

# Smart Cities

SESSION IV: Lecture 2: The Participatory City:  
Crowd-Sourcing, City Dash Boards, Social Media

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 @jmichaelbatty

<http://www.spatialcomplexity.info/>

<http://www.casa.ucl.ac.uk/>



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## Outline of the Lecture

1. Different forms of interaction: pulling data, pushing data, creating data
2. Pulling Data and Creating Maps by Pushing Data
3. Creating Data: Crowd-Sourcing
4. Displaying Real Time Data: Dashboards
5. Extracting and Mapping Social Media Data
6. *I have various examples of digital public participation but I don't have time to deal with these but I will add these a further lecture at the end of the 10th*



# Pulling Data and Creating Maps by Pushing Data

I am going to begin with looking at the sorts of maps we can now visualise online and there are many of these sites where one can do this and interact to produce simple analysis and new data

We usually do it on the desktop, but there are various applications to smaller devices such as tablets and phones and doubtless when we get digital paper, we will have yet another medium to enable us to create new ways of interaction.

I am going to start by showing you our entry into this world some 5 or 6 years ago when we created our site called Maptube: [www.maptube.org](http://www.maptube.org)



# Web 2 and Online Mapping

The screenshot shows the homepage of MapTube.org. At the top, there's a navigation bar with links for home, about, login, search, and help. The main content area features a "Featured Map" titled "Oyster Card Overcharging 2010", which displays a map of London with colored lines representing Oyster card usage patterns. Below this, there's a "QuickStart" section with instructions and a "Search page". A navigation bar at the bottom includes tabs for All, Population, Education, Health, Crime, Transport, Politics, Economics, and Land. The main content area also lists other maps like "London Tube Map", "Weather Underground Air Temperatures", and "world map".

**Welcome to MapTube**  
MapTube is a free resource for viewing, sharing, mixing and mashing maps online. Created by UCL's Centre for Advanced Spatial Analysis, users can select any number of maps to overlay and view.

**QuickStart**  
Click any map below to view it. To select a combination of maps, use the Search page. More information is available in the Help section.

Showing records 1 to 12 of 766: ► ▶  
Order by: Topical Maps - Most Popular Maps - Recently Viewed - Latest Uploads

**London Tube Map**  
A map of the London Underground with geographically correct station positions taken from wikimedia.  
[more information](#)  
Viewed 61362 times

**Weather Underground Air Temperatures**  
Weather underground air temperatures 1 June 2011 at 20:00  
[more information](#)  
Viewed 508 times

**KML**  
world map  
world map  
[more information](#)  
Viewed 1034 times

**world map**  
this is the world map with countrys details  
[more information](#)  
Viewed 292 times

**UK Political Parties 2005**  
This map shows the results of the 2005 UK General Election with Westminster constituencies coloured according to the winning party

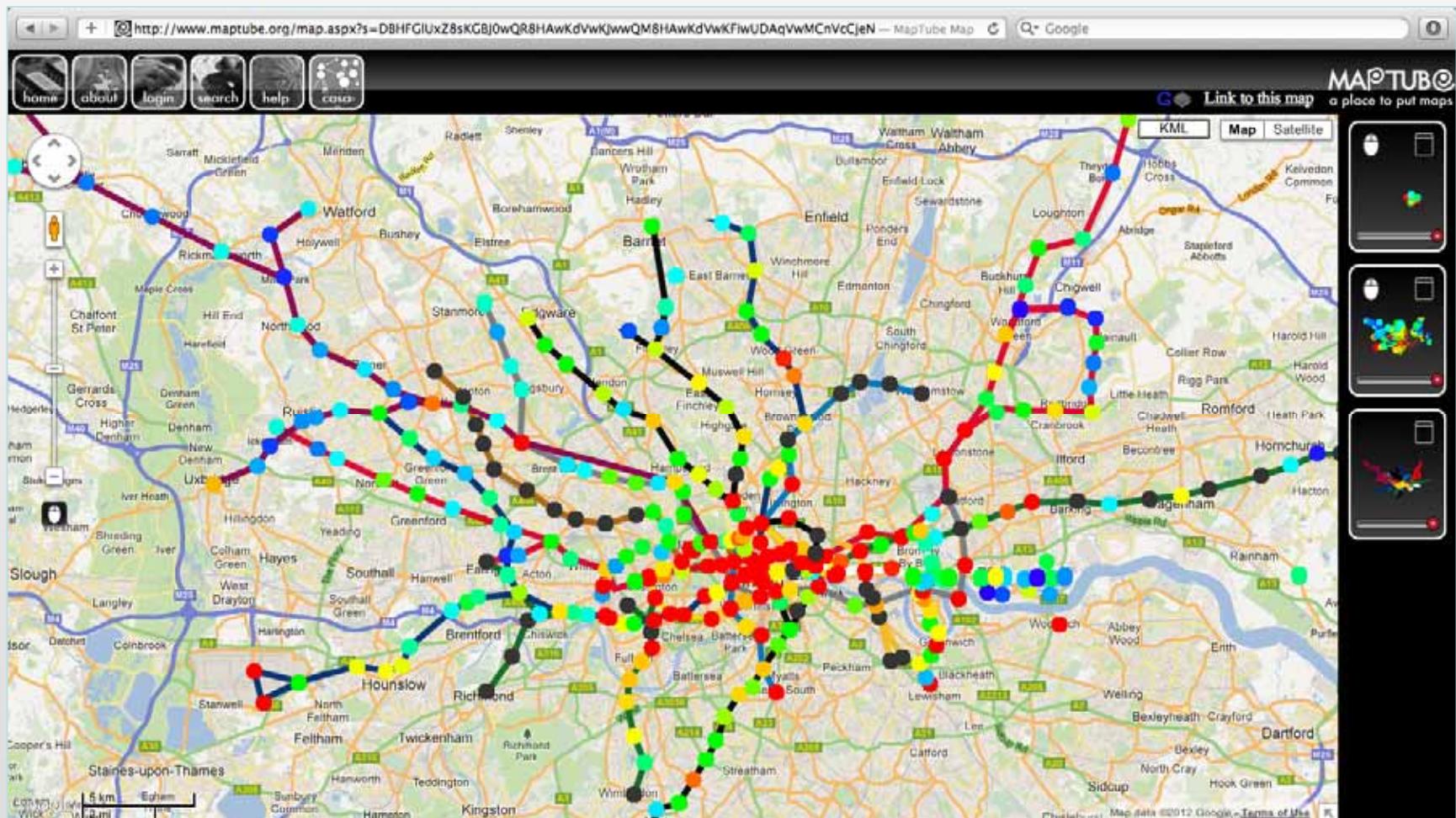
**Social Cohesion**  
Percentage of residents who agree that their local area is a place where people from different backgrounds get on well together



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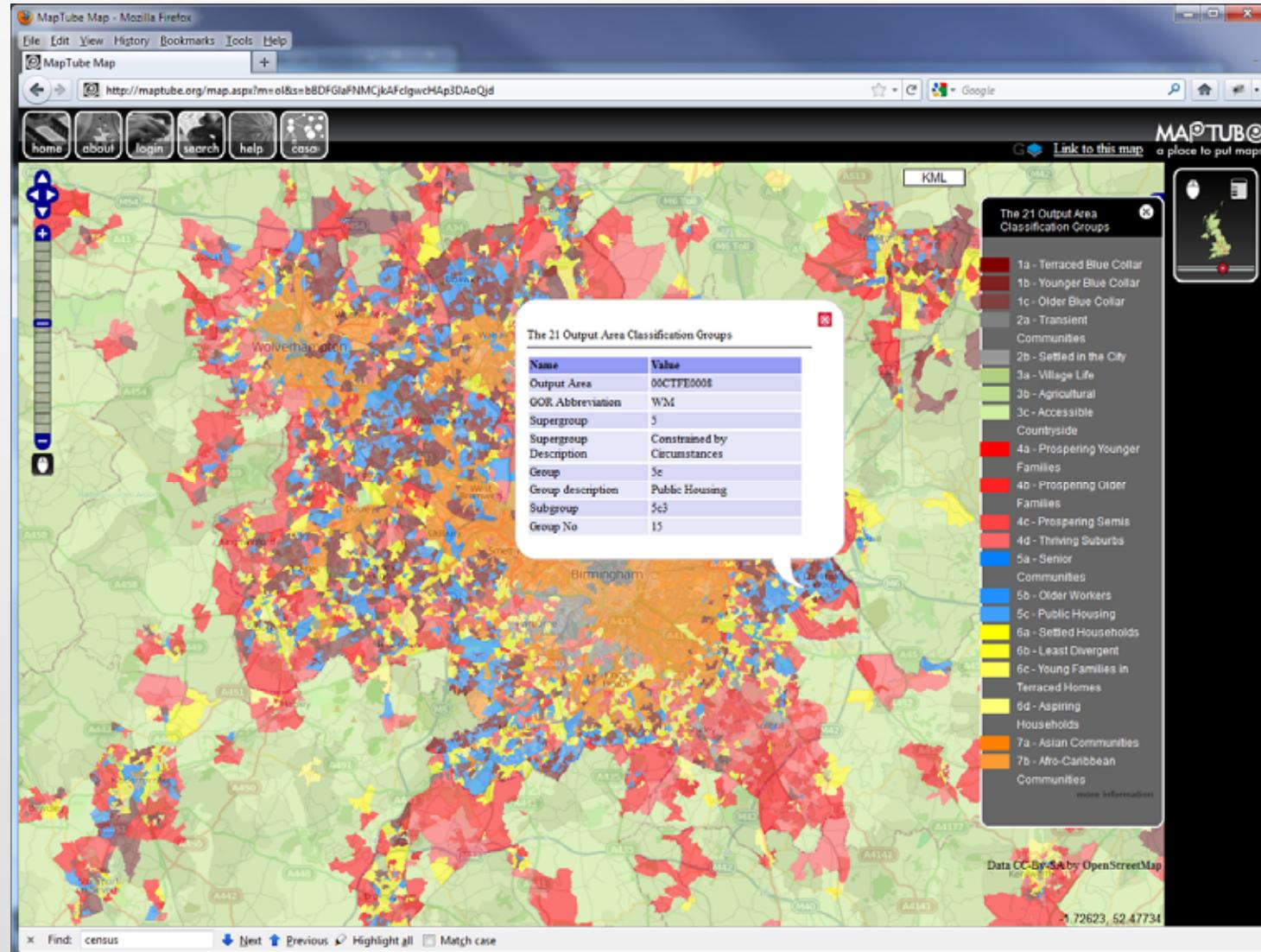


# Web 2 and Online Mapping



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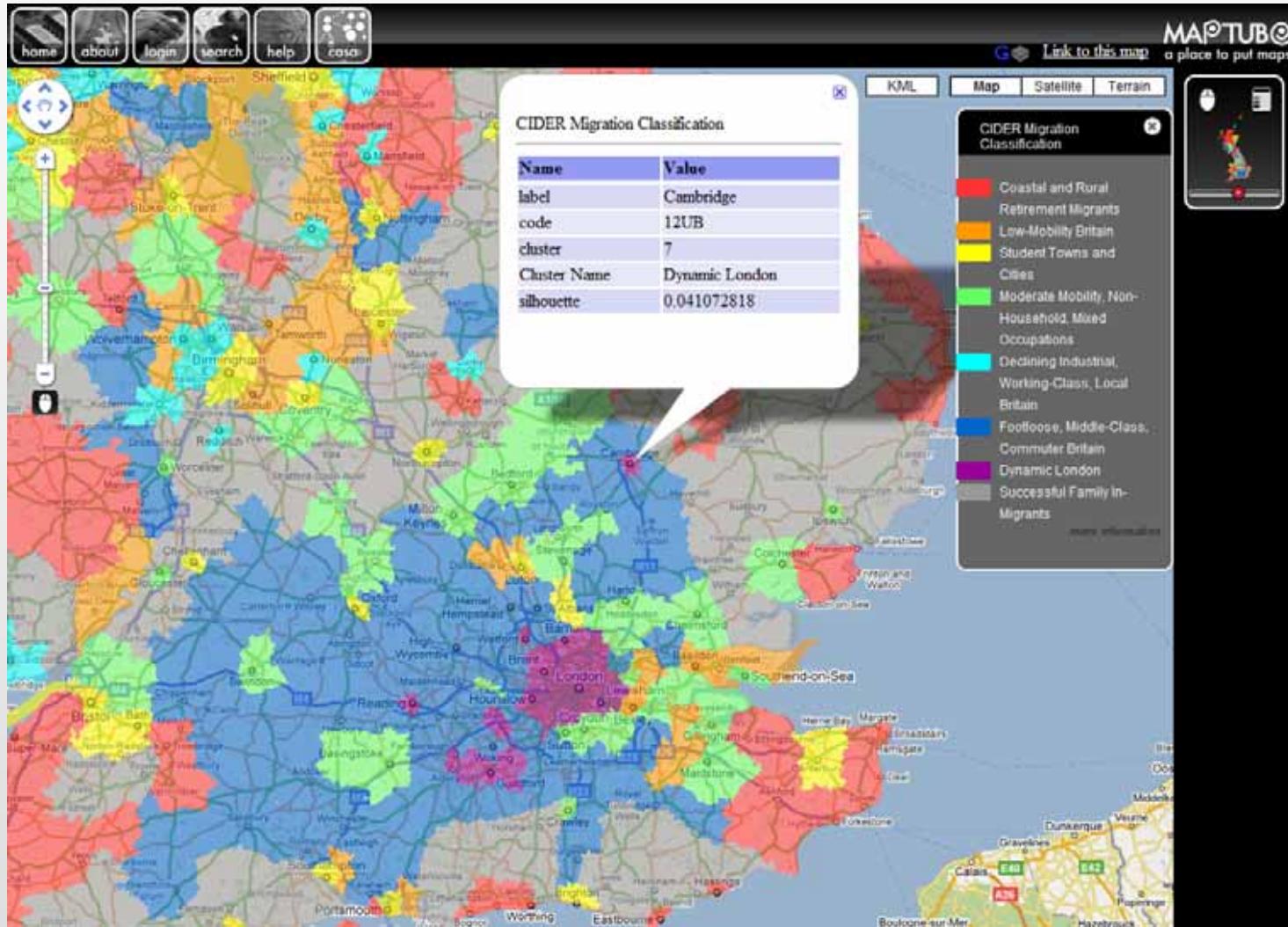


