Advances in Geographic Data Science and Urban Analytics

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LIFE CHANGING | World Shaping

Geographic
Data Science
Lab

geographicdatascience.com

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Traditional Social Sciences

"[Sample survey's] glory years, we contend, are in the past"

Savage and Burrows, 2007: 890

"Refusals to participate are also increasing"

de Heer, 2004:5

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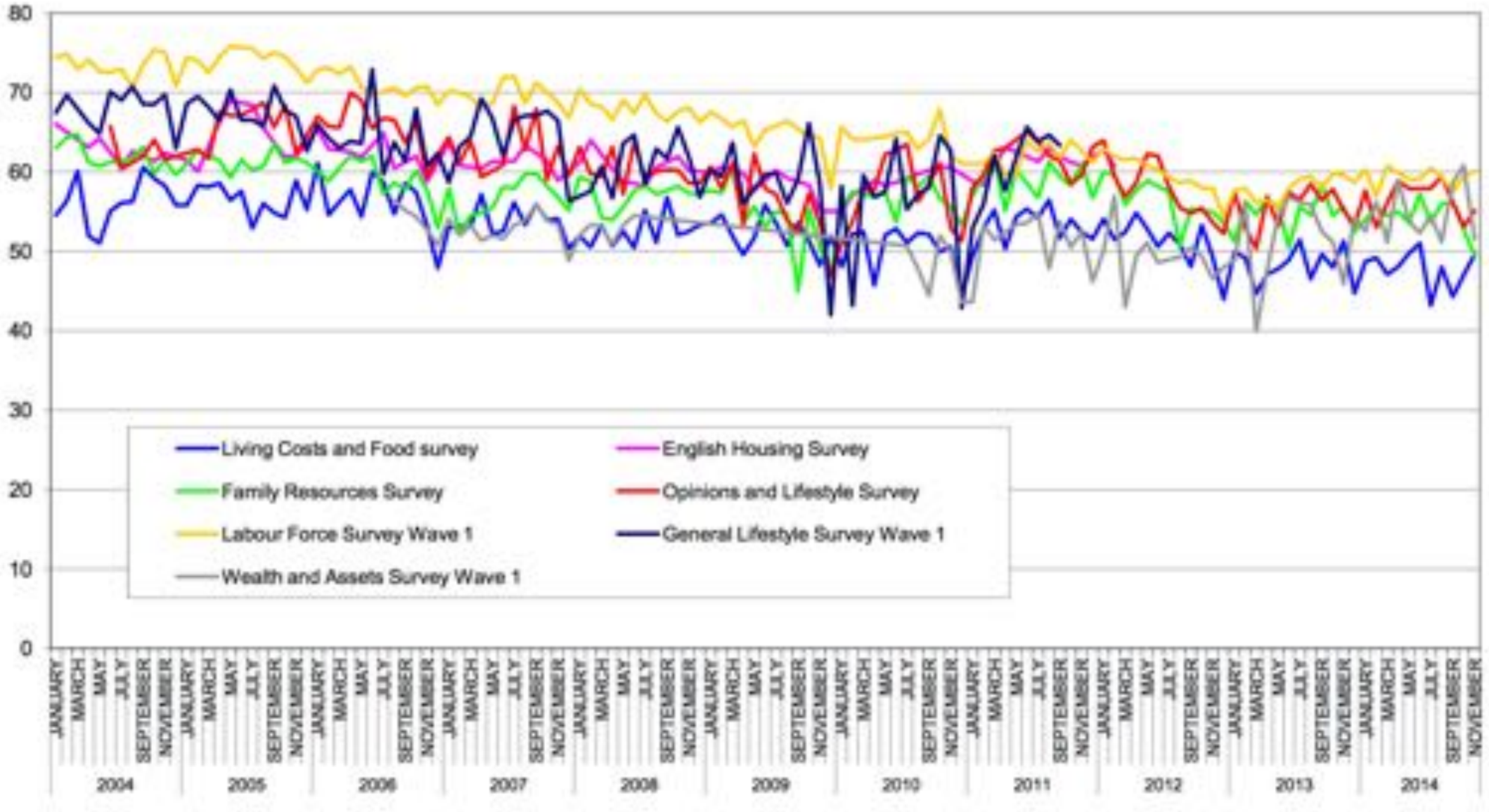
Atrostic et al 2001; Baruch 1999; de Heer 1999; Plewis, 2007; Savage and Burrows, 2007;

Response Rates 04-14



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ONS; FOI Request: Survey Response Rates (Feb-2015)

Great Opportunities

- Transactional data
  - Consumers in the private and public sectors
  - VGI - social media
- Sensor technology
  - Mobile / dynamic / linked humans
  - IOT - urban contexts

Times Square, NYC: Technology is integral to how cities can be managed and studied

Source: Photograph by Aurelien Guichard CC BY-SA (Flickr)

New Forms of Access

maps.cdrc.ac.uk
data.cdrc.ac.uk
cdrc.ac.uk

Consumer Data Research Centre

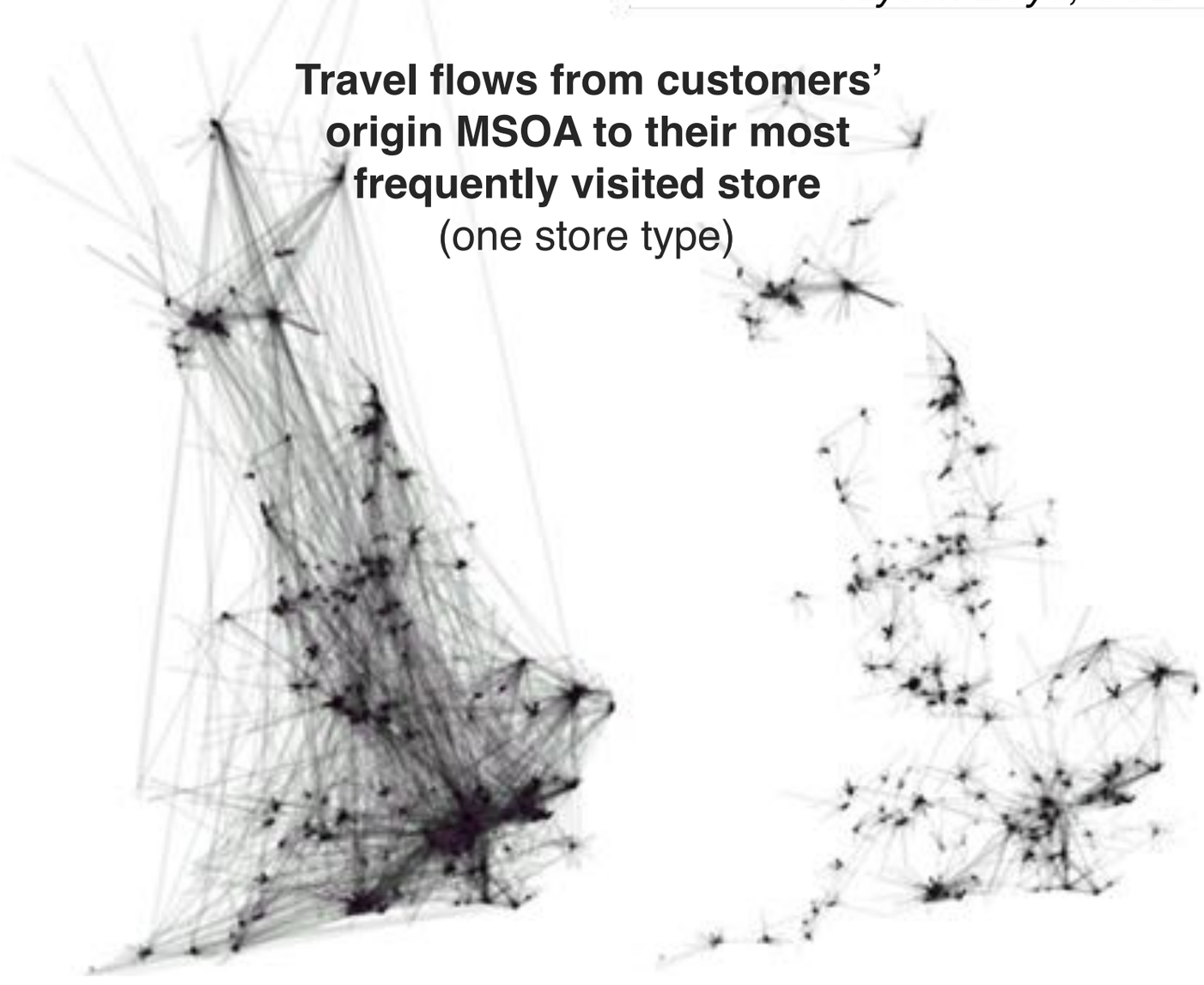
Challenging Social Sciences

- Data cleaning
- “Big” Data
  - Infrastructure
  - Access
- Techniques…

Raw data 65,770 accounts

Cleaned data 53,141 accounts

Alyson Lloyd, UCL



Travel flows from customers’ origin MSOA to their most frequently visited store
(one store type)

