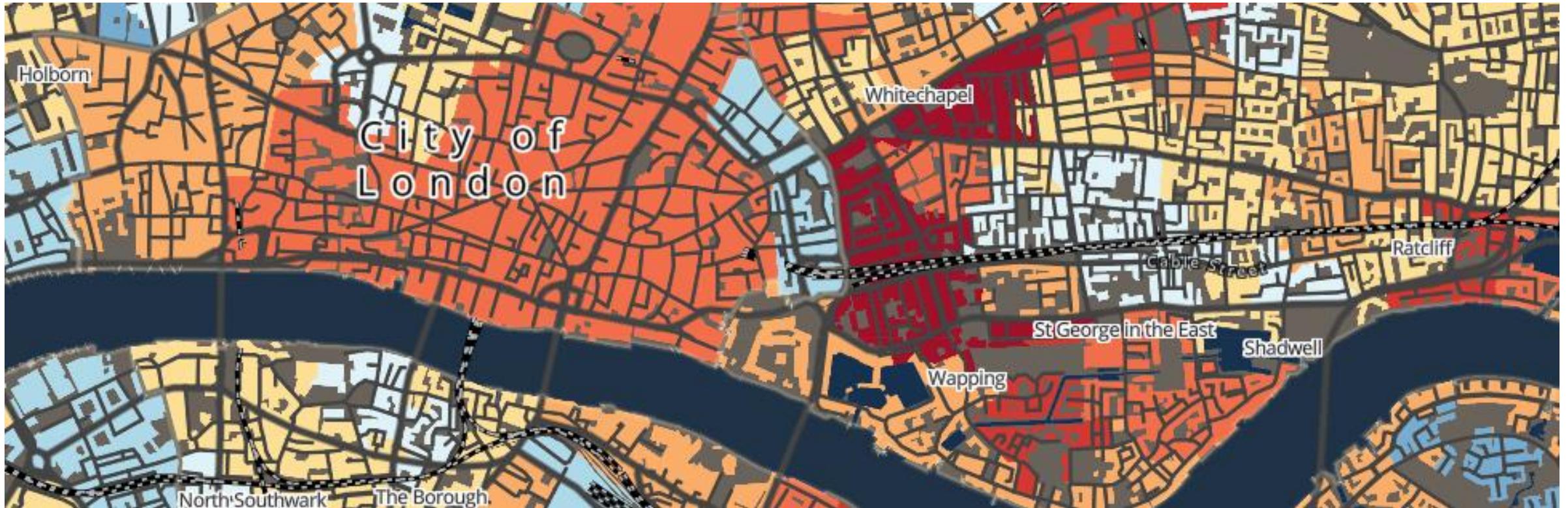


# Methods in Human Geography

## Quantitative Methods: Spatial Analysis I



Dr Justin van Dijk  
 j.t.vandijk@ucl.ac.uk



# This week

## Part I

- Spatial data.
- GIScience and GISystems.

## Part II

- Data sources.
- Attribute joins.

Spatial data

# Why is spatial data important?

- Many challenges and problems are inherently geographical.
- Almost all data is tied to specific locations and exhibits spatial variability.
- Helps answer the question: What is this place like compared to other places?
- They can be visualised into a format that is more intuitively understood by the human brain.

# Supermarkets around Brixton

A screenshot of a Google Maps search results page for "supermarket" in Brixton, London. The map shows the Brixton area with several supermarket locations marked with red icons. The results list includes:

- Tesco Superstore**: 3.7 stars (529 reviews), £ price range, located at 13 Acre Ln. Open, closes at 11 pm. Options: In-store shopping, In-store pick-up.
- Sainsbury's**: 4.1 stars (1,689 reviews), ££ price range, located at 2 Tulse Hill. Open, closes at 11 pm. Options: In-store pick-up, Delivery.
- Lidl**: 4.2 stars (2,555 reviews), £ price range, located at 189 Clapham Rd. Open, closes at 10 pm. Option: In-store shopping.
- Tesco Express**: 3.4 stars (39 reviews), £ price range, located at 128 Herne Hill. Open, closes at 11 pm. Option: Delivery.

The map also shows other local businesses like Iceland Supermarket, Valley Food & Wine, Budgens Supermarket, Nisa Local, and Super Save. The interface includes a sidebar with saved and recent locations, and a top bar with filters for Rating, Hours, and All filters.

# Pubs in Bloomsbury

pub - Google Maps

google.com/maps/search/pub/@51.5226195,-0.1365354,15.97z/data=!4m2!2m1!6e5?hl=en&entry=ttu&g\_ep=EgoYMDI0MTAyMC...

Price Rating Hours All filters

Results

Sponsored :

**Marlborough Arms**  
4.1 ★★★★☆ (1,271) ⏲ £10–20  
Pub · ⚡ · 36 Torrington Pl  
Old-fashioned pub with simple food menu  
Open · Closes 11 pm  
✓ Dine-in · ✗ Takeaway · ✗ Delivery

**The Court**  
4.6 ★★★★★ (2,804) ⏲ £10–20  
Pub · ⚡ · 108a Tottenham Ct Rd, Greater  
Spacious modern corner pub  
Open · Closes 12 am  
Dine-in · No takeaway · No delivery

**The Northumberland Arms**  
4.0 ★★★★☆ (675) ⏲ £10–20  
Pub · ⚡ · 108a Tottenham Ct Rd, Greater  
Traditional pub with simple food menu  
Open · Closes 11 pm

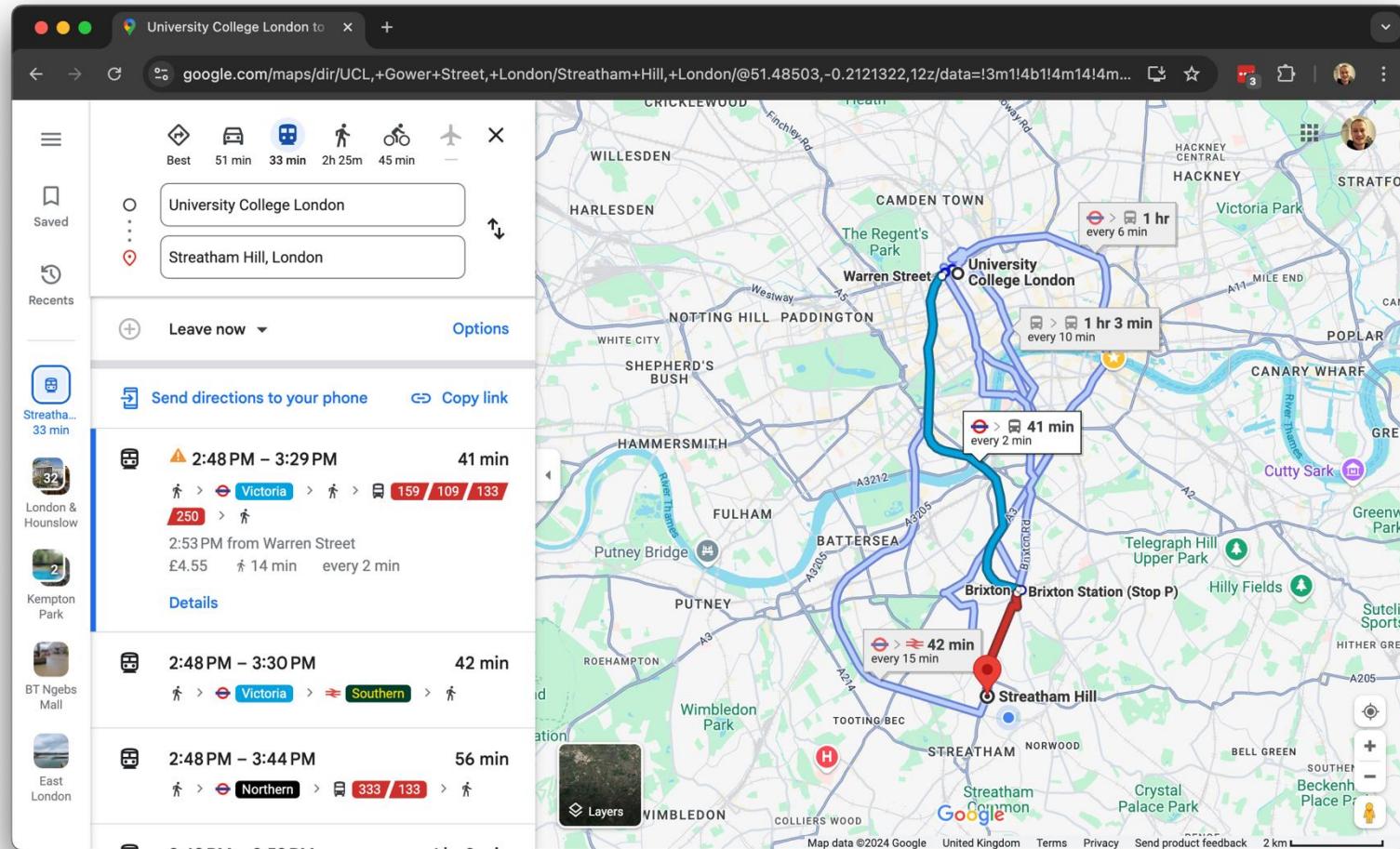
**Eat, Drink & Relax**  
We Have The Quality Food And Your  
Favourite Drinks. All You Need To Do Is... [Visit site](#)