Map data CC-By-SA OpenStreetMap, Census data Copyright ONS. Shown using MapTube by Richard Milton



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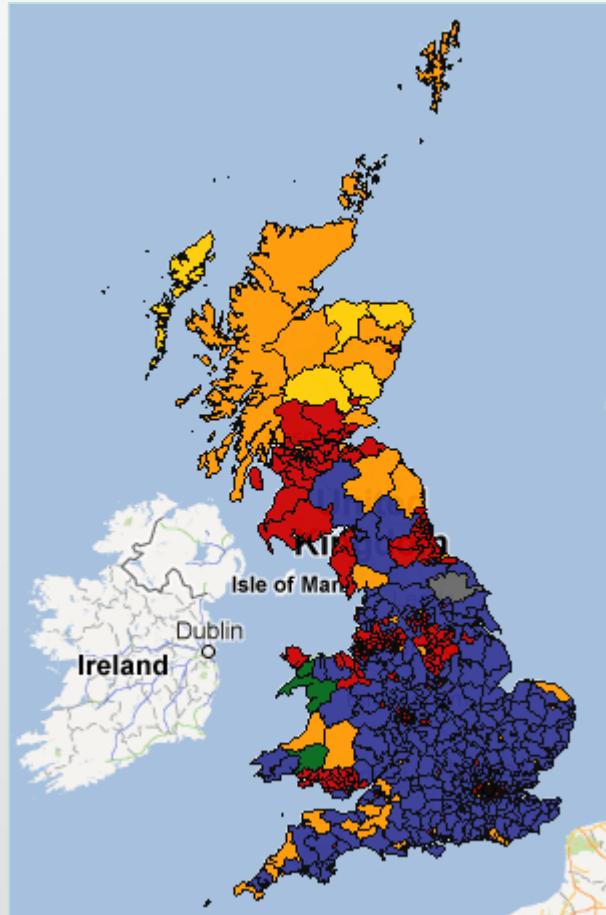


Produced by Adam Dennett (CASA) – Census data Copyright ONS –  
see <http://www.adamdennett.co.uk/> and <http://www.maptube.org/>

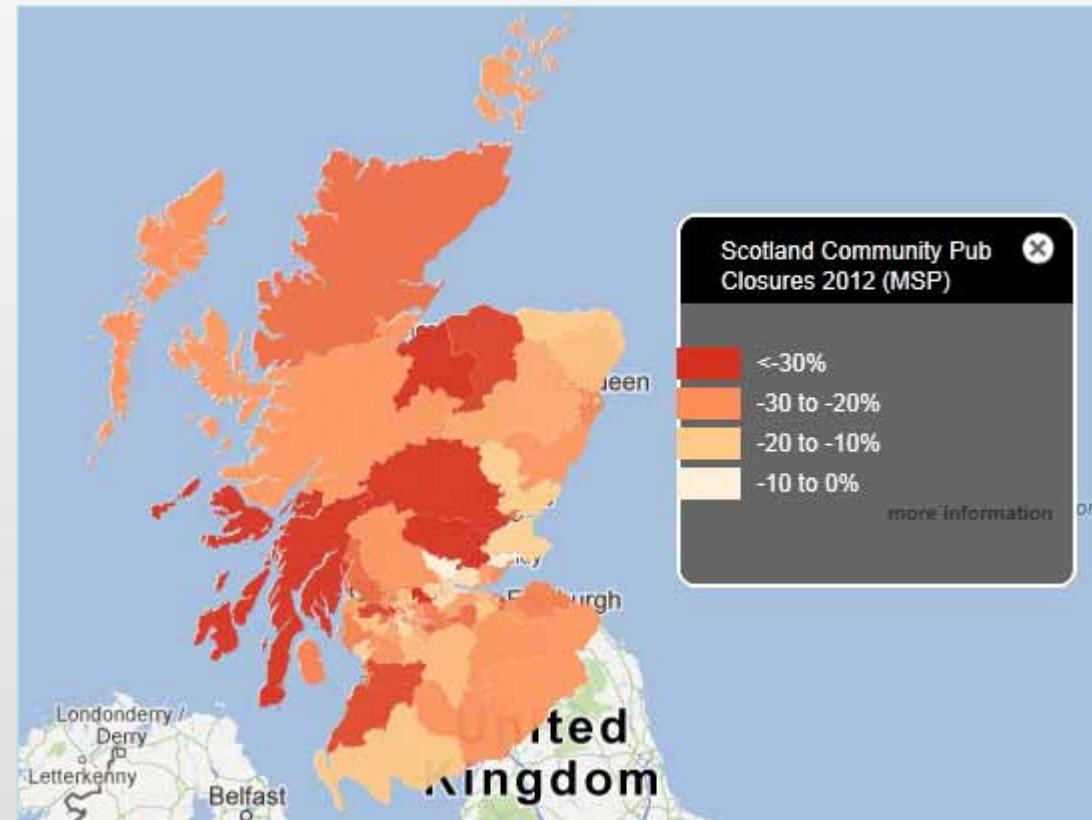


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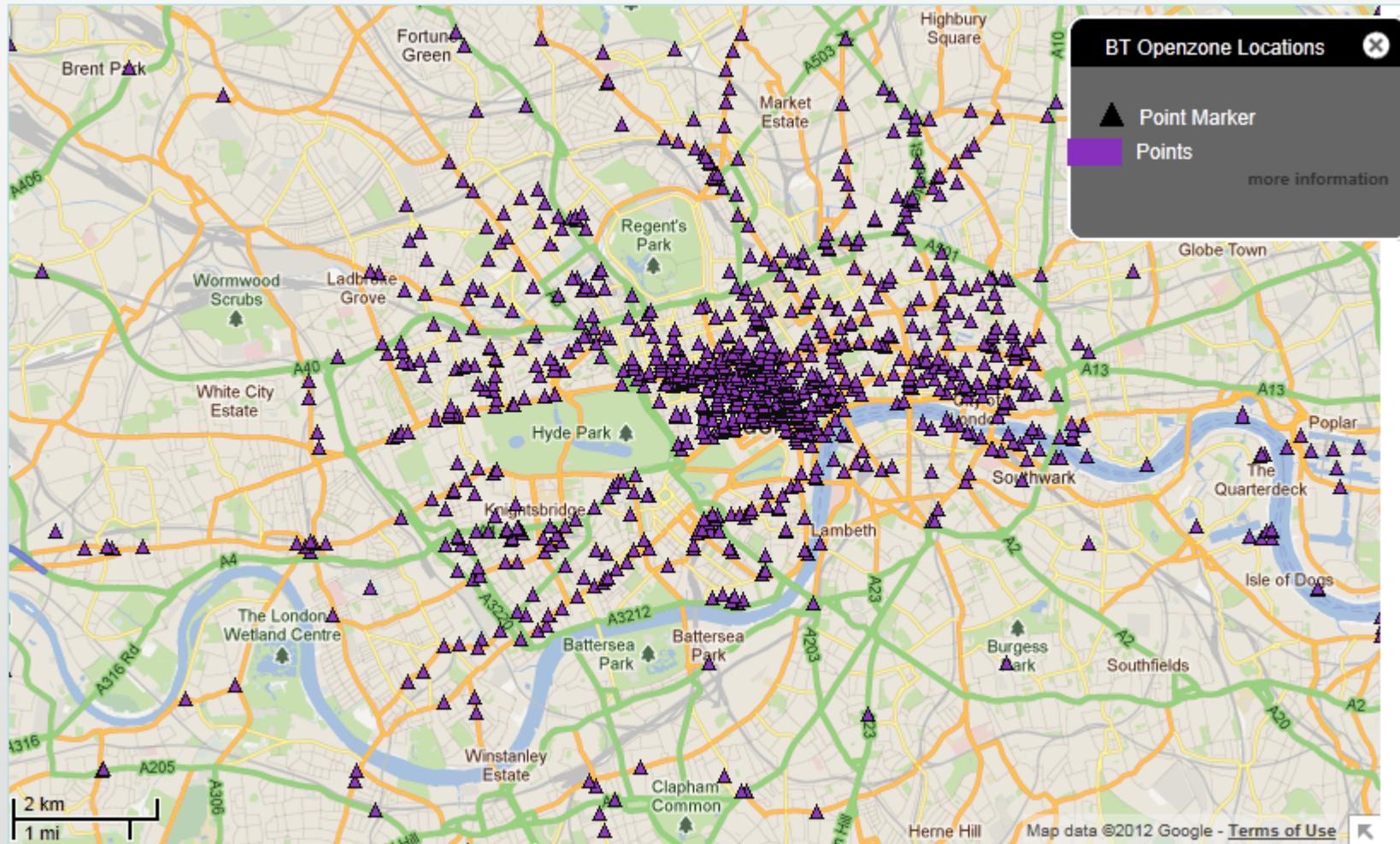
May 2010 General Election  
Result



Scotland Community Pub  
Closures 2012 (MSP)  
source: CGA Strategy



Adding Value – Comparing Data Sets  
Population density (2001 Census) with tube lines  
and real-time tube positions