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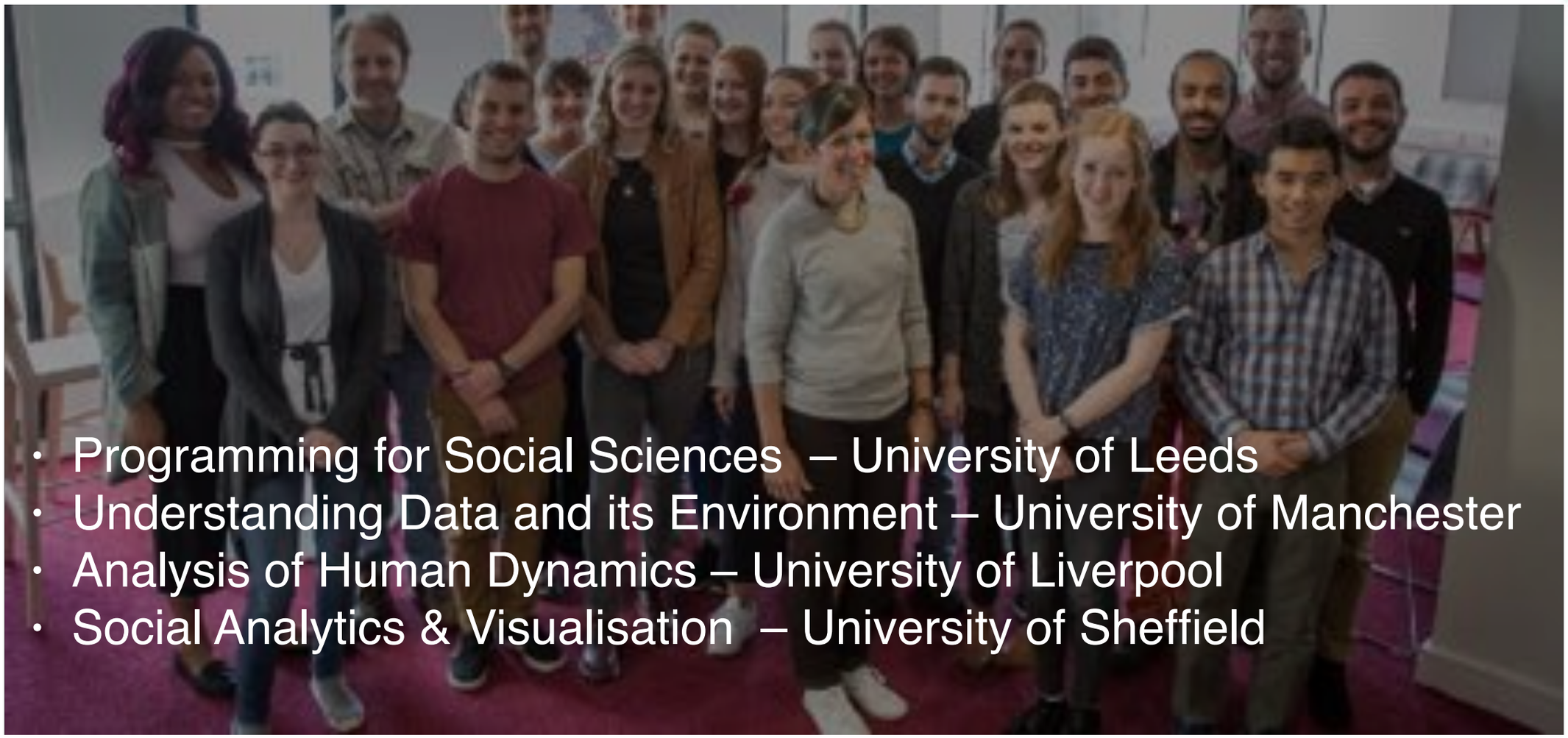
Challenging Social Sciences

- Skills acquisition



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https://datacdt.org

Urban Analytics Examples…

- Retail **Dynamics**
- Urban **Contexts**
    - Geodemographics
- Applications and Data Fusion
    - e-Resilience - regional retail systems
    - Dynamics
        - Sensors

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Retail Dynamics

- 2004 Boundaries (ODPM / DCLG)
  - Defined ”Town Centres”
  - Outdated
  - Not retail specific

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Pavlis, M, L. Dolgea and A. Singleton (2017). “A Modified DBSCAN Clustering Method to Estimate Retail Center Extent”. In: *Geographical Analysis*.

Retail Dynamics

Short Term

Grimsby: Centre (red), Convenience (blue), Comparison (Green)