**RESERVE A TABLE**

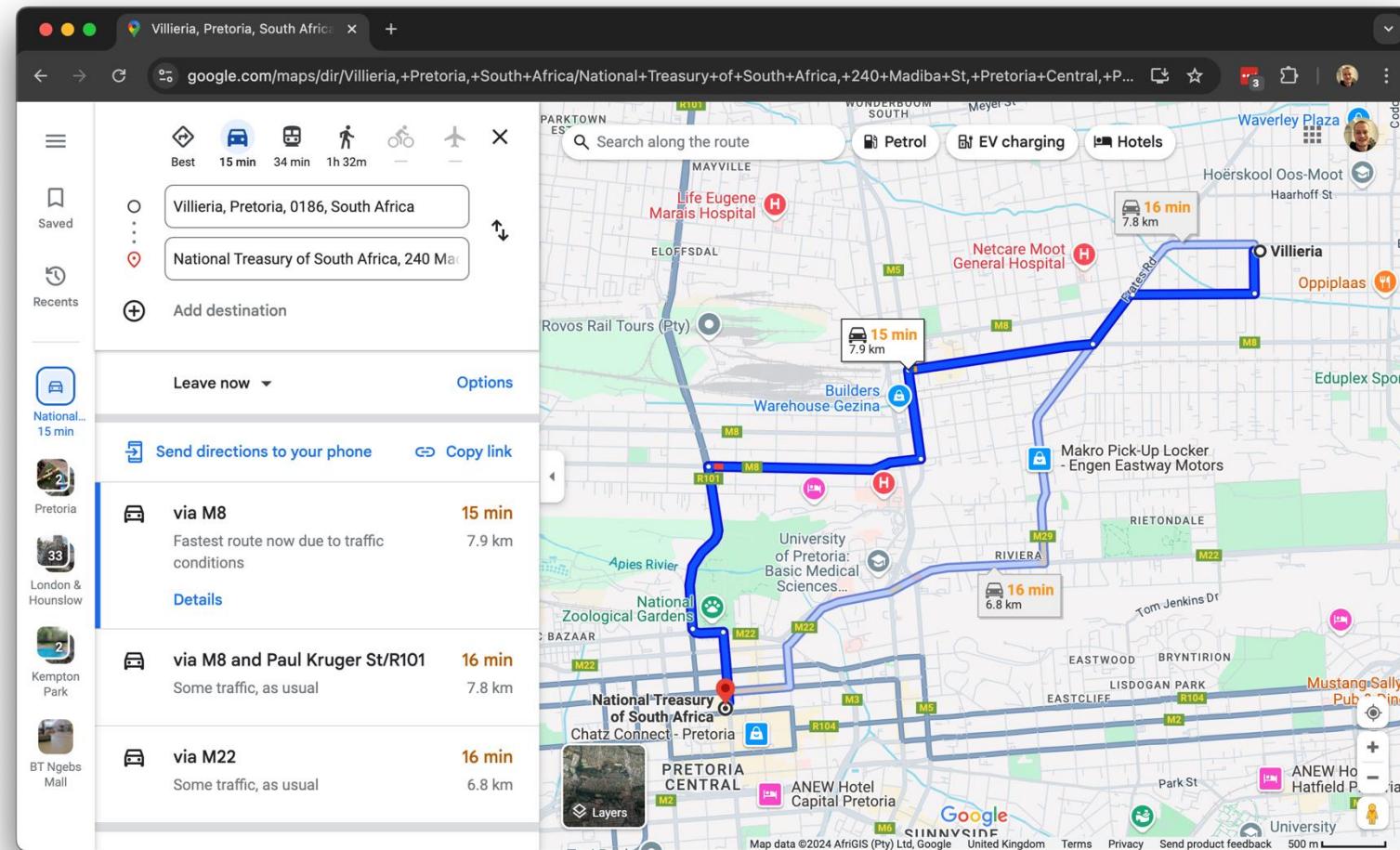
Update results when map moves

Map data ©2024 United Kingdom Terms Privacy Send product feedback 100 m

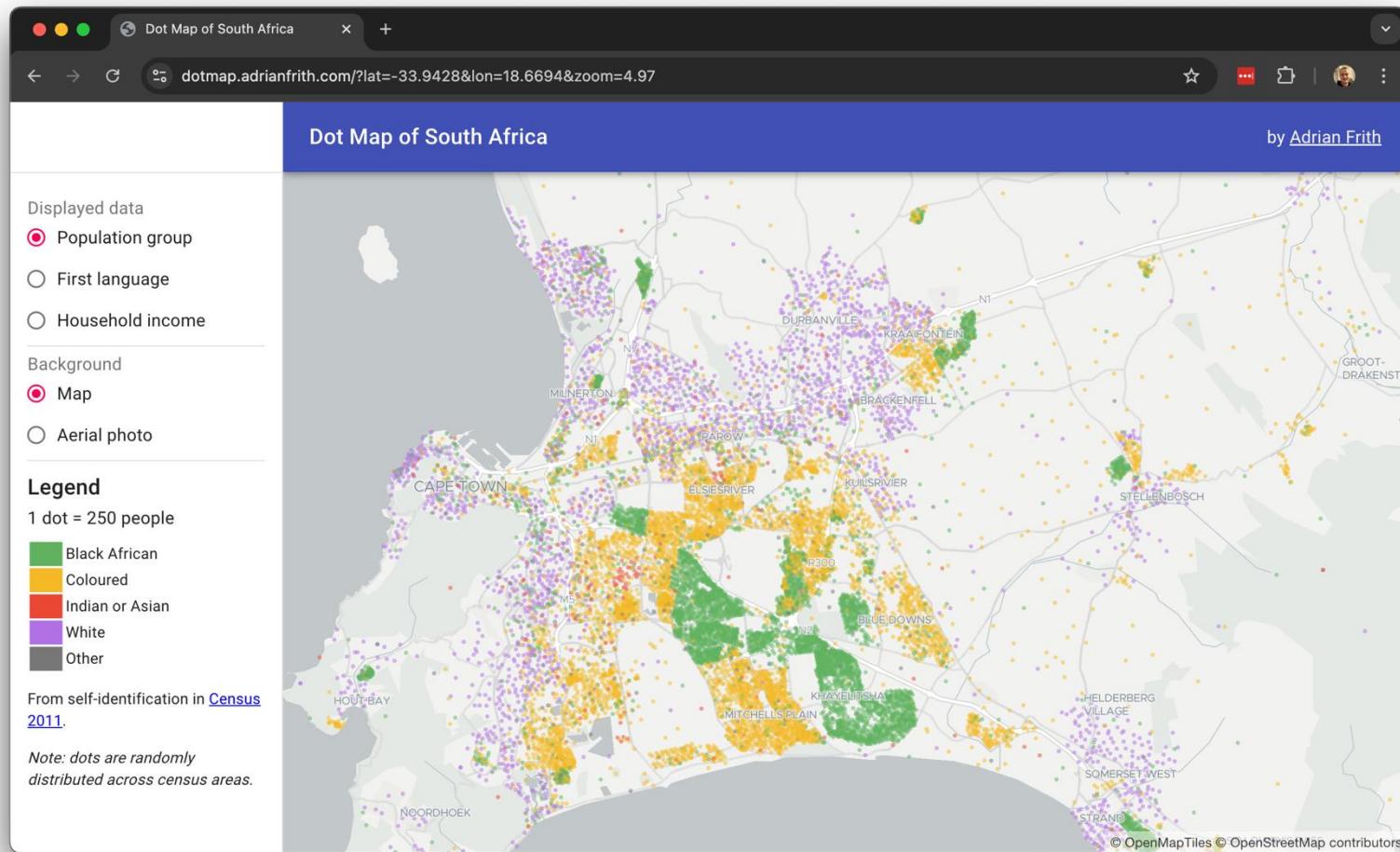
# Finding your way across the river



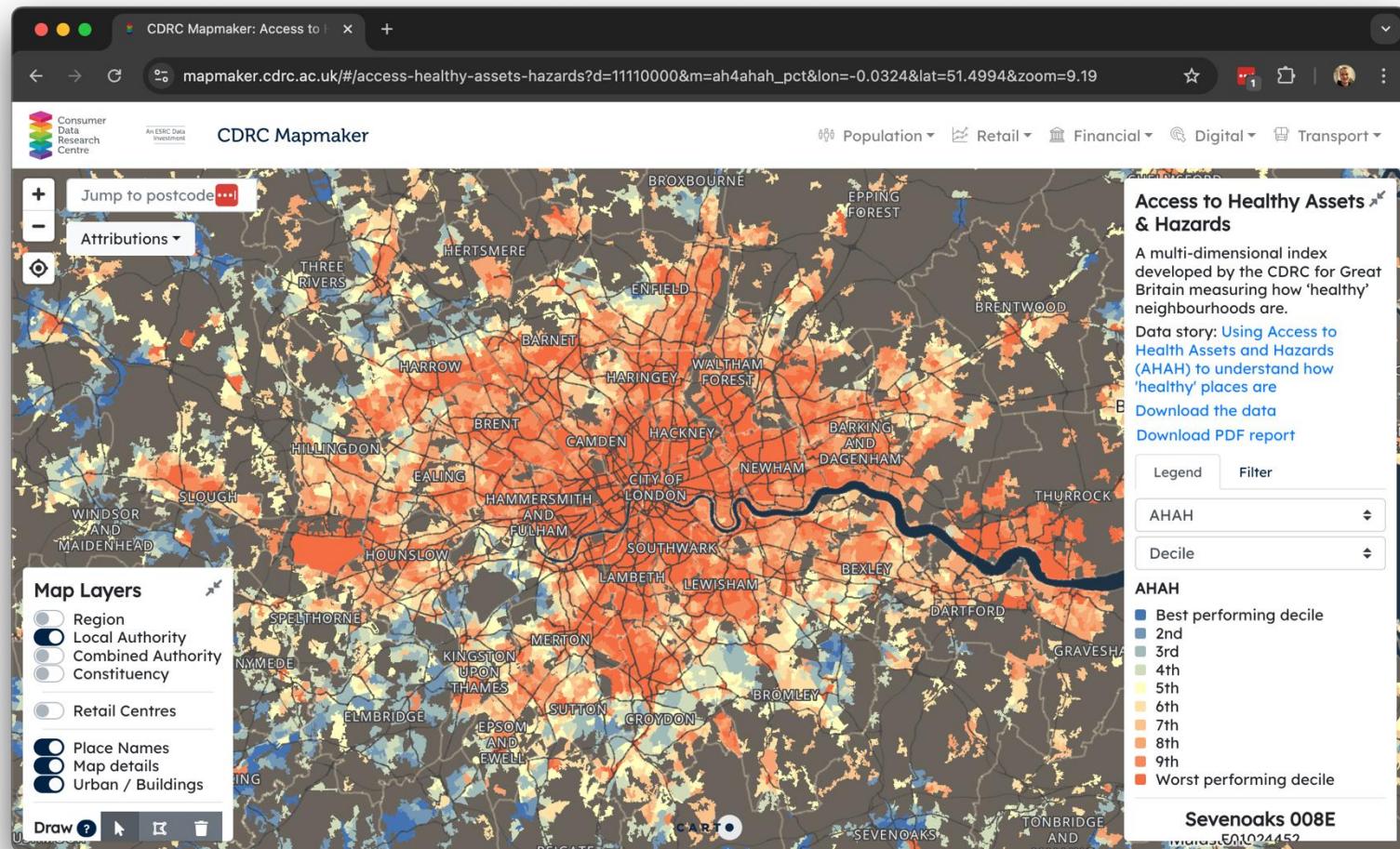
# Finding your way abroad



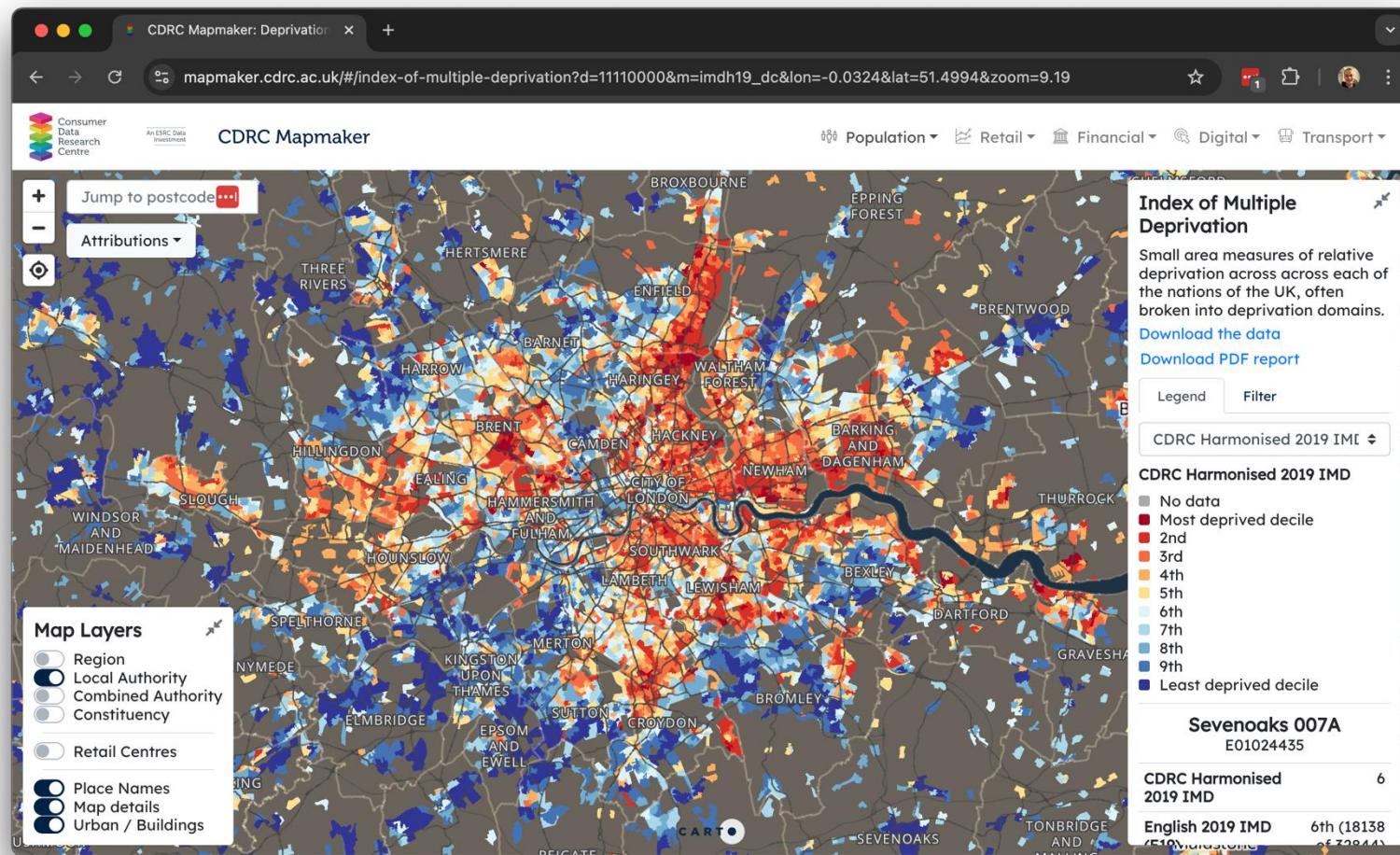
# Segregation in Cape Town



# Access to Healthy Assets and Hazards in the UK



# Index of Multiple Deprivation in England

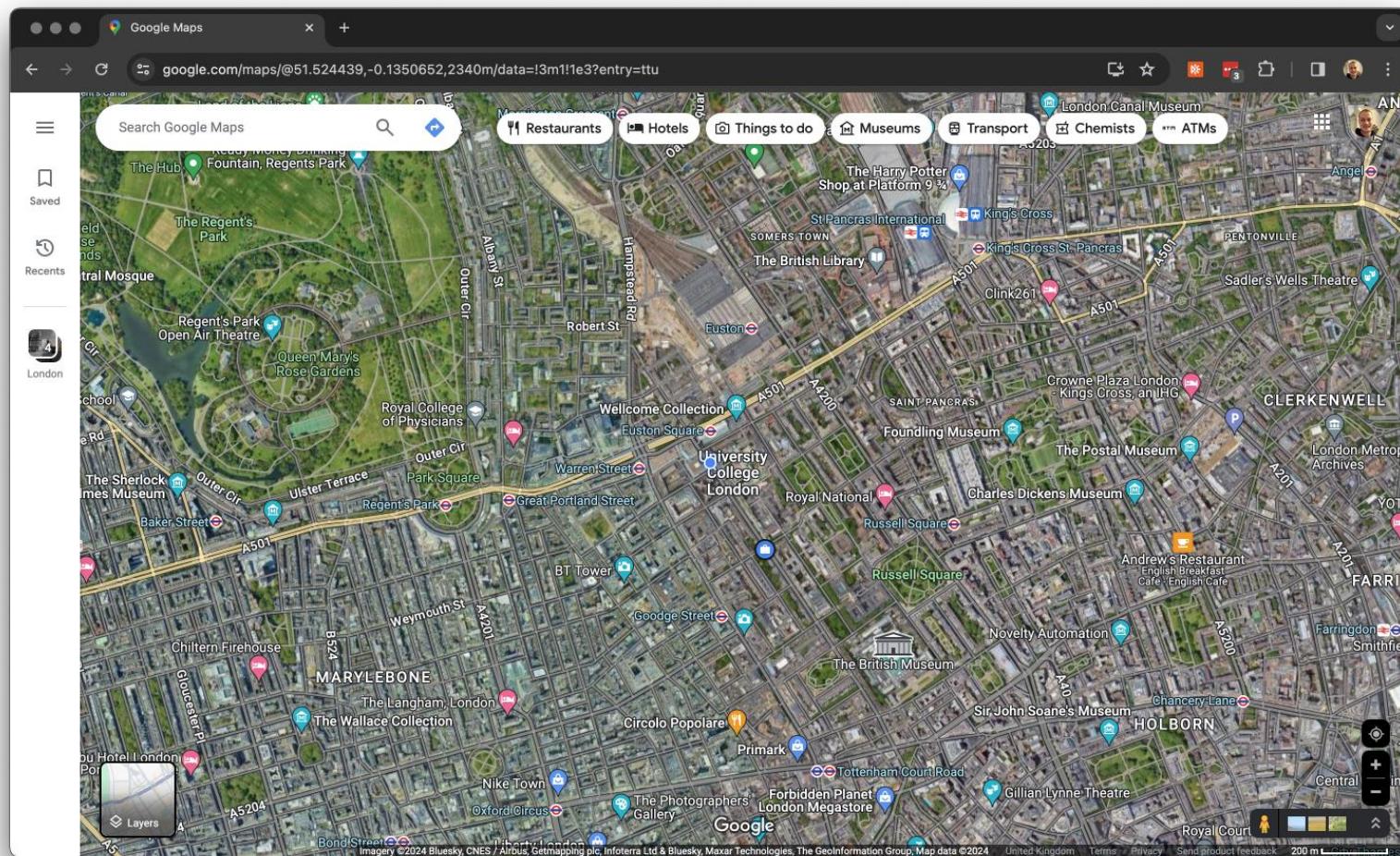


# GIScience and GISystems

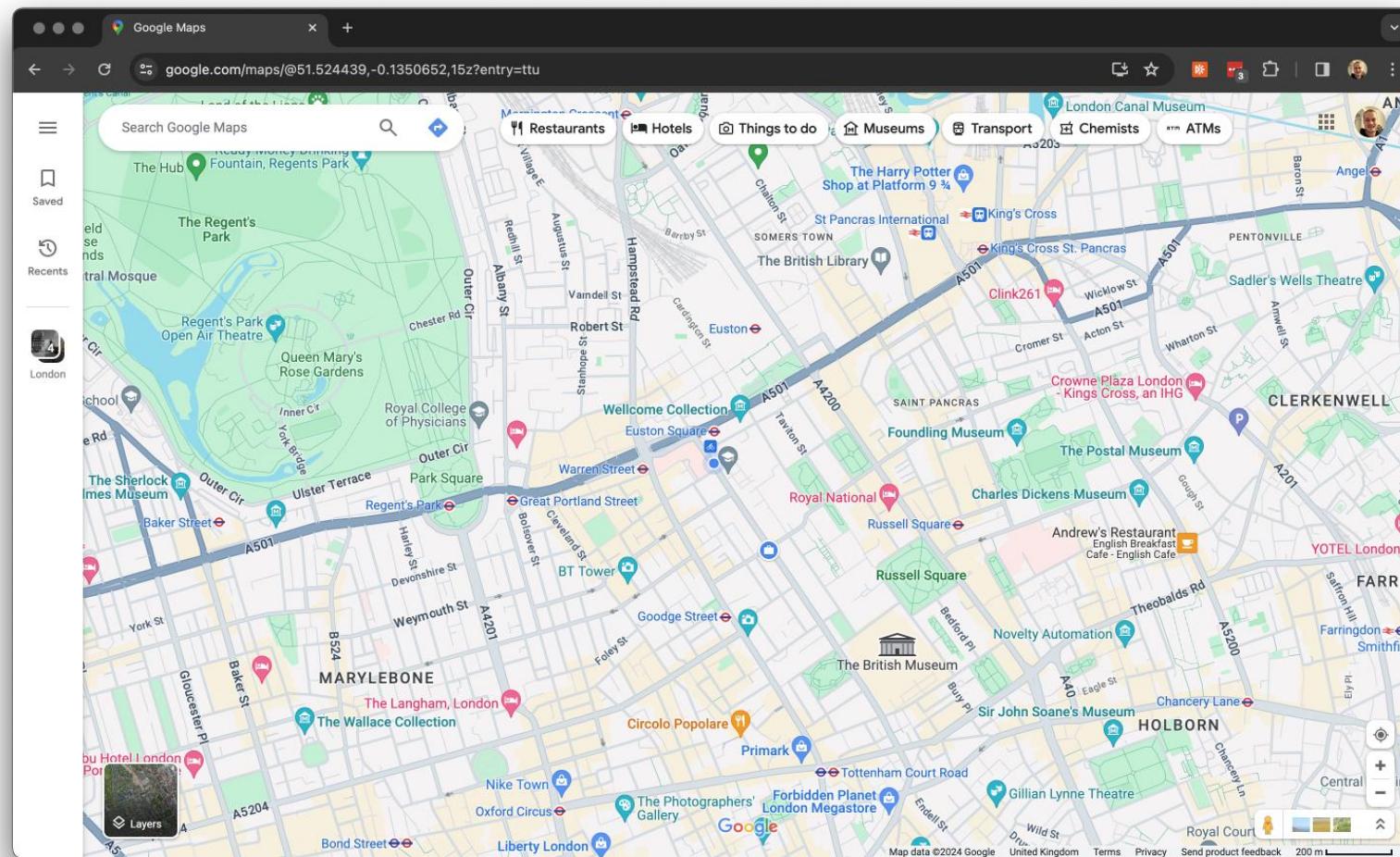
# Requirements

- GIScience: Theory
- GISystems: Methods and tools

# GIScience



# GIScience



# GIScience

- GIScience relies on representing spatial information in a digital format. Traditionally, geographic information is conveyed in two primary ways:

**Vector** This method uses a finite set of discrete geometric objects, such as points, lines, and polygons, to represent spatial features.

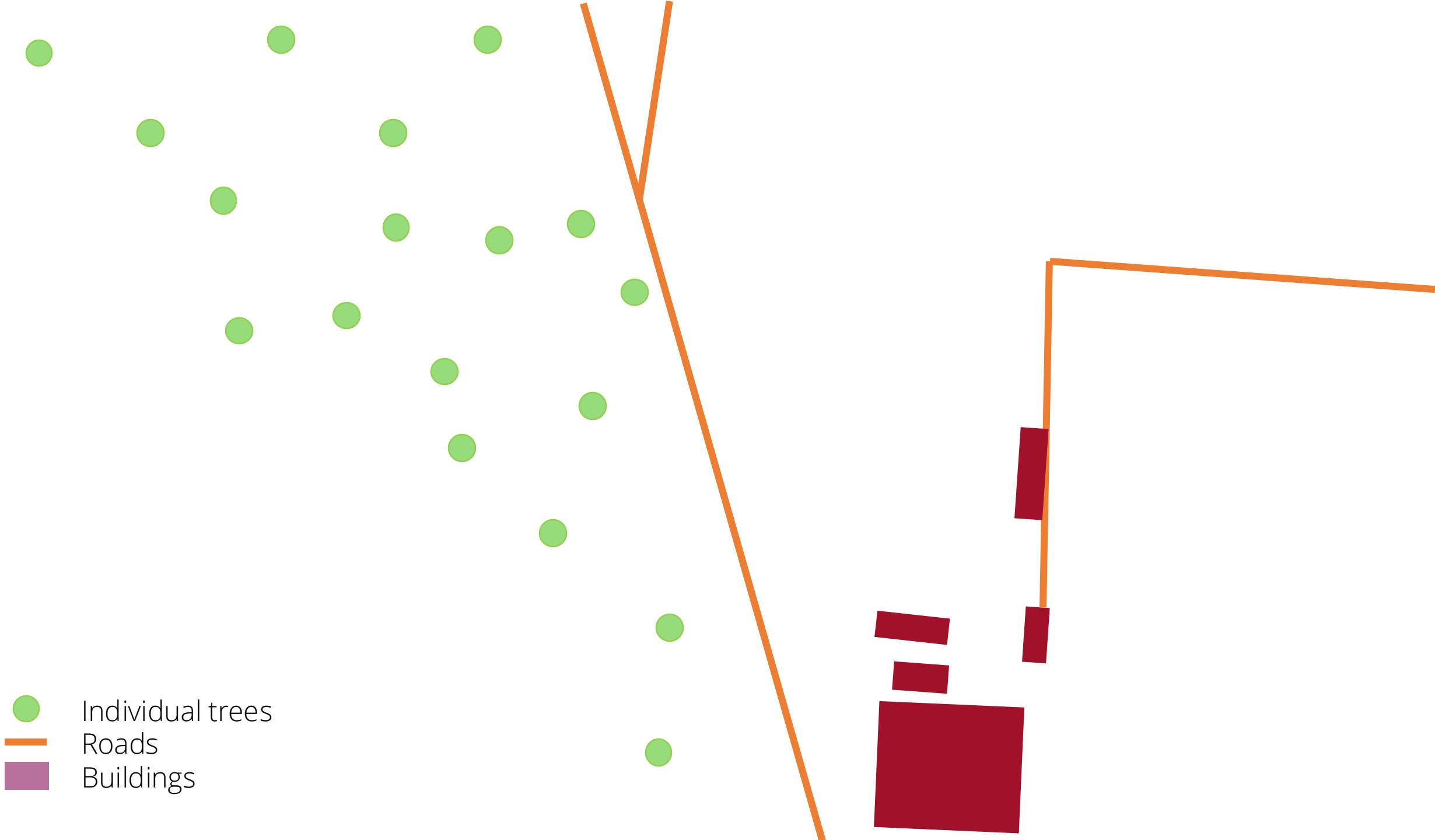
**Raster** This approach employs images or grids to represent surfaces, with each cell or pixel holding a value, often indicating attributes like colors or measurements.









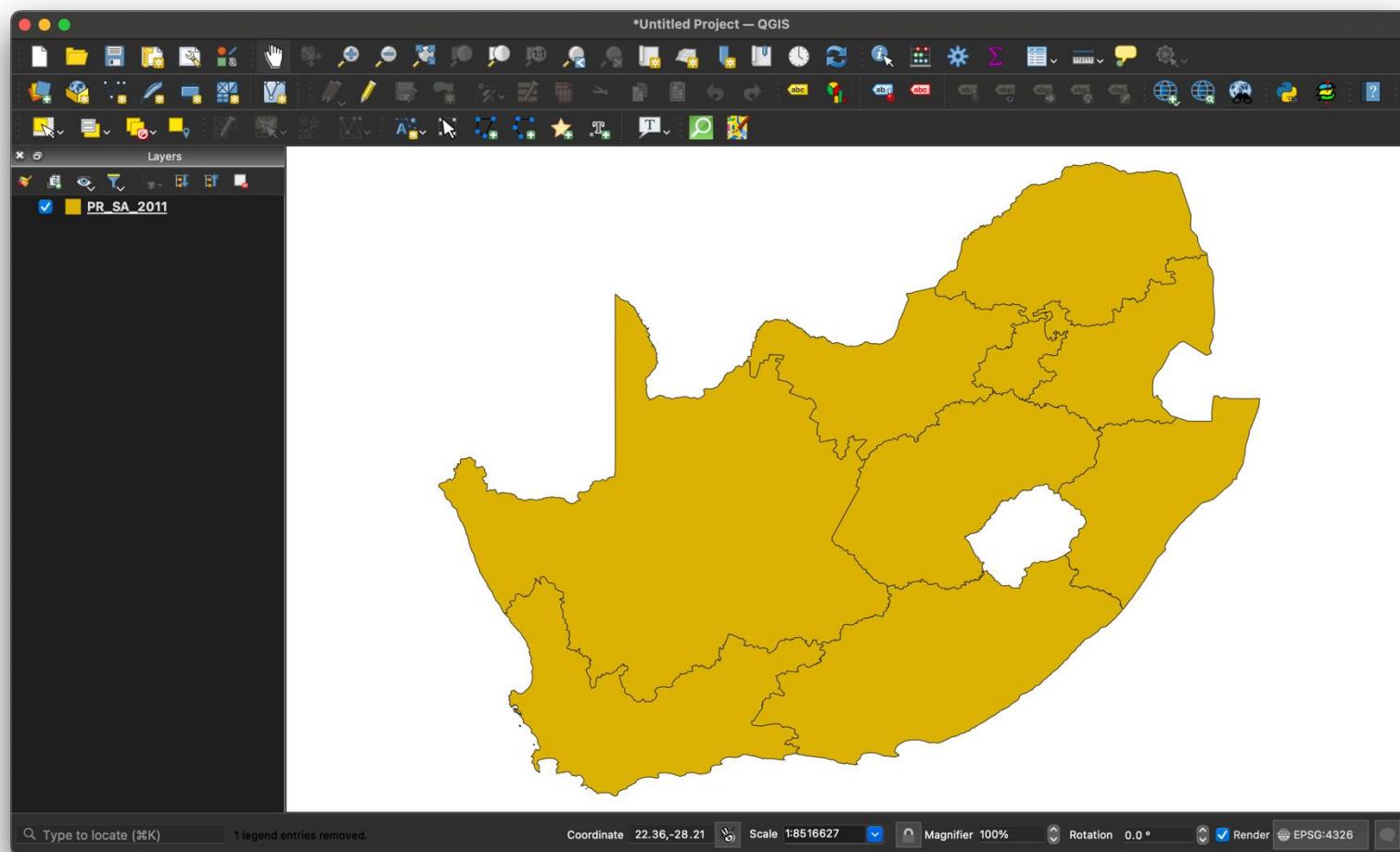




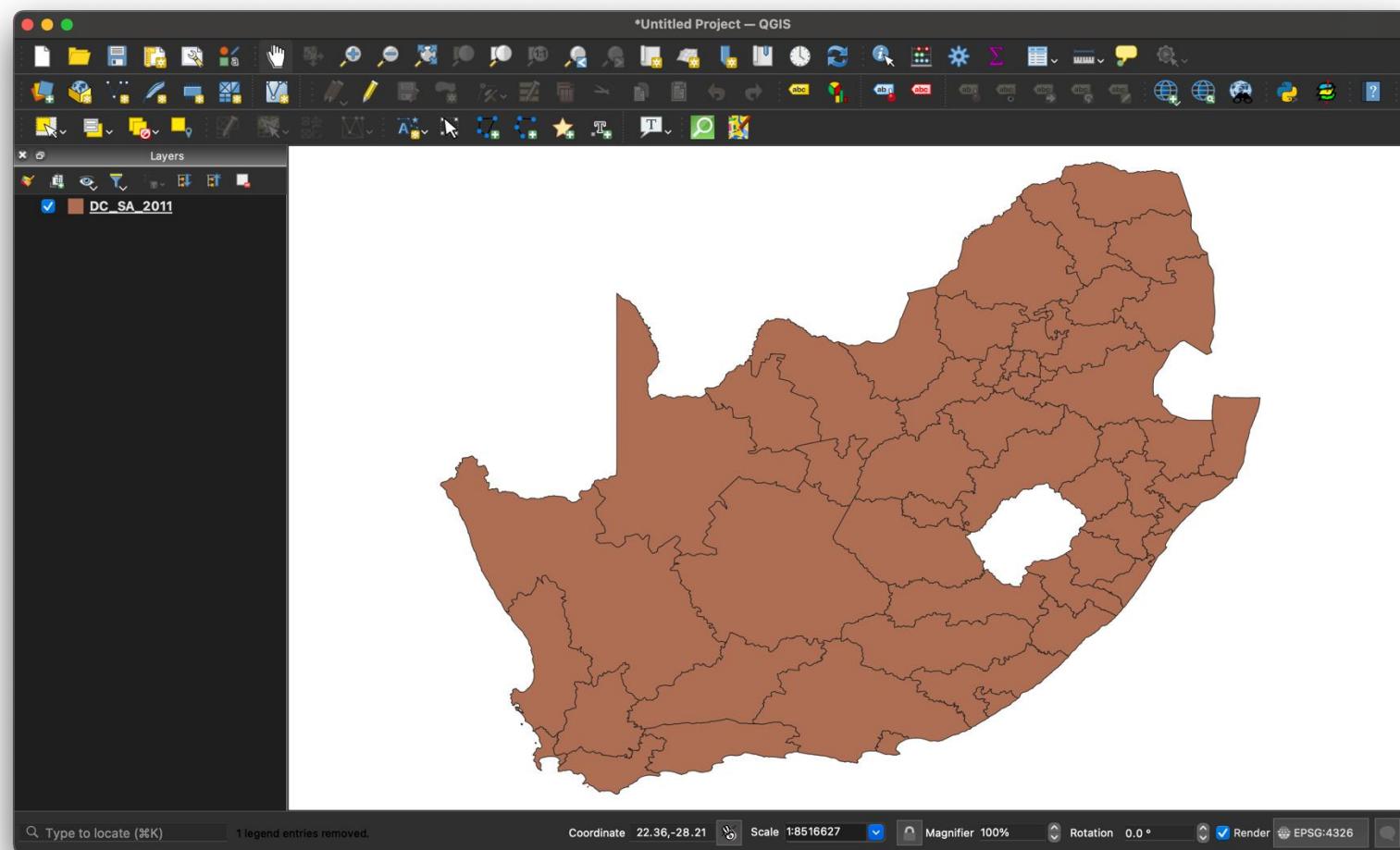


8	9	9	10	0	10	10	10	0	0	0	7	5	3	0	0	0	0	1
8	9	9	10	10	0	10	9	9	0	0	5	3	0	0	0	0	0	0
8	8	9	9	10	0	0	9	8	7	5	0	0	0	1	0	0	0	0
5	8	8	9	10	10	0	9	7	5	0	0	5	5	5	0	0	0	1
3	5	8	9	9	10	0	0	3	0	0	0	5	0	0	1	0	0	2
2	5	8	8	9	9	10	0	0	0	1	5	0	0	0	0	0	0	1
2	4	6	8	8	9	0	0	0	1	5	0	0	5	5	5	0	0	1
0	3	6	8	8	0	0	0	0	5	0	5	5	5	5	5	0	0	0
2	2	5	8	0	0	0	0	0	0	5	5	5	5	5	5	3	0	0
0	2	5	0	0	1	2	3	4	4	4	4	4	4	4	4	5	0	0
0	0	0	0	1	1	1	1	4	4	4	4	4	4	4	5	0	0	0
0	0	1	1	2	2	2	2	3	3	3	3	3	3	3	4	0	3	0
1	1	1	1	2	2	3	3	3	3	1	1	1	1	1	2	3	4	3