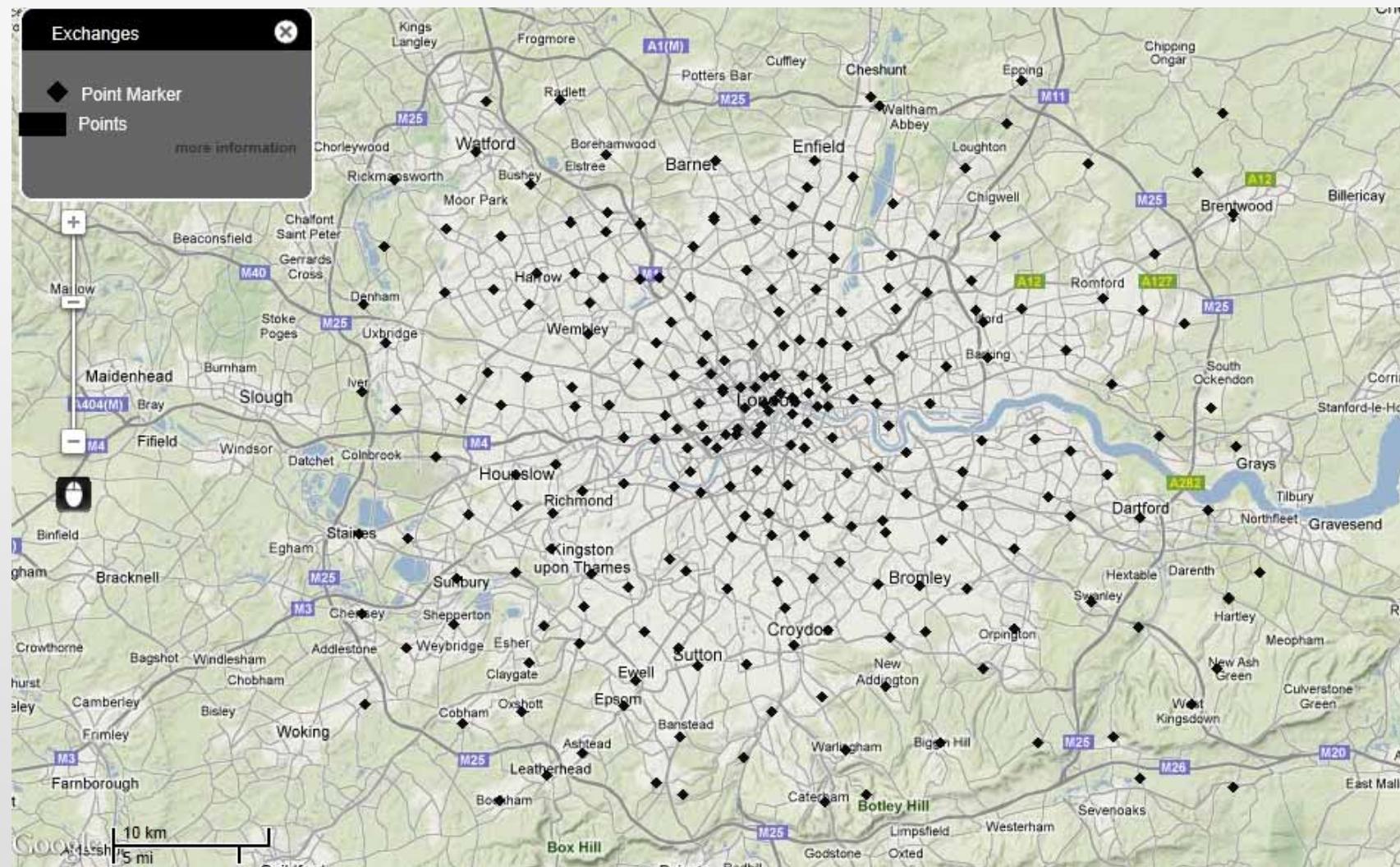


Information Infrastructure: BT Openzone Hotspots, March 2012



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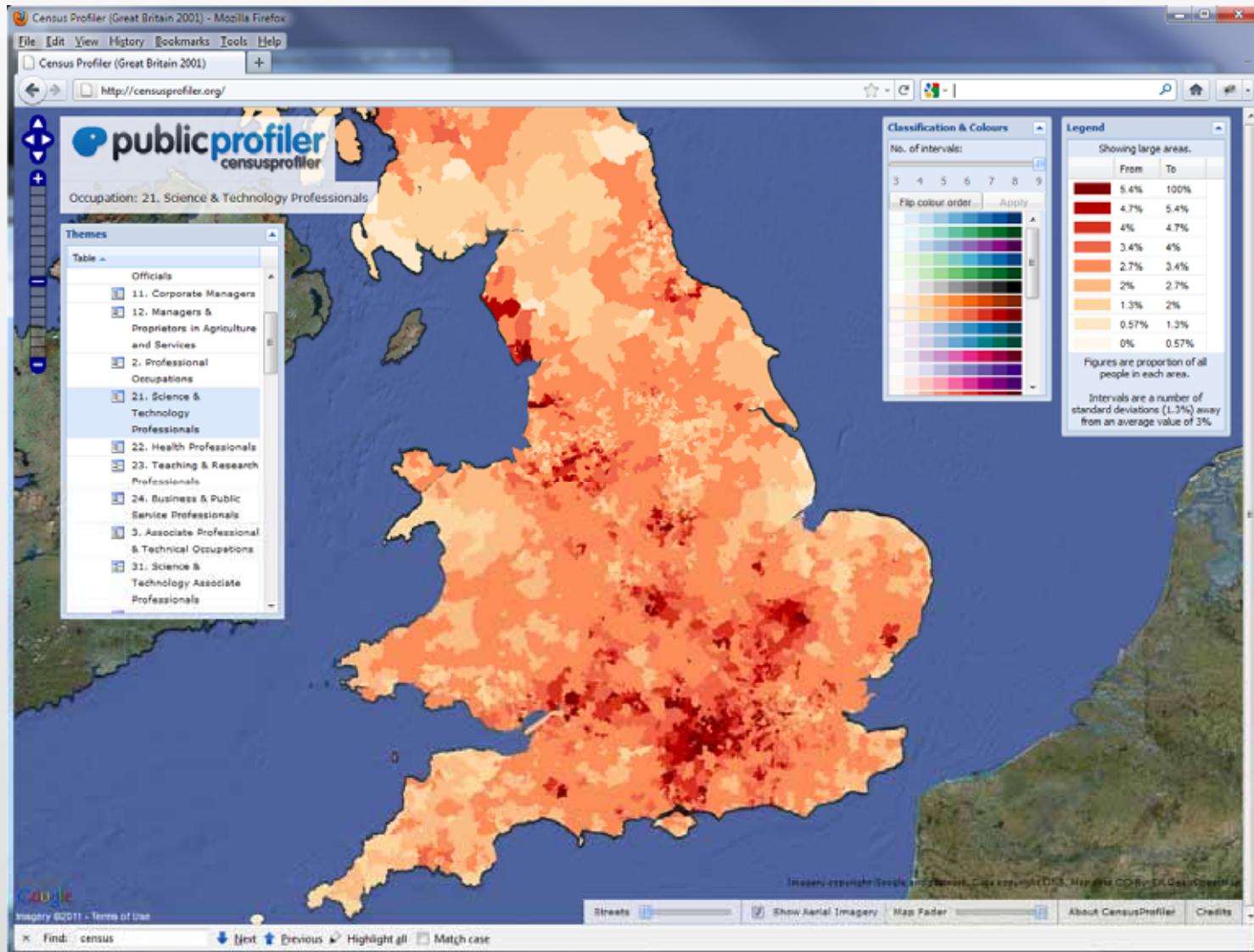


Information Infrastructure: Telephone Exchanges



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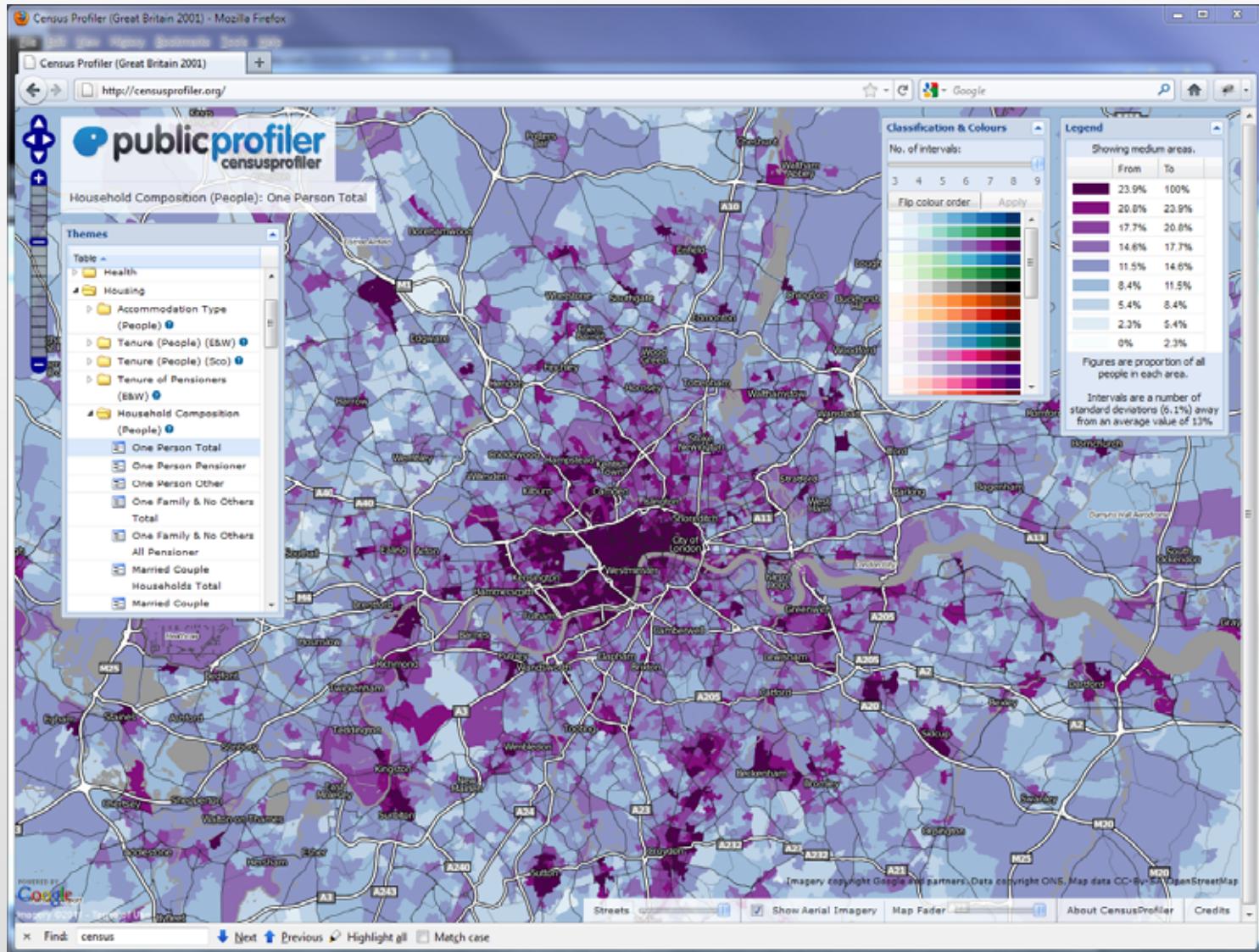


Map data CC-By-SA OpenStreetMap, Aerial imagery Copyright Google, Census data Copyright ONS



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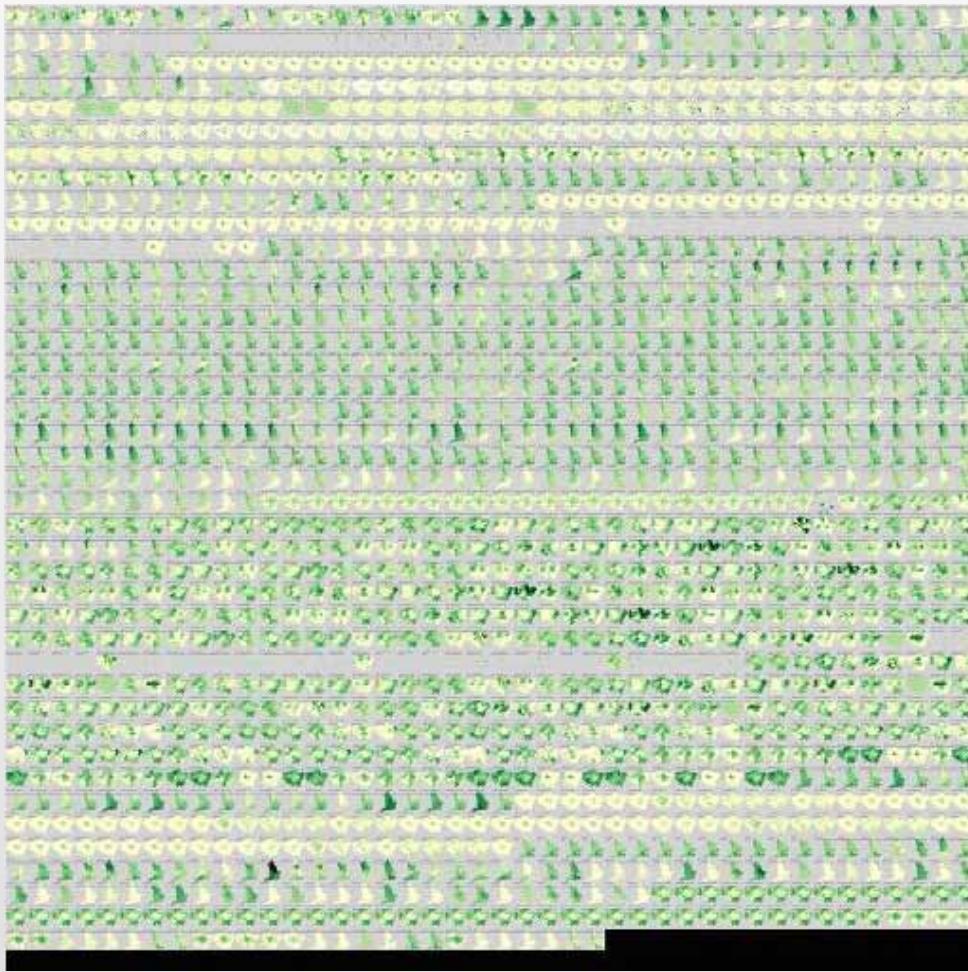


Map data CC-By-SA OpenStreetMap, Aerial imagery Copyright Google, Census data Copyright ONS

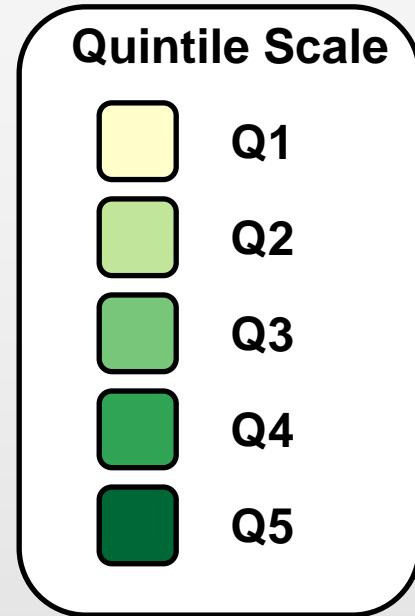


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102 datasets  
1706 variables (~50%)