Urban Contexts

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Supermarket

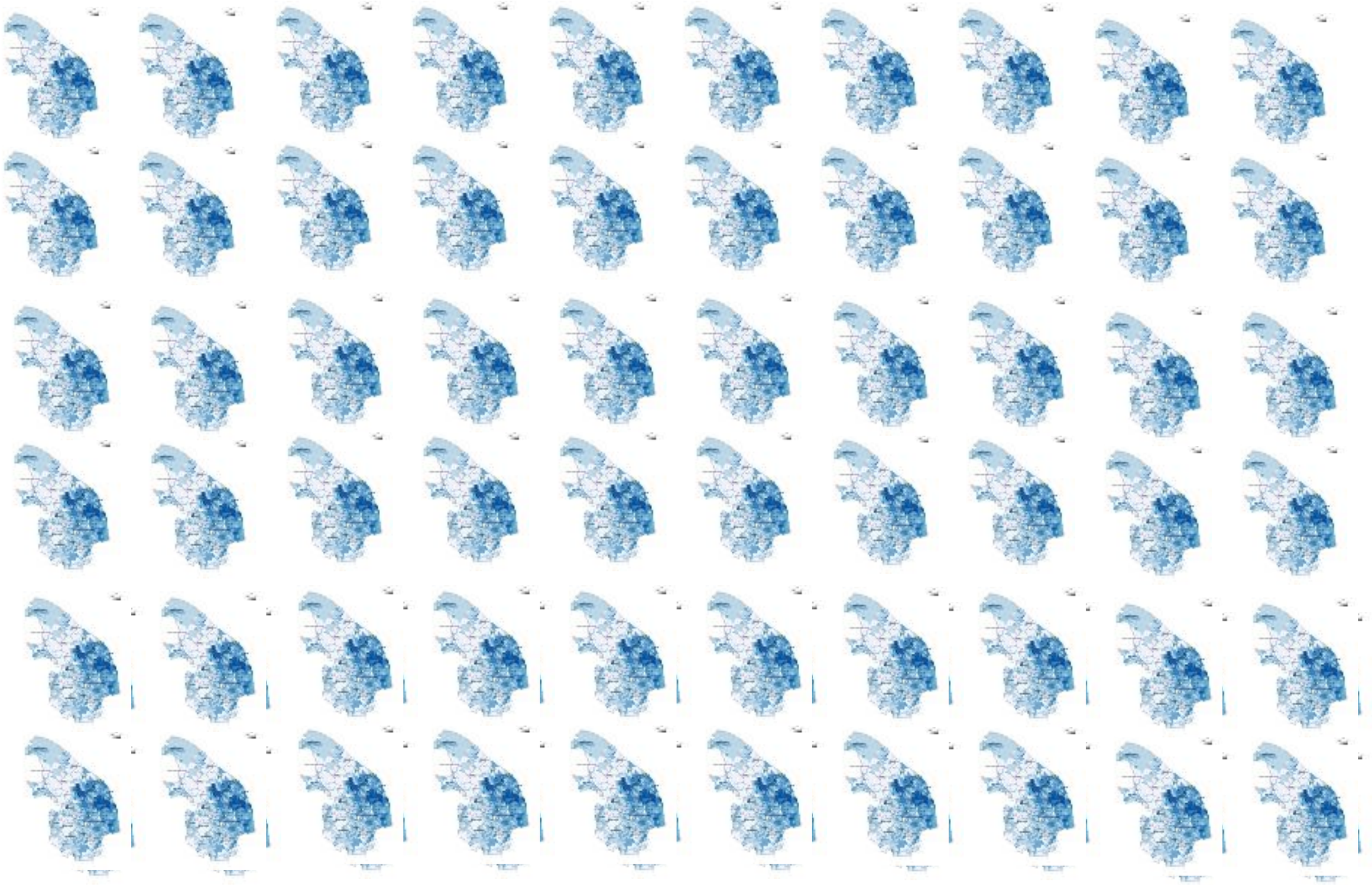
Local Shop

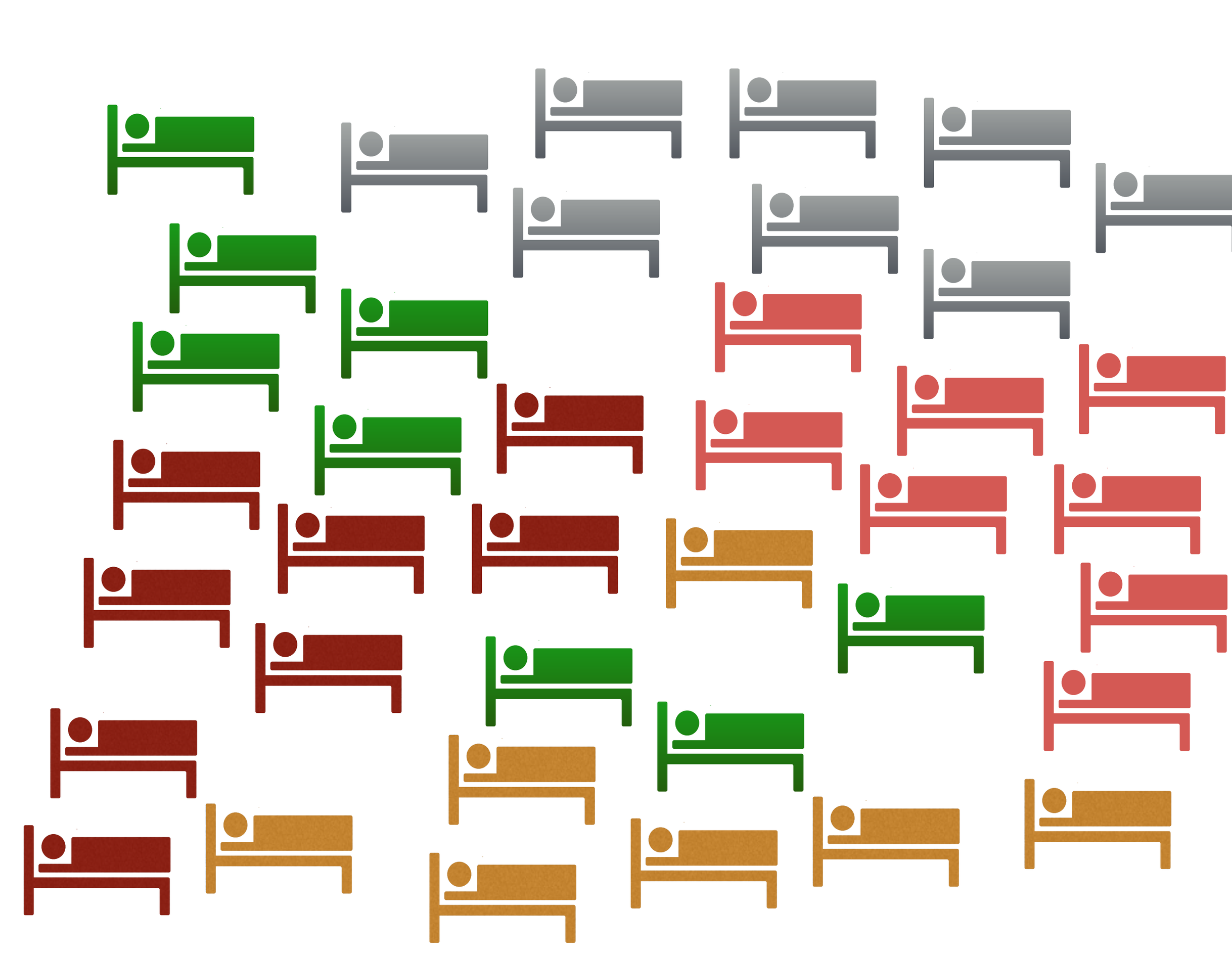
Sports Injury

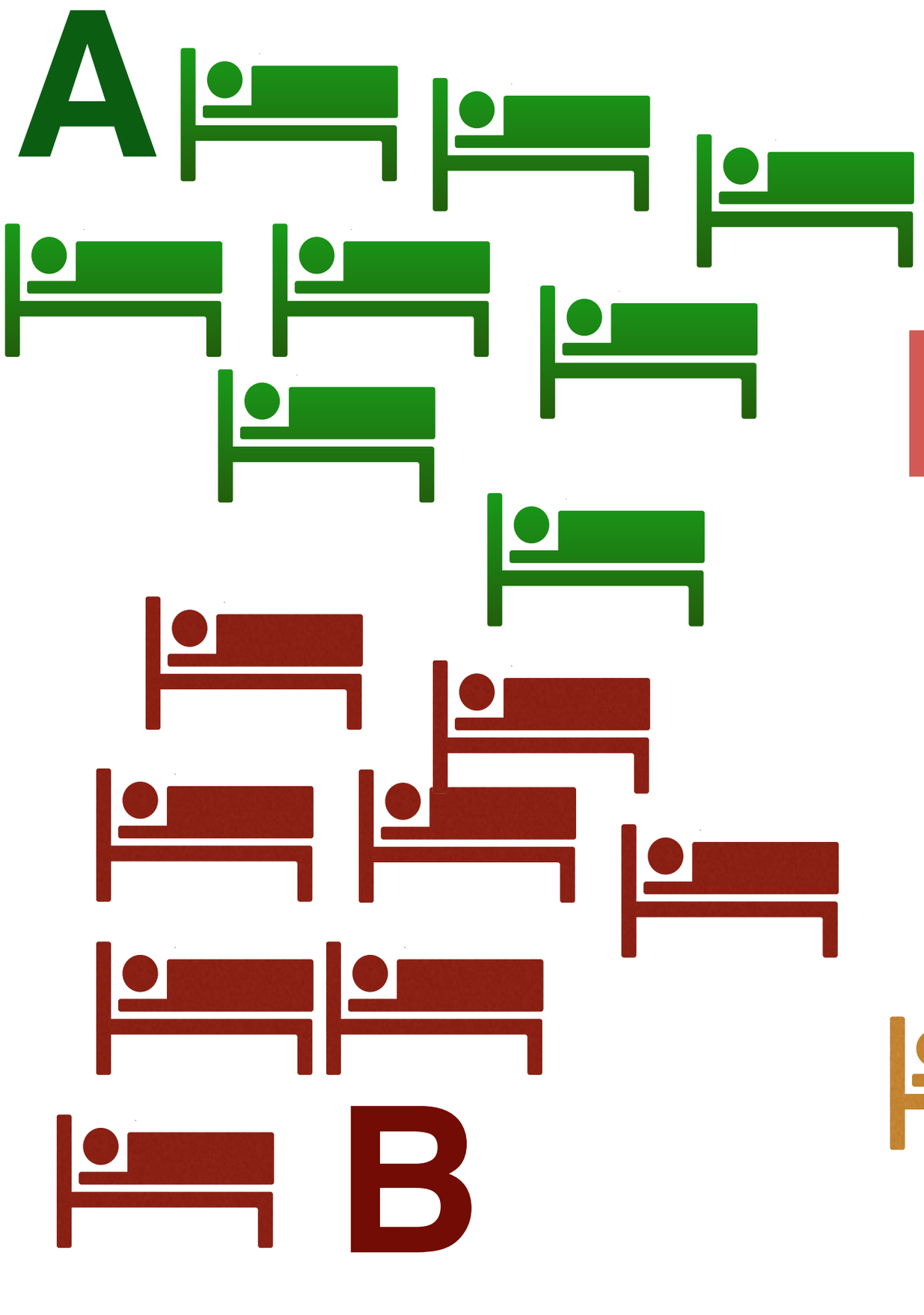
Heart Problems

Urban Contexts

https://www.flickr.com/photos/bluesquarething/5512923662/






A
B
C
D
E

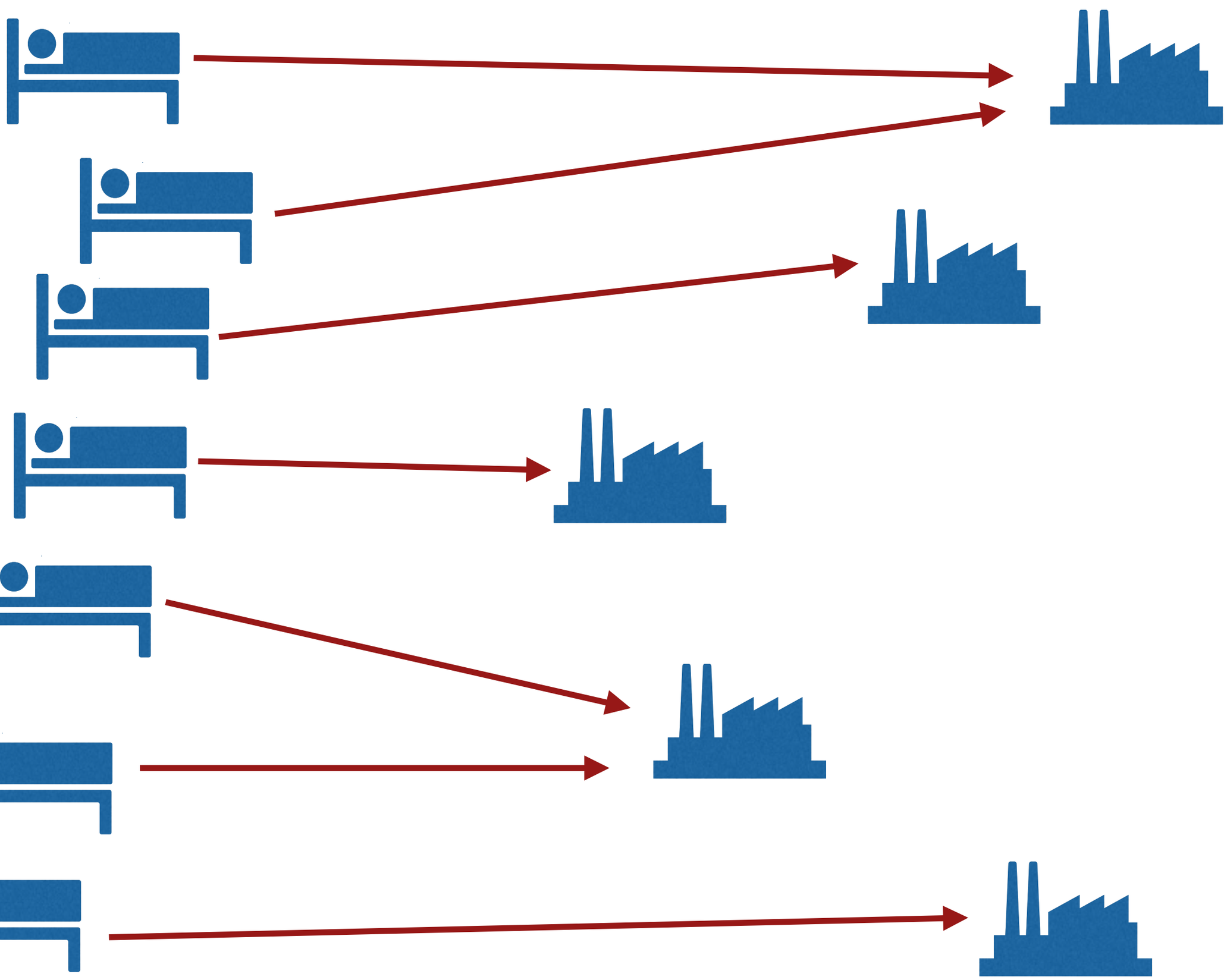
Office for National Statistics

Luton
Welwyn Garden City
Hertford
Sawbridgeworth
Harlow
St Albans
Hemel Hempstead
Potters Bar
Epping
East Barnet
Tottenham
Willesden
Ealing
London
Putney
Lewisham
Wimbledon
Orpington
Croydon

Gale, C, A. Singleton and P. Longley (2016). “Creating the 2011 area classification for output areas (2011 OAC)”. In: *Journal of Spatial Information Science*, pp. 1-27. URL: http://dx.doi.org/10.5311/JOSIS.2016.12.232.