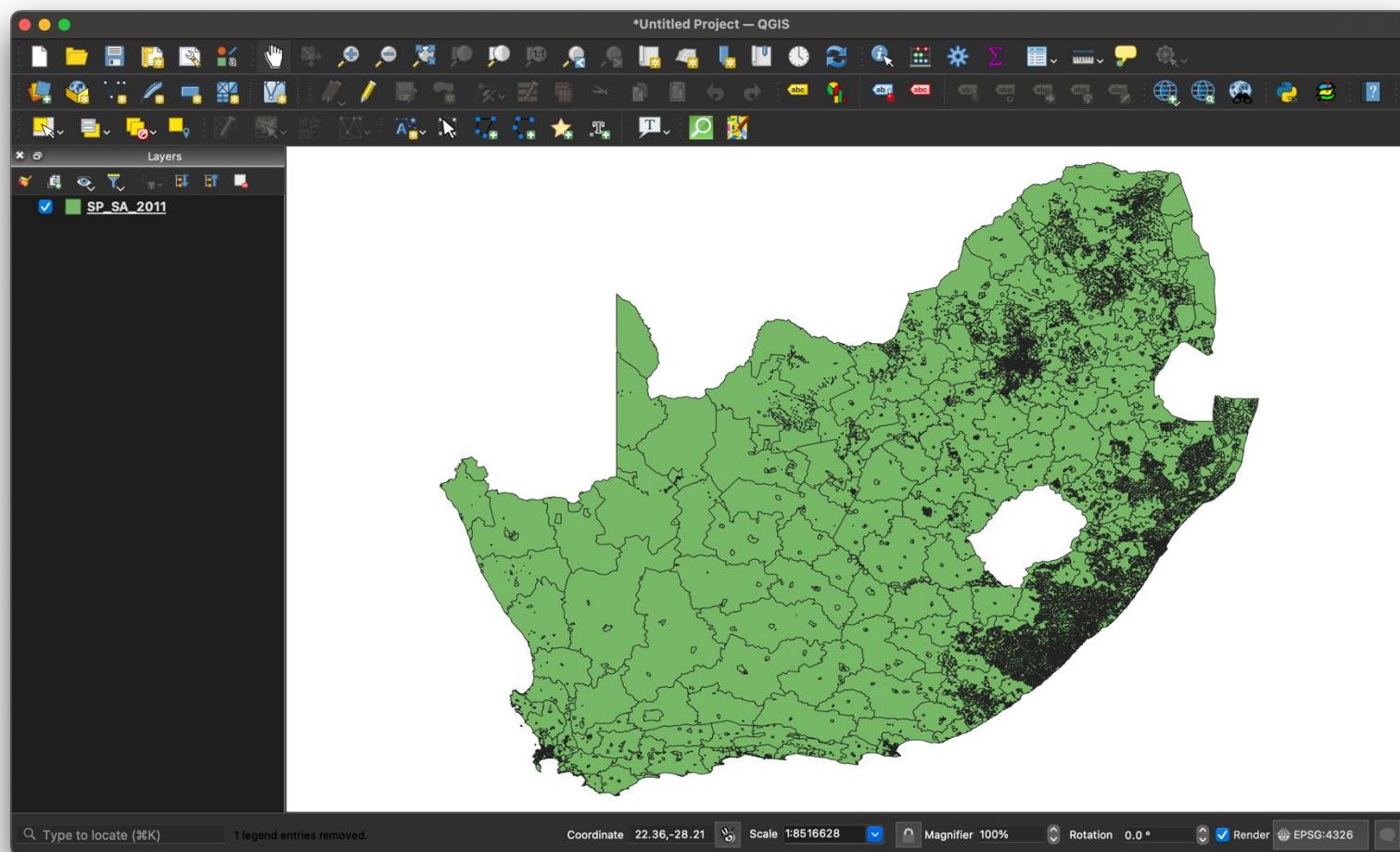
# GIScience



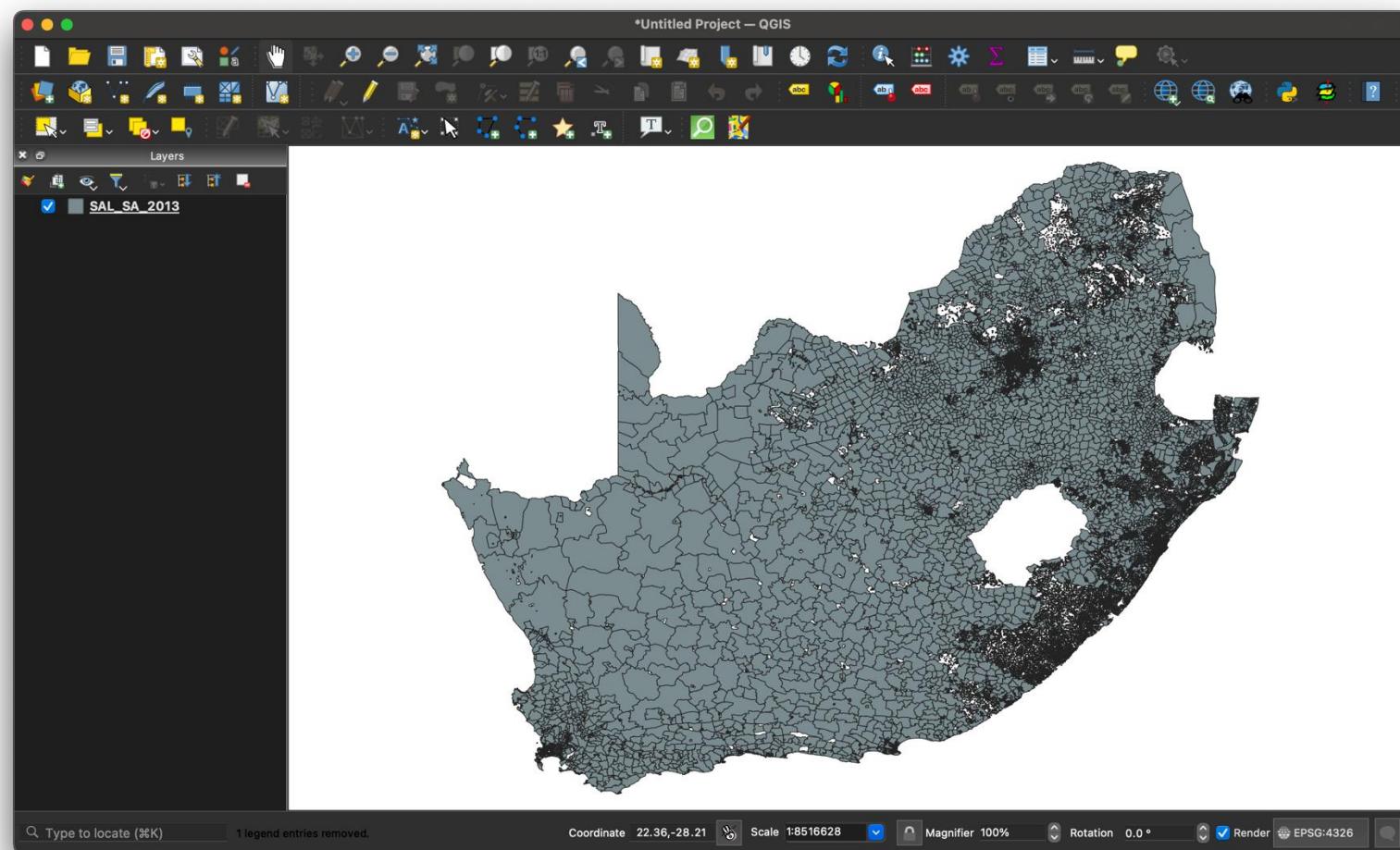
# GIScience



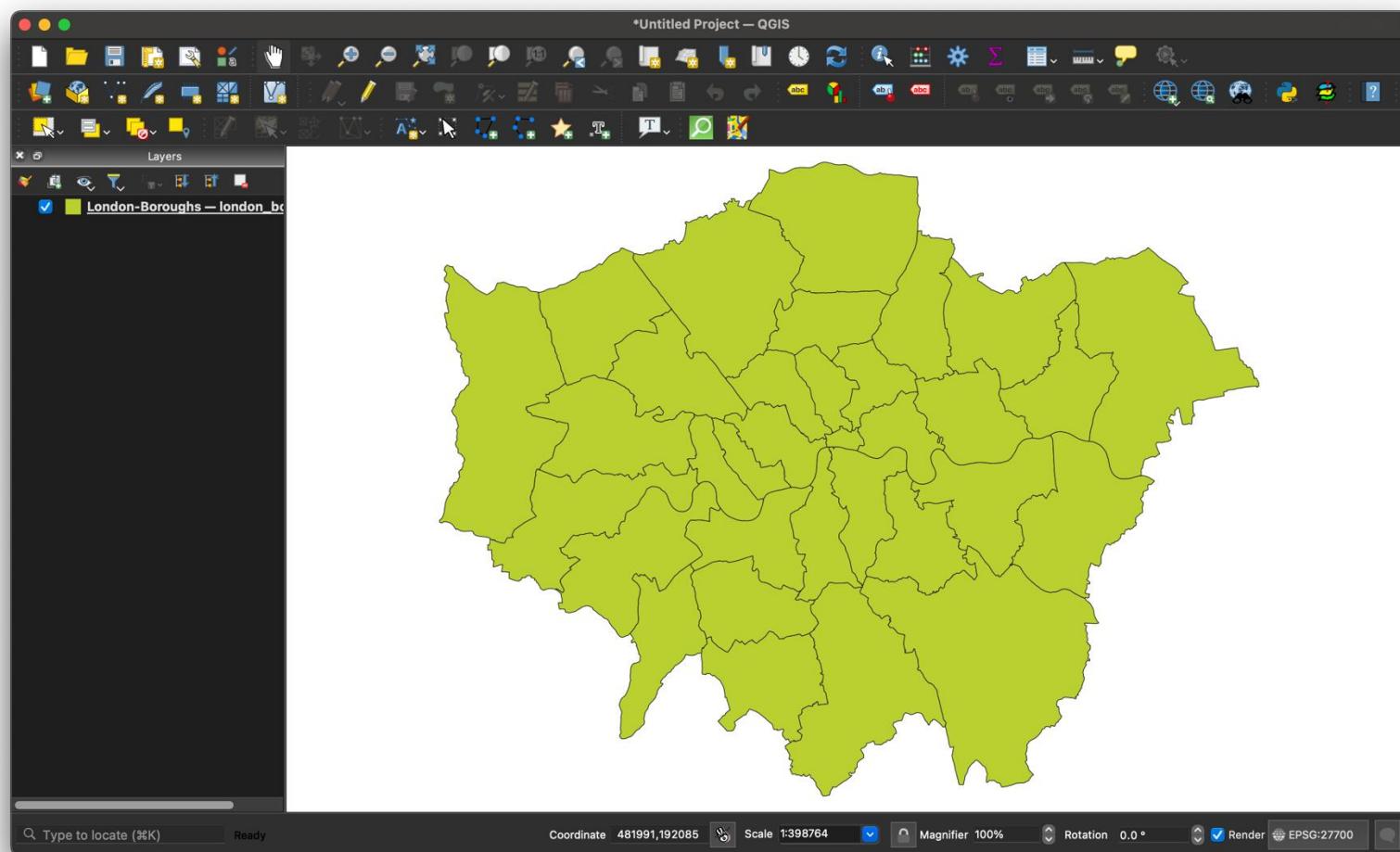
# GIScience



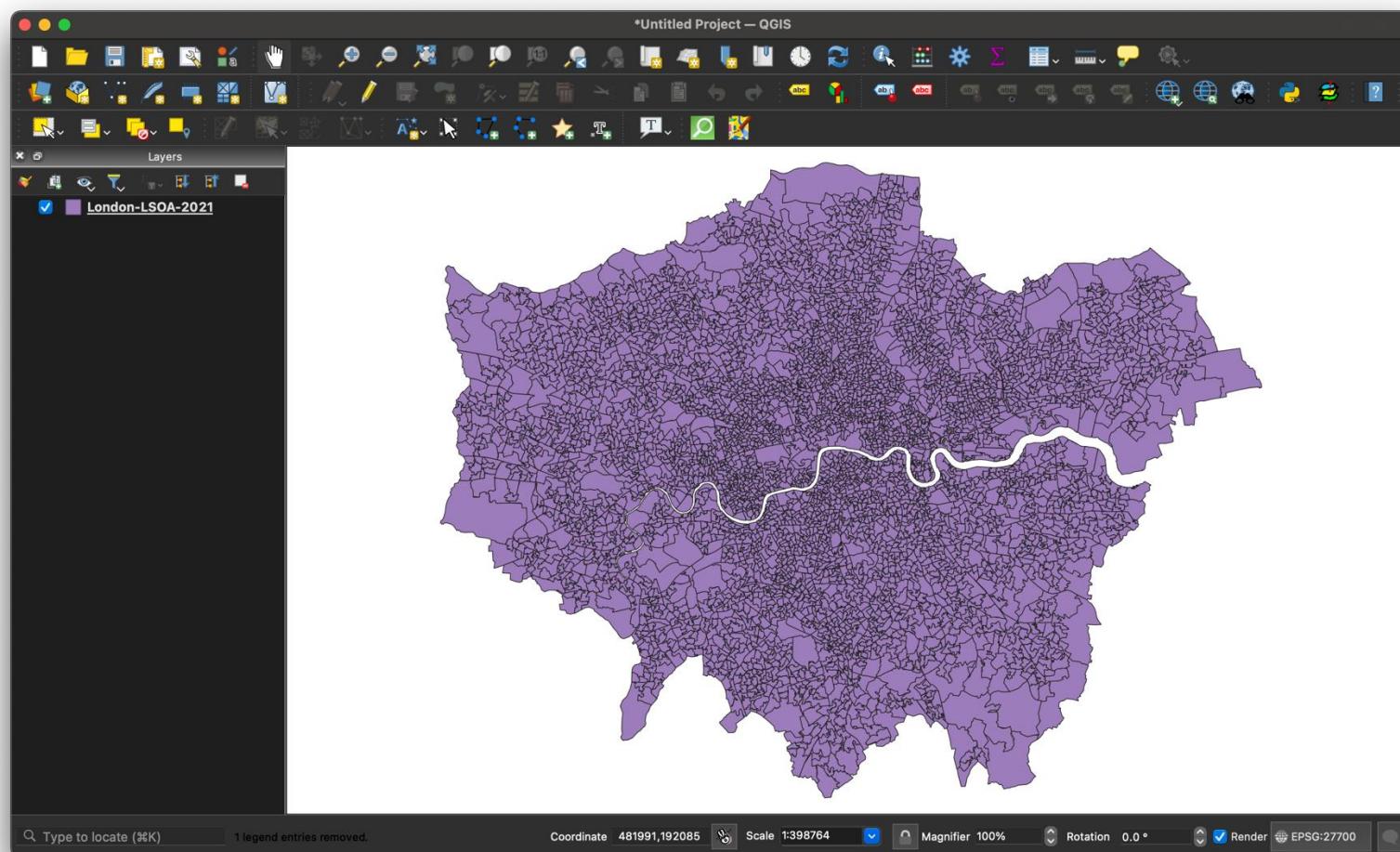
# GIScience



# GIScience



# GIScience



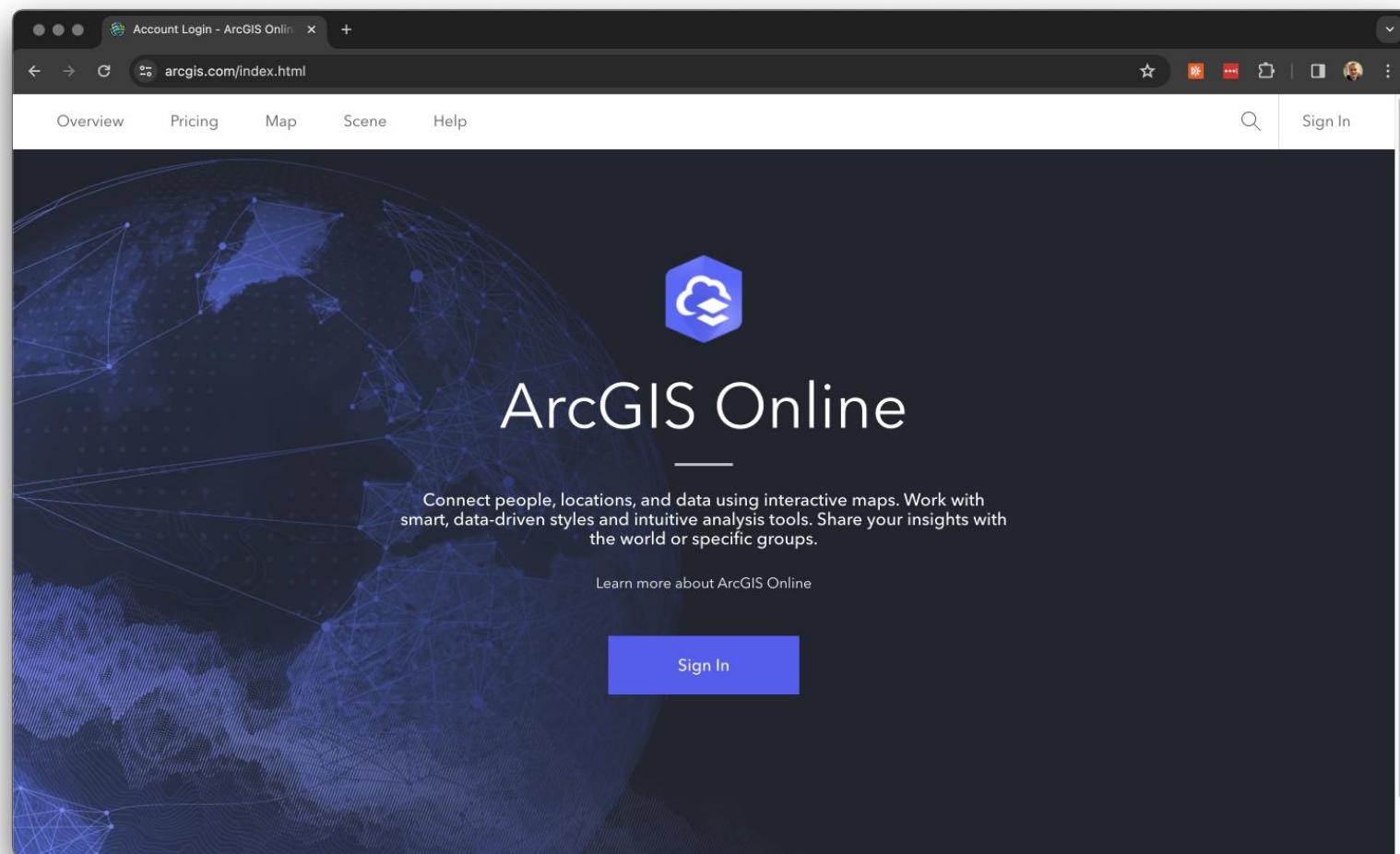
# Father of GIS

- Roger F. Tomlinson (1933-2014)
- Ph.D. dissertation: "*The application of electronic computing methods and techniques to the storage, compilation, and assessment of mapped data*" (1962, UCL).
- Conceived the idea of analysing multiple layers of spatial data within a single environment as well how to represent such spatial data in a digital format.

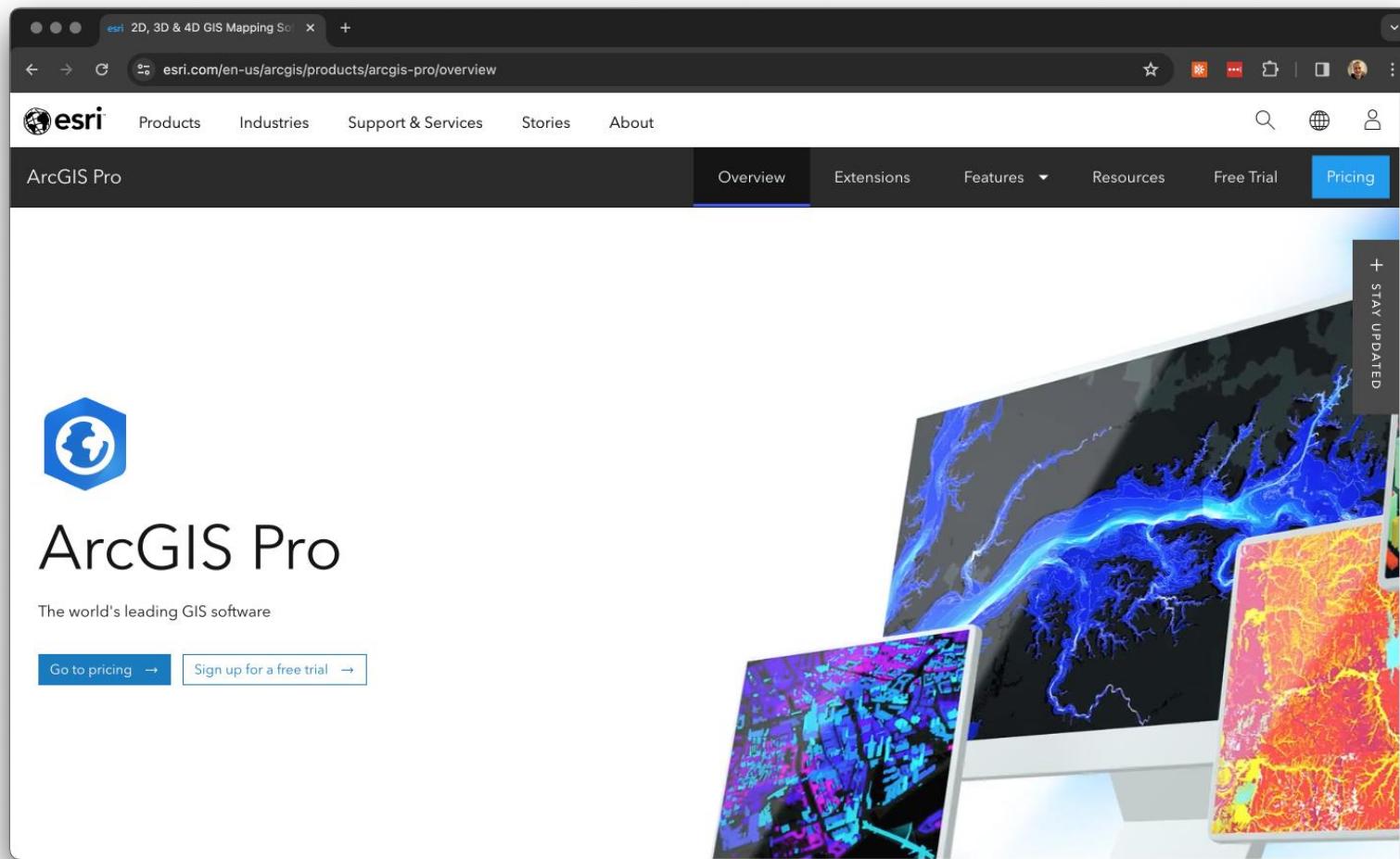
# Geographic Information Systems

- To effectively handle spatial information, we need tools that can:
  - Collect spatial data
  - Store spatial data
  - Analyse spatial data
  - Present spatial data
- Geographic Information Systems help us to manage spatial data.

# Geographic Information Systems



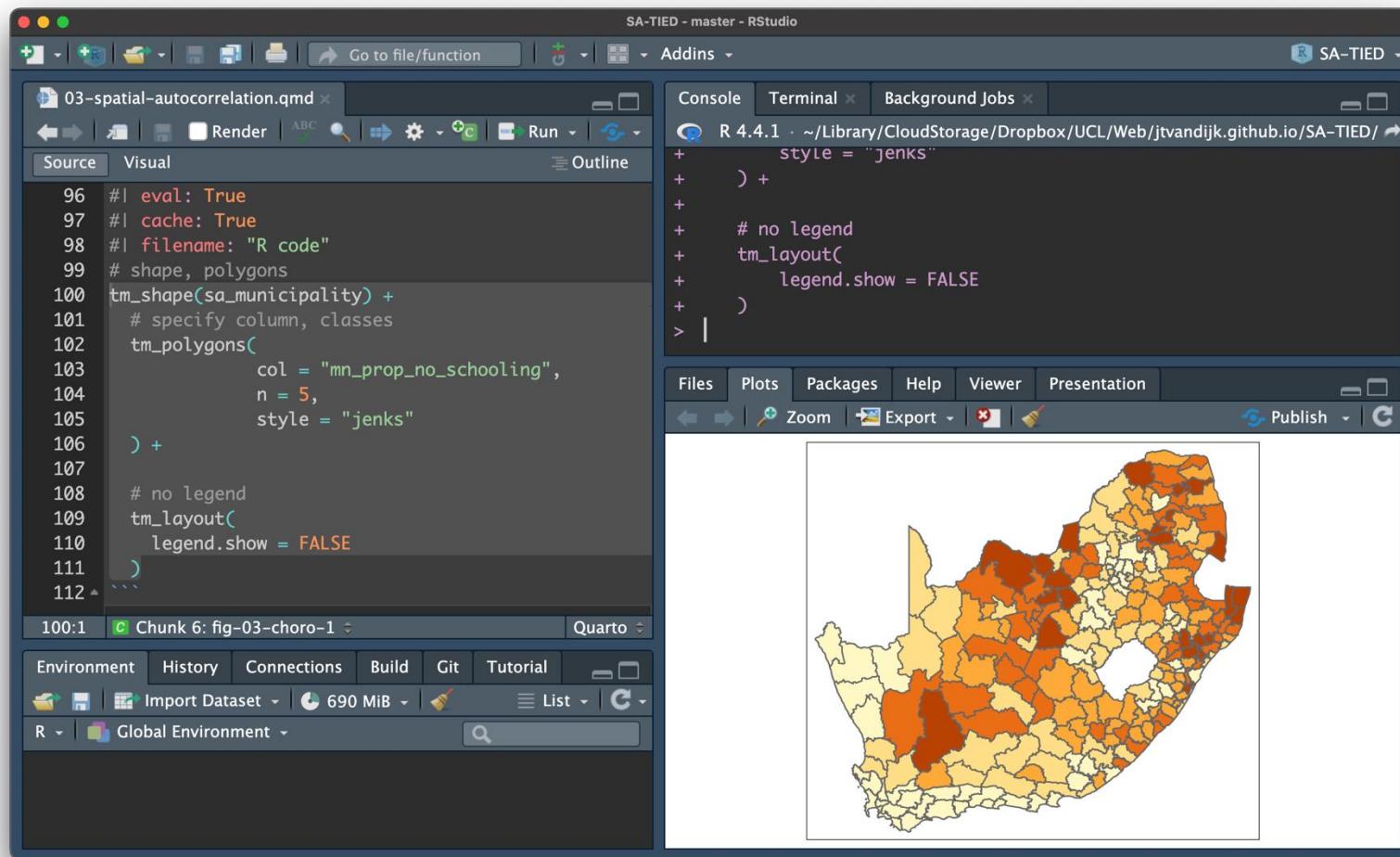
# Geographic Information Systems



# Geographic Information Systems



# Geographic Information Systems



# Spatial analysis

- We can use GIScience and GISystems to convert spatial data into actionable information by quantifying elements such as distributions and spatial processes.