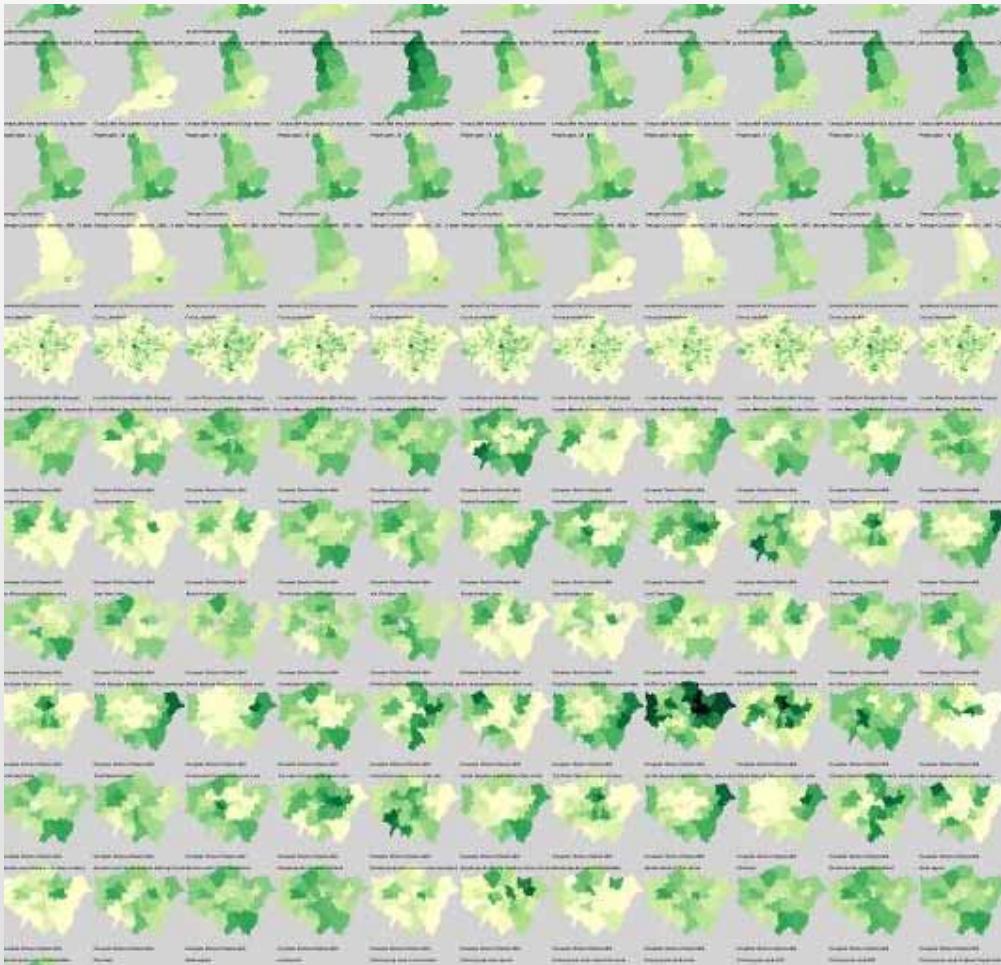
[london.gov.uk](http://london.gov.uk)

## Mining a Datastore: Ordering and Visualising Data

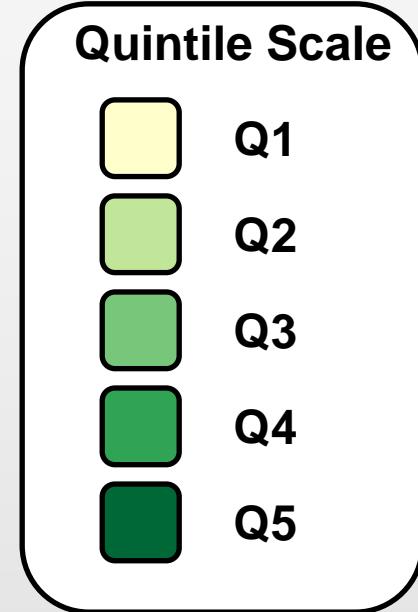


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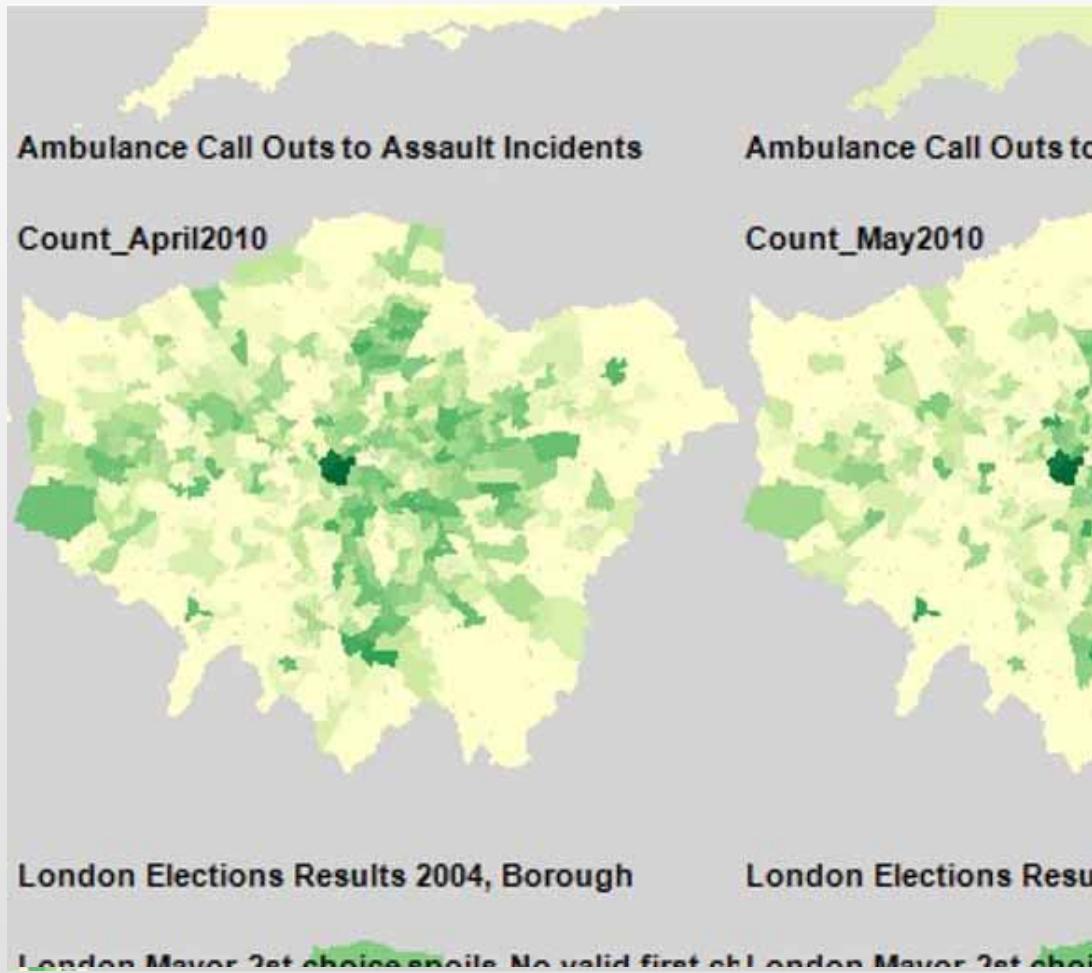
[london.gov.uk](http://london.gov.uk)

## Mining a Datastore: Ordering and Visualising Data

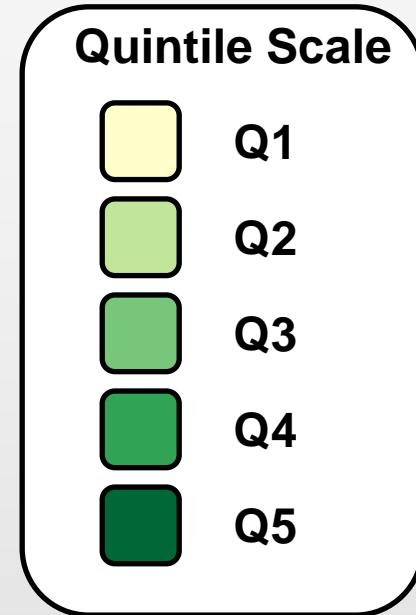


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1706 variables (~50%)



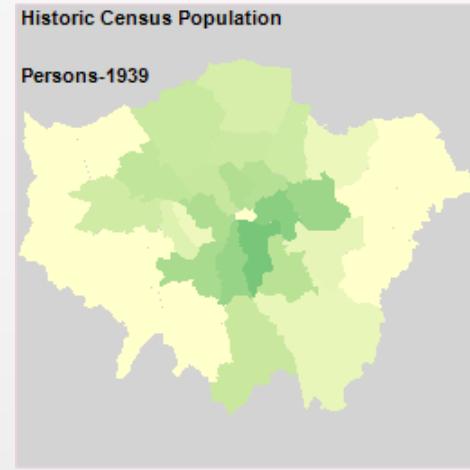
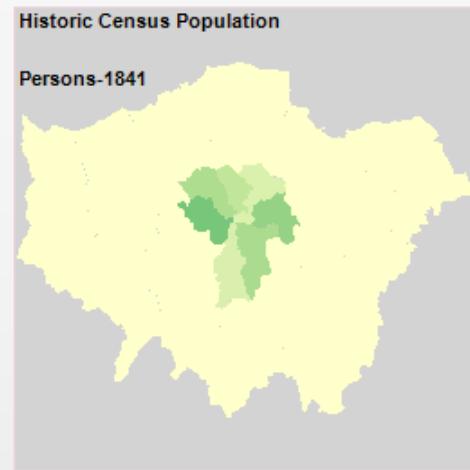
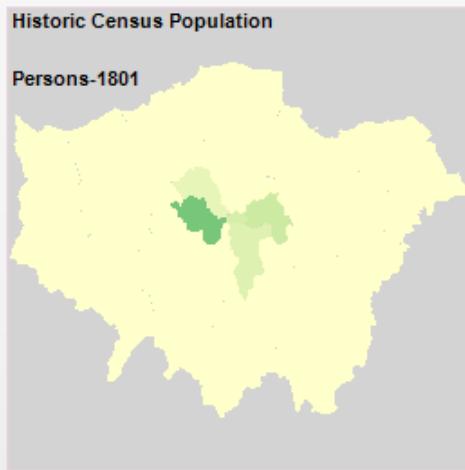
**london.gov.uk**

## Mining a Datastore: Ordering and Visualising Data

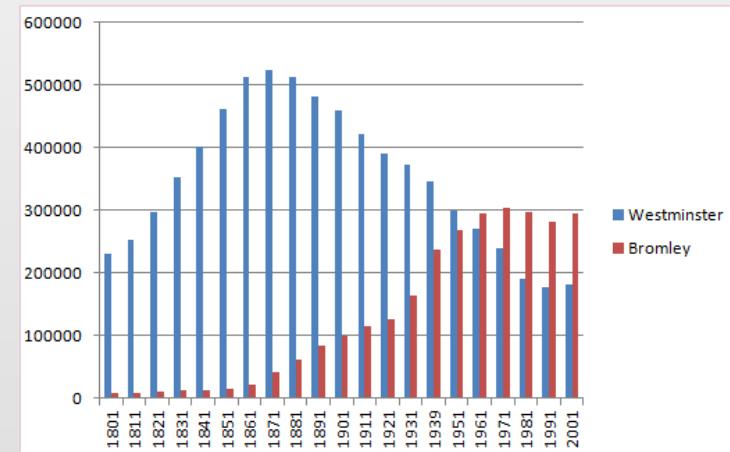
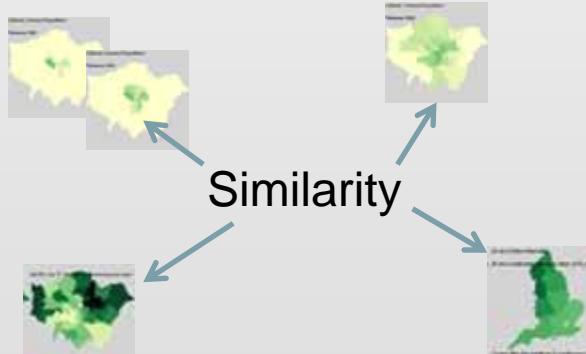


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London Datastore Historic Census Population: 1801, 1841 and 1939