Night

Day



London Classification of Workplace Zones

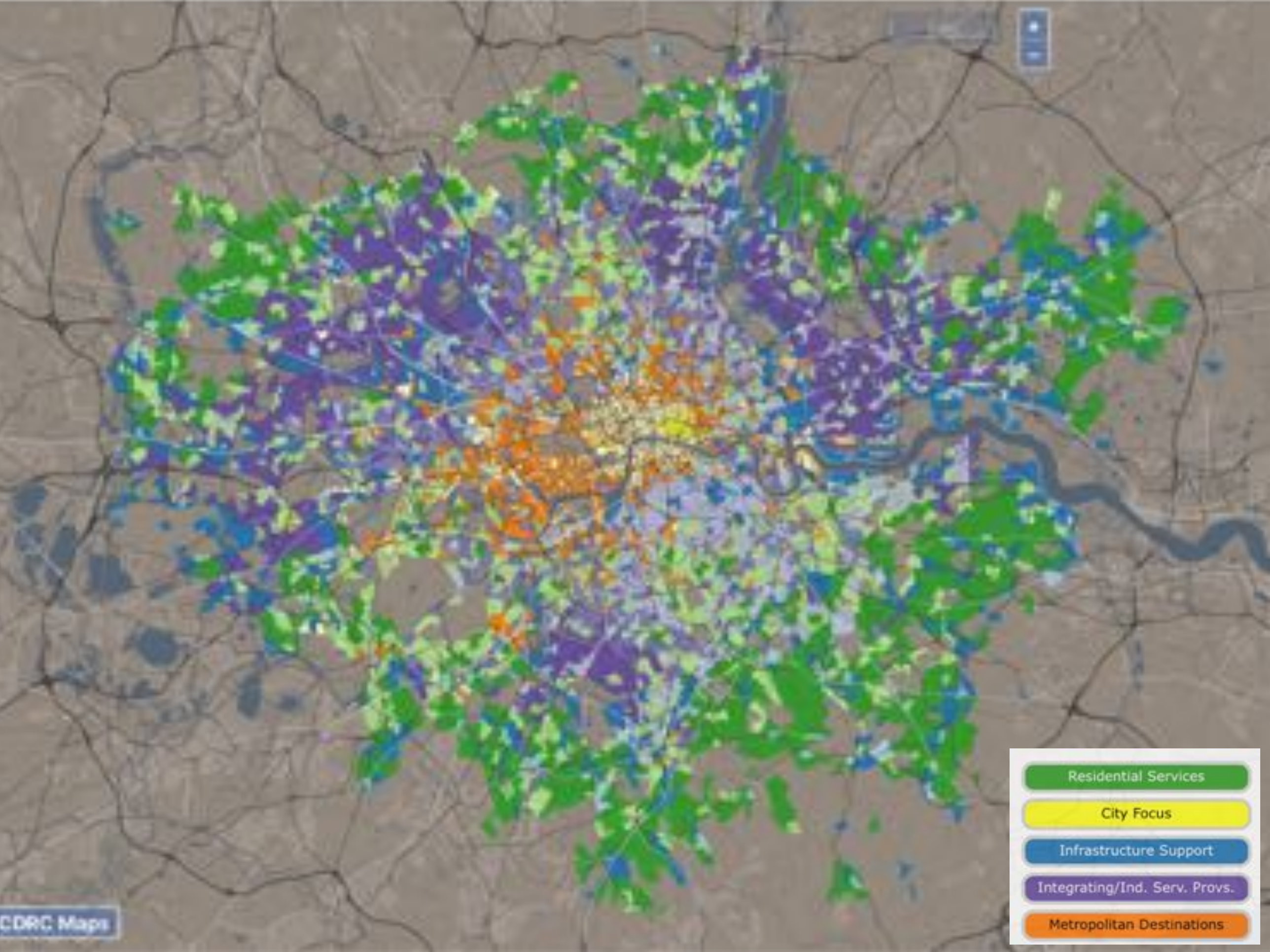
Domain	Sub Domain
Employment Type	Employment
	Occupation Types
	Retail Density
Dynamism / Attractiveness	Change
	Night-time Economy
Employee Characteristics	Demographic
	Diversity
	Socio-economic
Job Characteristics	Qualifications
	Working day
	NS-SEC
Commuting / Connections	Distance / Accessibility
	Mode
Residential Context	Demography
	Socio-economic
	Family structure
	Education
	Residential Mix

Office for National Statistics

- 2011 Census
- Business Register and Employment Survey

LDC

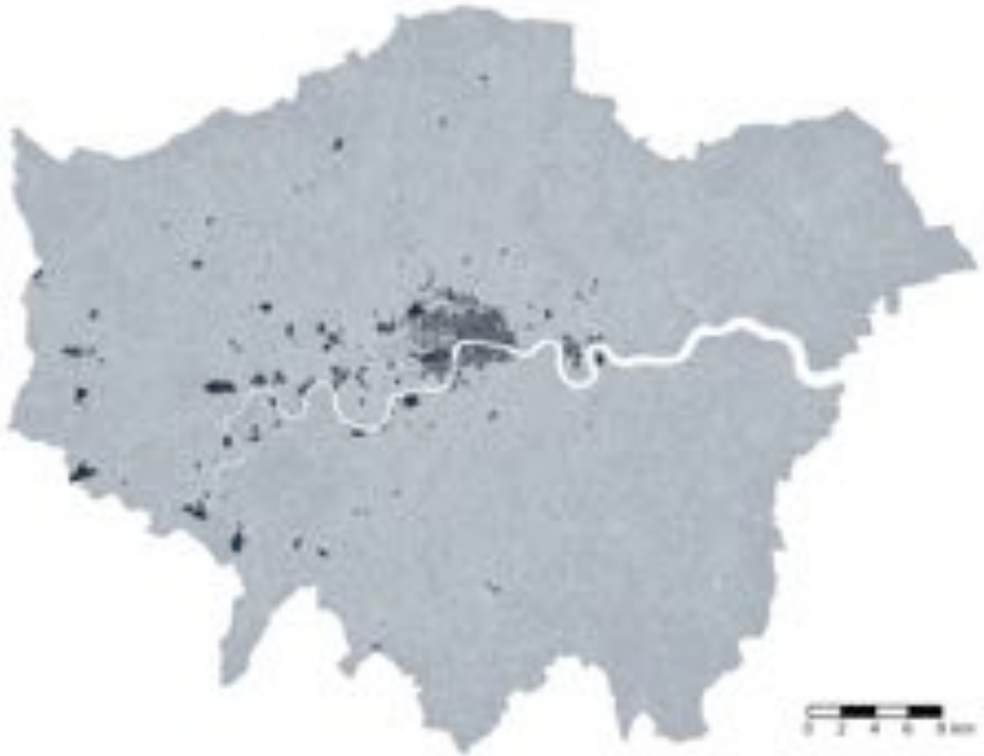
- Location and type retailers
- Sensor data


Residential Services
City Focus
Infrastructure Support
Integrating/Ind. Serv. Provs.
Metropolitan Destinations
CDRC Maps

Groups & Sub Groups

- **Group – A: Residential Services**
  - A1: Predominantly older, local education and health workers
  - A2: Lowly qualified workers in construction and allied local trades
- **Group – B: City Focus**
  - B1: Dynamic financial centres with extended operating hours
  - B2: Professional, retail and leisure Services in dynamic central locations
- **Group – C: Infrastructure Support**
  - C1: Younger customer service workers in wholesale or retail occupations
  - C2: Blue collar, manufacturing and transport services
- **Group – D: Integrating and Independent Service Providers**
  - D1: Health care support staff and routine service occupations
  - D2 Locally sourced, home helps and domestic or manual workers
  - D3: Travelling or home-based general service providers
- **Group – E: Metropolitan Destinations**
  - E1: High street destinations and domestic employers
  - E2: Accessible retail, leisure and tourist services

B: City Focus



These areas bring focus to a range of specialised professional activities and also accommodate more general support services and retail activities.

The portfolio of over-all activity may also be catalytic to the occurrence of night-time economies.