# Supermarkets around Brixton

A screenshot of a Google Maps search results page for "supermarket" in Brixton, London. The map shows the Brixton area with several supermarket locations marked by red icons with shopping carts. The results list includes:

- Tesco Superstore**: 3.7 stars (529 reviews), £ price range, Supermarket at 13 Acre Ln. Open - Closes 11 pm. Contact: 0345 677 9081.
- Sainsbury's**: 4.1 stars (1,689 reviews), ££ price range, Supermarket at 2 Tulse Hill. Open - Closes 11 pm. Contact: 020 3126 7399.
- Lidl**: 4.2 stars (2,555 reviews), £ price range, Supermarket at 189 Clapham Rd. Open - Closes 10 pm. Contact: 020 3966 5566.
- Tesco Express**: 3.4 stars (39 reviews), £ price range, Supermarket at 128 Herne Hill. Open - Closes 11 pm. Contact: 020 7226 0506.

The map also shows other local businesses like Iceland Supermarket, Valley Food & Wine, Budgens Supermarket, Nisa Local, and Super Save. The interface includes a sidebar with saved and recent locations, and a top bar with filters for Rating, Hours, and All filters.

# Pubs in Bloomsbury

pub - Google Maps

google.com/maps/search/pub/@51.5226195,-0.1365354,15.97z/data=!4m2!2m1!6e5?hl=en&entry=ttu&g\_ep=EgoYMDI0MTAyMC...