Mining a Datastore: Historic Populations for London

# Integrating Diverse Data: Adding Value

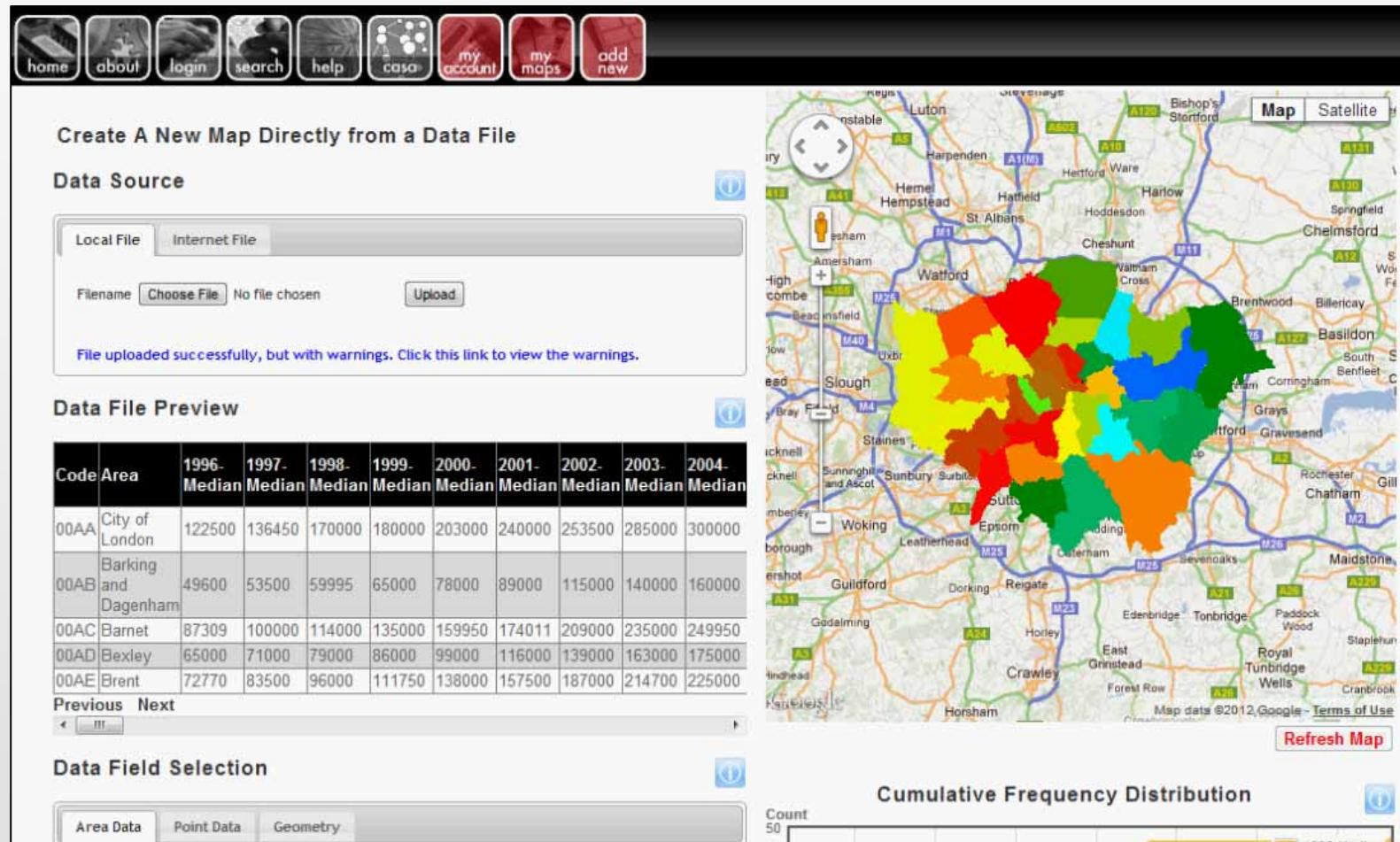
The screenshot shows a web browser window with the URL [data.london.gov.uk/datastore/package/average-house-prices-borough](http://data.london.gov.uk/datastore/package/average-house-prices-borough). The page title is "Average House Prices, Borough". The left sidebar contains a navigation menu with links such as "Datasets A-Z", "Categories", "Keywords", "Organisations", "Catalogue", "Search Datasets", "Request Dataset", "Popular Suggestions", "Latest Suggestions", "Blog", "Inspirational Uses", "Useful Links", "Digital Advisory Board", and "About". The main content area displays the "Average House Prices, Borough" dataset, which includes a summary, a star rating of 4.7, and detailed data about the dataset's scope and source.

Using our MapTube resource developed under DSR Genesis programme, we can now extract many open data



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[home](#) [about](#) [login](#) [search](#) [help](#) [casa](#) [my account](#) [my maps](#) [add new](#)

### Create A New Map Directly from a Data File

**Data Source**

Local File  Internet File

Filename  No file chosen

File uploaded successfully, but with warnings. Click this link to view the warnings.

**Data File Preview**

Code	Area	1996-Median	1997-Median	1998-Median	1999-Median	2000-Median	2001-Median	2002-Median	2003-Median	2004-Median
00AA	City of London	122500	136450	170000	180000	203000	240000	253500	285000	300000
00AB	Barking and Dagenham	49600	53500	59995	65000	78000	89000	115000	140000	160000
00AC	Barnet	87309	100000	114000	135000	159950	174011	209000	235000	249950
00AD	Bexley	65000	71000	79000	86000	99000	116000	139000	163000	175000
00AE	Brent	72770	83500	96000	111750	138000	157500	187000	214700	225000

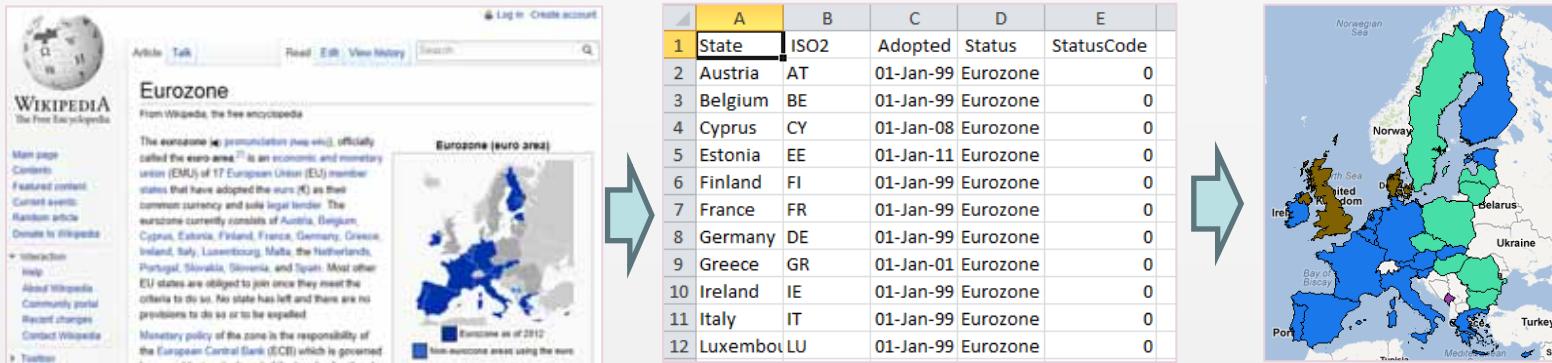
Previous [1](#) Next [1](#)

**Data Field Selection**

Area Data  Point Data  Geometry

**Cumulative Frequency Distribution**

Map data ©2012 Google [Terms of Use](#) Refresh Map



## Algorithm

### Polygons

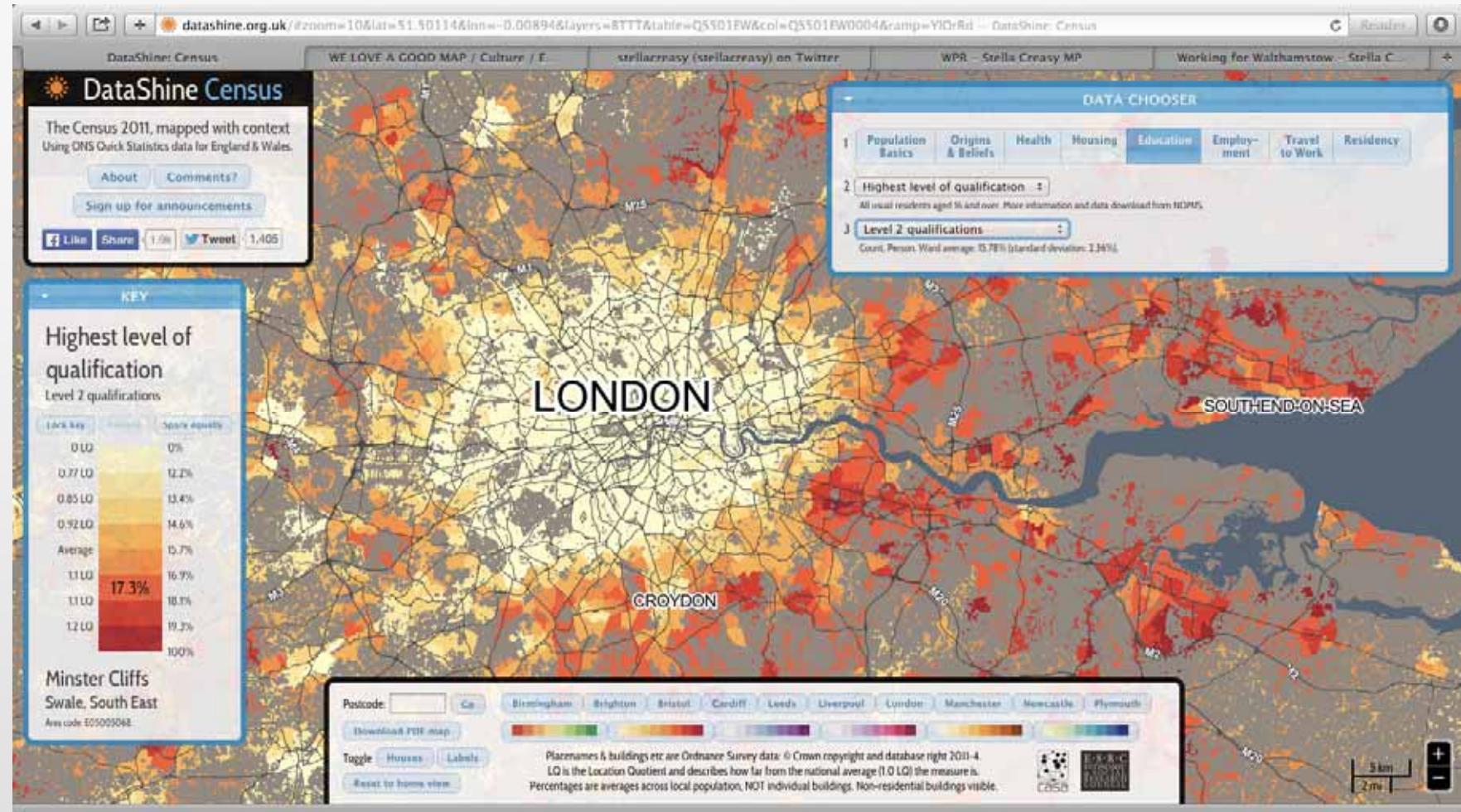
1. For the first N rows ( $N=10,000$ ) of every column, use a RegEx test to rule out any columns that can't possibly match
2. For the first N rows ( $N=1,000$ ) of the remaining columns, lookup key text in geocode database containing tuples of (key,dataset name) for every geography
3. Assign probability to column (prob, dataset) tuple based on number of matched rows

### Points

1. Compute statistics on columns for: Min, Max, IsNumeric, IsProgression and Column Name Weight
2. Find X and Y Columns based on IsNumeric&!IsProgression
3. Choose CRS based on Min and Max

We are developing many new versions of MapTube that enable us to extract data from web sources





<http://datashine.org.uk/>



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## Creating Data: CrowdSourcing

Crowdsourcing is using the power of digital media to create data – this can be done in highly structured ways all the way through to routine ways. They range from online censuses to fully interactive ways of discovering new things online which might be regarded as a form of data

We will look at some online examples. In this we need a broadcast media to make the audience or community aware that we need them to interact and a digital online media to capture their responses – their data





home about login search help casa

BBC RADIO 4

## Radio 4: Mapping the Credit Crunch

Welcome to Radio 4 Listeners, below is the Credit Crunch question, simply select an option and then input the first part of your postcode - for example RG11

MapTube will then take your answer and every hour automatically create a map of the nation's mood.

What single factor is hurting you most about the credit crunch?

- Mortgage or Rent
- Petrol
- Food Prices
- Job Security
- Utility Bills
- Not Affected

Enter the first part of your postcode:



