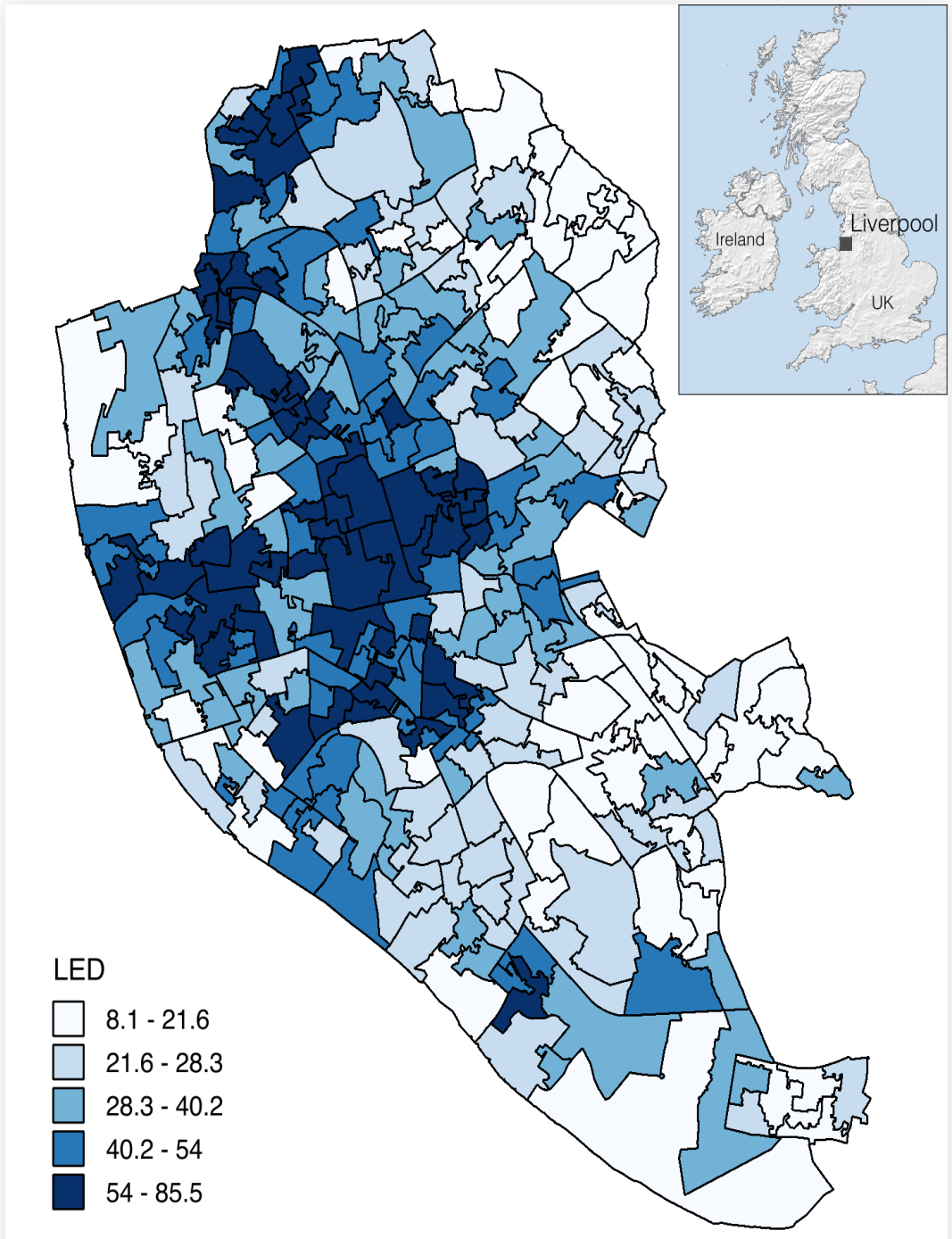


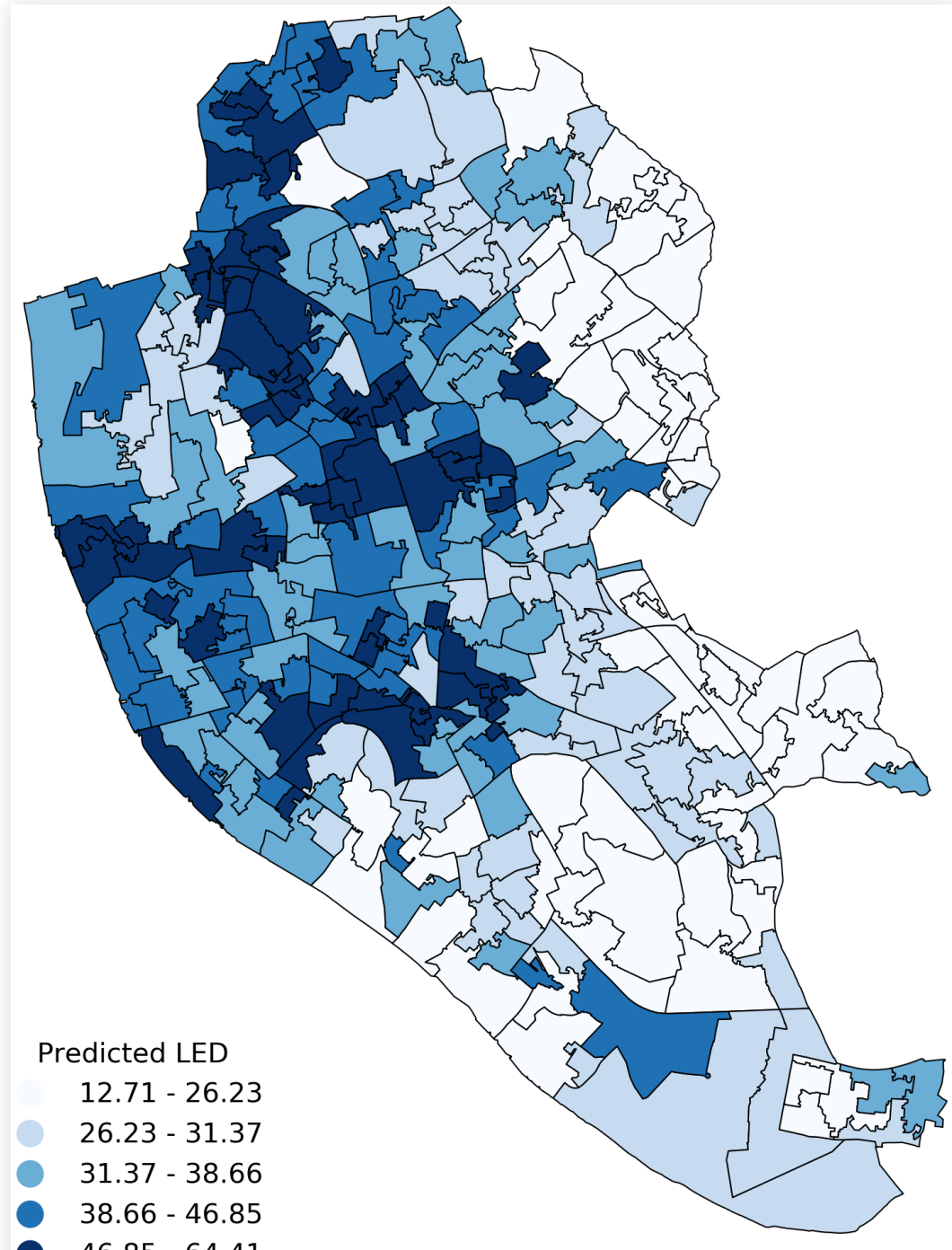
p_veg 5 % 20 % 35 % 50 % 65 %

p_b_water 0.1 % 2 % 4 % 6 % 8 %

RMM 1.16 1.23 1.30 1.37 1.41

0 100 m


Ireland
Liverpool
UK
LED
8.1 - 21.6
21.6 - 28.3
28.3 - 40.2
40.2 - 54
54 - 85.5


Predicted LED
12.71 - 26.23
26.23 - 31.37
31.37 - 38.66
38.66 - 46.85
46.85 - 64.41

So what?

- Generating an update of IMD is expensive
- Satellite images are *already* being collected (more and better every day!)
- Can we embed their use in policy-making?

Some thoughts on *how*

Some thoughts on *how*

- *Goals first, tech next*
- Low hanging (existing) fruits
- Tap into *existing* talent pools (e.g. Universities)

And a cautionary tale to beware who you rely on…

(c) No Creating Content From Google Maps Content. Customer will not create content based on Google Maps Content. For example, Customer will not: (i) trace or digitize roadways, building outlines, utility posts, or electrical lines from the Maps JavaScript API Satellite base map type; (ii) create 3D building models from 45° Imagery from Maps JavaScript API; (iii) build terrain models based on elevation values from the Elevation API; (iv) use latitude/longitude values from the Places API as an input for point-in-polygon analysis; (v) construct an index of tree locations within a city from Street View imagery; or (vi) convert text-based driving times into synthesized speech results.

(d) No Re-Creating Google Products or Features. Customer will not use the Services to create a product or service with features that are substantially similar to or that re-create the features of another Google product or service. Customer's product or service must contain substantial, independent value and features beyond the Google products or services. For example, Customer will not: (i) re-distribute the Google Maps Core Services or pass them off as if they were Customer's services; (ii) create a substitute of the Google Maps Core Services, Google Maps, or Google Maps mobile apps, or their features; (iii) use the Google Maps Core Services in a listings or directory service or to create or augment an advertising product; (iv) combine data from the Directions API, Geolocation API, and Maps SDK for Android to create

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