Price Rating Hours All filters

Results

Sponsored :

**Marlborough Arms**  
4.1 ★★★★☆ (1,271) ⏲ £10–20  
Pub · ⚡ · 36 Torrington Pl  
Old-fashioned pub with simple food menu  
Open · Closes 11 pm  
✓ Dine-in · ✗ Takeaway · ✗ Delivery

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Spacious modern corner pub  
Open · Closes 12 am  
Dine-in · No takeaway · No delivery

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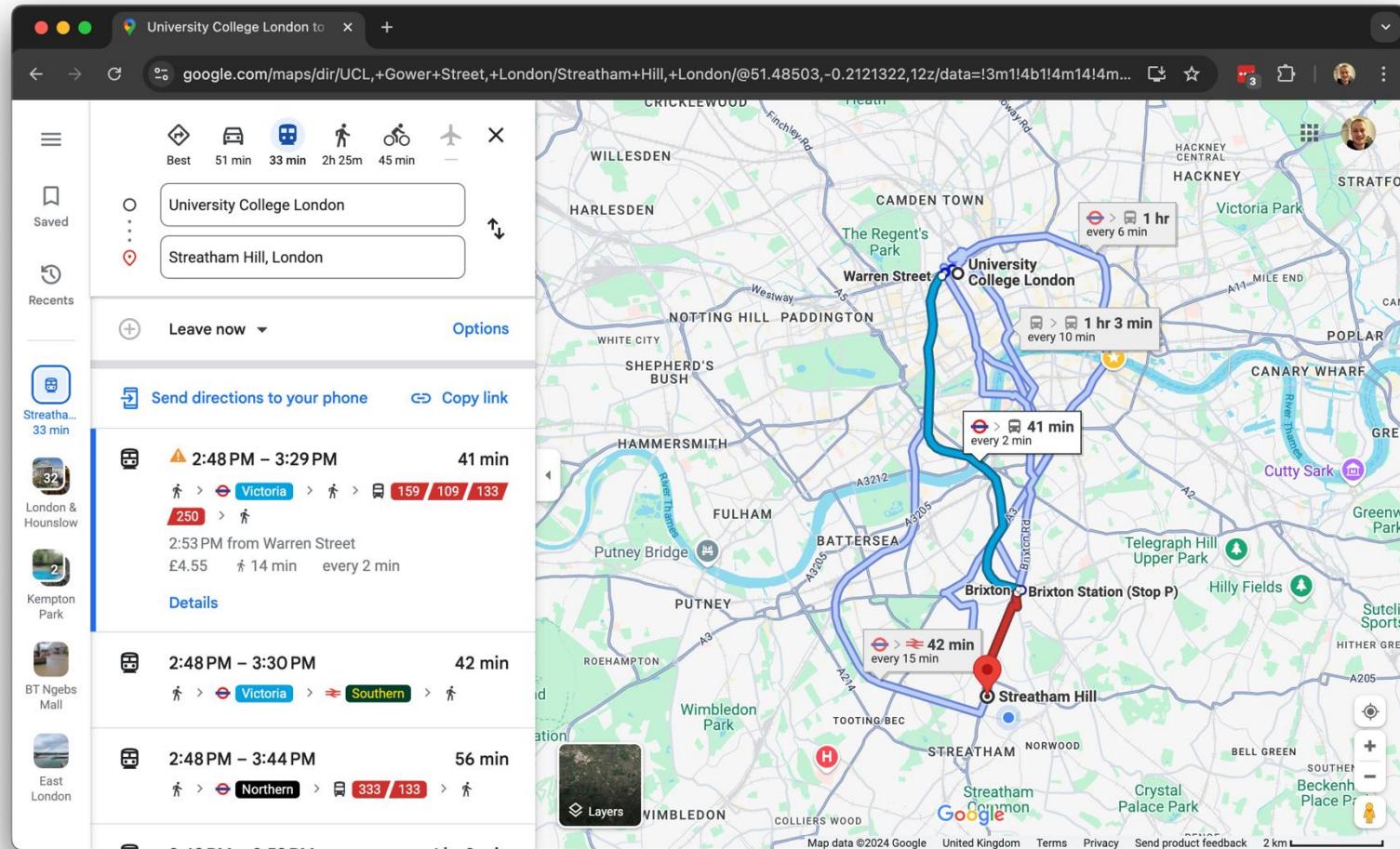
**Eat, Drink & Relax**  
We Have The Quality Food And Your  
Favourite Drinks. All You Need To Do Is... [Visit site](#)