23,475 responses  
April, May, June 2008

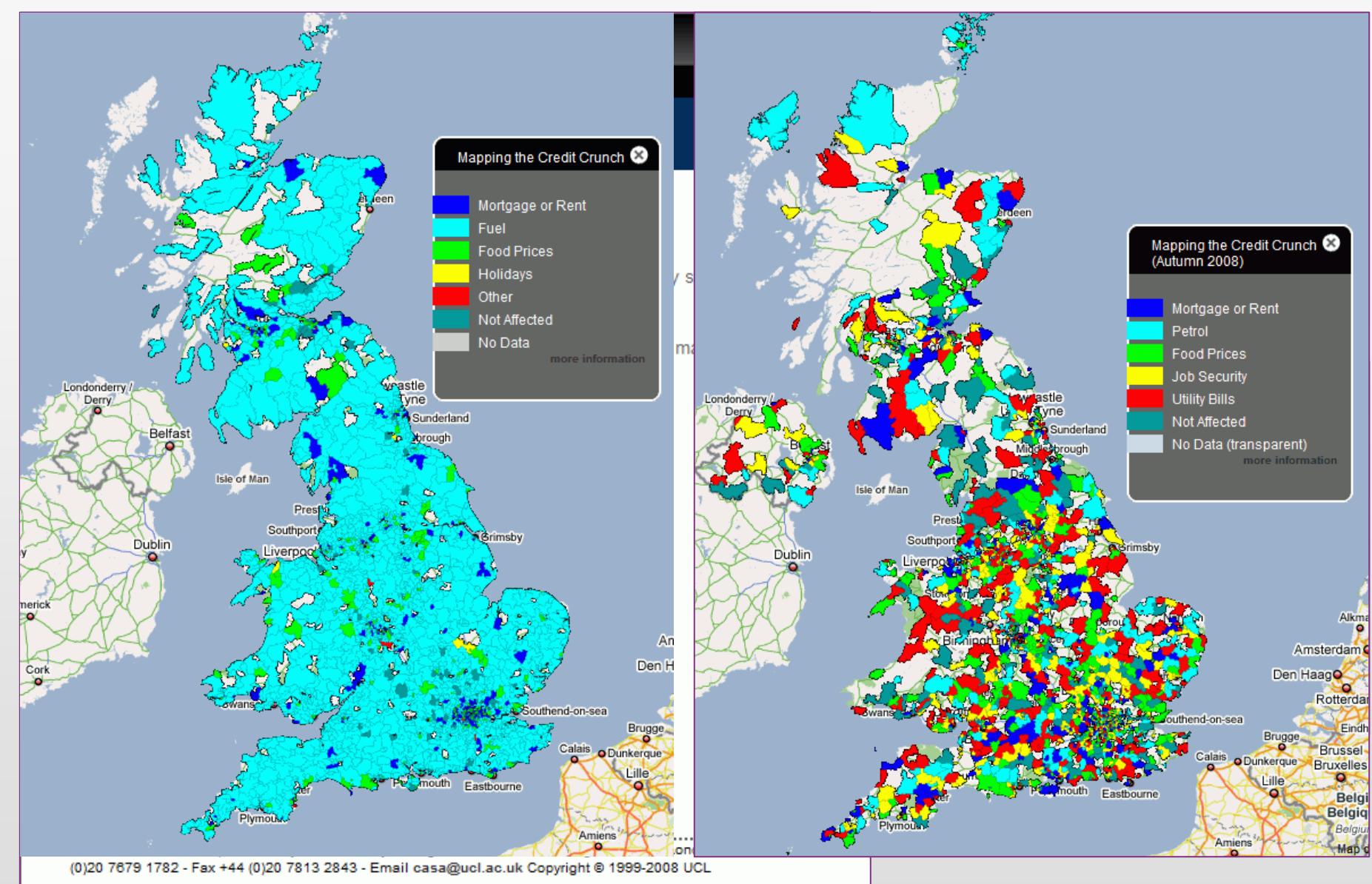
A new credit crunch survey started in October and currently has 3,802 responses.

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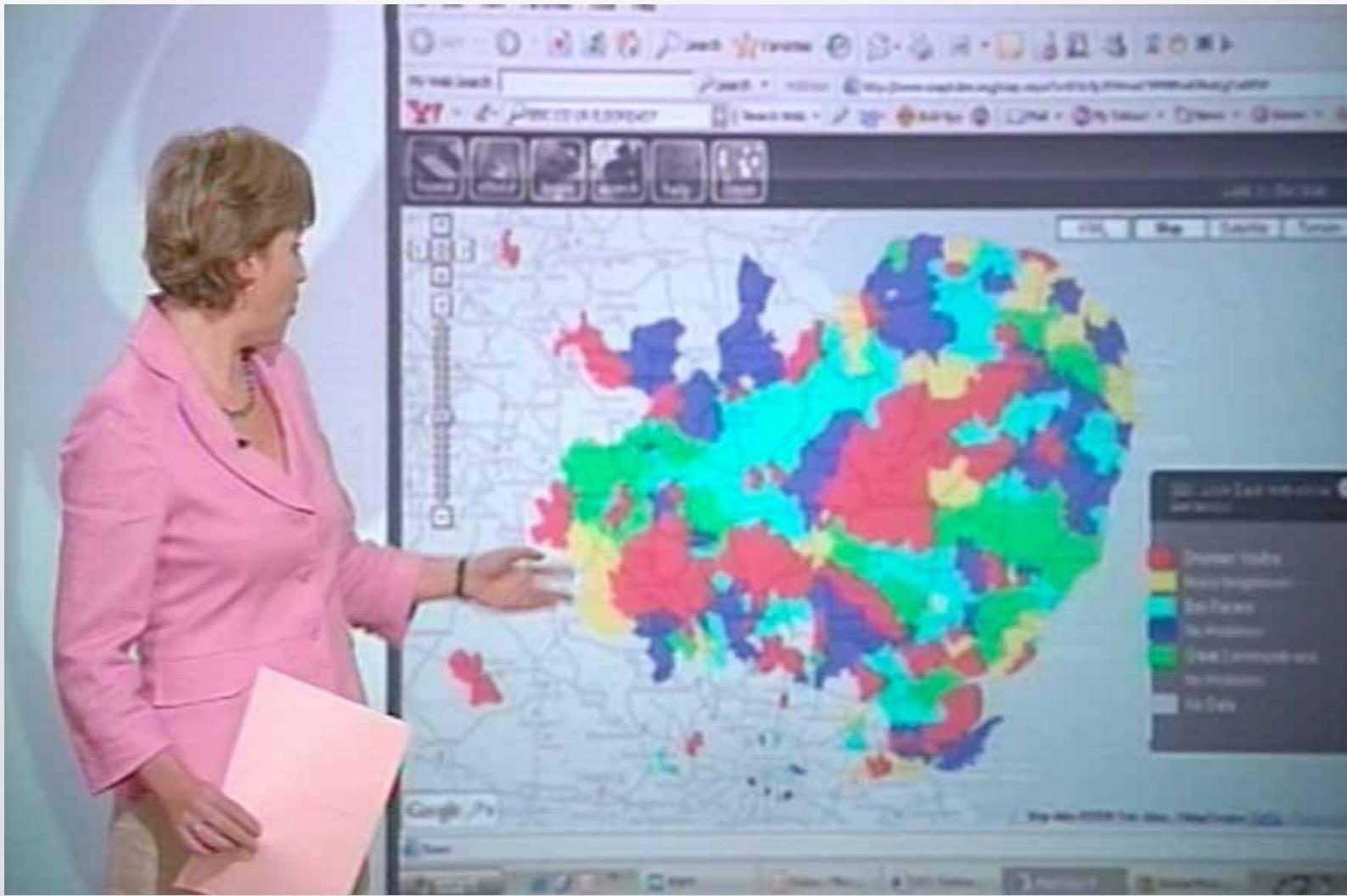
<http://www.maptube.org/creditcrunch/>



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## BBC Look East: Anti-Social Behaviour



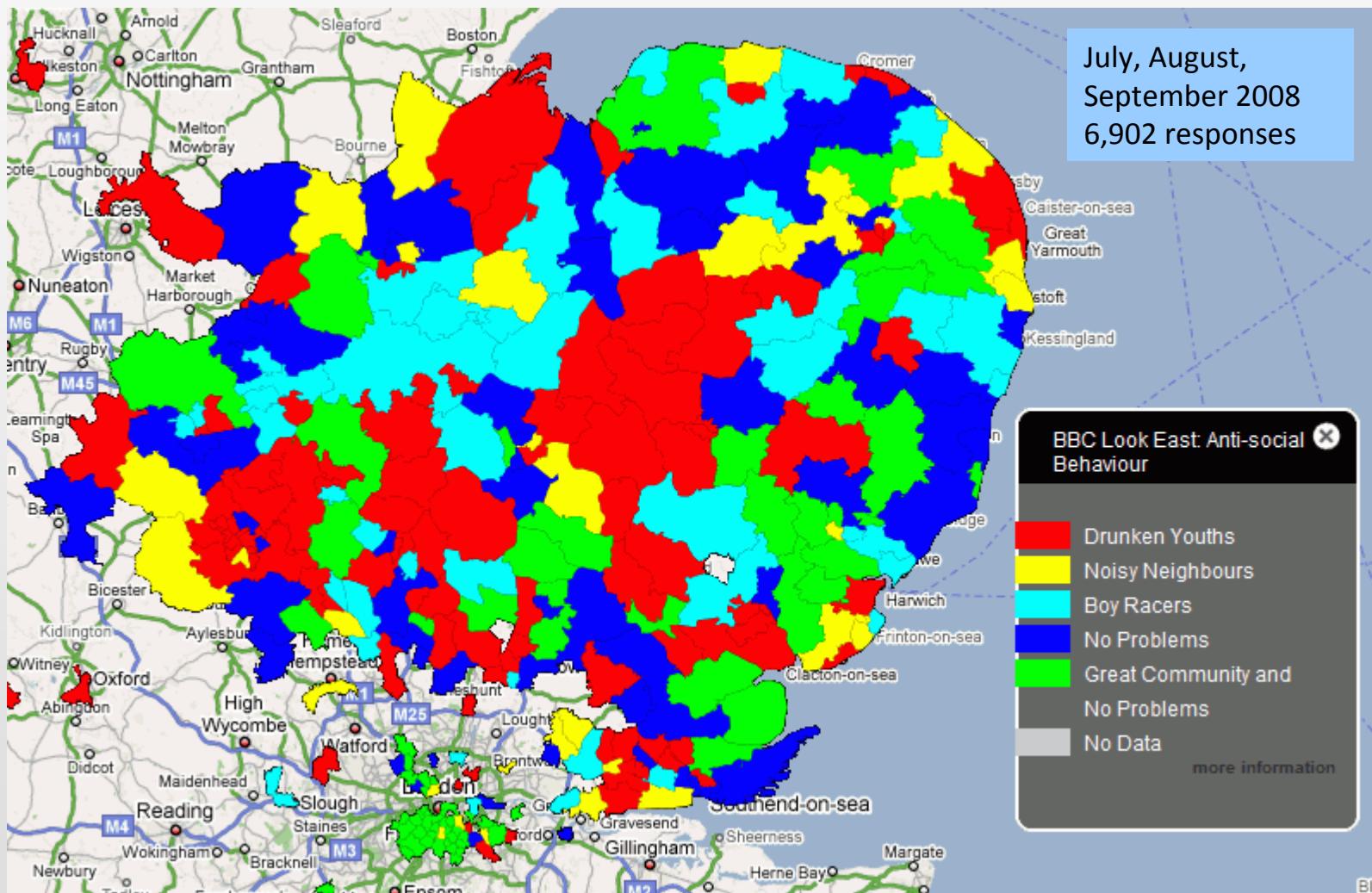
<http://www.maptube.org/lookeast>



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# BBC Look East: Anti-Social Behaviour