Workers in all of these activities are predominantly drawn from a core (age 25-39) labour force

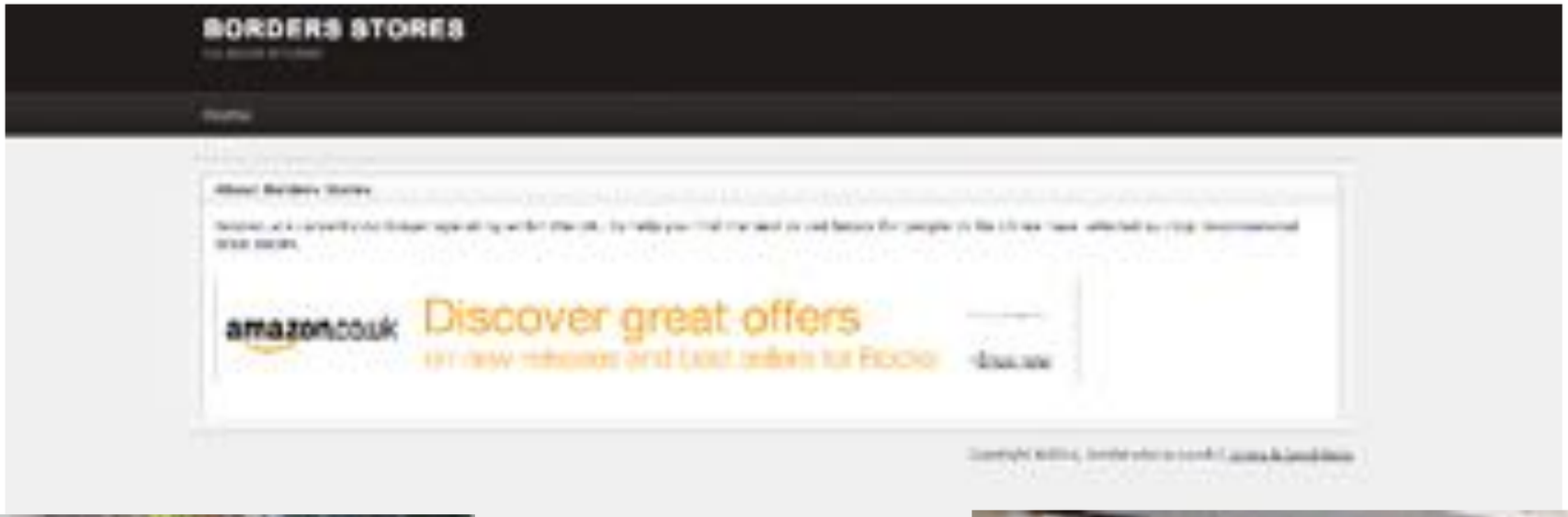
Source: https://upload.wikimedia.org/wikipedia/en/1/19/Canary_Wharf_Shopping_Mall.jpg

Group – E: Metropolitan Destinations

These areas are overwhelmingly located in Inner London and many serve as retail destinations.

A very international range of workers provide a wide range of high value and retail services. Many of these workers also reside in central London locations.

Integration - Internet & Retail



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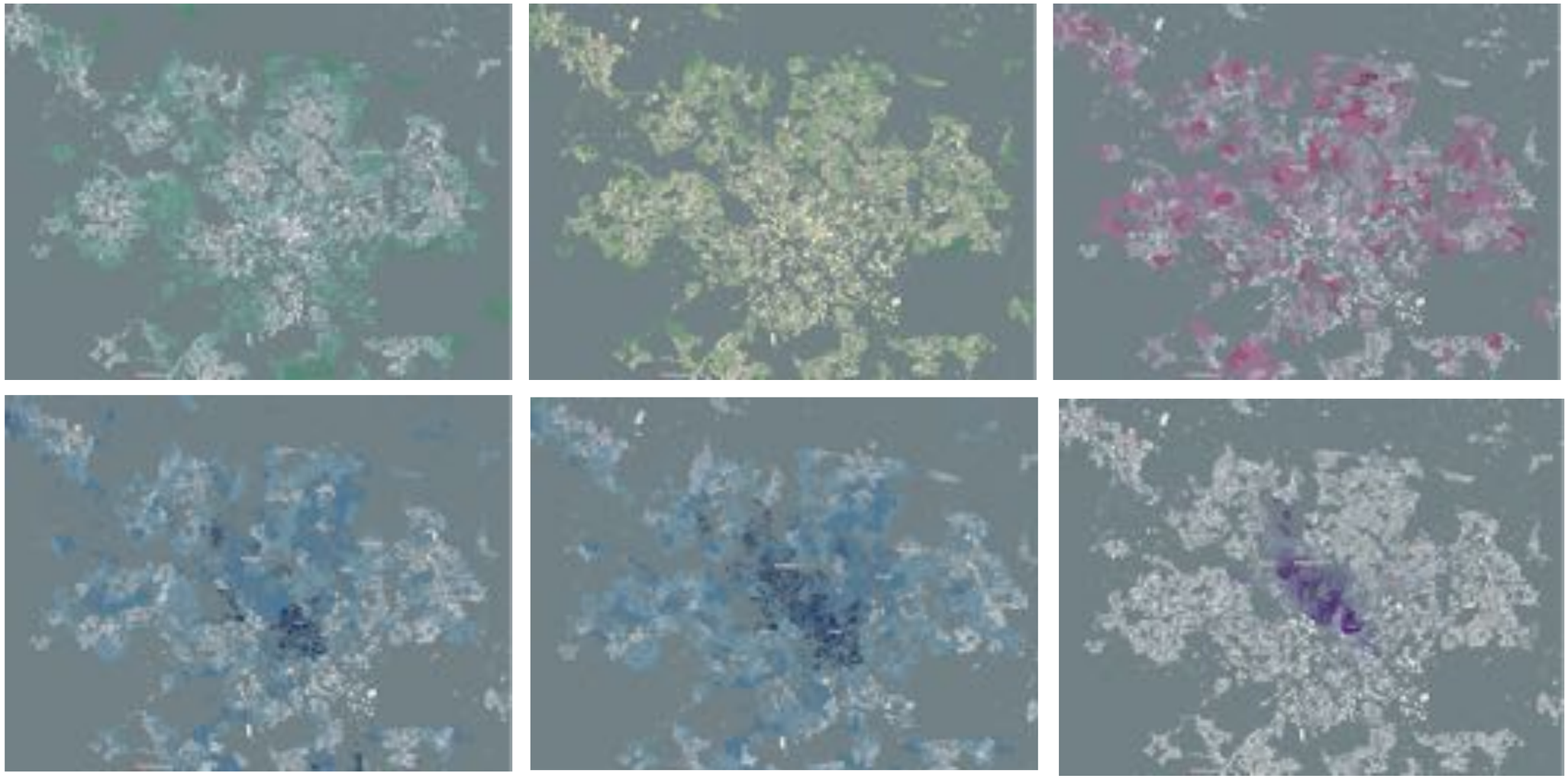

oiioiioii
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Sam Knows

Office for National Statistics

BROADBAND speedchecker

Ofcom

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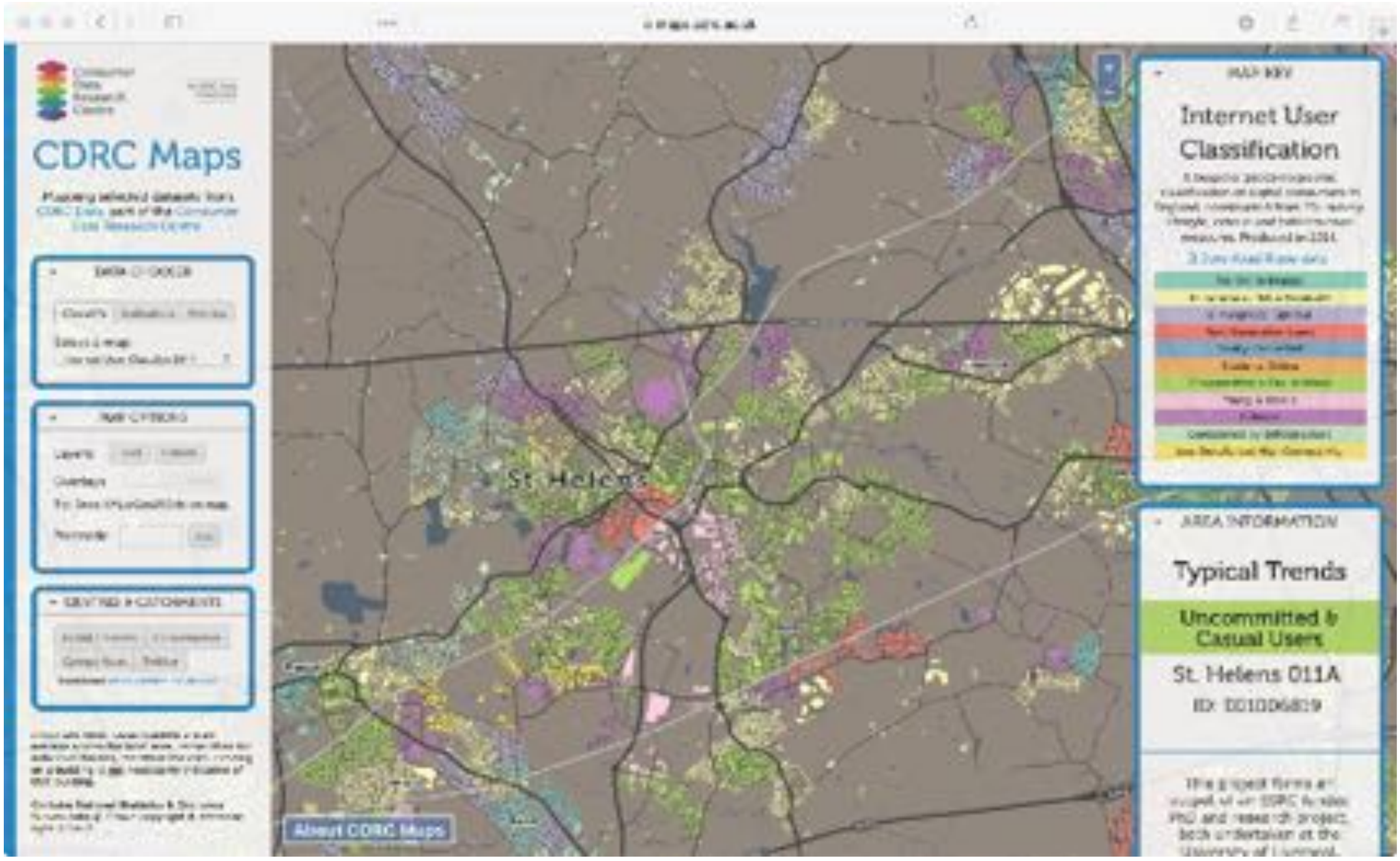
Internet User Classification