**RESERVE A TABLE**

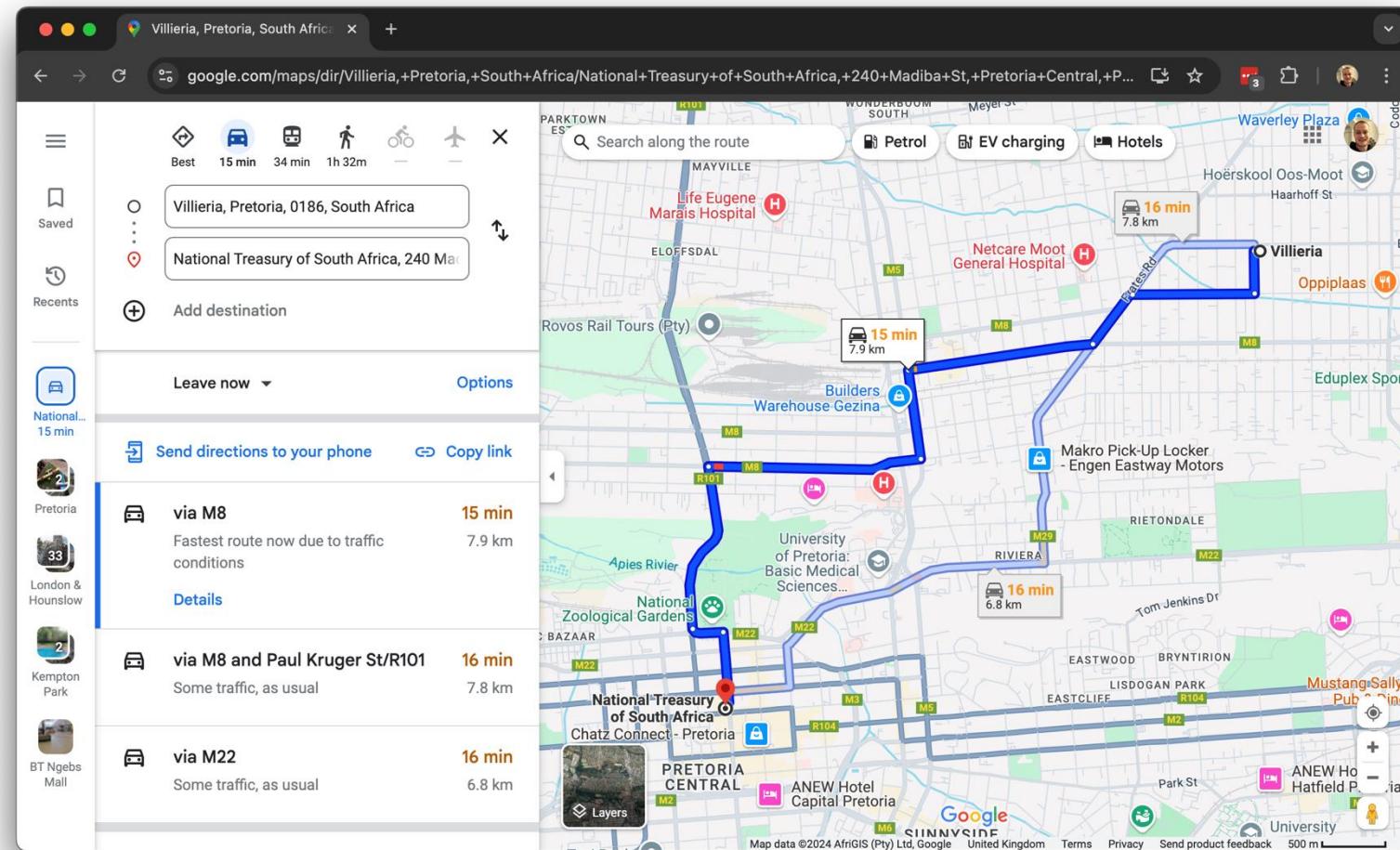
Update results when map moves

Map data ©2024 United Kingdom Terms Privacy Send product feedback 100 m

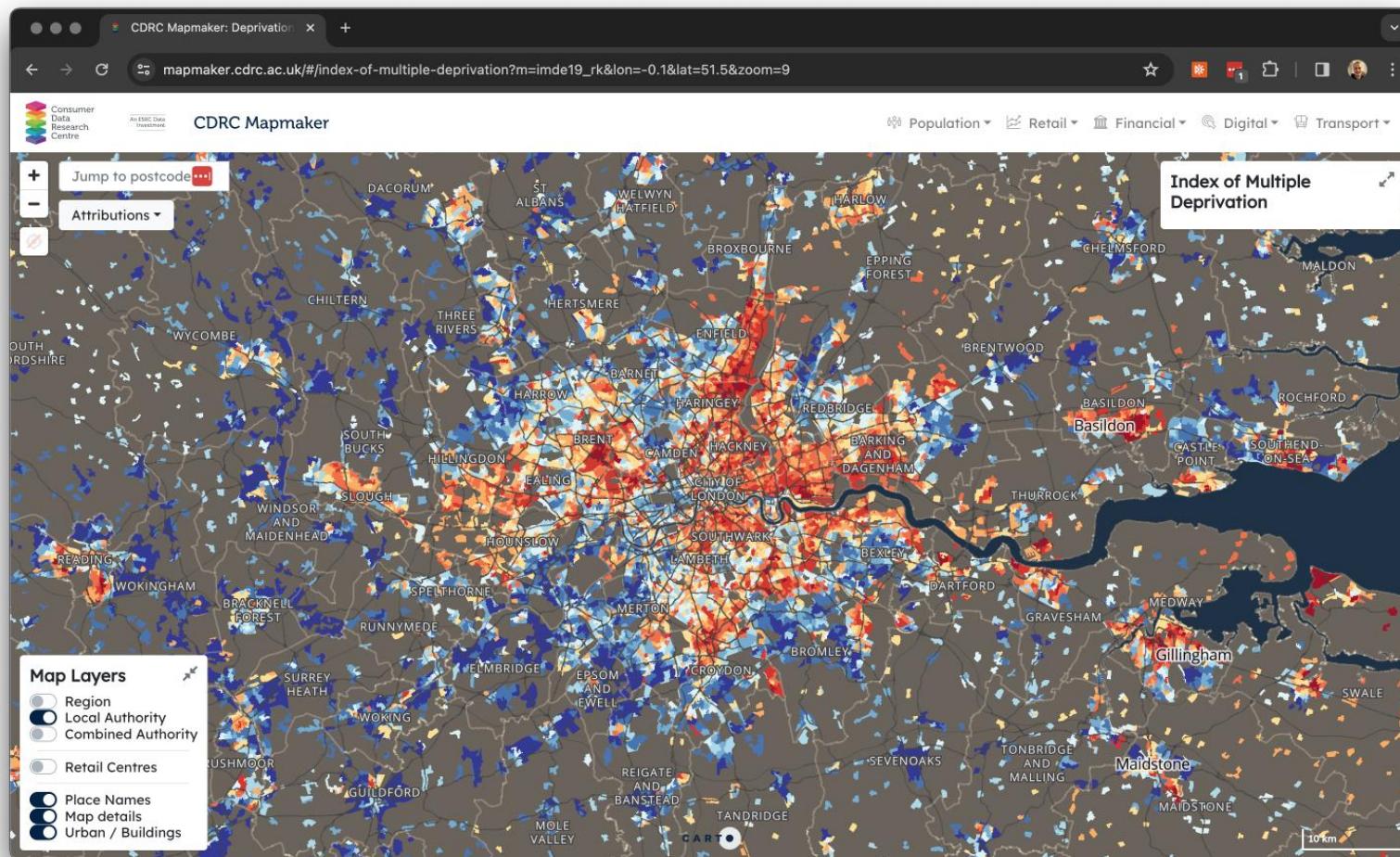
# Finding your way across the river



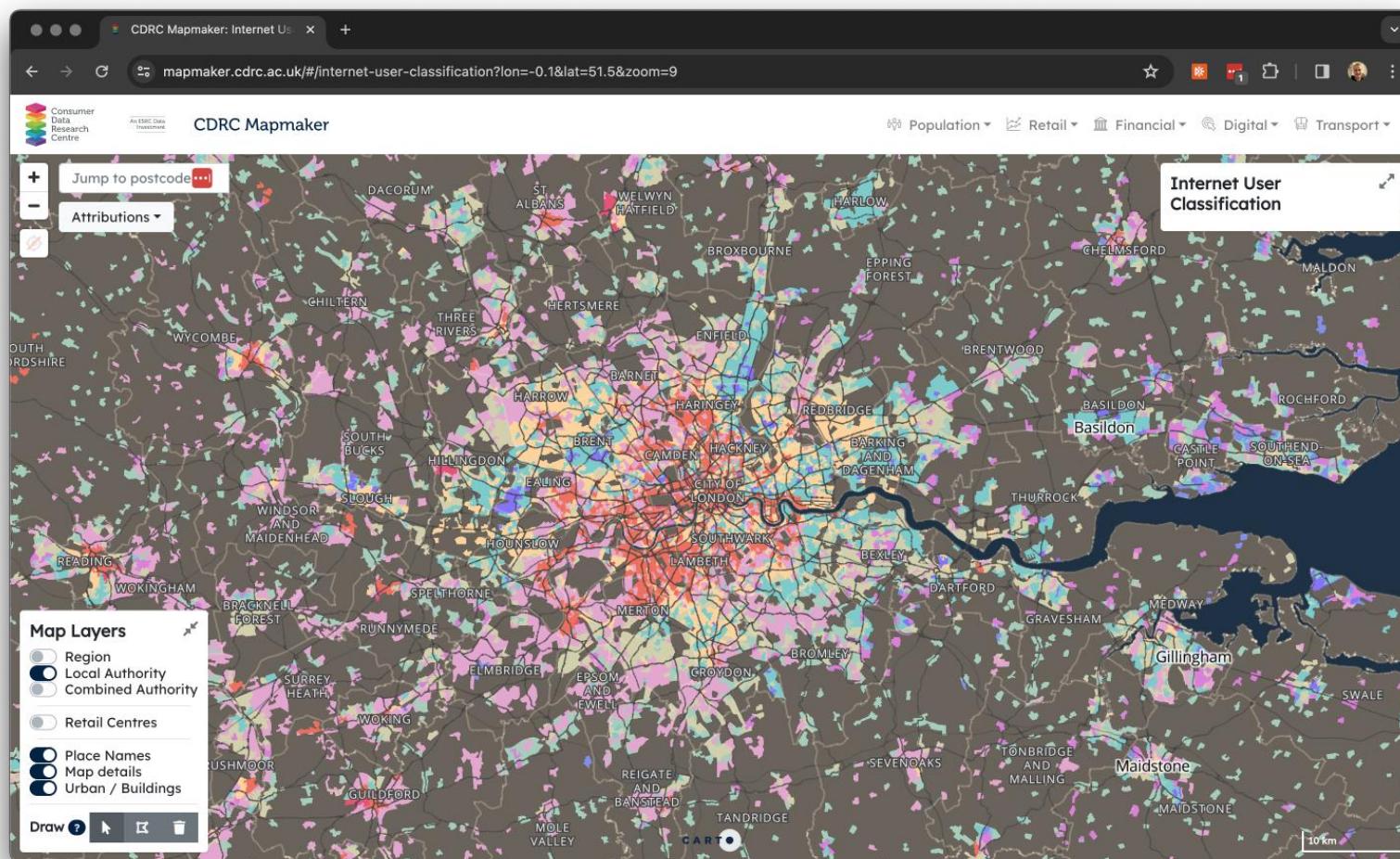
# Finding your way abroad



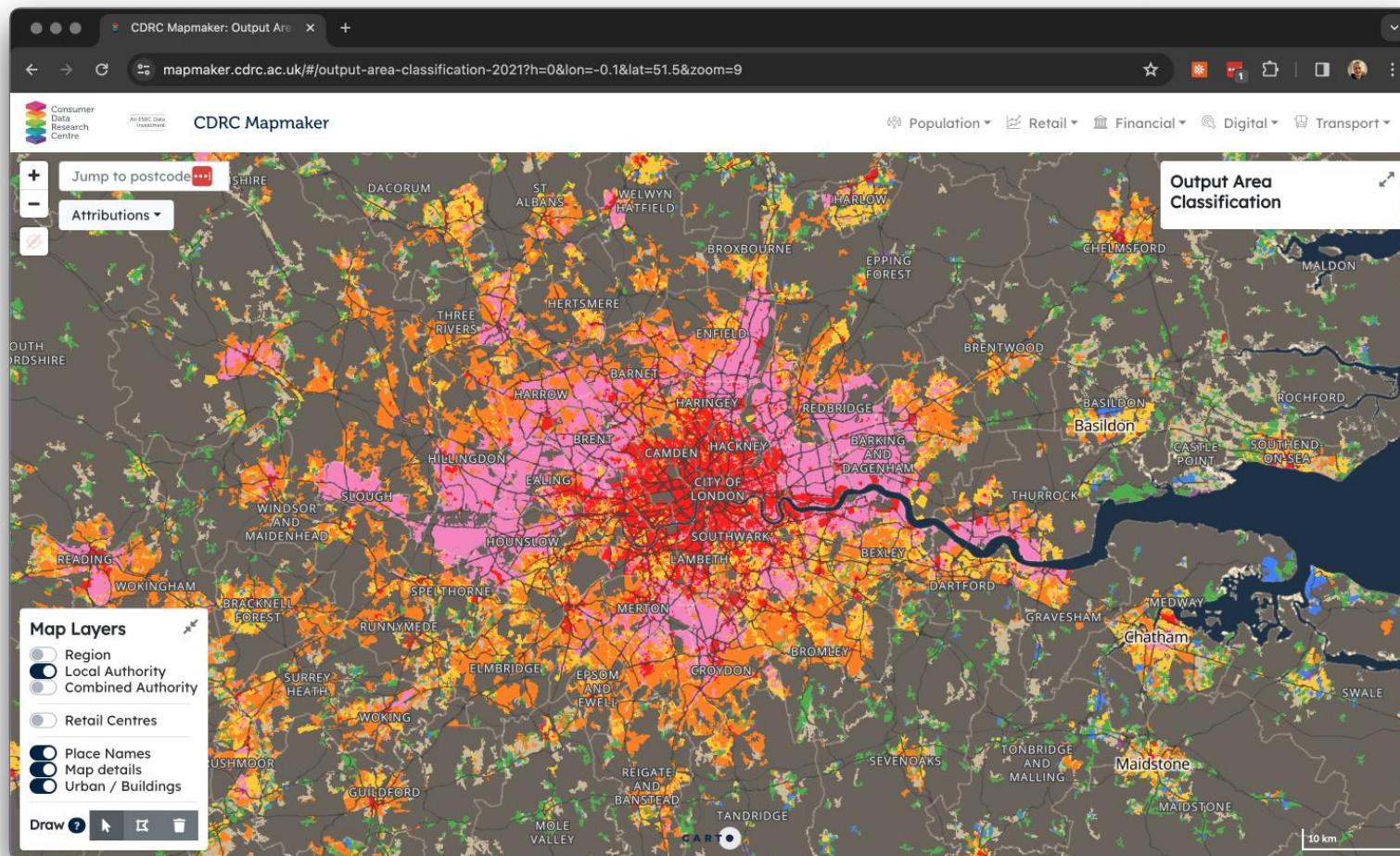
# Spatial analysis



# Spatial analysis



# Spatial analysis



# File formats: Geopackage

- A GeoPackage is an open, standards-based, platform-independent, portable, self-describing, compact format for transferring geospatial data.
- It stores spatial data layer as a single file, based upon an SQLite database.
- How to spot in the wild: `.gpkg`

# File formats: Shapefile

- **.shp** Contains the feature geometry. *Mandatory*.
- **.shx** Index file which stores the position of the feature's ID in the **.shp** file.  
*Mandatory*.
- **.dbf** Stores alle attribute information associated with the records. *Mandatory*.
- **.prj** contains the coordinate system information and projection. *Optional but not really*.
- **.xml** General metadata. *Optional*.
- **.cpg** Encoding information. *Optional*.
- **.sbn** Optimisation file for spatial queries. *Optional*.

# File formats: Shapefile



# Mentimeter

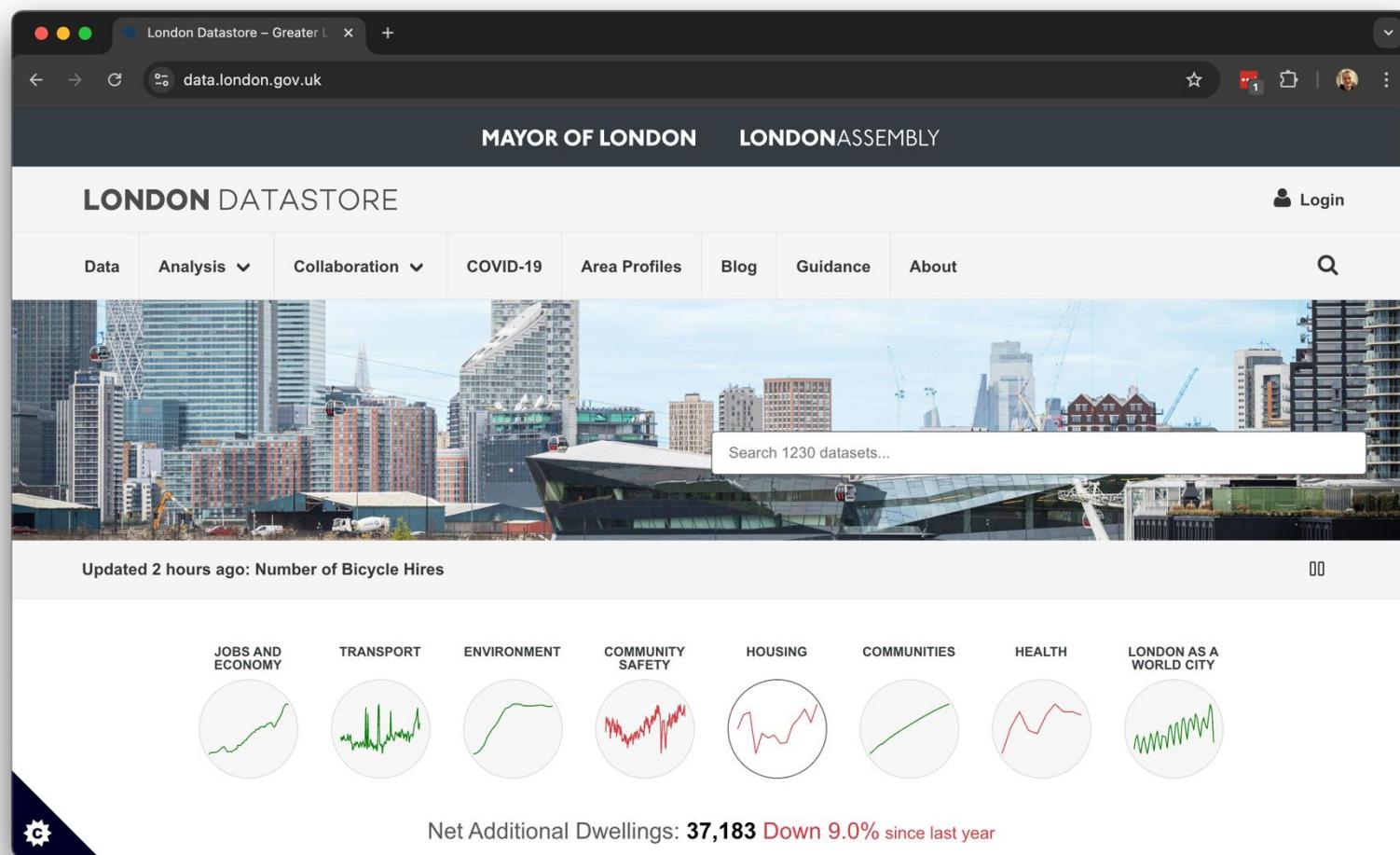
- Go to [www.menti.com](http://www.menti.com).
- Use code: 6421 5727



Break

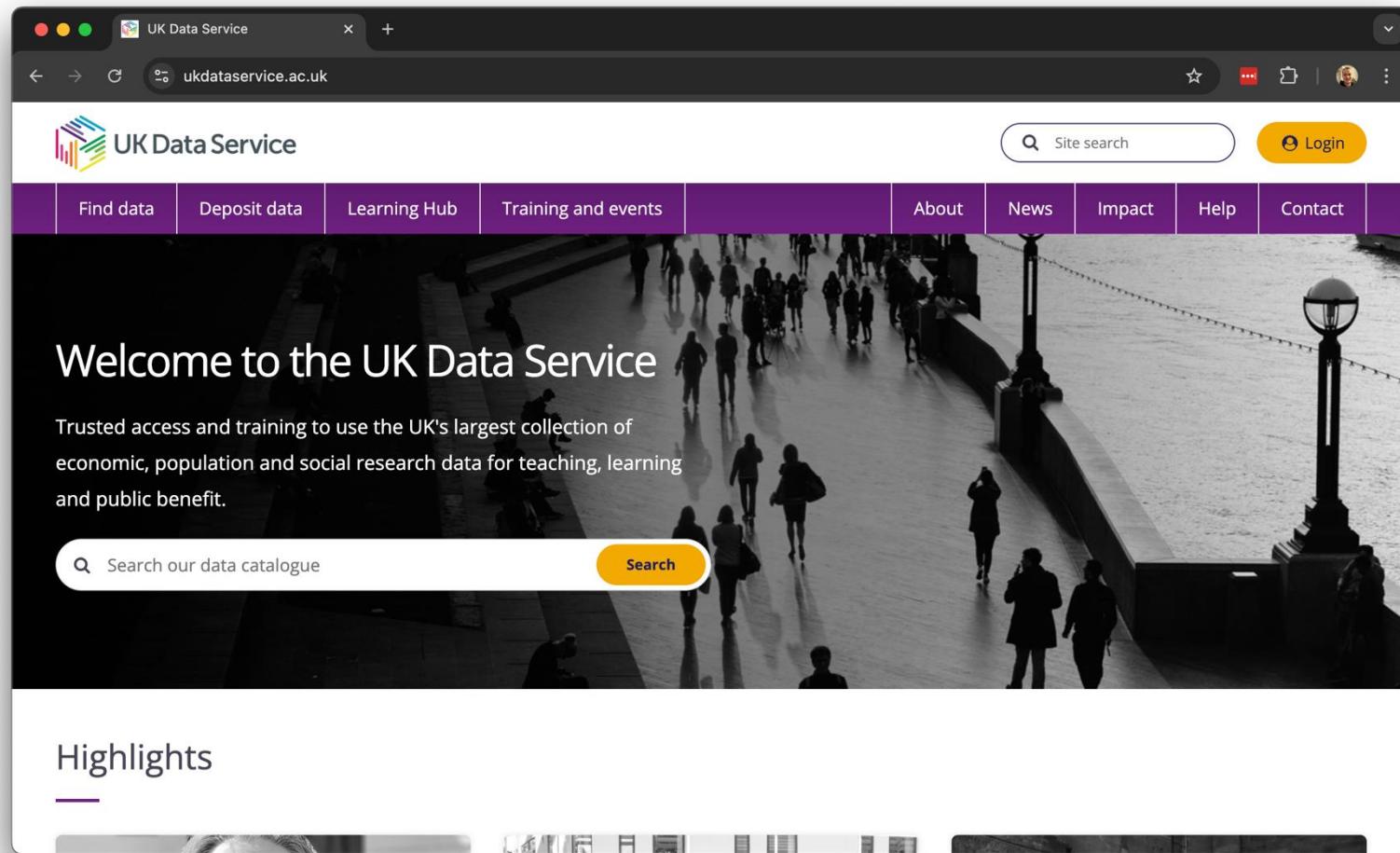
Data sources

# London Datastore



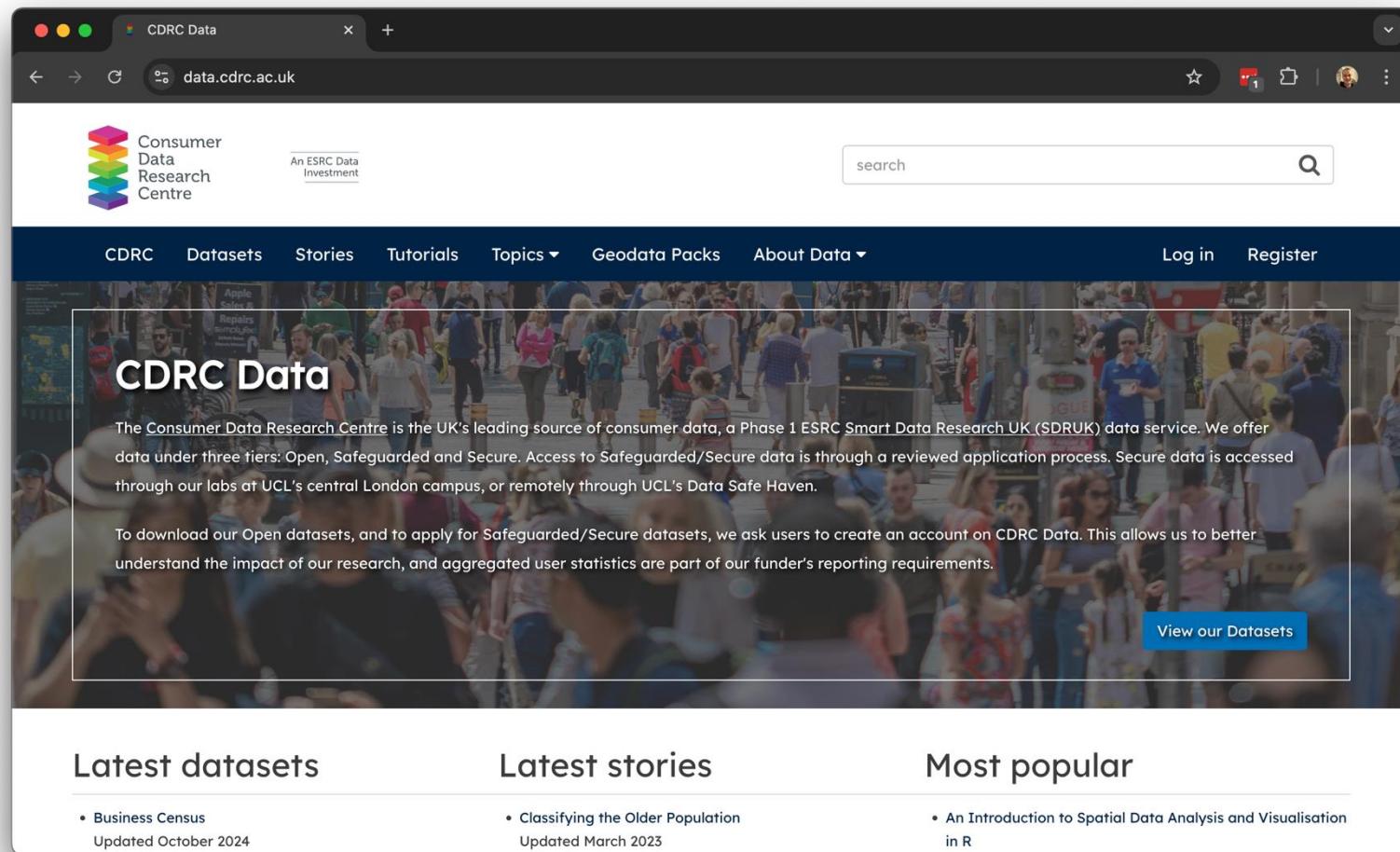
The screenshot shows the London Datastore website interface. At the top, there's a banner featuring the Mayor of London and London Assembly logos. Below the banner, the main navigation menu includes links for Data, Analysis, Collaboration, COVID-19, Area Profiles, Blog, Guidance, About, and a search icon. A prominent search bar is centered on the page with the placeholder text "Search 1230 datasets...". Below the search bar, a large image of the London skyline is displayed. A message "Updated 2 hours ago: Number of Bicycle Hires" is shown above a row of circular data visualizations. These visualizations represent various metrics: JOBS AND ECONOMY (green line), TRANSPORT (green line), ENVIRONMENT (green line), COMMUNITY SAFETY (red line), HOUSING (red line), COMMUNITIES (green line), HEALTH (red line), and LONDON AS A WORLD CITY (green line). A small badge with a gear icon is visible in the bottom left corner. At the bottom of the page, a statistic is displayed: "Net Additional Dwellings: **37,183** Down 9.0% since last year".