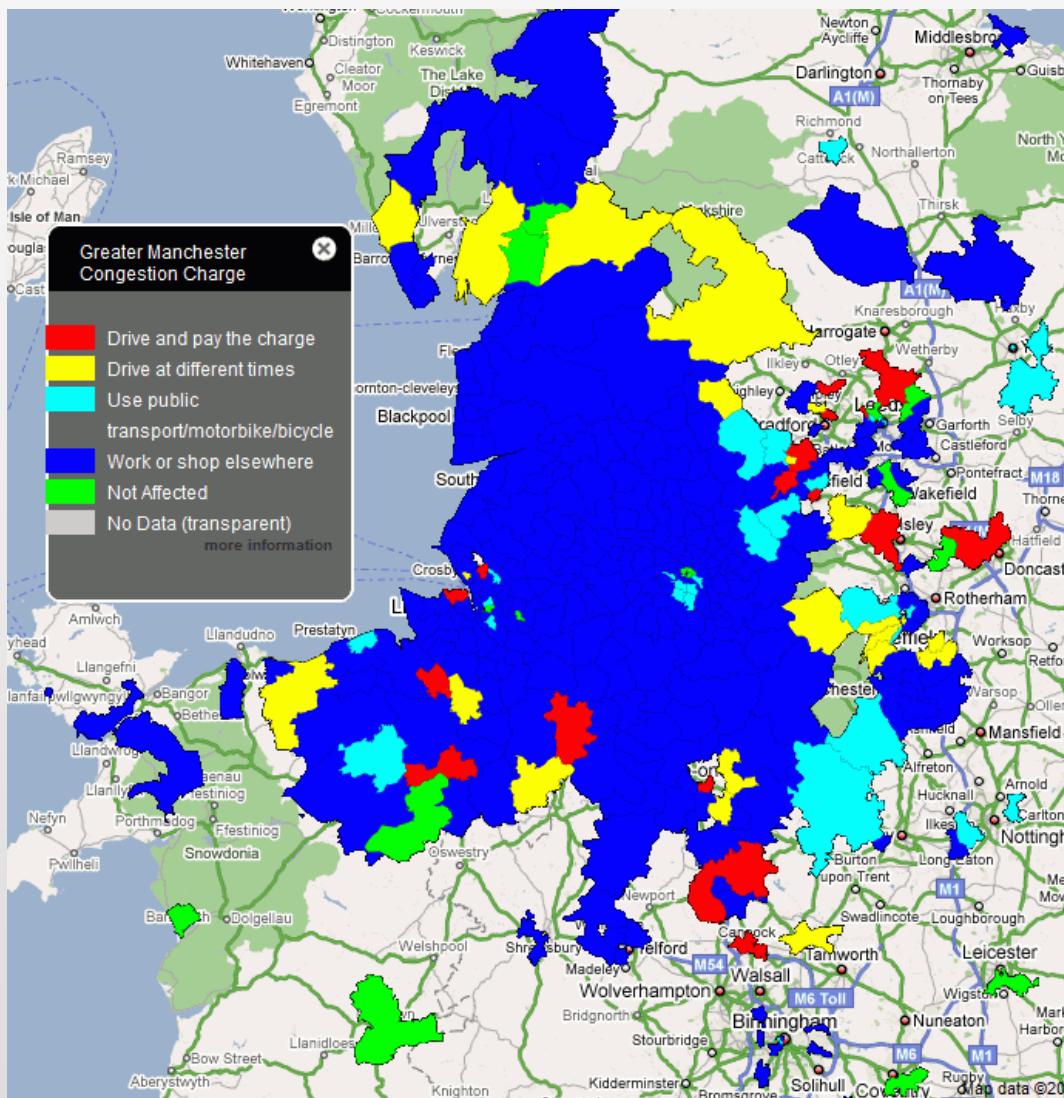
<http://www.maptube.org/lookeast>



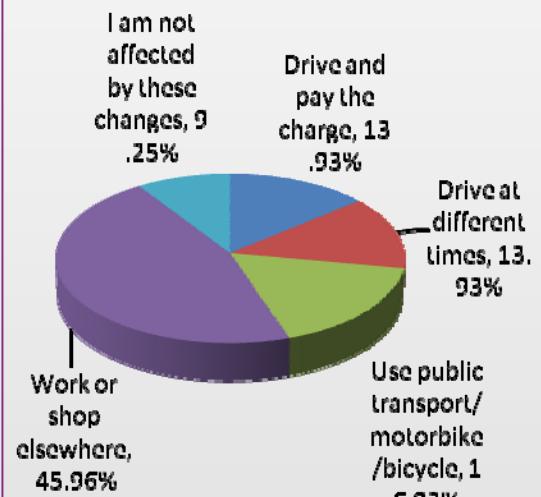
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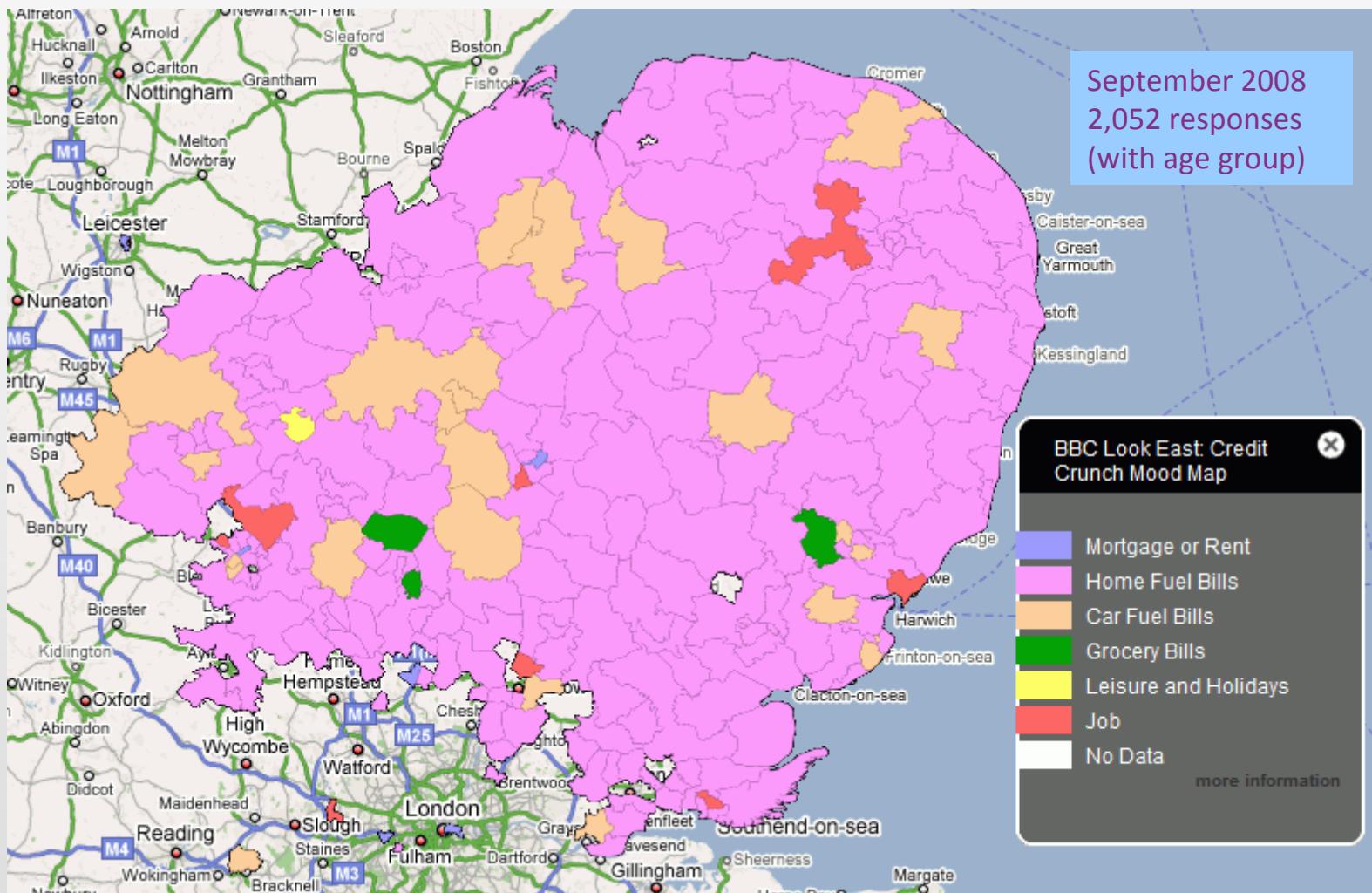
# Manchester Congestion Charge



15,902 responses  
October to December 2008



# BBC Look East: Credit Crunch



<http://www.maptube.org/LookEastCreditCrunch/>



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## *Data, Sensing, Capture, Extraction:*



Crowd-Sourcing: Survey Mapper let's you create a survey and mount it on the web; this is part of the BigDataToolkit

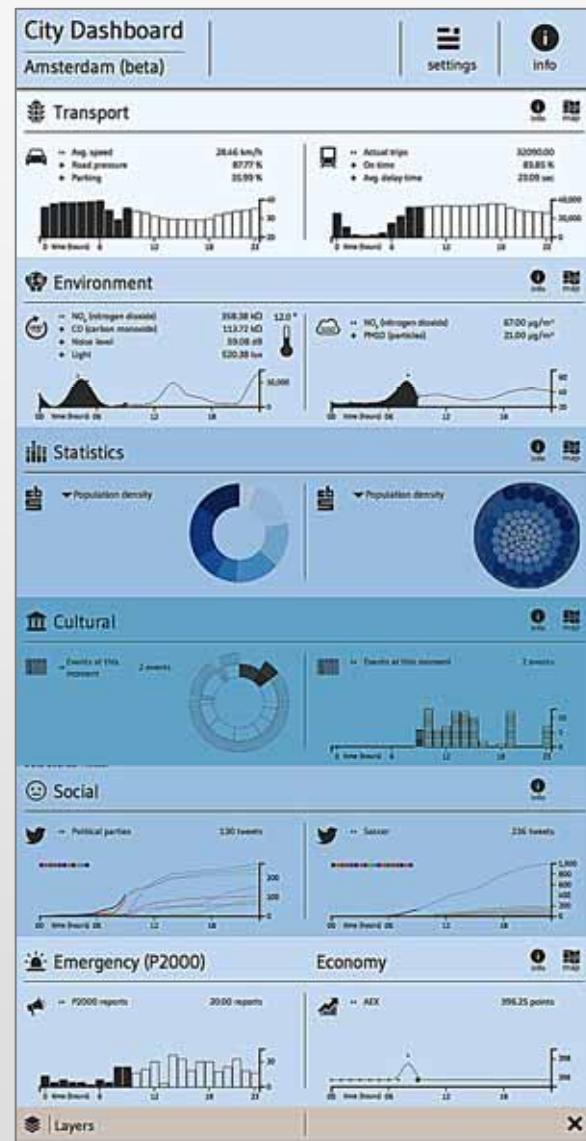
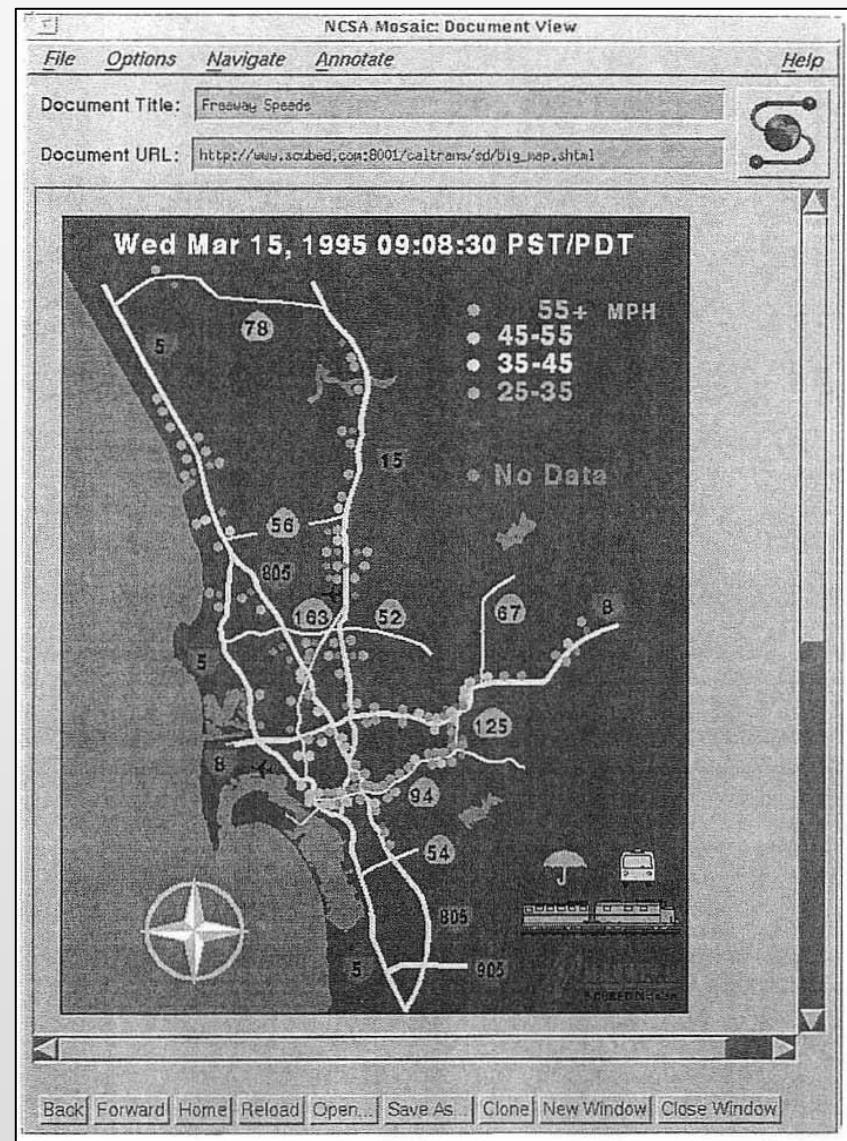


## Displaying Real Time Data: Dashboards

There are different types of dashboards ranging from simple portals showing state of a city in real time – without any analysis to more fully fledged analysis.

Let me refer you to a short article on smart cities and visualisation that we have and this will give you some background on dashboards. The most sophisticated have real time analytics involved but at one level these have been around for a long time. In fact my example in the first lecture I think it was or second of the San Diego Freeway system in 1995 is a kind of real time dashboard:





# London

51.51 N, 0.13 W

Sat 2 Feb @ 00:07:44

[Go to Map](#) - [Go to Grid](#) - [Change City](#)

## WEATHER STATIONS (MULTIPLE SOURCES)

STATION	WIND SPEED	WIND GUSTS	DIRECTION	TEMPERATURE	HUMIDITY	RAIN TODAY	PRESSURE	FORECAST
CASA Office: Bloomsbury W1	6.1 mph	4 mph	NE ↘	5.3 °C	81%	0.0 mm	1001.5 mbar	Clear Night
Hampstead NW3	6 mph	5.6 mph	NW ↗	4.2 °C	88%	0.0 mm	1000.0 mbar	Clear Night
Ben Cook: Bow E2	6.3 mph	7 mph	N ↖	5.0 °C	87%	0.0 mm	1003.1 mbar	Clear Night

## WEATHER (METAR)

London City Airport

WNW at 5 mph

5 C

## FORECAST (YAHOO! WTH)

Fri

6 C

Party Cloudy Wind

Sat

6 C

Mostly Sunny Wind

## TUBE LINE STATUS (TFL)

Bakerloo	Good Service
Central	Good Service
Circle	Good Service
District	Good Service
H & C	Good Service
Jubilee	Good Service
Metropolitan	Good Service
Northern	Good Service
Piccadilly	Good Service
Victoria	Good Service
W & C	Planned Closure <a href="#">more</a>
Overground	Good Service
DLR	Good Service

## BIKE SHARING (TFL)



## ON THE STREETS NOW (TFL)

249

Underground trains

## AIR POLLUTION (DEFRA)

	1 = Low	10 = V High	Ozone	NO <sub>2</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
Bloomsbury	1	2	1	1	1	1	1
Marylebone Rd	1	2	1	2	2	2	2
N Kensington	1	2	1	1	1	1	1

## RADS (CASA)

CASA Office Desk  
12 cpm (uncalibrated)

## RIVER LEVEL (PLA)

Thames (Tower Pier)  
1.54 metres

## STOCKS (YAHOO)

FTSE 100 Index  
6347.24  
+70.36 (1.11%)

## RANDOM TRAFFIC CAMERAS (TFL)



## BBC LONDON NEWS (BBC)

Detective jailed for Nowleak offer. Woman disfigured in acid attack. Shard's observation deck opens. Man stabbed in stomach at court. Stars oppose nightclub flats plan. Fraudster's motor insurance scam.