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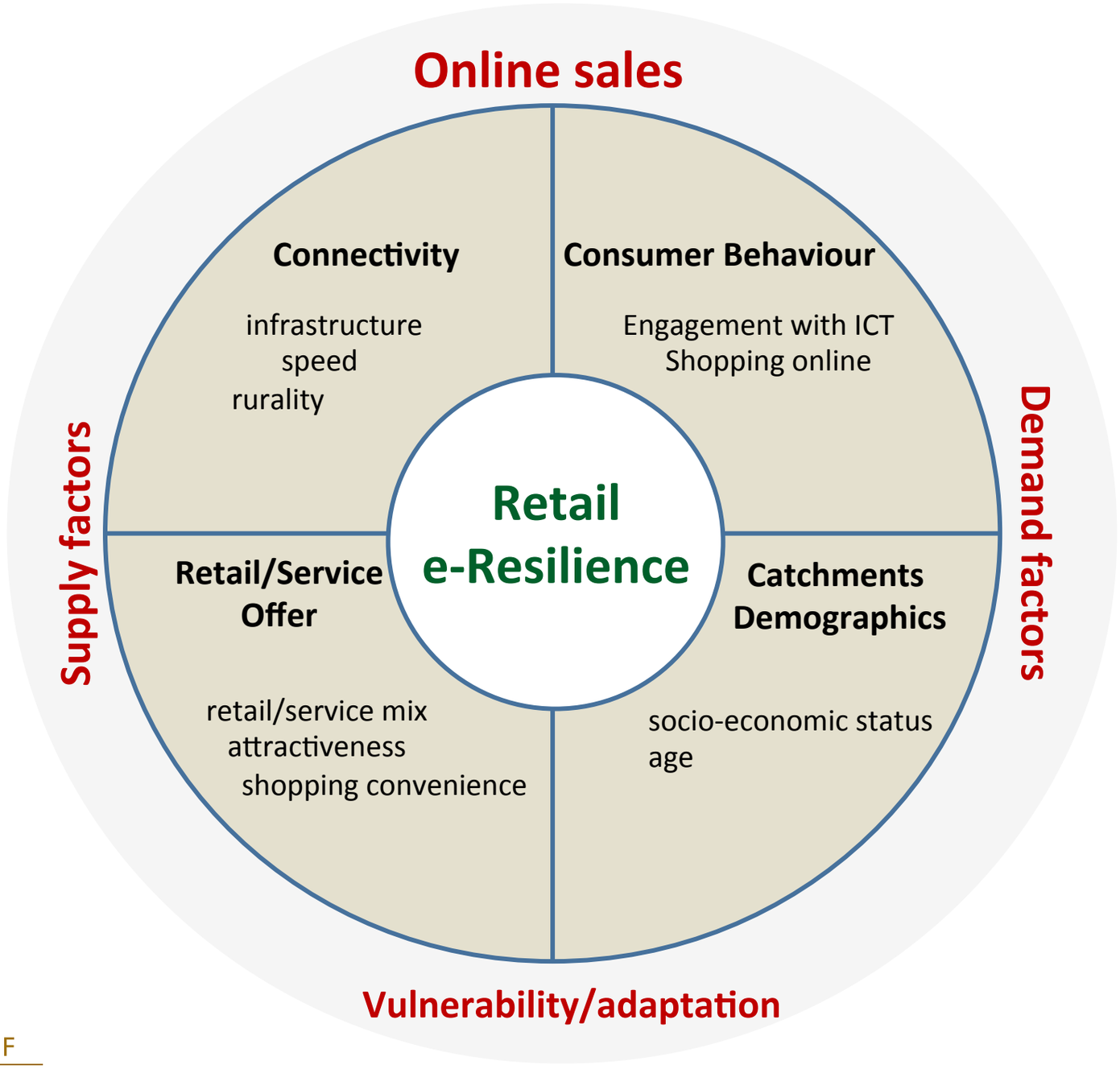
Dean Riddlesden

e-Resilience



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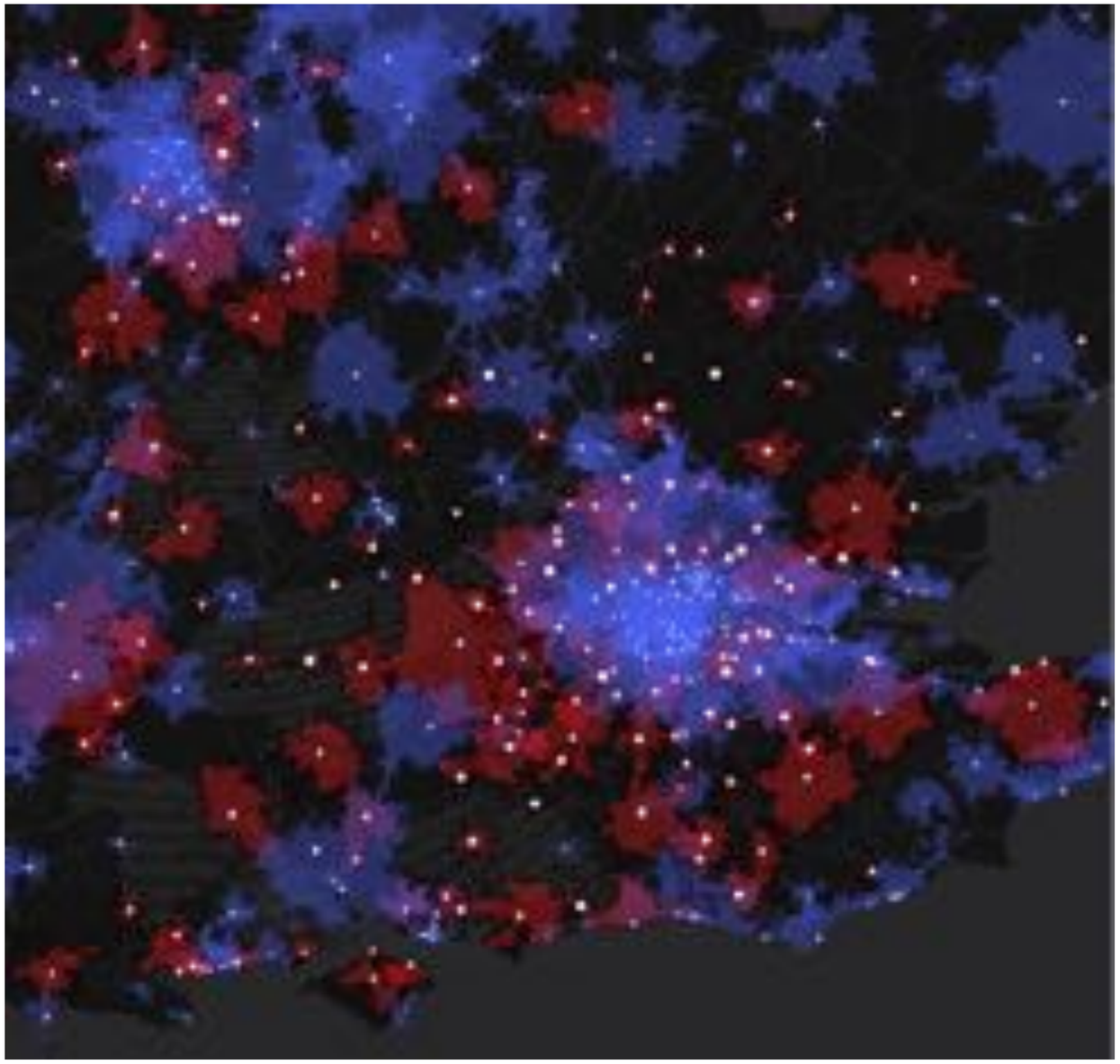
e-Resilience