# UK Data Service



The screenshot shows the homepage of the UK Data Service website, [ukdataservice.ac.uk](https://ukdataservice.ac.uk). The page features a dark header with the UK Data Service logo, a search bar, and a login button. Below the header is a purple navigation bar with links for Find data, Deposit data, Learning Hub, Training and events, About, News, Impact, Help, and Contact. The main content area has a black background with a photograph of people walking along a waterfront. The text "Welcome to the UK Data Service" is displayed, followed by a description of the service's purpose: "Trusted access and training to use the UK's largest collection of economic, population and social research data for teaching, learning and public benefit." A search bar with the placeholder "Search our data catalogue" and a yellow "Search" button are located below the welcome text. The word "Highlights" is visible at the bottom of the main content area.

# Geographic Data Service



The screenshot shows the homepage of the CDRC Data website, accessible via [data.cdrc.ac.uk](https://data.cdrc.ac.uk). The page features a dark header with the CDRC logo, navigation links for CDRC, Datasets, Stories, Tutorials, Topics, Geodata Packs, About Data, Log in, and Register. A search bar is positioned at the top right. The main content area has a large background image of a crowded street scene. Overlaid on this image is a white box containing the title "CDRC Data" and a detailed description of the service's purpose and data tiers. A blue button labeled "View our Datasets" is located at the bottom right of this box. Below the main image, three sections are displayed: "Latest datasets", "Latest stories", and "Most popular".

**CDRC Data**

The Consumer Data Research Centre is the UK's leading source of consumer data, a Phase 1 ESRC Smart Data Research UK (SDRUK) data service. We offer data under three tiers: Open, Safeguarded and Secure. Access to Safeguarded/Secure data is through a reviewed application process. Secure data is accessed through our labs at UCL's central London campus, or remotely through UCL's Data Safe Haven.

To download our Open datasets, and to apply for Safeguarded/Secure datasets, we ask users to create an account on CDRC Data. This allows us to better understand the impact of our research, and aggregated user statistics are part of our funder's reporting requirements.

[View our Datasets](#)

**Latest datasets**

- Business Census  
Updated October 2024

**Latest stories**

- Classifying the Older Population  
Updated March 2023

**Most popular**

- An Introduction to Spatial Data Analysis and Visualisation in R

# nomis

The screenshot shows the Nomis website (nomisweb.co.uk) displayed in a web browser. The page has a dark header with the 'nomis' logo and tagline 'official census and labour market statistics'. To the right is the 'Office for National Statistics' logo and a search bar. The main content area features three main sections: 'Labour Market Profiles', 'Data Downloads', and 'Census Statistics', each with a list of links. A footer at the bottom left mentions the '2021 Census Local Area Report'.

Nomis - Official Census and Labour Market Statistics

nomisweb.co.uk

# nomis

official census and labour market statistics

Office for National Statistics

Search...

Home Reports Data Sources Census Contact us Sign-in Settings

## Welcome to Nomis

Nomis is a service provided by [Office for National Statistics](#) (ONS), the UK's largest independent producer of official statistics. On this website, we publish statistics related to population, society and the labour market at national, regional and local levels. These include data from current and previous censuses.

[Information for first-time visitors](#)  
[Sign-in or Register](#)

### Labour Market Profiles

View a labour market profile of an area. Includes some of the data from our key datasets on population, employment, unemployment, qualifications, earnings, benefit claimants and businesses.

[Local Authority Profile](#) (district/county areas)  
[Local Enterprise Partnerships Profile](#)  
[Combined Authority Profile](#)  
[Regional and National Profile](#)  
[2010 Parliamentary Constituencies Profile](#)  
[2011 Ward Profile](#) (England & Wales only)

### Data Downloads

Create a data download from one of our full range of data sets. Data is available at a very detailed level.

[Query data](#)  
Download figures from a single data set.

### Census Statistics

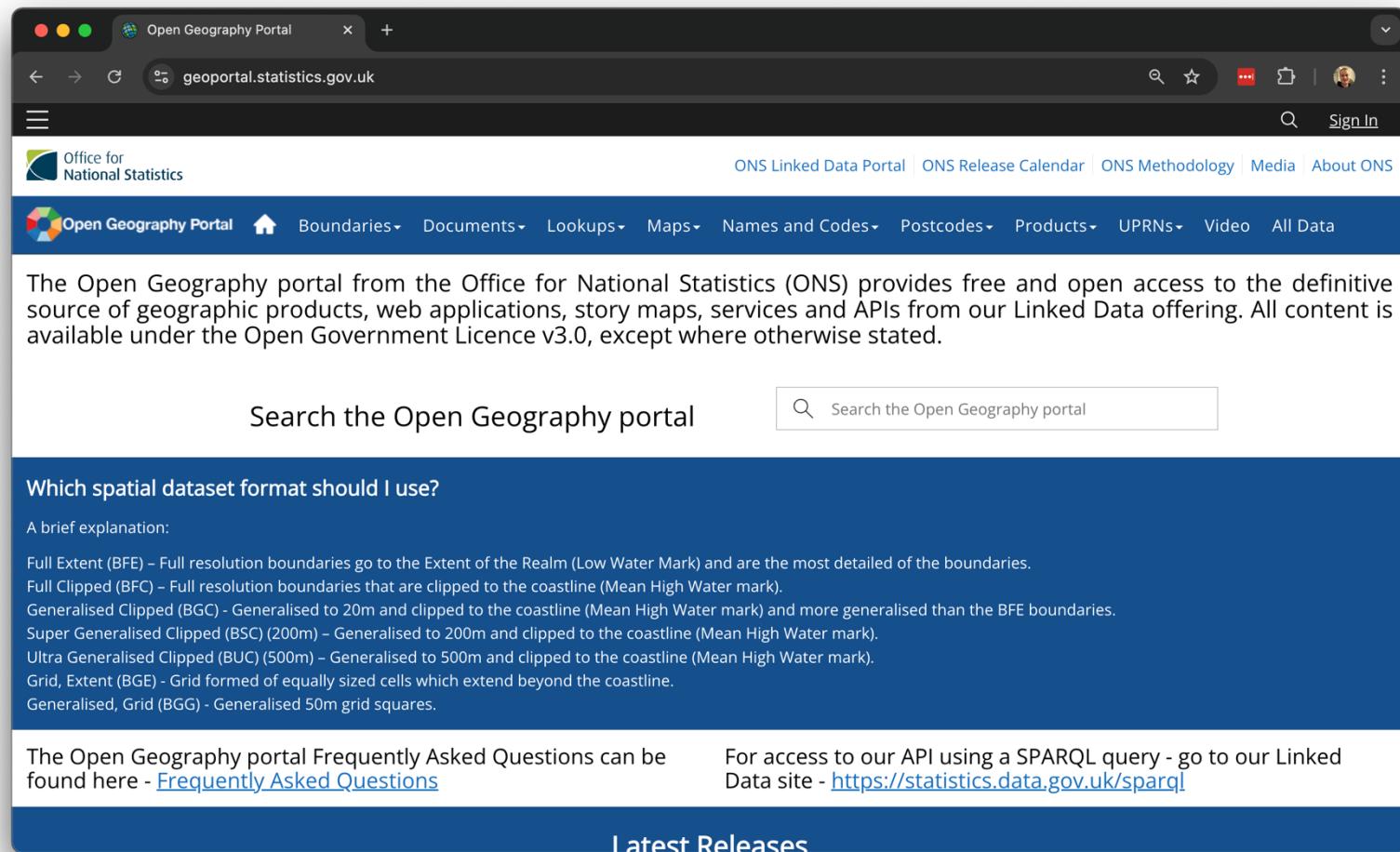
[2021 Data catalogue](#)  
Browse by table type and number.  
[2021 Search by topic \(table finder\)](#)  
Search by keyword and geography type.

2021 Census Local Area Report

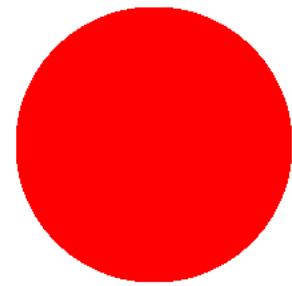
# Office for National Statistics

The screenshot shows a web browser window for the Office for National Statistics (ONS) website at [ons.gov.uk/datasets/create](https://ons.gov.uk/datasets/create). The page title is "Create a custom dataset". The header includes the ONS logo, language links (English (EN) | [Cymraeg \(CY\)](#)), and navigation links (Release calendar, Methodology, Media, About, Blog). A top navigation bar has categories: Home, Business, industry and trade, Economy, Employment and labour market, People, population and community, Taking part in a survey?, and another unlabeled category. Below the navigation is a search bar with placeholder text "Search for a keyword(s) or time series ID" and a green search icon. The breadcrumb navigation shows "Home > Census". The main content area features a large heading "Create a custom dataset". Below it is a paragraph explaining population types: "We group Census 2021 data together based on who or what the information is about, for example, people or households. We make population types from these groups or subsets of them. For example, people who are usually resident in England or Wales make up the population type usual residents. [Read about the measurements we used for Census 2021 data.](#)". A section titled "Select population type" contains a radio button labeled "All households" with a descriptive text below it: "Either one usual resident living alone or a group of people who share cooking and living facilities, where that group includes at least one usual resident." To the right of this section is a partially visible feedback message: "How satisfied were you wit... ▲".

# Open Geography Portal



The screenshot shows the homepage of the Open Geography Portal from the Office for National Statistics (ONS). The page is titled "Open Geography Portal" and features the URL "geoportal.statistics.gov.uk". The header includes the ONS logo, a search bar, and navigation links for "ONS Linked Data Portal", "ONS Release Calendar", "ONS Methodology", "Media", and "About ONS". A "Sign In" button is also present. Below the header, there is a main menu with categories: "Open Geography Portal", "Boundaries", "Documents", "Lookups", "Maps", "Names and Codes", "Postcodes", "Products", "UPRNs", "Video", and "All Data". A descriptive text block states: "The Open Geography portal from the Office for National Statistics (ONS) provides free and open access to the definitive source of geographic products, web applications, story maps, services and APIs from our Linked Data offering. All content is available under the Open Government Licence v3.0, except where otherwise stated." A search bar is located below this text. A section titled "Which spatial dataset format should I use?" provides a brief explanation of various formats: Full Extent (BFE), Full Clipped (BFC), Generalised Clipped (BGC), Super Generalised Clipped (BSC), Ultra Generalised Clipped (BUC), Grid, Extent (BGE), and Generalised, Grid (BGG). At the bottom, there are links to "Frequently Asked Questions" and information about the SPARQL API. A "Latest Releases" section is also visible at the very bottom.



LIVE

Attribute joins

# Attribute joins

<b>Geoid</b>	<b>Population</b>
GEO0018	540
GEO0019	320

# Attribute joins



GEO0018

FeatureID	GeOID
0050	GEO0018

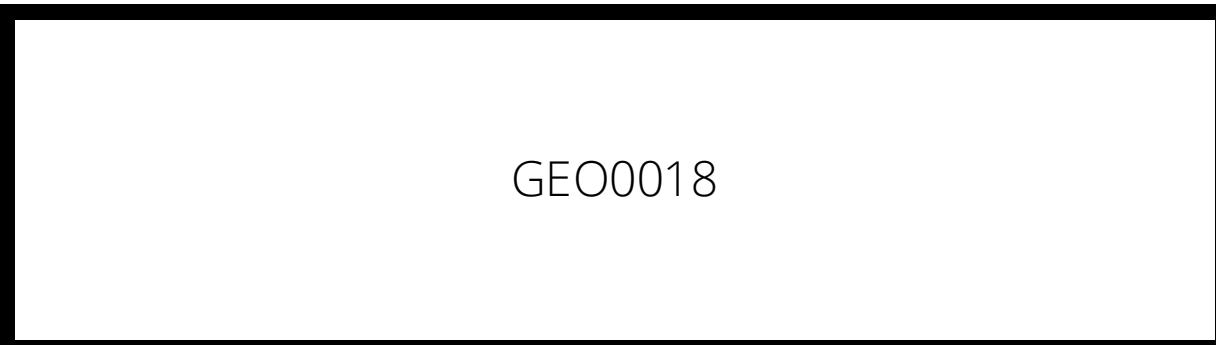
# Attribute joins



FeatureID	Geoid
0050	GEO0018

Geoid	Population
GEO0018	540
GEO0019	320

# Attribute joins



GEO0018

FeatureID	Geoid
0050	GEO0018

Geoid	Population
GEO0018	540
GEO0019	320

# Attribute joins

GEO0018

FeatureID	GeOID	Population
0050	GEO0018	540

# Left joins

Table 1



1		
2		

Table 2



1		
3		
4		

# Left joins

Table 1



1		
2		

Table 2



1		
3		
4		

Left Join



1			
2			

# Inner joins

Table 1



1		
2		

Table 2



1		
3		
4		

Inner Join



1			
---	--	--	--

# Outer joins

Table 1



1		
2		

Table 2

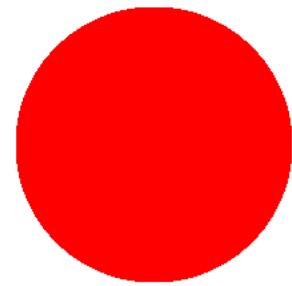


1		
3		
4		

Outer Join



1				
2				
3				
4				



LIVE

# Summary

# Summary

- Many challenges and problems are inherently geographical.
- Spatial data visualisation is an essential part of (quantitative) human geography for exploring and communicating spatial patterns.
- A wide range of secondary data sources is available, covering topics such as demographics, environment, and socio-economic trends.

# Summary



# Assessment

To explore one of this year's course themes (gentrification, identity, migration) in the context of London, submitted as a 1,500-word report (50% of module grade):

1. Outline a research question and hypothesis (200-250 words).
2. Obtain data and identify appropriate methods to use (200-250 words).
3. Present and interpret results (700-800 words).
4. Briefly evaluate your approach (200-300 words).

Deadline 13<sup>th</sup> of January 2025 at 12 noon GMT.

# Questions

Justin van Dijk

j.t.vandijk@ucl.ac.uk