## OPENSTREETMAP UPDATES (OSM)

Connect up highways for routing and duplicated highways. Capture buildings. Fix broken turn restriction. Fix broken turn restriction. ITO World / OS Locator / Bing. ITO World / OS Locator / Bing.

## ELECTRICITY (N.GRID)

Demand (Great Britain)  
**33734 MW**

## MOOD (LSE MAPPINESS)

1% happier than the long term average for here  
5% unhappier than the whole country right now

## TWITTER TRENDS FOR LONDON

#UCAPTourMemories #GrahamNorton Jaws #nowplaying iPad America Cheers Instagram iPhone

## LONDON NEWS AND EVENTS (TWITTER)

Tom Edwards: London Underground Trainpeople agency staff to strike <http://t.co/PFOahA2i>

## LONDON UNIVERSITIES (TWITTER)

CityUniversityLondon: CityUnrulyversity is now open! You can find out more and sign up for sessions here <http://t.co/fvFCW4be> #cityunruly

[Twitter](#) 1,137 About



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Batty, M., Hudson-Smith, A., Hugel, S., and Roumpani, F. (2015) Visualising Data for Smart Cities, in Vesco, A., and Ferrero, F. (Editors) **Handbook of Research on Social, Economic, and Environmental Sustainability in the Development of Smart Cities**, IGI Global, Hershey, PA, 339-362.

I have placed this article on my blog at

<http://www.spatialcomplexity.info/files/2015/10/Visualising-Smart-Cities.pdf>



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## Extracting and Mapping Social Media Data

We have started to mine, map, interpret much social media because of the ease of its availability – and we have started looking at Short Text Messaging – Twitter data.

We have also begun to look at phone tracking data – from the iPhone for example but many of our data sets such as the bikes data, the Oyster card and such like data are really part of the same domain of new bottom up data. We have no control over this but some of the social media data we are mining we have greater control over. Here are some examples.

And Here is a Map of Tweets above London which uses our 3D model to visualise these data



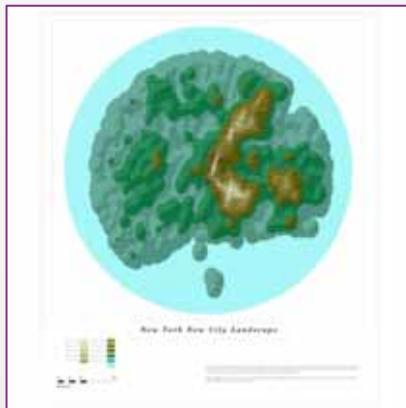


## London Twitter Cloud

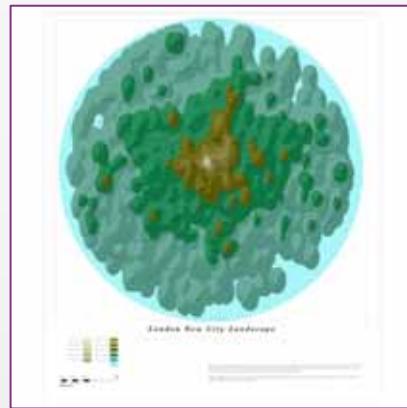


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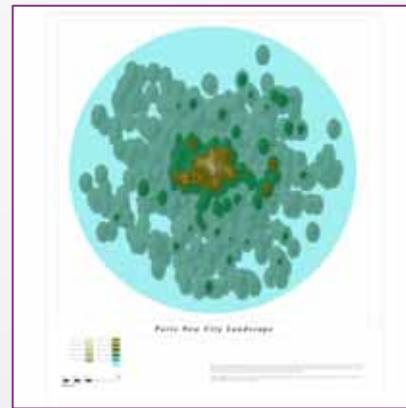




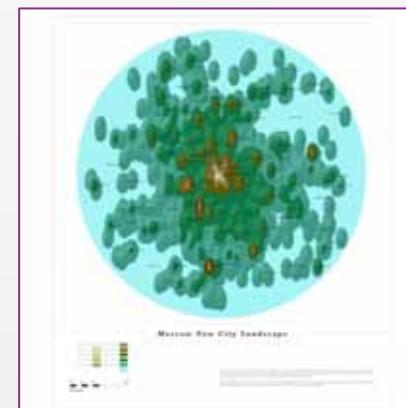
New York



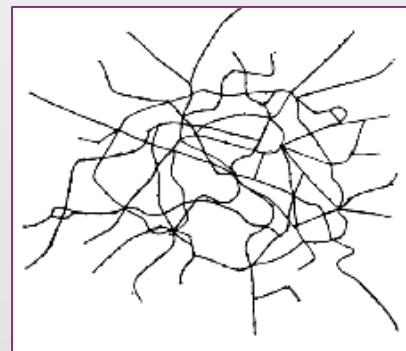
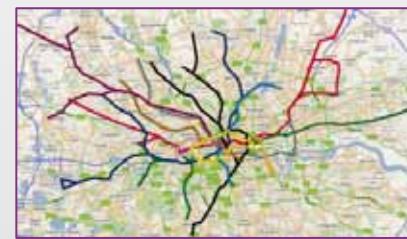
London

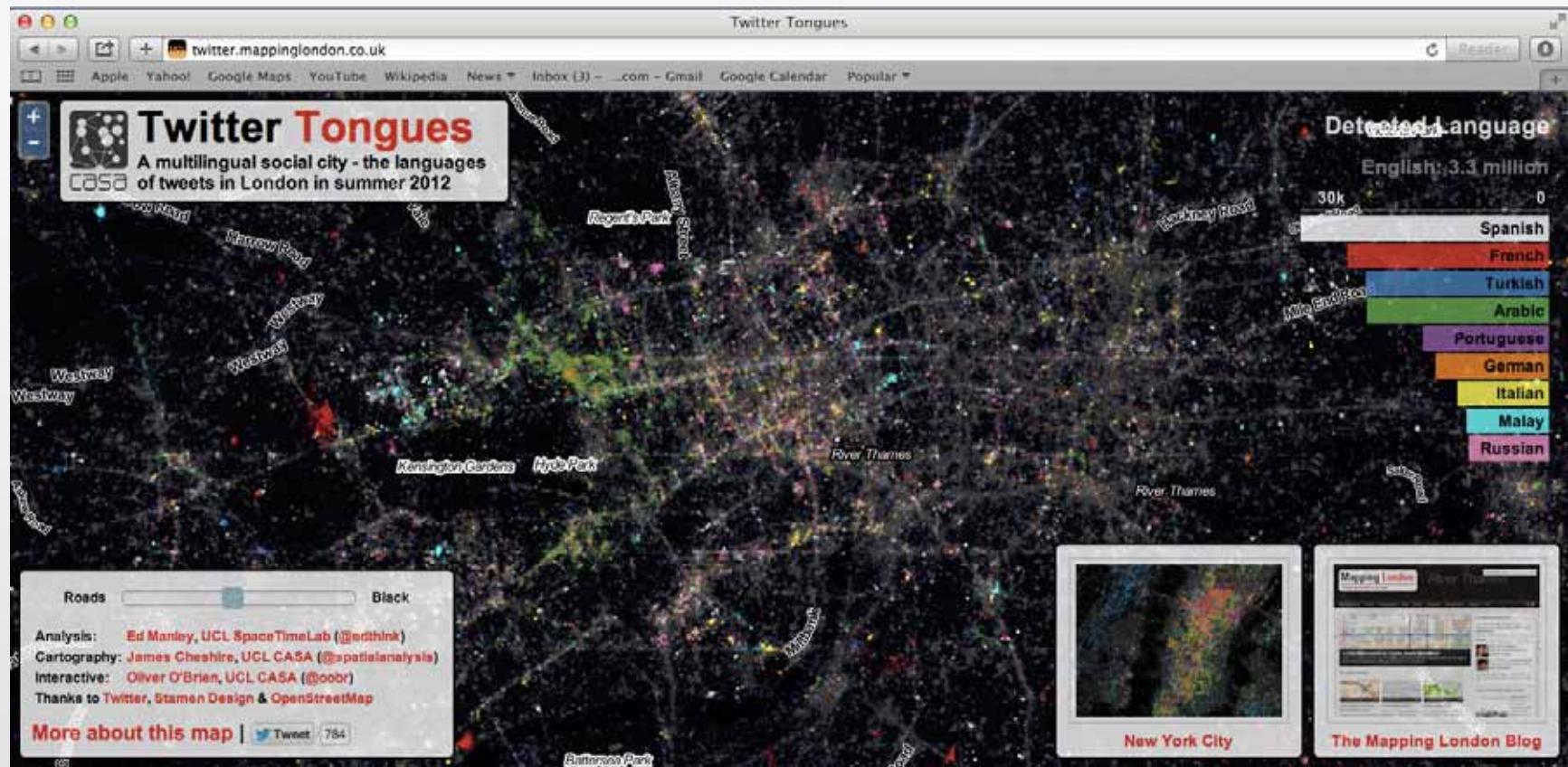


Paris



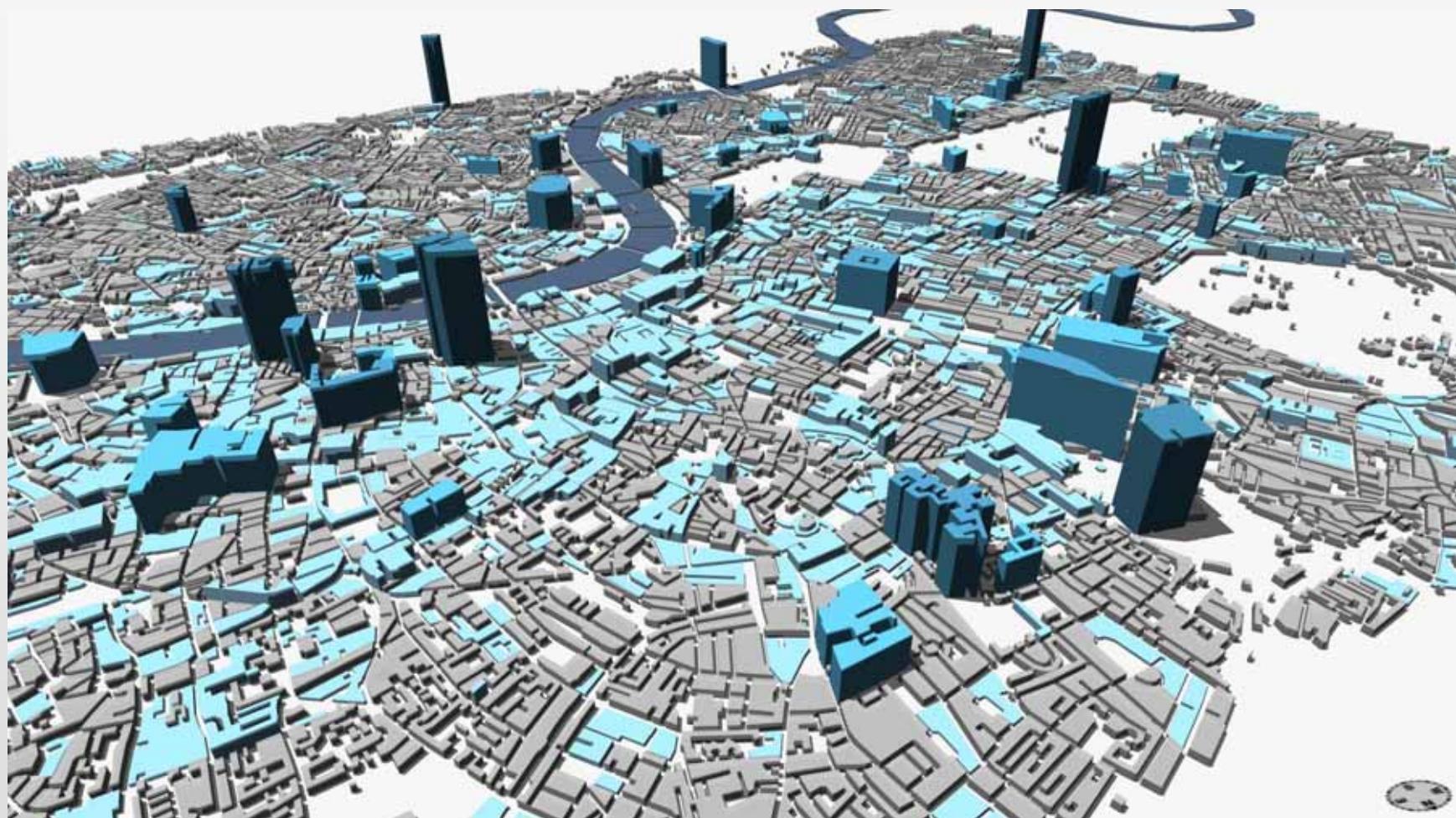
Moscow





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