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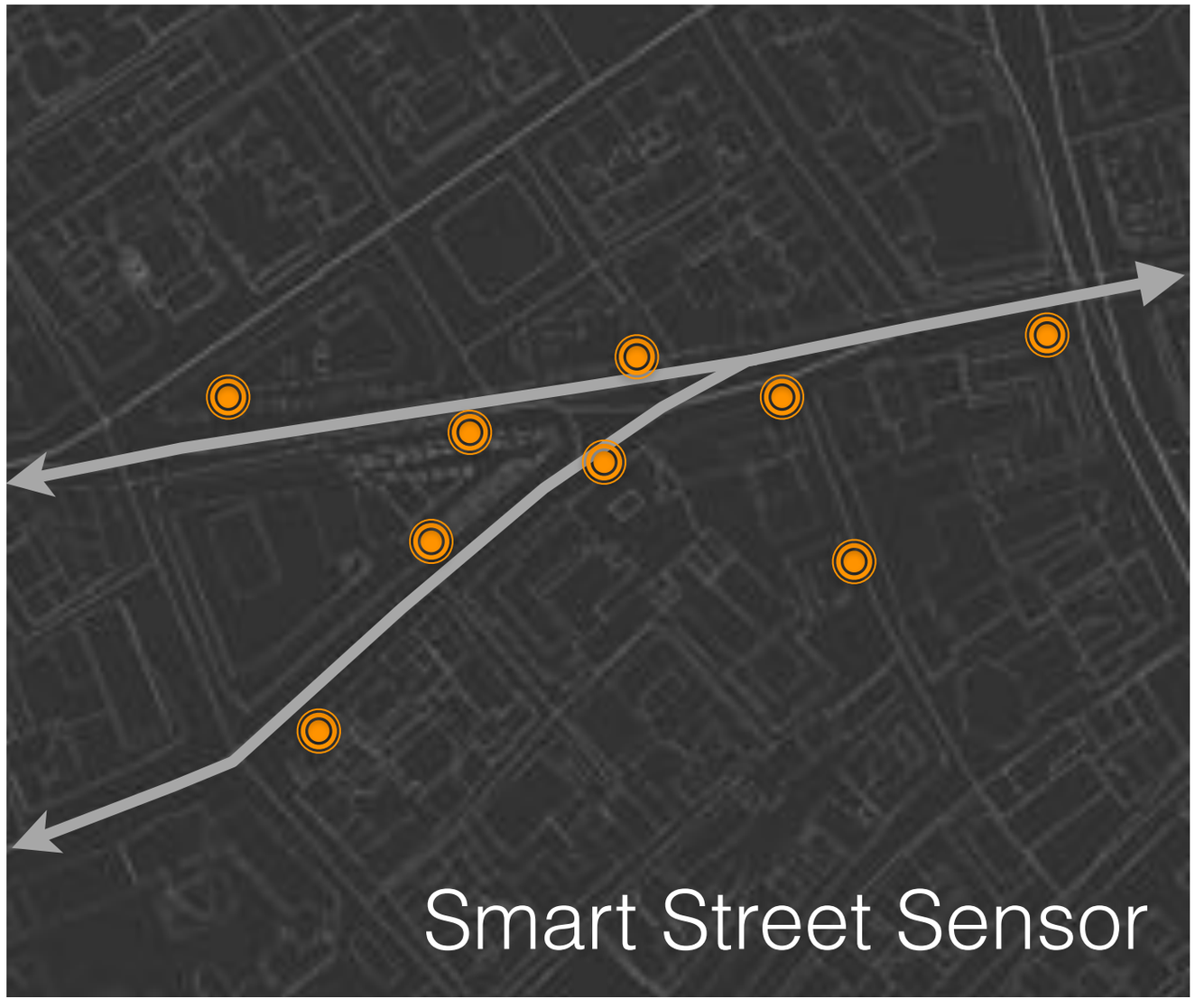
Singleton, A, L. Dolgea, M. Pavlis and P. Longley (2016). “Measuring the spatial vulnerability of retail centres to online consumption through a framework of e-resilience”. In: Geoforum 69, pp. 5-18.

Integration - Urban Dynamics



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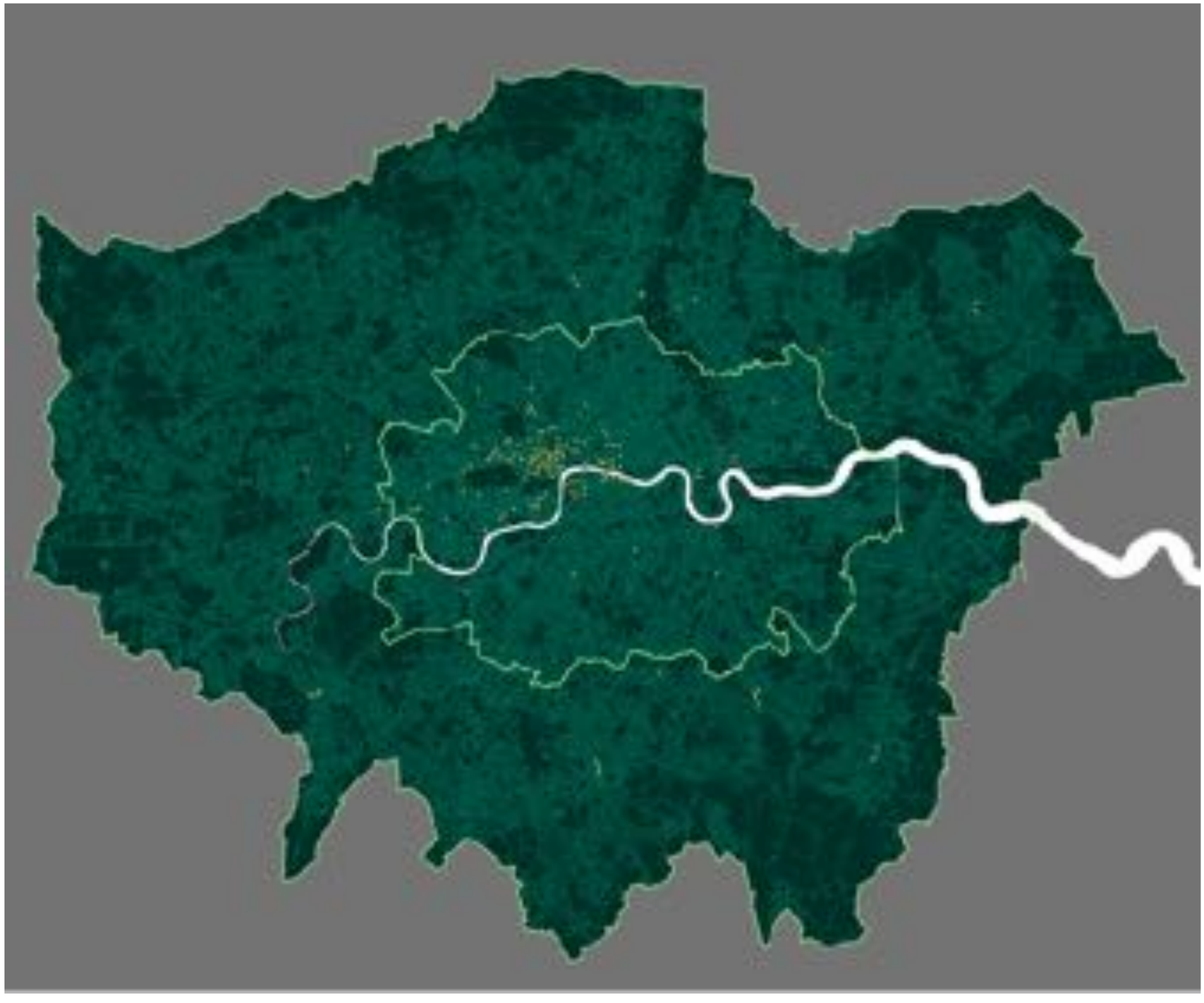
Minimum of 1000 sensors - UK wide

Smart Street Sensor



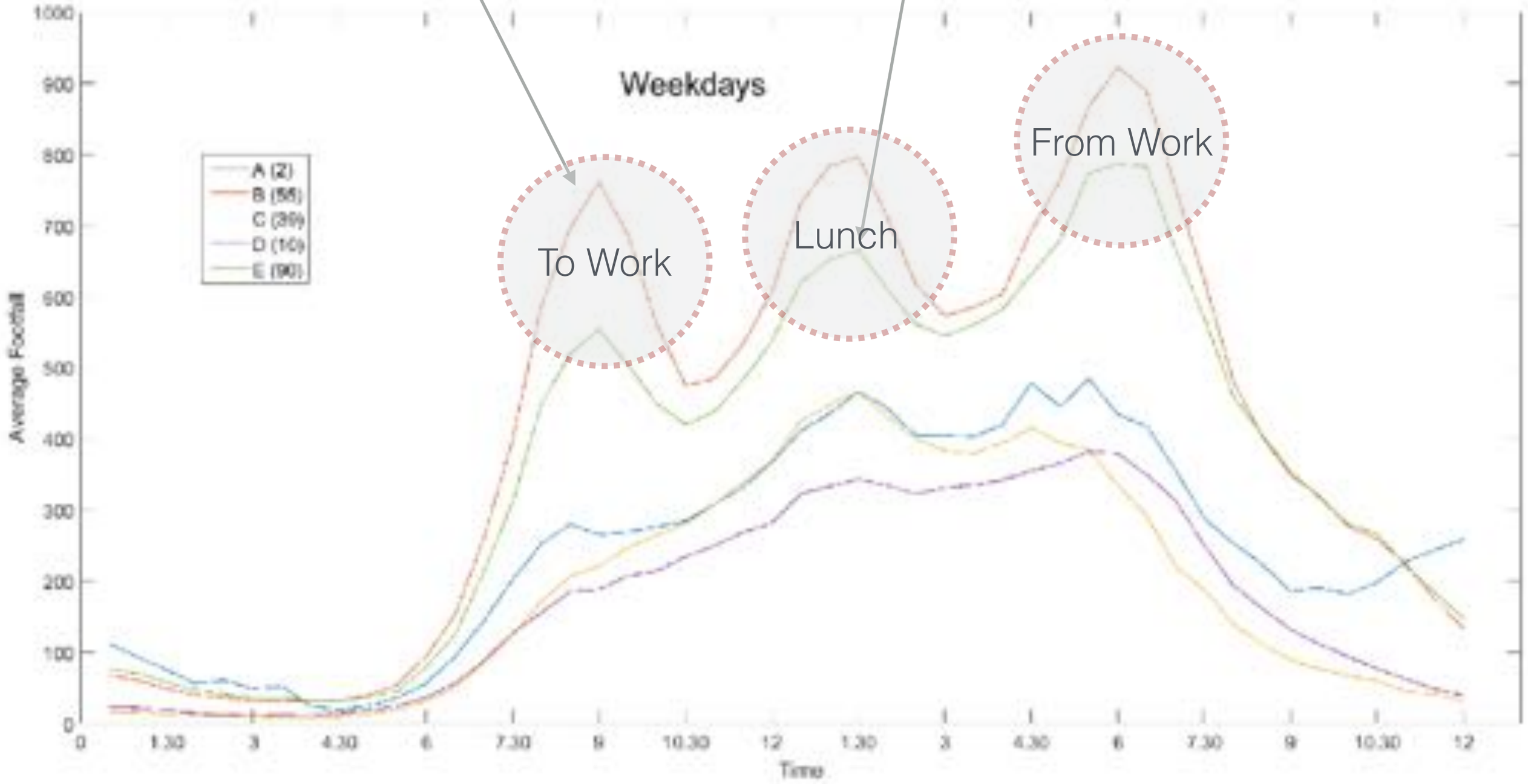
Smart Street Sensor

Smart Street Sensor

Group	Number of sensors
A: Residential Services	2
B: City Focus	55
C: Infrastructure Support	39
D: Integrating and Independent Service Providers	10
E: Metropolitan Destinations	90

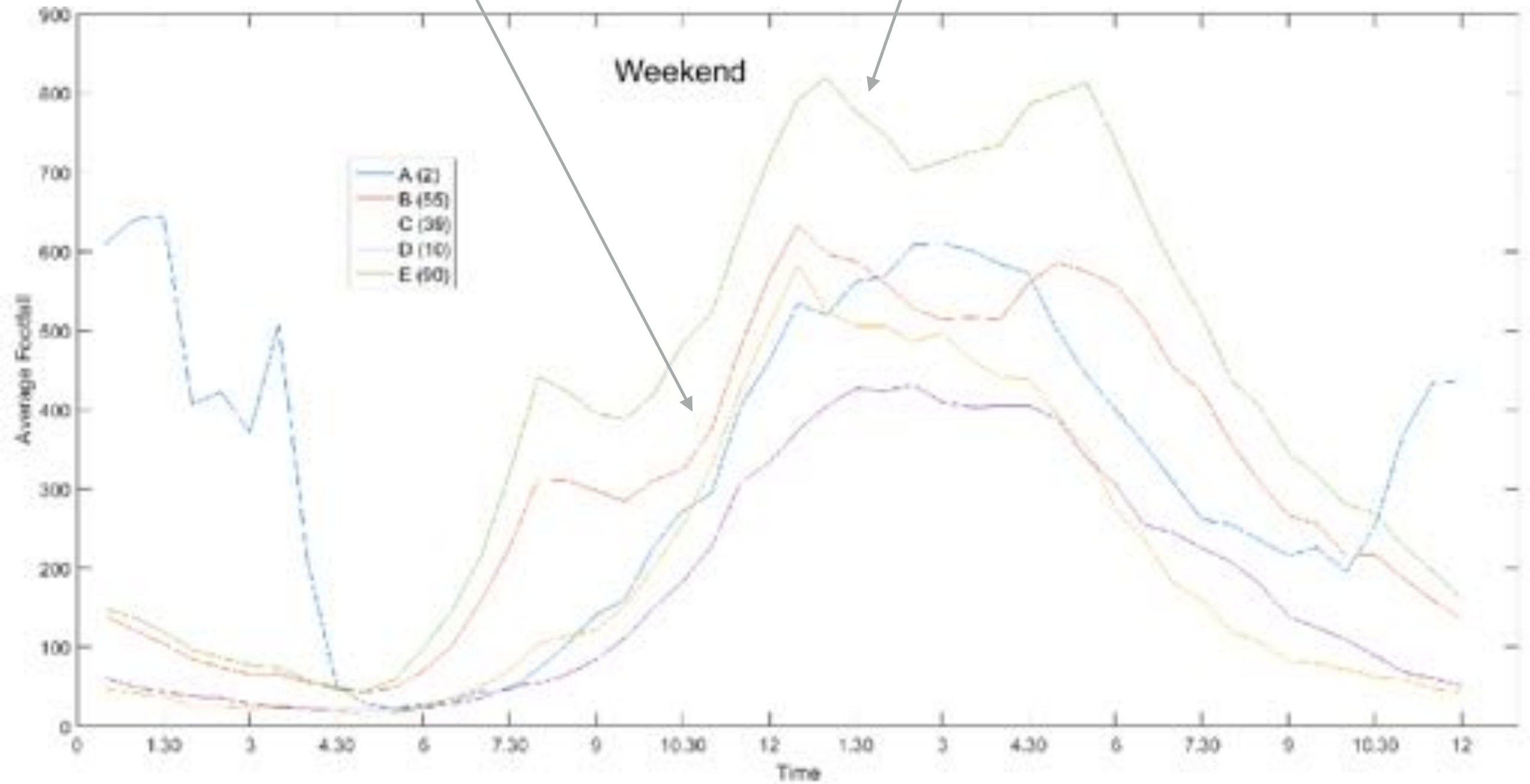
B: City Focus

E: Metropolitan Destinations



B: City Focus

E: Metropolitan Destinations



Conclusions

- New forms of data offer great opportunities to study the structure and function of cities
  - Future of urban social science
- Challenges for both access and analysis
- Urban analytics is interdisciplinary - framework through which we can study cities using new forms of data

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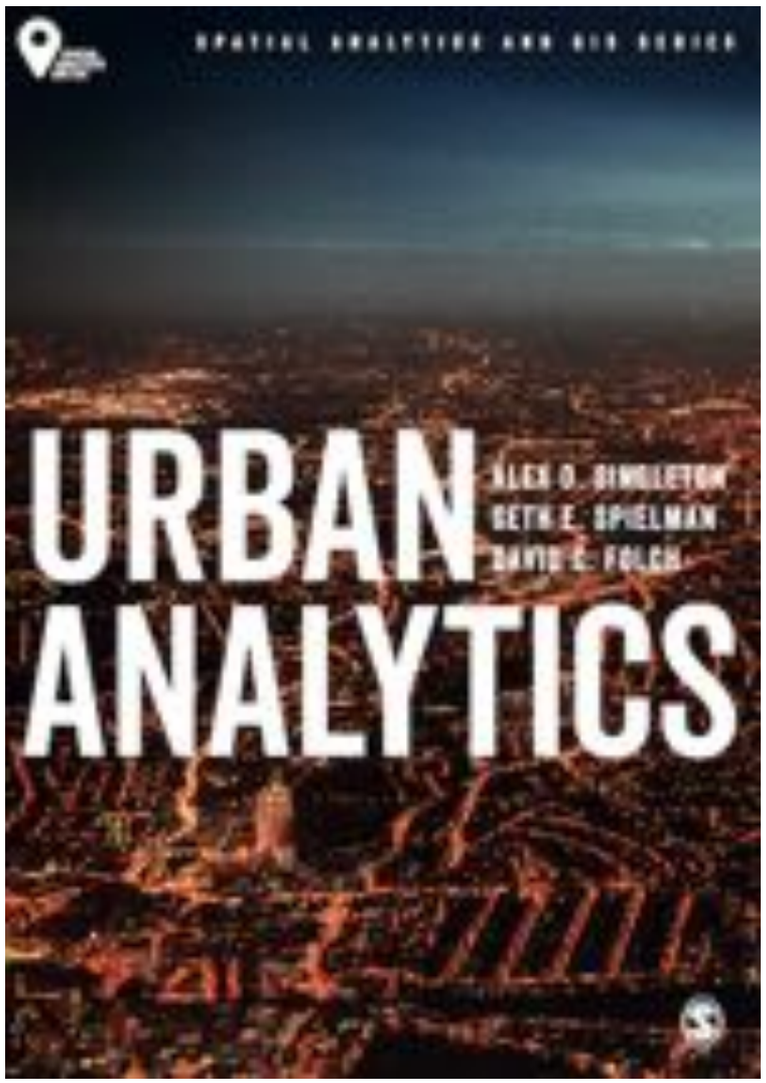
Many thanks…



1. Questioning the City through Urban Analytics
2. Sensing the City
3. Urban Data Infrastructure
4. Visualizing the City
5. Differences within Cities
6. Explaining the City
7. Generative Urban Systems
8. Cities as Networks and Flows
9. The Future of Urban Analytics

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Due out Jan 2018; Singleton, Spielman, Folch (Sage)